STATE WILDLIFE ACTION PLAN

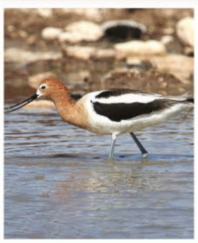
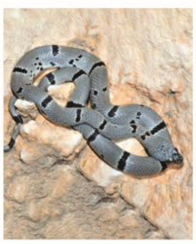
for New Mexico

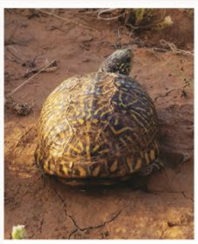
SEPTEMBER 2025

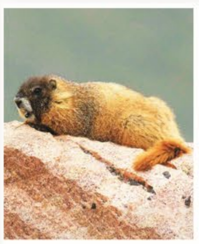








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GUNNISON'S PRAIRIE DOG *[Cynomys gunnisoni]* PHOTO James N. Stuart	**APLOMADO FALCON** *[Falco femoralisi]* PHOTO Gilbert Villegas	**ARIZONA TOAD** *[Anaxyrus microscaphus]* PHOTO Mark L. Watson	**AMERICAN PIKA** *[Ochotona princeps]* PHOTO Mark L. Watson	**GIANT SPOTTED WHIPTAIL** *[Aspidoscelis stictogramma]* PHOTO Mark L. Watson	**RIO GRANDE SILVERY MINNOW** *[Hybognathus amarus]* PHOTO United States Fish and Wildlife Service	**GREEN HERON** *[Butorides virescens]* PHOTO Mark L. Watson
AMERICAN AVOCET *[Recurvirostra americana]* PHOTO Mark L. Watson	**GRAY-BANDED KINGSNAKE** *[Lampropeltis alterna]* PHOTO Ian Latella	**BURROWING OWL** *[Athene cunicularia]* PHOTO Mark L. Watson	**NOEL'S AMPHIPODL** *[Gammarus desperatus]* PHOTO Brian Lang	**ORNATE BOX TURTLE** *[Terrapene ornata]* PHOTO Mark L. Watson	**BROAD-TAILED HUMMINGBIRD** *[Selasphorus platycercus]* PHOTO Mark L. Watson	**YELLOW-BELLIED MARMOT** *[Marmota flaviventris]* PHOTO Mark L. Watson

State Wildlife Action Plan for New Mexico

Recommended Citation:

New Mexico Department of Game and Fish. 2025. State Wildlife Action Plan for New Mexico. New Mexico Department of Game and Fish, Santa Fe, New Mexico, USA.

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Preface

This State Wildlife Action Plan (SWAP) for New Mexico represents the 2025 revised assessment of New Mexico's wildlife and their habitats by the New Mexico Department of Game and Fish (Department). It is based on a review and revision of the SWAP that was approved by United States (US) Fish and Wildlife Service (FWS) in 2017. Both the 2017 and 2025 SWAPs are non-regulatory planning documents that rely on the best available science, including the expert opinion of Department biologists, to provide a high-level view of the needs for and opportunities to conserve New Mexico's wildlife and their habitats. It looks at the variety of species and the range of habitats, their status, potential threats or constraints, and potential conservation actions to keep species secure. By synthesizing this information, the Department hopes to provide conservation practitioners with a document that can help them recognize needs, identify opportunities, and develop actions that can contribute to the conservation and enhancement of wildlife populations and their habitats in New Mexico. This document also qualifies the Department to participate in the USFWS's State Wildlife Grants (SWG) Program.

The SWAP addresses, and is organized around, the eight required elements identified by the SWG Program. The main components include: a brief overview of New Mexico; an identification and assessment of wildlife species and key habitats; a review of threats and potential conservation actions; an overview of climate change; detailed descriptions of the six ecoregions that make up the State; a review of monitoring efforts; plans for implementing the SWAP; literature cited; and appendices. The key themes of the document include wildlife species that warrant heightened attention (Species of Greatest Conservation Need; SGCN), the full suite of habitats found within New Mexico, what can be done to conserve them, and Conservation Opportunity Areas (COAs) where conservation efforts could be especially beneficial.

The Department staff reached out to interested entities and agencies with significant land-management, government, or educational responsibilities in New Mexico and whose staff have expertise relevant to the SWAP. Thirty-two state and federal agencies, Universities, non-profits, and other entities participated in a Core Team that met five times during the SWAP review and revision process and helped review draft SWAP content including the SGCN list, threats and climate change chapters, and the list of conservation actions. The various members of the Core Team brought diverse perspectives on, and knowledge regarding, species, important conservation actions, and threats to species and their habitats. Their reviews also reflect varying organizational mandates and opinions on desired outcomes from the SWAP. The members of the Core Team are identified in Appendix B.

Information about SGCN is found in Chapter 2, Chapters 4-11, Chapter 13, and Appendices E, F, and G. Key habitat information is introduced in Chapter 2, detailed habitat descriptions and the distribution of habitats within each COA can be found in Chapters 5-10. This document is organized around ecoregions, which are described in Chapter 2 and detailed in Chapters 5-10. Threats to species and habitats (excluding climate change and severe weather) are described in Chapter 3 and referenced in Chapters 5-10 and Appendix E. Climate change and severe weather are considered at a statewide level and are described and analyzed in Chapter 4 and information on vertebrate SGCN vulnerability to climate change is summarized in Appendix F. General conservation actions to address threats to habitats and species are described for each threat in Chapters 5-10. This document layout helps users approach conservation from the perspectives of species, habitats, ecoregions, threats and/or conservation actions. Information on these key elements can also be viewed online at https://nmswap.org.

Executive Summary

New Mexico is one of the most biologically diverse states in the nation, home to nearly 6,000 species of animals that occupy habitats from hot deserts to alpine tundra. Maintaining the viability of every species is difficult, and some have declined and are now listed as Threatened or Endangered under the Endangered Species Act. The State Wildlife Grants (SWG) and Tribal Wildlife Grants Programs were initiated by Congress as proactive and collaborative means to keep common species common. The New Mexico Department of Game and Fish (Department) began participating in SWG in 2002, when work began on the Department's Comprehensive Wildlife Conservation Strategy (CWCS). The CWCS was approved by the United States (US) Fish and Wildlife Service (FWS) in 2006. The CWCS was revised to be the State Wildlife Action Plan (SWAP) for New Mexico in 2016 and was approved by USFWS in 2017. These precursor documents and this current revised 2025 SWAP address eight required elements and fulfill SWG legislative requirements. The elements include:

1. the distribution and abundance of species of wildlife, including low and declining populations as each state fish and wildlife agency deemed appropriate, that are indicative of the diversity and health of wildlife of the State (in subsequent discussions, these species were referred to as Species of Greatest Conservation Need or SGCN);
2. the location and relative condition of key habitats and community types essential to the conservation of each state's SGCN;
3. the problems which may adversely affect SGCN or their habitats, and priority research and surveys needed to identify factors which may assist in restoration and improved conservation of SGCN and their habitats;
4. the actions necessary to conserve SGCN and their habitats and establish priorities for implementing such conservation actions;
5. the provisions for periodic monitoring of SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting conservation actions as appropriate to respond to new information or changing conditions;
6. each state's provisions to review its SWAP at intervals not to exceed 10 years;
7. each state's provisions for coordination during the development, implementation, review, and revision of its SWAP with Federal, State, and local agencies and Indian Tribes that manage significant areas of land or water within the State, or administer programs that significantly affect the conservation of species or their habitats; and
8. each state's provisions to ensure public participation in the development, revision, and implementation of its SWAP.

The SWAP is a non-regulatory planning document that provides a high-level overview of the status of species and habitats in New Mexico and will allow the State to receive federal aid to help secure the status of SGCN. It is also intended as a conservation blueprint to inform activities of Department partners in the conservation of SGCN and their habitats across the State. The Department relied on the best available science, including species experts, to assess and select species, habitats, threats, and conservation actions. The process began with review of the status of >1500 species catalogued in the Biota Information System of New Mexico (BISON-M; https://bison-m.org/). As a result of this assessment, 14 species were removed and 284 species were added to the 2017 SGCN list. Species were included on the revised list if they were or had recently been in decline or were vulnerable, endemic, disjunct, vulnerable specifically to climate change, and/or keystone. For each SGCN, New Mexico had to represent a substantive part of the species' range (i.e., New Mexico is part of the species' core range). Each SGCN was then placed into one of four categories to help guide conservation action implementation. The new SGCN list includes 67 Category F (Current Focal Species), 80 Category I (Conservation Impact Species), 302 Category D (Data Needs Species), and 56 Category L (Limited Conservation Opportunity Species) species .

New Mexico's size and biodiversity make statewide conservation planning and implementation impractical. Thus, threats and conservation actions were identified for each ecoregion. Conservation actions include: determining trends, distribution, and status of SGCN; restoring habitats and SGCN populations and gaining public support for these actions; reducing habitat fragmentation, anthropogenic disturbance, and the effects of climate change; and controlling and eradicating invasive species.

Ecoregion	**Areas of Concern and Conservation Actions**
Colorado Plateaus are dominated by sagebrush steppe and piñon-juniper woodlands.	Impact of industrial development, restoring suitable flows and riverine and riparian habitat for SGCN, and cheatgrass (*Bromus tectorum*) management.
Southern Rocky Mountains are dominated by montane forests and support the most cold-water streams.	Habitat loss and fragmentation from development, insect and disease impacts on trees, and restoring the natural role of fire in forests.
High Plains and Tablelands are dominated by shortgrass prairie.	Balancing cost-effective livestock and crop production with adequate habitat for SGCN, impacts of industrial and renewable energy development, and conserving and restoring aquatic and riparian habitats, especially playas.
Chihuahuan Desert is dominated by desert and semi-desert shrublands and grasslands.	Balancing cost-effective livestock and crop production with SGCN habitat, impact of industrial and renewable energy development, and conserving and restoring aquatic and riparian habitats.
Madrean Archipelago is dominated by desert and semi-desert shrublands and grasslands and supports unique Madrean forests and woodlands.	Balancing cost-effective livestock and crop production with adequate habitat for SGCN, groundwater withdrawal, restoring the natural role of fire, and effects of border enforcement activities.
Arizona/New Mexico Mountains are dominated by conifer forests and woodlands.	Aquatic and riparian habitat conservation and restoring the role of fire in forest ecosystems.

New Mexico's SWAP catalogs the state of our knowledge about native wildlife, threats to their habitats, and strategies to mitigate or manage those threats. Thus, the SWAP is comprehensive in scope and strategic in nature. The issues addressed and the actions outlined in this SWAP cross political, jurisdictional, and ecological boundaries. Commitment, coordination, and communication among the diverse parties involved are critical to the collaborative conservation success that the SWAP describes and aims to achieve.

The Department engaged the public through three presentations to the New Mexico State Game Commission, two hybrid public meetings before which a draft list of SGCN was posted for review and comment, and posting a final draft of the SWAP for public comment.

The Commission-approved SWAP was submitted to USFWS for review and approval on 30 September 2025. Once approved, the Department is eligible to receive SWG funds to implement the SWAP through 2035.

Table of Contents

List of Tables

List of Figures

Acknowledgments

Members of the Core Team for the 2025 State Wildlife Action Plan (SWAP) for New Mexico review and revision included a total of 50 individuals representing 32 unique organizations (see Appendix B). Members of the Core Team for the 2017 SWAP review and revision included V. Seamster, New Mexico Department of Game and Fish (Department); A. Franklin and D. Sarabia, New Mexico Environment Department; C. Montoya-Hendricks, New Mexico State Land Office; R. McCollough and E. Muldavin, Natural Heritage New Mexico (NHNM), University of New Mexico (UNM); K. Boykin, Center for Applied Spatial Ecology, and S. Smallidge, Range Improvement Task Force, New Mexico State University; M. Porter, United States (US) Army Corps of Engineers; L. Bonner and K. Granillo, US Fish and Wildlife Service (USFWS); B. Dykstra, US Forest Service (USFS); M. Ramsey, US Bureau of Land Management; M. Wrigley, US National Park Service; and B. Dunn, contracted consultant/writer.

The 2025 SWAP review and revision was based on updating the content of the 2017 SWAP; few major structural changes were made; Habitat Descriptions were reformatted to be more consistent across habitats and their content easier to access; all habitats that occur in each ecoregion were included in habitat x threat tables in each ecoregion chapter; one Appendix that listed external experts that were consulted in the preparation of the 2017 SWAP was removed and acknowledgements of external experts consulted for the 2025 SWAP added here; a new format was used for Appendix E; a new appendix focused on Species of Greatest Conservation Need (SGCN) climate vulnerability was added (Appendix F); and the focal content of a few extant appendices (Appendices A, B, C, and D) was modified to better reflect the agency, tribal, and public engagement work performed for the 2025 revision.

B. Dunn (contracted consultant/writer) served as the primary author of the 2017 SWAP except for Chapter 4 (Climate Change - written by M. Friggens, USFS, and C. Hayes, V. Seamster, and M. Volke, Department), Preface and Chapter 12 (Implementation, Review, and Revision – written by M. Wunder, Department), and Chapter 11 (Monitoring – written by M. Watson [Department] and M. Wunder). E. Muldavin reviewed and revised the Habitat Descriptions in Chapters 5 through 10 in 2017 and 2025, with support from A. Kennedy (NHNM) in 2025, and reviewed and revised Table 7 and the terrestrial habitats tables in Chapters 5 through 10 in 2025 with support from A. Urbanovsky (NHNM). C. Hayes and L. Pierce (Department) produced Appendix E in 2017 and R. Norwood, J. Smith, and A. Subedi (NHNM) updated it in 2025. 2025 maps were created by M. Friggens (climate change refugia), C. Gonzalez (NHNM; terrestrial habitats, Conservation Opportunity Areas [COAs], Riparian COAs [RCOAs], climate change refugia in COAs), K. Howley (Department; land stewardship, ecoregions, aquatic habitats, threats to SGCN, climate change), and M. Stevens (Utah Department of Natural Resources; western yellow-billed cuckoo [*Coccyzus americanus occidentalis*]). E. Muldavin provided quality control of 2025 terrestrial habitat maps and text to describe RCOAs with contributions from C. Gonzalez. C. Gonzalez, E. Milford (NHNM), and E. Muldavin contributed to the development, rating, and quality control of RCOAs. R. McCollough provided needed data about SGCN and reviewed COA narratives for the 2017 SWAP. M. Friggens and E. Muldavin provided information on climate refugia and climate change impacts for COAs in the 2025 SWAP. M. Horner (NHNM) developed and used a geospatial model to identify COAs in 2017 and C.

Gonzalez and E. Muldavin updated the data processing steps and COA boundaries (including adding new COAs and removing some from the 2017 SWAP) in 2025. C. Gonzalez updated the underlying datasets used to delineate COAs, habitat associations, and description of COAs and R. Norwood updated SGCN associations for COAs in 2025. K. Bagne and J. Triepke (USFS) contributed to climate change assessments in 2017 and S. Mladinich (South Central Climate Adaptation Science Center) provided climate impact-related data and references for the climate change and ecoregion chapters in 2025. J. Fraser, C. Jackson, J. Kindle, M. Marshall, A. Pullin, and D. Robinson (Natural Resources Institute at Texas A & M University) performed a climate change vulnerability assessment for all vertebrate SGCN in 2025; this assessment was supported in part by an anonymous donor. Additional contributors in 2017 included P. Darr, S. Liley, K. Madden, K. Patten, M. Ruhl, J. Stuart, D, Trujillo, and D. Weybright, Department.

All chapters of the 2017 SWAP were reviewed and revised as needed by V. Seamster for the 2025 SWAP revision. D. Vaughan, Department, reviewed all revised chapters for errors and consistency with Associated Press style. R. Baca, Department, did graphic design updates for the 2025 SWAP. Significant content additions and reviews for the 2025 SWAP were contributed by the following Department employees: E. Duvuvuei (SGCN list, habitat associations, monitoring, regional chapter), R. Kellermueller (threats chapter, conservation actions), J. Marchetti (threats chapter, conservation actions), L. Pierce (SGCN list, habitat associations, monitoring, regional chapter), J. Stuart (SGCN list, habitat associations, monitoring, regional chapter), M. Watson (threats chapter), J. Wick (SGCN list, habitat associations, monitoring, regional chapter). R. Norwood developed a query used in updating the SGCN list for the 2025 SWAP and updated SGCN x habitat, SGCN x ecoregion, and habitat x threat associations. J. Smith supervised data entry efforts associated with the SGCN selection process in 2025 and, with support from E. Nakhla (NHNM), developed species descriptions for use on the companion New Mexico SWAP website (https://nmswap.org/). D. Basail-Nicolaisen, M. Carver, and G. Peters (NHNM) performed data entry that informed the 2025 SGCN selection process. Significant additions to the SGCN list were provided by J. Frey (NMSU) and 11 of her colleagues comprising the New Mexico Mammal Conservation Advisory Group. Pollinating insect SGCN, associated threats and habitats, and information on species monitoring were identified through the work of Q. Baine. S. Doneski, and D. Lightfoot (Museum of Southwestern Biology, UNM), and A. Walker (New Mexico BioPark Society). The following experts were consulted regarding the pollinating insect SGCN list: K. Burls, S. Killingsworth, and C. Fallon (Xerces Society), S. Cary and J. Tuttle (Private Individuals), J. Gruber (Friends' Central School), C. Harp (Colorado State University), E. Metzler (in memoriam), D. Wagner (University of Connecticut), and K. Wright (Washington State Department of Agriculture). A. Subedi performed data entry relevant to pollinating insect SGCN. A terrestrial mollusc expert, K. Perez (University of Texas Rio Grande Valley), was consulted regarding the 2025 list of terrestrial mollusc SGCN.

Y. Chauvin, M. Lavin, C. Light, NHNM, and M. Watson contributed photos of habitats. L. Pierce contributed a photo by C. Painter (formerly Department) of the western river cooter (*Pseudemys gorzugi*). Photos from B. Lang (formerly Department), I. Latella (Arizona Game and Fish Department), J. Stuart, USFWS, G. Villegas, and M. Watson appear on the cover designed by R. Baca.

Acronyms

Acronym[1]	Name
AFWA	Association of Fish and Wildlife Agencies
AGFD	Arizona Game and Fish Department
BLM	US Bureau of Land Management
BOR	US Bureau of Reclamation
CBP	US Customs and Border Protection
CEC*	Commission for Environmental Cooperation
COA	Conservation Opportunity Area
Commission	New Mexico State Game Commission
CONUS*	Continental United States
CWCS	Comprehensive Wildlife Conservation Strategy
Department	New Mexico Department of Game and Fish
DHS*	US Department of Homeland Security
DOD	US Department of Defense
DOE	US Department of Energy
EMNRD	New Mexico Energy, Minerals, and Natural Resources Department
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
ESRI*	Earth Systems Research Institute
IUCN	International Union for the Conservation of Nature
LBNL*	Lawrence Berkeley National Laboratory
NASA*	US National Aeronautics and Space Administration
NHD	National Hydrography Dataset
NHNM	Natural Heritage New Mexico
NMBGMR	New Mexico Bureau of Geology and Mineral Resources
NMDOT	New Mexico Department of Transportation
NMDA	New Mexico Department of Agriculture
NMED	New Mexico Environment Department
NMISC	New Mexico Interstate Stream Commission
NMOSE	New Mexico Office of the State Engineer
NMSP	New Mexico State Parks
NMSU	New Mexico State University
NOAA*	US National Oceanic and Atmospheric Administration
NPS	US National Park Service
NRCS	US Natural Resources Conservation Service
NSF	US National Science Foundation
NWR	National Wildlife Refuge

[1] Acronyms marked with an * may only appear in the lists of data sources for maps presented throughout this document.

Acronym[1]	Name
OHV	Off-Highway Vehicles
SFD	New Mexico State Forestry Division
SGCN	Species of Greatest Conservation Need
SLO	New Mexico State Land Office
SWAP	State Wildlife Action Plan
SWCD	Soil and Water Conservation District
SWG	State Wildlife Grants
TNC	The Nature Conservancy
UNM	University of New Mexico
US	United States
USACE	US Army Corps of Engineers
USEIA	US Energy Information Administration
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
USNVC	US National Vegetation Classification
WSMR	White Sands Missile Range

Chapter 1: New Mexico State Wildlife Overview

BIODIVERSITY

New Mexico is the fifth largest state in the United States (US) and one of the five most biologically diverse. Within its 315,194 km^2 (121,589 mi^2), which span elevations of 867-4,013 m (2,844 -13,161 ft), are hot and cold deserts; short and mid-grass prairies; oak (*Quercus* spp.) and piñon (*Pinus* spp.) -juniper *(Juniperus* spp.) woodlands; pine (*Pinus* spp.), mixed-conifer, and spruce (*Picea* spp.)-fir (*Abies* spp.) forests; and alpine tundra (Figure 4). Although relatively arid, the state also supports a variety of aquatic environments including 6,914 km (4,296 mi) of cold-water, and 6,560 km (4,076 mi) of warm-water, perennial streams, and 170 publicly accessible lakes, reservoirs, and ponds (Figure 5). In total, New Mexico's terrestrial and aquatic ecosystems support 3,783 species of vascular plants (Allred and Ivey 2012) and nearly 6,000 species[2] of animals (https://bison-m.org/). Included among the animals are species, such as the jaguar (*Panthera onca arizonensis*), with large ranges of which New Mexico is part of the boundary. The jaguar's historic breeding range extended from South America into southern New Mexico. The state also hosts many narrowly endemic species with extremely small ranges. These include the White Sands pupfish (*Cyprinodon tularosa*), whose entire range is in the Tularosa Basin of south-central New Mexico.

CONSERVATION CHALLENGES

The Department is mandated to conserve, regulate, propagate, and protect wildlife and fish within the State. This is a complex task considering the diversity of land stewards (Figure 1), limited budgets, and the challenge of mitigating the influence of approximately 2.1 million New Mexicans. Roughly 27% of these citizens reside in metropolitan Albuquerque and half reside in 10 cities, leaving most of the state relatively sparsely populated. In addition to resident New Mexicans, millions of people visit the State each year, many of whom find wildlife and their habitats positive components of the landscape. The presence of these visitors also influences wildlife and their habitats. Although most human activity occurs in urban areas, wildlife still can be adversely affected by these activities throughout the State, particularly through land uses that degrade or eliminate wildlife habitat. As a result, some species populations may decline enough to jeopardize their continued existence. If this happens, it could result in the species being considered for listing as Threatened or Endangered through the New Mexico Wildlife Conservation Act or federal Endangered Species Act. Land use and human activities within designated critical habitat of federally listed species may be restricted. Because of this, additional species listings, and subsequent actions to recover listed species, can become controversial, contentious, and expensive.

As of early 2025, over 1,675 animal and plant taxa were listed as Threatened or Endangered in the US under the federal Endangered Species Act and 14 were being considered as candidates

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[2] In this document, the term species refers to both species and sub-species.

for listing in the US (https://ecos.fws.gov/ecp/report/species). These statistics certainly indicate the need for an alternative adaptive management approach, one through which species can be conserved at levels where listing and costly recovery actions are not needed.

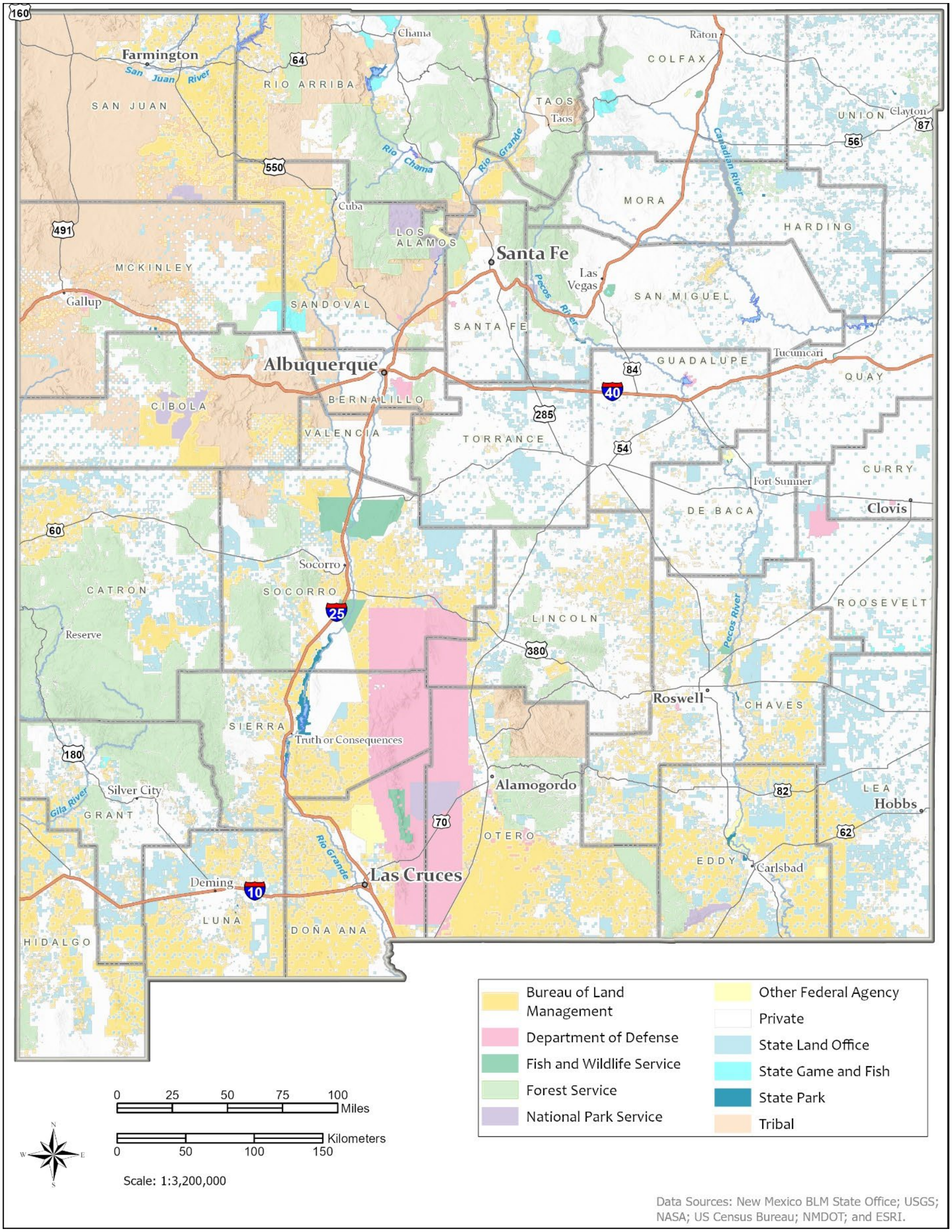


Figure 1. Land stewardship: owners and managers of New Mexico's land.

THE STATE AND TRIBAL WILDLIFE GRANTS PROGRAM

An alternative adaptive management approach for New Mexico's wildlife came into existence in 2001 when Congress passed legislation creating the State Wildlife Grants (SWG) Program. This program is a proactive, collaborative effort to provide guidance and assistance in conserving species at population levels that ensure long-term persistence, thereby preventing the need for federal species listing decisions. From 2002 to 2024, over $1.2 billion were allocated to states for this purpose (https://www.fws.gov/program/state-wildlife-grants). These funds were apportioned to states on the basis of state land area and population. Funds available to New Mexico averaged about $1 million per year. Full participation by the Department in the SWG Program and use of SWG funds to benefit Species of Greatest Conservation Need (SGCN) began in October 2005 with completion of a Comprehensive Wildlife Conservation Strategy (CWCS) and approval of that plan in 2006 by the US Fish and Wildlife Service (USFWS). That participation continued following the submission of a revised State Wildlife Action Plan (SWAP) for New Mexico in 2016 and approval by USFWS in 2017. The CWCS and 2017 SWAP provided: (1) strategies that interested federal, Tribal, state, and local governments and private entities could consider when planning their conservation efforts; (2) important insights about long-term needs of New Mexico's wildlife; (3) ecologically based, strategic approaches to conservation that help maintain populations at sustainable levels; and (4) venues for public engagement necessary to ensure involvement in, as well as acceptance and implementation of, conservation strategies.

ACCOMPLISHMENTS

There have been many specific accomplishments as a result of guidance provided by the SWAP from 2017 to 2024. Over $800,000 of $7.3 million of SWG funds allocated to the Department (https://www.fws.gov/program/state-wildlife-grants) were matched with state funds through the Department's Share with Wildlife (SwW) program; 90% of those dollars funded more than 30 research projects focused on SGCN and their habitats (https://bison-m.org/ContractSearch.aspx). Projects, and rough federal funding levels, supported by SWG funds matched with other state monies benefitted amphibians and reptiles (one ongoing amphibian and reptile SGCN program management grant, $600,000), fish (one survey/research, $100,000; three management/recovery, two of which are ongoing grants, $2,000,000), and invertebrates (one ongoing aquatic invertebrate management/recovery grant, funds lumped with an ongoing fish management/recovery grant). Also funded were two aquatic habitat-improvement projects to benefit fish (Mimbres River and Rio Costilla drainages, $750,000) and three aquatic habitat construction projects to benefit fish, including a fish passage structure along the Pecos River, a fish barrier, and a refugia pond ($775,000); coordination of the SwW program ($200,000); development of species distribution models for 37 SGCN and focused occurrence data compilation for 21 SGCN ($600,000); preparation and release of the New Mexico SWAP website ($75,000; https://nmswap.org/); and review and revision of the 2017 SWAP ($1,000,000).

Conservation Progress for the Western River Cooter

The western river cooter (*Pseudemys gorzugi*) is a turtle found along the Pecos and Black Rivers in southeastern New Mexico and is listed as Threatened by the Department. Populations have declined in New Mexico due to stream dewatering, vegetation loss, and pollution, as well as direct mortality resulting from illegal recreational shooting (BISON-M 2024). From 2017-24, SWG funds were used to support three years of surveys for the western river cooter on the Black, Delaware, and Pecos Rivers. These surveys initiated development of a population model for this species (Mali and Duarte 2024), identified turtles in the process of nesting, documented juvenile turtles (a sign of successful reproduction), and documented a population of turtles approximately 80 km (50 mi) north of the previously known northernmost edge of this species' distribution. These findings contributed to the USFWS's determination that this species was not warranted for federal listing in 2022 (USFWS 2022b).

REQUIRED ELEMENTS OF THE PLAN

Each state is required to revise its SWAP at least once every 10 years. This 2025 SWAP for New Mexico is the review and revision of the 2017 SWAP and addresses the following eight elements required by the SWG Program:

1. the distribution and abundance of species of wildlife, including low and declining populations as each state fish and wildlife agency deemed appropriate, that are indicative of the diversity and health of wildlife of the State (in subsequent discussions, these species were referred to as SGCN);
2. the location and relative condition of key habitats and community types essential to the conservation of each state's SGCN;
3. the problems which may adversely affect SGCN or their habitats, and priority research and surveys needed to identify factors which may assist in restoration and improved conservation of SGCN and their habitats;
4. the actions necessary to conserve SGCN and their habitats and establish priorities for implementing such conservation actions;
5. the provisions for periodic monitoring of SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting conservation actions as appropriate to respond to new information or changing conditions;
6. each state's provisions to review its SWAP at intervals not to exceed 10 years;
7. each state's provisions for coordination during the development, implementation, review, and revision of its SWAP with Federal, State, and local agencies and Indian Tribes that manage significant areas of land or water within the State, or administer programs that significantly affect the conservation of species or their habitats; and
8. each state's provisions to ensure public participation in the development, revision, and implementation of its SWAP.

SWAP DEVELOPMENT PROCESS

Twenty-nine Pueblos, Tribes, and Nations were invited to consult on the 2025 SWAP in May 2023 (Appendix A). One Nation and one Pueblo requested in-person meetings, and a new section focused on Tribal wildlife management in New Mexico was developed for the SWAP based on these conversations (see Chapter 2). Thirty-three unique state and federal agencies, universities, non-profits, and other entities were invited from September through November 2023 to join a Core Team that directly contributed to developing the 2025 SWAP (Appendix B). Fifty individuals were consistently invited to Core Team meetings and 45 attended at least one of the five Core Team meetings that took place between December 2023 and February 2025. Agencies and universities represented on the Core Team included: US Army Corps of Engineers; US Bureau of Land Management; US Bureau of Reclamation; US Department of Energy; US National Park Service; US Forest Service; USFWS; New Mexico Highlands University; New Mexico State University; New Mexico Tech; University of New Mexico; Western New Mexico University; Interstate Stream Commission; New Mexico Department of Energy, Minerals, and Natural Resources; New Mexico Environment Department; and New Mexico State Land Office.

Data gathering for the SWAP began in August 2023, when the Department and staff at Natural History New Mexico (NHNM) began reviewing and revising the criteria and process for selecting SGCN. The Department and NHNM crosswalked between selection criteria and information available on just over 7,000 species in the Biota Information System of New Mexico (BISON-M; https://bison-m.org/), 1,653 of which are found in New Mexico and are within the non-insect taxonomic categories for which the Department has management authority (mammals, birds, reptiles, fish, amphibians, molluscs, and crustaceans) or are pollinating insects (bees, beetles, butterflies, flies, and moths). They used a complex database query to generate an initial list of 500 potential non-insect SGCN for review by internal Department staff. Following this internal review, the Core Team evaluated the draft list of 406 non-insect SGCN and taxon experts outside the Core Team (see Acknowledgements section) were invited to review the draft list of 102 terrestrial molluscs. In June 2024, a draft list of 86 pollinating insect SGCN was sent to the Core Team to review and a draft list of 499 SGCN, including pollinating insects, was posted for public comment, along with a description of SGCN selection criteria and categories. Thirty-three individuals attended one of the two hybrid public meetings held in July 2024, one each in Albuquerque and Las Cruces, and the Department received a total of 25 written comments during the public comment period. Public meeting attendees and individuals submitting written comments represented 23 organizations (Appendix C). The SGCN list was considered final at 505 species in October 2024.

The Department informed the New Mexico State Game Commission (Commission) and public about progress and direction of the SWAP in August 2023 and 2024.. The purpose of these presentations was to explain the background and process for reviewing and revising the SWAP and provide an overview of the draft SGCN list. A completed draft was made available for public comment from 8 May through 9 June 2025. The draft was revised based on the comments received (Appendix D) and then presented to the Commission for approval on XX 2025.

The Commission requested XX.

The Department submitted the final Commission-approved SWAP to USFWS for review and approval on 30 September 2025. Once approved, the SWAP ensures that the Department is eligible to receive available SWG funds through 2035. Underlying these efforts will be continued assessment of SGCN and adaptation of actions to address evolving conservation challenges. The Department commits to revising the SWAP by 2035 as per SWG Program requirements.

SUMMARY OF CHANGES FROM THE 2017 SWAP

The 2025 SWAP represents a substantive update from the 2017 SWAP, though the general structure of the 2017 SWAP remains largely unmodified. The significant changes from the 2017 to 2025 versions of the SWAP are described in Table 1 below.

Table 1. Summary of changes from the 2017 to the 2025 State Wildlife Action Plan (SWAP) for New Mexico.

Subject	2017 State Wildlife Action Plan	2025 State Wildlife Action Plan	For More Information See:
Action necessary to conserve Species of Greatest Conservation Need (SGCN) and their habitats	Actions determined for each “Threat” category as defined by Salafsky et al. (2008) with updates from the International Union for the Conservation of Nature and Conservation Measures Partnership (IUCN 2016).	Threats guiding conservation actions updated to reflect version 3.3 of the International Union for the Conservation of Nature and Conservation Measures Partnership threat descriptions (IUCN 2022). Conservation actions expanded and updated to reflect current best management practices with a special focus on actions that address climate change and multiple threats.	Chapter 3 (Pages 90-92), Chapters 5-10 (Threats and Conservation Actions Sections)
Climate Change and Severe Weather	Discussed in a separate chapter, including analyses of the potential impacts of climate change on two SGCN.	Climate Change Vulnerability Index analysis completed for 295 vertebrate SGCN and climate change chapter updated to reflect more recent information, including on climate refugia.	Chapter 4, Appendix F
Conservation Opportunity Areas (COAs)	Analyses identified 16 areas across the State that provide superior potential for the conservation of SGCN.	The original 16 COAs and their SGCN associations were updated, including additions and removals of some COAs; new total is 30. A total of 2,344 Riparian COAs were newly identified to inform conservation and restoration of these biodiverse habitats across the State.	Chapter 3 (Pages 93-100), Chapters 5-10 (Conservation Opportunity Areas Sections), Appendix G
Habitats	All macrogroups from US National Vegetation Classification System (USNVC) for the State of New Mexico considered.	Macrogroup names, descriptions, and acreages per ecoregion updated to reflect the latest version (3.0) of the USNVC (https://usnvc.org/). Aquatic habitat maps updated.	Chapter 2 (Pages 37-51), Chapters 5-10 (Terrestrial and Aquatic Habitat Maps and Habitat Descriptions Sections)

Subject	2017 State Wildlife Action Plan	2025 State Wildlife Action Plan	For More Information See:
Problems which may adversely affect SGCN or their habitats	Framework followed Salafsky et al. (2008) with updates from the International Union for the Conservation of Nature and Conservation Measures Partnership (IUCN 2016); termed “Threats”.	Threats descriptions updated to reflect IUCN (2022), and more recent information added across all threat categories, especially regarding emerging and increasingly impactful threats. Query run in the Biota Information System of New Mexico (https://bison-m.org/) to update species x threat associations.	Chapter 3 (Pages 52-89), Chapters 5-10 (Threats and Conservation Actions Sections), Appendix E
SGCN	235 species, no insects included.	505 species; 14 species removed from 2017 SWAP list, 284 added; pollinating insects added.	Chapter 2, Chapters 5-10 (Species of Greatest Conservation Need [SGCN] and Their Habitats Sections)
SGCN Categories	SGCN assigned to one of five categories.	SGCN assigned to one of four categories.	Chapter 2 (Pages 14-17), Chapters 5-10 (Species of Greatest Conservation Need [SGCN] and Their Habitats Sections)

ROADMAP TO THE ELEMENTS

The 2025 SWAP addresses the eight required elements using both species- and habitat-based approaches. This section summarizes where information on each of the eight required elements can be found (Table 2). Information on relationships between species and their habitats is provided in the ecoregion chapters (Table 15, Table 19, Table 23, Table 27, Table 31, Table 35).

Table 2. Roadmap to the eight required elements of the 2025 State Wildlife Action Plan (SWAP) for New Mexico.

Element and sub-element	Location
1. Select species indicative of diversity and health of wildlife of the State.	
A. Cite sources on abundance and distribution.	Chapter 2 (Pages 13-31), Chapters 5-10 (Species of Greatest Conservation Need [SGCN] and Their Habitats Sections), Chapter 11 (Pages 444-472)
B. Provide information on abundance and distribution for species in all major groups.	Chapter 2 (Pages 13-31), Chapters 5-10 (Species of Greatest Conservation Need [SGCN] and Their Habitats Sections), Chapter 13 (Pages 484-485), Appendices E, G
C. Identify low and declining populations.	Chapter 2 (Pages 13-31), Chapters 5-10 (Species of Greatest Conservation Need [SGCN] and Their Habitats Sections)
D. Consideration of all major groups of wildlife	Chapter 2 (Pages 13-31)
E. Describe process for identifying Species of Greatest Conservation Need (SGCN).	Chapter 2 (Pages 13-18)
2. Describe location and relative condition of key habitats essential to SGCN.	
A. Explain level of detail.	Chapter 2 (Pages 37-39, 47, 51)
B. Describe key habitats and conditions well enough to prescribe conservation actions.	Chapter 2 (Pages 40-46, 48-50), Chapters 5-10 (Terrestrial Habitat Types Tables, Aquatic and Terrestrial Habitat Maps, and Habitat Description Sections)
3. Determine problems which may adversely affect SGCN or their habitats and survey efforts needed to facilitate species and habitat restoration and conservation.	
A. Cite sources of information on threats.	Chapter 3 (Pages 52-89), Chapter 4, Appendices E, F

Element and sub-element	Location
B. Describe threats well enough to develop focused conservation actions.	Chapter 3 (Pages 52-89), Chapter 4, Chapters 5-10 (Threats and Conservation Actions Sections), Appendices E, F
C. Consider all threats relevant to species and habitats of the State.	Chapter 3 (Pages 52-89), Chapter 4, Chapters 5-10 (Threats and Conservation Actions Sections), Appendices E, F
D. Identify efforts to obtain needed information if current data are insufficient to describe threats.	Chapter 11 (Pages 441-474)
E. Describe priority research, survey needs, and resulting products well enough to develop projects.	Chapters 5-10 (Threats and Conservation Actions Sections), Chapter 11, Appendix E
4. Determine and prioritize actions necessary to conserve SGCN and their habitats.	
A. Identify how conservation actions address threats to SGCN and their habitats.	Chapter 3 (Pages 90-92), Chapters 5-10 (Threats and Conservation Actions Sections), Appendix E
B. Describe conservation actions sufficiently to guide implementation of actions.	Chapter 3 (Pages 90-92, 97-100), Chapters 5-10 (Threats and Conservation Actions Sections)
C. Link conservation actions to objectives and indicators that will facilitate monitoring and performance measurement.	Chapter 3 (Pages 90-92), Chapters 5-10 (Threats and Conservation Actions Sections), Chapter 11 (Pages 444-472), Appendix E
D. Describe conservation actions that federal agencies or regional, national, or international partners could address.	Chapter 3 (Pages 90-92), Chapters 5-10 (Threats and Conservation Actions Sections), Chapter 13 (Pages 482-488)
E. Identify research or survey needs to obtain sufficient information for conservation action development.	Chapter 3 (Pages 90-92), Chapters 5-10 (Threats and Conservation Actions Sections), Chapter 11, Appendix E
F. Prioritize conservation actions.	Chapter 3 (Pages 90-100), Chapters 5-10 (Threats and Conservation Actions and Conservation Opportunity Areas Sections)

Element and sub-element	Location
5. Plans to monitor SGCN and their habitats, the effectiveness of conservation actions, and adapt conservation actions to respond to new information or changing conditions.	
A. Describe plans for monitoring SGCN and their habitats.	Chapter 11
B. Describe how conservation action outcomes will be monitored.	Chapter 11 (Page 440, 473-474)
C. Explain where and why monitoring is not appropriate, necessary, or possible.	Chapter 11
D. Plan monitoring for one of several levels: individual species, guilds, or natural communities.	Chapter 11 (Pages 438-440, 442-474)
E. Explain how monitoring utilizes or builds on existing systems or explain how information will be obtained to determine the effectiveness of conservation actions.	Chapter 11 (Pages 439-474)
F. Consider appropriate geographic scale for monitoring species/species group status and effectiveness of conservation actions.	Chapter 11, Chapter 13 (Pages 482-488)
G. Allow for the evaluation of conservation actions and implementation of new actions as needed.	Chapter 11 (Pages 440-441)
6. Describe procedures to review the SWAP at intervals not to exceed 10 years.	
A. Describe process to review the SWAP within 10 years.	Chapter 12 (Pages 475-476)
7. Describe plans to coordinate development, implementation, review, and revision of the SWAP with federal, state, and local agencies and Indian Tribes that manage significant land and water or administer programs that significantly affect the conservation of SGCN and their habitats.	
A. Describe efforts to coordinate with and involve federal, state, and local agencies and Tribes in development of the SWAP.	Chapter 1 (Pages 6-7), Chapter 12, Chapter 13 (Pages 482-483, 489), Appendices A, B
B. Describe continued coordination with agencies and Tribes in implementation, review, and revision of the SWAP.	Chapters 12-13
8. Describe public participation in the development, revision, and implementation of the SWAP.	
A. Describe efforts to involve the public in development of the SWAP.	Chapter 1 (Pages 6-7), Chapter 12, Appendices C, D
B. Describe public involvement in implementation and revision of the SWAP.	Chapter 1 (Pages 4, 6-7), Chapter 12, Appendices C, D

Chapter 2: Species of Greatest Conservation Need, Ecoregions, and Habitats

SPECIES OF GREATEST CONSERVATION NEED (SGCN)

Species considered for inclusion as SGCN had to be verified as being present within, or not confirmed as extirpated from, the state (determined using distribution information in the Biota Information System of New Mexico [BISON-M]; https://bison-m.org/ and NatureServe Explorer https://explorer.natureserve.org/Search) and meet at least one of the following conditions:

Climate Change Vulnerability: Species that are less likely to be able to acclimate to changing climate conditions.

Decline: Species that either are currently experiencing or have historically experienced a substantial long-term decline in habitat or numbers.

Disjunct: Species that have populations geographically isolated from other populations of the same species and are thereby disproportionately susceptible to local decline or extirpation.

Endemic: Species that are limited to New Mexico.

Keystone: Species that are of demonstrable importance for ecosystem function (Cottee-Jones and Whittaker 2012). These species may contribute more to the conservation of biological diversity, through their impacts on other species, than expected based on their relative abundance, and their removal is likely to lead to a reduction in species diversity or change in community structure or dynamics.

Vulnerable: Species for which some aspect of their life history and ecology makes them disproportionately susceptible to decline within the next 10 years. Factors include, but are not limited to, concentration to small areas during migration or hibernation; low reproductive rates; susceptibility to disease, habitat loss, wildfire, and anthropogenic overexploitation.

All SGCN had to meet the following criterion:

Core Range: New Mexico represents a substantive portion of the species' range; the species is found in multiple counties in New Mexico or, if it is only found in one county at the edge of the state, New Mexico still represents approximately 10% or more of the species' range. Also excludes species found in one or two counties on the border with Arizona or Texas for which Arizona or Texas populations, respectively, are stable.

Some species met at least one of the above conditions but were not considered as SGCN because (1) they are rarely present in the state; (2) they were introduced to New Mexico (i.e., not part of the state's native fauna); (3) they are legally harvestable with statutory protection as game animals or sport fish (EXCEPTIONS are species that are also designated as Threatened or Endangered at the state or federal level, have limited distribution in New Mexico, or are keystone species); (4) they are common or abundant across their distribution, or widespread, in

New Mexico; (5) they have a stable population, expanding distribution, or there are no known threats to the species; (6) their taxonomy is questionable; (7) they do not breed or winter in the state or are vagrants (relevant for migratory species only); or (8) they are non-pollinating insects (EXCEPTIONS: the Department focused on pollinating insects in recognition of their important ecological role and typically better known status compared to other insects, thus specific species in the following four orders of insects identified as containing pollinators have been included as SGCN: Coleoptera, Diptera, Hymenoptera, Lepidoptera [Wardhaugh 2015]). SGCN selection and exclusion criteria were crosswalked to information available in BISON-M and a query was developed to capture species in BISON-M responsive to the criteria. The resulting list was thoroughly reviewed by Department biologists and members of the State Wildlife Action Plan (SWAP) for New Mexico Core Team and appropriate revisions were made. Species were grouped into four categories once they were selected as SGCN to reflect current conservation activities and guide future conservation actions implemented to benefit these species (Table 3).

Table 3. Categories of Species of Greatest Conservation Need (SGCN).[3]

SGCN Categories
Current Focal Species (F) These are species for which, based on their status, population trends, or other factors, the Department is currently either implementing conservation actions (including active monitoring) or anticipating the need for conservation work in the next 10 years. This may include species that are Proposed or Candidates for listing as Threatened or Endangered under the Endangered Species Act (ESA) or for which there is a potential that the species may be uplisted from Threatened to Endangered or, conversely, downlisted. Implementing conservation actions for these species may preclude the need for federal listing or uplisting or may support downlisting. The Department recognizes the importance of species in other SGCN categories and will shift focus to these species as new information and opportunities arise.
Conservation Impact Species (I) This category includes species where conservation action taken in New Mexico is likely to have a substantive, positive outcome for the species or their associated ecosystems (e.g., actions focused on keystone species). This may include endemic/geographically restricted species and habitat specialists that utilize specific patches of habitat that are either narrowly distributed or highly disjunct (e.g., vertical cliffs, river/arroyo banks, waterfalls, talus slopes, established burrows/cavities). Conservation of specific habitats may be especially beneficial for these species. This category may also include species that are impacted by threats that can be more readily addressed (e.g., removal of an invasive species that is not yet well established, implementation of a conservation easement in an area containing important habitat features). It may also include resident species that carry out their full life cycle in New Mexico and are therefore less subject to threats experienced in other states or countries.
Data Needs Species (D) This category includes species for which the primary conservation need is to obtain additional biological data and information. More data are needed to understand the current status and ecology of these species within New Mexico and/or range wide and identify specific conservation needs and actions. Implementing new, or updating outdated, survey or monitoring efforts will be especially beneficial for these species. The Department will re-evaluate the appropriateness of Data Needs Species remaining in this category and on the SGCN list as new information becomes available.
Limited Conservation Opportunity Species (L) These species are of documented conservation need but the potential for conservation actions taken in New Mexico to have a substantive impact on a species' conservation status

[3] Species that are state or federally listed as Threatened or Endangered may fall in any category. Reference to listing status in any category description is not intended to limit that category to species with a particular listing status.

range wide is limited. This category may include species that are of conservation concern (e.g., they have been listed as Threatened or Endangered under the ESA or at the state level) and occur in New Mexico but most individuals or breeding populations are in other states or countries or the species is in New Mexico for a limited portion of their annual cycle. It may also include species for which substantive resources and protections may already be available in other states or at the federal level, reducing the need for use of State Wildlife Grant funds for these species in New Mexico. Also included are species where public agencies face access or other logistical issues or where the primary threats may be harder to address locally (e.g., climate change impacts not thoroughly addressed with local adaptation actions). Coordination with other states or countries on regional conservation activities may be the most impactful action to take for these species.

A total of 505 species were selected to be SGCN for the 2025 SWAP (Table 4, Table 5). As of 2025, the Department has no regulatory authority for implementing conservation or management actions for non-crustacean arthropods but recognizes the important ecological role of pollinating insects. Additionally, the Department will gain this regulatory authority in 2026 (NMS 2025). Thus, pollinating insects were considered in the SGCN selection process; this 2025 SWAP represents a statewide plan intended to inform conservation actions taken not only by the Department, but also by its many partners in conservation work to benefit SGCN. Fourteen species identified as SGCN in the 2017 SWAP were removed from the list and 284 other species were added (Table 4). Many of the additions to the 2025 list of SGCN were pollinating insects (non-crustacean arthropods not included in the 2017 SWAP) and birds, which also represent the most diverse taxonomic group evaluated in the 2025 SWAP revision and a group for which substantive new information on conservation status has become available since 2017. Fish (59%) and amphibians (20%) contained the highest proportions of their SGCN in category F (i.e., species currently, or anticipated to be, the focus of conservation action by the Department). All pollinating beetles and flies and the majority of crustaceans (84%), pollinating bees (65%), and amphibians (56%) known (based on data in BISON-M as of October 2024) to occur in New Mexico are identified as SGCN. Conversely, only 13% of pollinating moths and butterflies, 32% of mammals, and 33% of reptiles in New Mexico are SGCN. Overall, 33% of all known New Mexico vertebrates, molluscs, crustaceans, and pollinating insects (i.e., 505 of 1,521 total species; total as of October 2024) were designated as SGCN. The 2025 SGCN represent 8% of all animal species known to occur in New Mexico (i.e., 505 of 5,967 total species; total as of October 2024).

The Department does not have authority to conserve or manage plants. Plant species in need of conservation are identified and listed as endangered by the Endangered Plant Program at the New Mexico Energy, Minerals, and Natural Resources Department (https://www.emnrd.nm.gov/sfd/rare-plants/). As of 2024, New Mexico has 46 such State-Endangered species. New Mexico also supports 235 rare and Endangered plants as described in the New Mexico Rare Plant Conservation Strategy (NMRPCS; https://www.emnrd.nm.gov/sfd/new-mexico-rare-plant-conservation-strategy/). Entities implementing conservation actions to benefit animal SGCN identified in this SWAP are encouraged to also consider including any local state-endangered or NMRPCS species in their project design. Conservation activities beneficial for plants are outlined in the NMRPCS.

Table 4. Taxonomic distribution of Species of Greatest Conservation Need (SGCN) by conservation category.

Category[4] / Taxon	F	I	D	L	Total[5]
Amphibians	3	7	2	3	15 (+1, -0)
Bees	0	4	25	2	31 (+31, -0)
Beetles	0	1	1	0	2 (+2, -0)
Birds	16	7	94	28	145 (+77, -4)
Crustaceans	2	0	29	0	31 (+5, -4)
Fish	23	7	1	8	39 (+10, -0)
Flies	0	1	8	0	9 (+9, -0)
Mammals	12	8	33	4	57 (+34, -1)
Molluscs	7	3	75	0	85 (+43, -4)
Moths and Butterflies	0	37	11	4	52 (+52, -0)
Reptiles	4	5	23	7	39 (+20, -1)
Total	67	80	302	56	505 (+284, -14)

[4] Category abbreviations are: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.
[5] Numbers in parentheses represent additions and removals compared to the list of SGCN in the 2017 State Wildlife Action Plan.

Table 5. Taxon, common, and scientific names for Species of Greatest Conservation Need.[6]

Taxon	Common Name[7]	Scientific Name
Amphibians	Arizona Toad	*Anaxyrus microscaphus microscaphus*
Amphibians	Arizona Treefrog	*Dryophytes wrightorum*
Amphibians	Barking Frog	*Craugastor augusti latrans*
Amphibians	Blanchard's Cricket Frog*	*Acris blanchardi*
Amphibians	Boreal Chorus Frog	*Pseudacris maculata*
Amphibians	Boreal Toad	*Anaxyrus boreas boreas*
Amphibians	Chiricahua Leopard Frog	*Lithobates chiricahuensis*
Amphibians	Jemez Mountains Salamander	*Plethodon neomexicanus*
Amphibians	Lowland Leopard Frog	*Lithobates yavapaiensis*
Amphibians	Northern Leopard Frog	*Lithobates pipiens*
Amphibians	Plains Leopard Frog	*Lithobates blairi*
Amphibians	Rio Grande Leopard Frog	*Lithobates berlandieri*
Amphibians	Sacramento Mountain Salamander	*Aneides hardii*
Amphibians	Sonoran Desert Toad	*Incilius alvarius*
Amphibians	Western Narrow-mouthed Toad	*Gastrophryne olivacea*
Bees	Andrenid Bee*	*Macrotera magniceps*
Bees	Andrenid Bee*	*Perdita biparticeps*
Bees	Andrenid Bee*	*Perdita claripennis*
Bees	Andrenid Bee*	*Perdita geminata*
Bees	Andrenid Bee*	*Perdita grandiceps*
Bees	Andrenid Bee*	*Perdita maculipes*
Bees	Andrenid Bee*	*Perdita senecionis*
Bees	Andrenid Bee*	*Perdita tarda*
Bees	Austin's Fairy Bee*	*Perdita austini*
Bees	Bare Fairy Bee*	*Perdita aperta*
Bees	Beloved Fairy Bee*	*Perdita cara*
Bees	Brave Digger Bee*	*Anthophora vallorum*
Bees	Chihuahuan Desert Digger Bee*	*Anthophora chihuahua*
Bees	Cockerell's Bumble Bee*	*Bombus cockerelli*
Bees	Dakota Leaf-cutter Bee*	*Megachile dakotensis*

[6] For full details on information triggering each species' inclusion on the Species of Greatest Conservation Need (SGCN) list, see this spreadsheet: https://bison-m.org/Documents/50759_BISONM_Codes_Per_SGCN_Criterion_v5.xlsx. Abbreviations include: Categories: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species. Criteria: C = Climate Change Vulnerability; De = Decline; Di= Disjunct; E = Endemic; K = Keystone; V = Vulnerable.

[7] Species that are new to the SGCN list for the 2025 State Wildlife Action Plan are marked with an *. Hyperlinks are to species booklets for each SGCN in the Biota Information System of New Mexico (https://bison-m.org/). Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.

Taxon	Common Name[7]	Scientific Name
Bees	Half-scarlet Fairy Bee*	*Perdita semicrocea*
Bees	Melittid Bee*	*Hesperapis trochanterata*
Bees	Mighty Leaf-cutter Bee*	*Megachile fortis*
Bees	Mimbres Miner Bee*	*Andrena mimbresensis*
Bees	Morrison's Bumble Bee*	*Bombus morrisoni*
Bees	Neff's Miner Bee*	*Andrena neffi*
Bees	Sand Dune Wool-carder Bee*	*Anthidium rodecki*
Bees	Southern Plains Bumble Bee*	*Bombus fraternus*
Bees	Southwest Leaf-cutter Bee*	*Megachile melanderi*
Bees	Sweat Bee*	*Conanthalictus conanthi*
Bees	Thirsty Plasterer Bee*	*Colletes aridus*
Bees	Triton Fairy Bee*	*Perdita trinotata*
Bees	Volger's Mining Bee*	*Andrena vogleri*
Bees	Watson's Mason Bee*	*Osmia watsoni*
Bees	Western Bumble Bee*	*Bombus occidentalis*
Bees	White Sands Sweat Bee*	*Lasioglossum argammon*
Beetles	Anthony Blister Beetle*	*Lytta mirifica*
Beetles	Wood's Jewel Beetle*	*Chrysina woodi*
Birds	Abert's Towhee	*Melozone aberti aberti*
Birds	American Bittern	*Botaurus lentiginosus*
Birds	American Dipper*	*Cinclus mexicanus unicolor*
Birds	American Kestrel*	*Falco sparverius sparverius*
Birds	American Pipit*	*Anthus rubescens*
Birds	American Tree Sparrow*	*Spizelloides arborea ochracea*
Birds	Aplomado Falcon	*Falco femoralis septentrionalis*
Birds	Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*
Birds	Arizona Woodpecker*	*Dryobates arizonae*
Birds	Baird's Sparrow	*Centronyx bairdii*
Birds	Bald Eagle	*Haliaeetus leucocephalus*
Birds	Band-tailed Pigeon*	*Patagioenas fasciata*
Birds	Bank Swallow	*Riparia riparia riparia*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Bendire's Thrasher	*Toxostoma bendirei*
Birds	Bewick's Wren*	*Thryomanes bewickii*
Birds	Black Rosy-Finch*	*Leucosticte atrata*
Birds	Black Swift	*Cypseloides niger*
Birds	Black-billed Magpie*	*Pica hudsonia*
Birds	Black-chinned Sparrow	*Spizella atrogularis evura*
Birds	Black-headed Grosbeak*	*Pheucticus melanocephalus*
Birds	Black-throated Gray Warbler	*Setophaga nigrescens*
Birds	Black-throated Sparrow*	*Amphispiza bilineata*

Taxon	Common Name[7]	Scientific Name
Birds	Boreal Owl	*Aegolius funereus*
Birds	Brewer's Sparrow*	*Spizella breweri*
Birds	Broad-billed Hummingbird	*Cynanthus latirostris magicus*
Birds	Broad-tailed Hummingbird*	*Selasphorus platycercus platycercus*
Birds	Brown Pelican*	*Pelecanus occidentalis carolinensis*
Birds	Brown-capped Rosy-Finch	*Leucosticte australis*
Birds	Buff-breasted Flycatcher*	*Empidonax fulvifrons pygmaeus*
Birds	Bullock's Oriole*	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia hypugaea*
Birds	Cactus Wren*	*Campylorhynchus brunneicapillus couesi*
Birds	Canyon Towhee*	*Melozone fusca*
Birds	Canyon Wren*	*Catherpes mexicanus conspersus*
Birds	Cassin's Finch	*Haemorhous cassinii*
Birds	Cassin's Kingbird*	*Tyrannus vociferans vociferans*
Birds	Cassin's Sparrow	*Peucaea cassinii*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Chihuahuan Meadowlark*	*Sturnella lilianae*
Birds	Chihuahuan Raven*	*Corvus cryptoleucus*
Birds	Chipping Sparrow*	*Spizella passerina arizonae*
Birds	Clark's Grebe	*Aechmophorus clarkii*
Birds	Clark's Nutcracker	*Nucifraga columbiana*
Birds	Cliff Swallow*	*Petrochelidon pyrrhonota*
Birds	Common Black Hawk	*Buteogallus anthracinus anthracinus*
Birds	Common Ground Dove	*Columbina passerina pallescens*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Costa's Hummingbird	*Calypte costae*
Birds	Eastern Bluebird*	*Sialia sialis*
Birds	Elegant Trogon	*Trogon elegans canescens*
Birds	Elf Owl	*Micrathene whitneyi whitneyi*
Birds	Evening Grosbeak	*Coccothraustes vespertinus*
Birds	Ferruginous Hawk*	*Buteo regalis*
Birds	Field Sparrow*	*Spizella pusilla arenacea*
Birds	Flammulated Owl	*Psiloscops flammeolus*
Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*
Birds	Golden Eagle*	*Aquila chrysaetos canadensis*
Birds	Grace's Warbler	*Setophaga graciae*
Birds	Grasshopper Sparrow*	*Ammodramus savannarum perpallidus*
Birds	Gray Vireo	*Vireo vicinior*

Taxon	Common Name[7]	Scientific Name
Birds	Gray-crowned Rosy-Finch*	*Leucosticte tephrocotis*
Birds	Greater Pewee*	*Contopus pertinax pallidiventris*
Birds	Greater Yellowlegs*	*Tringa melanoleuca*
Birds	Green-tailed Towhee*	*Pipilo chlorurus*
Birds	Harris's Hawk*	*Parabuteo unicinctus harrisi*
Birds	Horned Lark*	*Eremophila alpestris*
Birds	Juniper Titmouse	*Baeolophus ridgwayi*
Birds	Killdeer*	*Charadrius vociferus vociferus*
Birds	Lapland Longspur*	*Calcarius lapponicus alascensis*
Birds	Lark Bunting*	*Calamospiza melanocorys*
Birds	Lark Sparrow*	*Chondestes grammacus strigatus*
Birds	Lazuli Bunting*	*Passerina amoena*
Birds	Least Tern	*Sternula antillarum athalassos*
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*
Birds	Lewis's Woodpecker	*Melanerpes lewis*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus americanus*
Birds	Long-billed Dowitcher*	*Limnodromus scolopaceus*
Birds	Long-eared Owl*	*Asio otus*
Birds	Lucifer Hummingbird	*Calothorax lucifer*
Birds	Lucy's Warbler	*Leiothlypis luciae*
Birds	Mexican Chickadee*	*Poecile sclateri eidos*
Birds	Mexican Spotted Owl	*Strix occidentalis lucida*
Birds	Mexican Whip-poor-will	*Antrostomus arizonae arizonae*
Birds	Mountain Bluebird	*Sialia currucoides*
Birds	Mountain Chickadee*	*Poecile gambeli gambeli*
Birds	Mountain Plover	*Charadrius montanus*
Birds	Neotropic Cormorant	*Phalacrocorax brasilianus*
Birds	Northern Beardless-Tyrannulet	*Camptostoma imberbe ridgwayi*
Birds	Northern Harrier*	*Circus hudsonius*
Birds	Northern Rough-winged Swallow*	*Stelgidopteryx serripennis*
Birds	Olive Warbler*	*Peucedramus taeniatus arizonae*
Birds	Olive-sided Flycatcher	*Contopus cooperi*
Birds	Peregrine Falcon	*Falco peregrinus*
Birds	Phainopepla*	*Phainopepla nitens lepida*
Birds	Pine Grosbeak*	*Pinicola enucleator montana*
Birds	Pine Siskin*	*Spinus pinus*
Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*
Birds	Piping Plover*	*Charadrius melodus circumcinctus*
Birds	Plumbeous Vireo*	*Vireo plumbeus*
Birds	Prairie Falcon*	*Falco mexicanus*

Taxon	Common Name[7]	Scientific Name
Birds	Purple Martin*	*Progne subis*
Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*
Birds	Pyrrhuloxia*	*Cardinalis sinuatus sinuatus*
Birds	Red-faced Warbler	*Cardellina rubrifrons*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*
Birds	Red-naped Sapsucker*	*Sphyrapicus nuchalis*
Birds	Rock Wren*	*Salpinctes obsoletus obsoletus*
Birds	Sage Thrasher*	*Oreoscoptes montanus*
Birds	Sagebrush Sparrow	*Artemisiospiza nevadensis*
Birds	Savannah Sparrow*	*Passerculus sandwichensis*
Birds	Scott's Oriole*	*Icterus parisorum*
Birds	Short-eared Owl*	*Asio flammeus flammeus*
Birds	Snowy Plover	*Charadrius nivosus*
Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*
Birds	Spotted Sandpiper*	*Actitis macularius*
Birds	Spotted Towhee*	*Pipilo maculatus*
Birds	Sprague's Pipit	*Anthus spragueii*
Birds	Steller's Jay*	*Cyanocitta stelleri macrolopha*
Birds	Thick-billed Kingbird	*Tyrannus crassirostris*
Birds	Thick-billed Longspur	*Rhynchophanes mccownii*
Birds	Varied Bunting	*Passerina versicolor*
Birds	Verdin*	*Auriparus flaviceps ornatus*
Birds	Vesper Sparrow	*Pooecetes gramineus*
Birds	Violet-crowned Hummingbird	*Leucolia violiceps ellioti*
Birds	Violet-green Swallow*	*Tachycineta thalassina lepida*
Birds	Virginia's Warbler	*Leiothlypis virginiae*
Birds	Western Bluebird	*Sialia mexicana bairdi*
Birds	Western Grebe*	*Aechmophorus occidentalis*
Birds	Western Kingbird*	*Tyrannus verticalis*
Birds	Western Meadowlark*	*Sturnella neglecta*
Birds	Western Sandpiper*	*Calidris mauri*
Birds	Western Wood Pewee*	*Contopus sordidulus*
Birds	Whiskered Screech-Owl	*Megascops trichopsis asperus*
Birds	White-eared Hummingbird*	*Basilinna leucotis borealis*
Birds	White-tailed Ptarmigan	*Lagopus leucura altipetens*
Birds	White-throated Swift*	*Aeronautes saxatalis saxatalis*
Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*
Birds	Wilson's Warbler*	*Cardellina pusilla*
Birds	Woodhouse's Scrub Jay*	*Aphelocoma woodhouseii*
Birds	Yellow-billed Cuckoo*	*Coccyzus americanus americanus*
Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*

Taxon	Common Name[7]	Scientific Name
Birds	Yellow-eyed Junco	*Junco phaeonotus palliatus*
Birds	Yellow-headed Blackbird*	*Xanthocephalus xanthocephalus*
Crustaceans	Alkali Fairy Shrimp	*Branchinecta mackini*
Crustaceans	Beavertail Fairy Shrimp	*Thamnocephalus platyurus*
Crustaceans	BLNWR cryptic species Amphipod	*Gammarus* sp.
Crustaceans	Bowman's Fairy Shrimp	*Streptocephalus thomasbowmani*
Crustaceans	Brine Shrimp	*Artemia franciscana*
Crustaceans	Clam Shrimp	*Eulimnadia follisimilis*
Crustaceans	Colorado Fairy Shrimp	*Branchinecta coloradensis*
Crustaceans	Conchas Crayfish	*Faxonius deanae*
Crustaceans	Cylindrical Cyst Clam Shrimp	*Eulimnadia cylindrova*
Crustaceans	Desert Fairy Shrimp*	*Streptocephalus dorothae*
Crustaceans	Desert Tadpole Shrimp*	*Triops newberryi*
Crustaceans	Diversity Clam Shrimp	*Eulimnadia diversa*
Crustaceans	Dumont's Fairy Shrimp	*Streptocephalus henridumontis*
Crustaceans	Fuzzy Cyst Clam Shrimp	*Eulimnadia antlei*
Crustaceans	Great Plains Fairy Shrimp	*Streptocephalus texanus*
Crustaceans	Knobblip Fairy Shrimp	*Eubranchipus bundyi*
Crustaceans	Lynch Tadpole Shrimp	*Lepidurus lemmoni*
Crustaceans	Mackin Fairy Shrimp*	*Streptocephalus mackini*
Crustaceans	Mexican Beavertail Fairy Shrimp	*Thamnocephalus mexicanus*
Crustaceans	Moore's Fairy Shrimp	*Streptocephalus moorei*
Crustaceans	Noel's Amphipod	*Gammarus desperatus*
Crustaceans	Packard's Fairy Shrimp	*Branchinecta packardi*
Crustaceans	Playa Clam Shrimp*	*Leptestheria compleximanus*
Crustaceans	Scud*	*Hyalella azteca*
Crustaceans	Short Finger Clam Shrimp	*Lynceus brevifrons*
Crustaceans	Sitting Bull Spring cryptic species Amphipod	*Gammarus* sp.
Crustaceans	Socorro Isopod	*Thermosphaeroma thermophilum*
Crustaceans	Southern Plains Crayfish	*Procambarus simulans simulans*
Crustaceans	Sublette's Fairy Shrimp	*Phallocryptis sublettei*
Crustaceans	Texan Clam Shrimp	*Eulimnadia texana*
Crustaceans	Versatile Fairy Shrimp	*Branchinecta lindahli*
Fish	Arkansas River Shiner	*Notropis girardi*
Fish	Bigscale Logperch	*Percina macrolepida*
Fish	Blue Sucker	*Cycleptus elongatus*
Fish	Central Stoneroller*	*Campostoma anomalum*
Fish	Chihuahua Chub	*Gila nigrescens*
Fish	Colorado Pikeminnow	*Ptychocheilus lucius*
Fish	Desert Sucker	*Catostomus clarkii*
Fish	Gila Chub	*Gila intermedia*

Taxon	Common Name[7]	Scientific Name
Fish	Gila Topminnow	*Poeciliopsis occidentalis occidentalis*
Fish	Gila Trout	*Oncorhynchus gilae*
Fish	Gray Redhorse	*Moxostoma congestum*
Fish	Greenthroat Darter	*Etheostoma lepidum*
Fish	Headwater Catfish*	*Ictalurus lupus*
Fish	Headwater Chub	*Gila nigra*
Fish	Loach Minnow	*Rhinichthys cobitis*
Fish	Longnose Gar*	*Lepisosteus osseus*
Fish	Mexican Tetra	*Astyanax mexicanus*
Fish	Mottled Sculpin*	*Cottus bairdii*
Fish	Pecos Bluntnose Shiner	*Notropis simus pecosensis*
Fish	Pecos Gambusia	*Gambusia nobilis*
Fish	Pecos Pupfish	*Cyprinodon pecosensis*
Fish	Peppered Chub	*Macrhybopsis tetranema*
Fish	Plains Minnow*	*Hybognathus placitus*
Fish	Razorback Sucker	*Xyrauchen texanus*
Fish	Rio Grande Chub	*Gila pandora*
Fish	Rio Grande Cutthroat Trout*	*Oncorhynchus clarkii virginalis*
Fish	Rio Grande Shiner*	*Notropis jemezanus*
Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*
Fish	Rio Grande Sucker	*Catostomus plebeius*
Fish	Roundnose Minnow*	*Dionda episcopa*
Fish	Roundtail Chub	*Gila robusta*
Fish	Smallmouth Buffalo*	*Ictiobus bubalus*
Fish	Sonora Sucker	*Catostomus insignis*
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*
Fish	Speckled Chub*	*Macrhybopsis aestivalis*
Fish	Spikedace	*Meda fulgida*
Fish	Suckermouth Minnow	*Phenacobius mirabilis*
Fish	White Sands Pupfish	*Cyprinodon tularosa*
Fish	Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*
Flies	Alamogordo Window Fly*	*Caenotus inornatus*
Flies	Crandall's Hornet Fly*	*Spilomyia crandalli*
Flies	Dune Flower-loving Fly*	*Apiocera bilineata*
Flies	Painter's Mydas Fly*	*Rhaphiomidas painteri*
Flies	Prairie Bee Fly*	*Poecilognathus scolopax*
Flies	Rio Grande Flower-loving Fly*	*Apiocera hamata*
Flies	Small Window Fly*	*Caenotus minutus*
Flies	Southwestern Slender Bee Fly*	*Thevenetimyia speciosa*
Flies	Yellow-tailed Hornet Fly*	*Spilomyia kahli*
Mammals	Allen's Big-eared Bat*	*Idionycteris phyllotis*
Mammals	American Beaver*	*Castor canadensis*

Taxon	Common Name[7]	Scientific Name
Mammals	American Mink	*Neogale vison*
Mammals	American Pika	*Ochotona princeps*
Mammals	Arizona Gray Squirrel*	*Sciurus arizonensis arizonensis*
Mammals	Arizona Montane Vole	*Microtus montanus arizonensis*
Mammals	Arizona Shrew	*Sorex arizonae*
Mammals	Banner-tailed Kangaroo Rat*	*Dipodomys spectabilis*
Mammals	Big Free-tailed Bat*	*Nyctinomops macrotis*
Mammals	Black-footed Ferret	*Mustela nigripes*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Canada Lynx*	*Lynx canadensis*
Mammals	Cave Myotis*	*Myotis velifer*
Mammals	Common Porcupine*	*Erethizon dorsatum*
Mammals	Desert Pocket Gopher*	*Geomys arenarius*
Mammals	Eastern Red Bat*	*Lasiurus borealis*
Mammals	Ermine Weasel*	*Mustela richardsonii*
Mammals	Fringed Myotis*	*Myotis thysanodes thysanodes*
Mammals	Gray-collared Chipmunk*	*Neotamias cinereicollis cinereicollis*
Mammals	Gray-footed Chipmunk*	*Neotamias canipes*
Mammals	Gunnison's prairie dog	*Cynomys gunnisoni*
Mammals	Heather Vole*	*Phenacomys intermedius intermedius*
Mammals	Hoary Bat*	*Aeorestes cinereus cinereus*
Mammals	Holzner's Cottontail Rabbit*	*Sylvilagus holzneri*
Mammals	Hooded Skunk*	*Mephitis macroura milleri*
Mammals	Jaguar	*Panthera onca arizonensis*
Mammals	Least Shrew	*Cryptotis parvus*
Mammals	Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*
Mammals	Mexican Gray Wolf	*Canis lupus baileyi*
Mammals	Mexican Long-nosed Bat	*Leptonycteris nivalis*
Mammals	Mexican Long-tongued Bat	*Choeronycteris mexicana*
Mammals	New Mexico Jumping Mouse	*Zapus hudsonius luteus (=Zapus luteus luteus)*
Mammals	North American River Otter	*Lontra canadensis*
Mammals	Northern Pygmy Mouse*	*Baiomys taylori ater*
Mammals	Organ Mountains Colorado Chipmunk	*Neotamias quadrivittatus australis*
Mammals	Oscura Mountains Colorado Chipmunk	*Neotamias quadrivittatus oscuraensis*
Mammals	Pacific Marten	*Martes caurina*
Mammals	Peñasco Least Chipmunk	*Neotamias minimus atristriatus*
Mammals	Pocketed Free-tailed Bat*	*Nyctinomops femorosaccus*
Mammals	Prairie Vole*	*Microtus ochrogaster haydenii*
Mammals	Snowshoe Hare*	*Lepus americanus bairdii*
Mammals	Southern Pocket Gopher	*Thomomys umbrinus*

Taxon	Common Name[7]	Scientific Name
Mammals	Southern Red-backed Vole*	*Myodes gapperi*
Mammals	Southwestern Little Brown Myotis*	*Myotis occultus*
Mammals	Spotted Bat	*Euderma maculatum*
Mammals	Thirteen-lined Ground Squirrel*	*Ictidomys tridecemlineatus*
Mammals	Tri-colored Bat*	*Perimyotis subflavus*
Mammals	Western Jumping Mouse*	*Zapus princeps princeps*
Mammals	Western Red Bat*	*Lasiurus blossevillii*
Mammals	Western Water Shrew*	*Sorex navigator*
Mammals	Western Yellow Bat	*Dasypterus xanthinus*
Mammals	White-nosed Coati*	*Nasua narica*
Mammals	White-sided Jackrabbit	*Lepus callotis gaillardi*
Mammals	White-tailed Jackrabbit*	*Lepus townsendii campanius*
Mammals	Yellow-bellied Marmot*	*Marmota flaviventris*
Mammals	Yellow-nosed Cotton Rat*	*Sigmodon ochrognathus*
Mammals	Yuma Myotis*	*Myotis yumanensis yumanensis*
Molluscs	Alamosa Springsnail	*Pseudotryonia alamosae*
Molluscs	Animas Mountains Holospira Snail	*Holospira animasensis*
Molluscs	Animas Peak Woodlandsnail	*Ashmunella animasensis*
Molluscs	Animas Talussnail	*Sonorella animasensis*
Molluscs	Apache Snaggletooth Snail*	*Gastrocopta cochisensis*
Molluscs	Bearded Mountainsnail*	*Oreohelix barbata*
Molluscs	Big Hatchet Woodlandsnail*	*Ashmunella mearnsii*
Molluscs	Bishop Tubeshell Snail*	*Coelostemma pyrgonasta*
Molluscs	Black Range Mountainsnail*	*Oreohelix metcalfei*
Molluscs	Black Range Mountainsnail*	*Oreohelix metcalfei cuchillensis*
Molluscs	Black Range Woodlandsnail*	*Ashmunella cockerelli*
Molluscs	Burnt Corral Pyrg*	*Pyrgulopsis similis*
Molluscs	Capitan Woodlandsnail*	*Ashmunella pseudodonta*
Molluscs	Chupadera Springsnail	*Pyrgulopsis chupaderae*
Molluscs	Cockerell Holospira Snail*	*Holospira cockerelli*
Molluscs	Cooke's Peak Woodlandsnail	*Ashmunella macromphala*
Molluscs	Creeping Ancylid Snail	*Ferrissia rivularis*
Molluscs	Cross Holospira Snail	*Holospira crossei*
Molluscs	Diablo Mountainsnail*	*Oreohelix houghi*
Molluscs	Doña Ana Talussnail	*Sonorella todseni*
Molluscs	Dry Creek Woodlandsnail*	*Ashmunella tetrodon*
Molluscs	Dry Creek Woodlandsnail*	*Ashmunella tetrodon fragilis*
Molluscs	False Marsh Slug	*Deroceras heterura*
Molluscs	Florida Mountain Woodlandsnail*	*Ashmunella walkeri*
Molluscs	Franklin Mountain Talussnail*	*Sonorella metcalfi*
Molluscs	Franklin Mountain Woodlandsnail*	*Ashmunella pasonis pasonis*
Molluscs	Fringed Mountainsnail	*Radiocentrum ferrissi*
Molluscs	Gila Springsnail	*Pyrgulopsis gilae*

Taxon	Common Name[7]	Scientific Name
Molluscs	Goat Mountain Woodlandsnail*	*Ashmunella harrisi*
Molluscs	Guadelupe Woodlandsnail*	*Ashmunella carlsbadensis*
Molluscs	Hacheta Grande Woodlandsnail	*Ashmunella hebardi*
Molluscs	Hacheta Mountainsnail*	*Radiocentrum hachetanum*
Molluscs	Heart Vertigo Snail*	*Vertigo hinkleyi*
Molluscs	Iron Creek Woodlandsnail*	*Ashmunella mendax*
Molluscs	Jemez Woodlandsnail	*Ashmunella ashmuni*
Molluscs	Jordan Spring Pyrg*	*Pyrgulopsis marilynae*
Molluscs	Koster's Springsnail	*Juturnia kosteri*
Molluscs	Lake Fingernailclam	*Musculium lacustre*
Molluscs	Lang Canyon Talussnail	*Sonorella painteri*
Molluscs	Lilljeborg's Peaclam	*Pisidium lilljeborgi*
Molluscs	Long Fingernailclam	*Musculium transversum*
Molluscs	Magdalena Mountainsnail*	*Oreohelix magdalenae*
Molluscs	Maple Canyon Woodlandsnail*	*Ashmunella todseni*
Molluscs	Metcalf Holospira Snail	*Holospira metcalfi*
Molluscs	Mineral Creek Mountainsnail	*Oreohelix pilsbryi*
Molluscs	Morgan Creek Mountainsnail*	*Oreohelix swopei*
Molluscs	Mount Riley Woodlandsnail*	*Ashmunella rileyensis*
Molluscs	Mountainsnail*	*Oreohelix nogalensis*
Molluscs	Multirib Vallonia Snail*	*Vallonia gracilicosta*
Molluscs	New Mexico Hot Springsnail	*Pyrgulopsis thermalis*
Molluscs	New Mexico Ramshorn Snail	*Pecosorbis kansasensis*
Molluscs	New Mexico Talussnail (Big Hatchet Mountains, Florida Mountains)	*Sonorella hachitana*
Molluscs	New Mexico Talussnail (Peloncillo Mountains)	*Sonorella hachitana peloncillensis*
Molluscs	Northern Threeband*	*Humboldtiana ultima*
Molluscs	Organ Mountain Woodlandsnail*	*Ashmunella organensis*
Molluscs	Ovate Vertigo Snail	*Vertigo ovata*
Molluscs	Paper Pondshell	*Utterbackia imbecillis*
Molluscs	Pecos Assiminea	*Assiminea pecos*
Molluscs	Pecos Springsnail	*Pyrgulopsis pecosensis*
Molluscs	Pinos Altos Mountainsnail*	*Oreohelix confragosa*
Molluscs	Rocky Mountainsnail*	*Oreohelix strigosa depressa*
Molluscs	Roswell Springsnail	*Pyrgulopsis roswellensis*
Molluscs	Ruidoso Snaggletooth Snail	*Gastrocopta ruidosensis*
Molluscs	Salinas Peak Woodlandsnail*	*Ashmunella salinasensis*
Molluscs	San Augustin Mountainsnail*	*Oreohelix litoralis*
Molluscs	Sangre de Cristo Woodlandsnail	*Ashmunella thomsoniana*
Molluscs	Shortneck Snaggletooth Snail	*Gastrocopta dalliana dalliana*
Molluscs	Silver Creek Woodlandsnail	*Ashmunella binneyi*
Molluscs	Socorro Mountainsnail*	*Oreohelix neomexicana*
Molluscs	Socorro Springsnail	*Pyrgulopsis neomexicana*

Taxon	Common Name[7]	Scientific Name
Molluscs	Sonoran Snaggletooth Snail*	*Gastrocopta prototypus*
Molluscs	Star Gyro	*Gyraulus crista*
Molluscs	Subalpine Mountainsnail*	*Oreohelix subrudis*
Molluscs	Swamp Fingernailclam	*Musculium partumeium*
Molluscs	Texas Hornshell	*Popenaias popeii*
Molluscs	Tularosa Springsnail	*Juturnia tularosae*
Molluscs	Vallonia Snail	*Vallonia sonorana*
Molluscs	Vertigo Snail*	*Vertigo concinnula*
Molluscs	Whitewashed Rabdotus Snail*	*Rabdotus dealbatus neomexicanus*
Molluscs	Whitewater Creek Woodlandsnail*	*Ashmunella danielsi*
Molluscs	Woodlandsnail	*Ashmunella amblya cornudasensis*
Molluscs	Woodlandsnail*	*Ashmunella auriculata*
Molluscs	Woodlandsnail*	*Ashmunella kochii*
Molluscs	Woodlandsnail*	*Ashmunella rhyssa*
Molluscs	Wrinkled Marshsnail	*Stagnicola caperata*
Moths and Butterflies	Anicia Checkerspot*	*Euphydryas anicia*
Moths and Butterflies	Apache Northern Crescent*	*Phyciodes cocyta apache*
Moths and Butterflies	Blanchard's Pelochrista Moth*	*Pelochrista blanchardi*
Moths and Butterflies	Capulin Mountain Alberta Arctic*	*Oeneis alberta capulinensis*
Moths and Butterflies	Carlsbad Agave-Borer*	*Agathymus neumoegeni carlsbadensis*
Moths and Butterflies	Colorado Melissa Arctic*	*Oeneis melissa lucilla*
Moths and Butterflies	Colorado Rita Dotted-blue*	*Euphilotes rita coloradensis*
Moths and Butterflies	Dotted Checkerspot*	*Poladryas minuta*
Moths and Butterflies	Lafontaine's Cutworm Moth*	*Euxoa lafontainei*
Moths and Butterflies	Landry's Flower Moth*	*Arotrura landryorum*
Moths and Butterflies	Magdalena Alpine Butterfly*	*Erebia magdalena magdalena*
Moths and Butterflies	Monarch*	*Danaus plexippus*
Moths and Butterflies	Mottled Duskywing*	*Erynnis martialis*
Moths and Butterflies	Mountain Checkered-skipper*	*Pyrgus xanthus*
Moths and Butterflies	New Mexico Desert Blue*	*Euphilotes ellisii anasazi*

Taxon	Common Name[7]	Scientific Name
Moths and Butterflies	Nokomis Silverspot*	*Speyeria (Argynnis) nokomis*
Moths and Butterflies	Nokomis Silverspot*	*Speyeria (Argynnis) nokomis nokomis*
Moths and Butterflies	Orange Giant Skipper*	*Agathymus neumoegeni*
Moths and Butterflies	Organ Mountains Poling's Hairstreak*	*Satyrium polingi organensis*
Moths and Butterflies	Pogue's Flower Moth*	*Schinia poguei*
Moths and Butterflies	Questa Skipper*	*Ochlodes yuma anasazi*
Moths and Butterflies	Raton Mesa Boisduval's Blue*	*Icaricia icarioides nigrafem*
Moths and Butterflies	Raton Mesa Northwestern Fritillary*	*Argynnis hesperis ratonensis*
Moths and Butterflies	Raton Mesa Silvery Blue*	*Glaucopsyche lygdamus erico*
Moths and Butterflies	Rhena Crossline Skipper*	*Polites origenes rhena*
Moths and Butterflies	Rhesus Skipper*	*Polites rhesus*
Moths and Butterflies	Rindge's Emerald Moth*	*Nemoria rindgei*
Moths and Butterflies	Rocky Mountain Polixenes Arctic*	*Oeneis polixenes brucei*
Moths and Butterflies	Sacramento Mountains Borer Moth*	*Papaipema dribi*
Moths and Butterflies	Sacramento Mountains Western Green Hairstreak*	*Callophrys affinis albipalpus*
Moths and Butterflies	Sacramento Mountains Checkerspot Butterfly*	*Euphydryas anicia cloudcrofti*
Moths and Butterflies	Sacramento Mountains Coral Hairstreak*	*Satyrium titus carrizozo*
Moths and Butterflies	Sacramento Mountains Emerald Moth*	*Nemoria subsequens*
Moths and Butterflies	Sacramento Mountains Silvery Blue Butterfly*	*Glaucopsyche lygdamus ruidoso*
Moths and Butterflies	Sacramento Mountains White-lined Hairstreak*	*Callophrys sheridanii sacramento*
Moths and Butterflies	Sacred Boisduval's Blue*	*Icaricia icarioides sacre*
Moths and Butterflies	Sierra Blanca Margined White*	*Pieris marginalis siblanca*
Moths and Butterflies	Snow's Lustrous Copper*	*Lycaena cupreus snowi*
Moths and Butterflies	Socorro Chryxus Arctic*	*Oeneis chryxus socorro*

Taxon	Common Name[7]	Scientific Name
Moths and Butterflies	Southwestern Brown Moth*	*Plagiomimicus astigmatosum*
Moths and Butterflies	Sunrise Skipper*	*Adopaeoides prittwitzi*
Moths and Butterflies	Ursine Giant Skipper*	*Megathymus ursus ursus*
Moths and Butterflies	West Coast Lady*	*Vanessa annabella*
Moths and Butterflies	Western Hobomok Skipper*	*Lon hobomok wetona*
Moths and Butterflies	White Sands Cutworm Moth*	*Protogygia whitesandsensis*
Moths and Butterflies	White Sands Dune Moth*	*Areniscythris whitesands*
Moths and Butterflies	White Sands Owlet Moth*	*Aleptina arenaria*
Moths and Butterflies	White Sands Twirler Moth*	*Chionodes bustosorum*
Moths and Butterflies	White Sands Yinyang Moth*	*Cochylis yinyangana*
Moths and Butterflies	Wiest's Sphinx Moth*	*Euproserpinus wiesti*
Moths and Butterflies	Yuma Skipper*	*Ochlodes yuma yuma*
Moths and Butterflies	Zuni Flower Moth*	*Schinia zuni*
Reptiles	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*
Reptiles	Arizona Black Rattlesnake	*Crotalus cerberus*
Reptiles	Banded Rock Rattlesnake*	*Crotalus lepidus klauberi*
Reptiles	Big Bend Slider	*Trachemys gaigeae*
Reptiles	Bleached Earless Lizard*	*Holbrookia maculata ruthveni*
Reptiles	Bolson's Tortoise*	*Gopherus flavomarginatus*
Reptiles	Dunes Sagebrush Lizard	*Sceloporus arenicolus*
Reptiles	Giant Spotted Whiptail	*Aspidoscelis stictogramma*
Reptiles	Gila Monster	*Heloderma suspectum*
Reptiles	Gray-banded Kingsnake	*Lampropeltis alterna*
Reptiles	Gray-checkered Whiptail	*Aspidoscelis dixoni*
Reptiles	Green Rat Snake	*Senticolis triaspis intermedia*
Reptiles	Knobloch's Mountain Kingsnake*	*Lampropeltis knoblochi*
Reptiles	Little White Whiptail*	*Aspidoscelis arizonae gypsi*
Reptiles	Madrean Mountain Spiny Lizard*	*Sceloporus jarrovii jarrovii*
Reptiles	Midland Smooth Softshell Turtle*	*Apalone mutica mutica*
Reptiles	Mojave Rattlesnake*	*Crotalus scutulatus scutulatus*
Reptiles	Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*
Reptiles	Mountain Skink	*Plestiodon callicephalus*
Reptiles	Narrow-headed Gartersnake	*Thamnophis rufipunctatus*

Taxon	Common Name[7]	Scientific Name
Reptiles	New Mexico Ridge-nosed Rattlesnake	*Crotalus willardi obscurus*
Reptiles	North American Racer*	*Coluber constrictor*
Reptiles	Northern Mexican Gartersnake	*Thamnophis eques megalops*
Reptiles	Ornate Box Turtle*	*Terrapene ornata*
Reptiles	Plains Gartersnake*	*Thamnophis radix*
Reptiles	Pyro Mountain Kingsnake*	*Lampropeltis pyromelana*
Reptiles	Slevin's Bunchgrass Lizard	*Sceloporus slevini*
Reptiles	Smooth Greensnake*	*Opheodrys vernalis blanchardi*
Reptiles	Sonoran Lyresnake*	*Trimorphodon lambda*
Reptiles	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*
Reptiles	Texas Lyresnake*	*Trimorphodon vilkinsonii*
Reptiles	Texas Spotted Whiptail*	*Aspidoscelis gularis gularis*
Reptiles	Trans-Pecos Rat Snake*	*Bogertophis subocularis subocularis*
Reptiles	Western Blind Snake*	*Rena humilis segregus*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Western Painted Turtle*	*Chrysemys picta bellii*
Reptiles	Western River Cooter	*Pseudemys gorzugi*
Reptiles	Yaqui Black-headed Snake*	*Tantilla yaquia*
Reptiles	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*

TRIBAL WILDLIFE MANAGEMENT IN NEW MEXICO AND NEIGHBORING STATES

There are at least 23 Pueblos, Tribes, and Nations (Tribes) in New Mexico and approximately seven Tribes in neighboring states that have ancestral connections to New Mexico. These Tribes have diverse knowledge of and cultural perspectives on wildlife and the natural world. The Department has identified over 430 species, including over 145 SGCN, that have been documented on the more than 3,100,000 ha (7,750,000 ac) of Tribal lands in New Mexico. More broadly, there is an increasing understanding that indigenous lands contain high biodiversity, even compared to officially designated protected areas (e.g., Schuster et al. 2019). Further, the contributions of Indigenous Knowledge (IK) to the fields of ecology (Jessen et al. 2022) and conservation biology (Ciocco et al. 2022) are increasingly recognized. IK includes place-based knowledge accumulated across generations within many different cultural contexts (Jessen et al. 2022). Indigenous perceptions and beliefs are often grounded in a long history of interacting with nature, but they are not static, nor are they necessarily consistent among individuals or subdivisions of indigenous society. Tribal perspectives on particular species may be deeply rooted in religious, historic, and communal practice rather than in biology or ecology.

Much knowledge of wildlife, especially their cultural significance and related religious customs, is sacred, kept private among Tribes, and not shared with the non-indigenous public. The history of interactions between state resource management agencies and Tribes over wildlife is complex and varied (e.g., Hoagland and Albert 2023). The Department acknowledges the primacy of land jurisdiction and defers to Tribal sovereignty over wildlife and land management on Tribal trust (trust) lands. Across the wider landscape, the Department seeks out and welcomes Tribal perspectives on those issues and decisions that are culturally important to native peoples but are under the jurisdiction of the Department. Many Tribes have established their own natural-resource management departments and have developed plans (e.g., Mikesic 2000, Tom et al. 2018) and wildlife-related assessments (e.g., HCSEE 2013) that guide their wildlife stewardship. The species of particular interest to individual Tribes varies greatly among Tribes, across the landscape, through time, and as bio-physical and socio-economic conditions change. Thus, the SGCN that may be surveyed or otherwise considered by Tribes are likely to change over time and it is unlikely for there to ever be complete alignment between the SGCN list and species of interest and cultural importance to each Tribe. There are permitting requirements for Tribes in recognition of federal jurisdiction over species listed as Threatened or Endangered under the Endangered Species Act, over a 1000 migratory bird species covered under the Migratory Bird Treaty Act, and bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos canadensis*) under the Bald and Golden Protection Act. There have been productive partnerships between the Tribes, the federal government, and the Department regarding these species as Department staff often participate in working groups and conservation actions focused on federally listed and protected species. These partnerships can result in significant conservation achievements that benefit both federally listed and protected species and Tribally significant species. The Department values the partnerships it has engaged in and applauds those achievements spearheaded by Tribes and the federal government and hopes that this SWAP will encourage and inform future similar Tribal efforts and partnerships focused on SGCN. The Department also recognizes the proliferation of co-stewardship agreements between the federal government and Tribes, especially for areas outside current trust lands that are of cultural significance to tribes. As a statewide plan, conservation actions and SGCN in the SWAP may be appropriate for consideration in the work accomplished under these agreements.

Tribal representatives recommended not sharing protected information regarding individual species that are of interest to Tribes during the formal SWAP Tribal consultation process. They preferred that the Department acknowledge the importance of Tribal sovereignty over wildlife management on trust lands in New Mexico; amend conservation actions to include Tribal activities; and present available information on Tribal wildlife management efforts. Tribes lacking official natural-resource management plans can point to this information when applying for funds to support natural-resource activities on trust lands. The Department knows that Tribes play an important role in conserving SGCN and welcomes and encourages partnerships with Tribes and incorporation of their perspectives to SGCN conservation and management. This SWAP presents overarching guidelines that Tribes can refer to as they try to overcome threats and conserve species of both cultural and conservation concern.

ECOREGIONS

New Mexico's size and biodiversity make conservation planning and implementation on a statewide basis impractical. To resolve this, Level II ecoregions mapped by Griffith et al. (2006) and updated in CEC (2021) were selected to focus conservation strategies within specific ecoregions. The ecoregion designations used are part of a four-level, nested system (Level I [continental scale] through IV [sub-regional scale]) developed by The Commission for Environmental Cooperation (1997) to provide uniform classification of areas with similar ecological characteristics throughout North America.

New Mexico encompasses parts of six Level II ecoregions, the most of any state. These ecoregions extend south to central Mexico and north to Canada and include desert (Cold Desert, Warm Desert, and Western Sierra Madre Piedmont), montane (Western Cordillera, Upper Gila Mountains), and prairie (South-Central Semi-arid Prairie) ecosystems (Figure 2, Figure 3). In this SWAP, modified Level III ecoregion names were used that are more descriptive and recognizable to natural-resource managers than the Level II names (Table 6). Level III ecoregion narratives are derived from Griffith (2010).

Table 6. Names used in this report for six Level II ecoregions found in New Mexico.

Names Used in This SWAP	Level II Ecoregions		Level III Ecoregions
	Code[8]	**Name**	**Name**
Colorado Plateaus	10.1	Cold Deserts	Colorado Plateaus
			Arizona/New Mexico Plateaus
Southern Rocky Mountains	6.2	Western Cordillera	Southern Rocky Mountains
High Plains and Tablelands	9.4	South Central Semi-arid Prairie	High Plains
			Southwestern Tablelands
Chihuahuan Desert	10.2	Warm Deserts	Chihuahuan Desert
Madrean Archipelago	12.1	Western Sierra Madre Piedmont	Madrean Archipelago
Arizona/New Mexico Mountains	13.1	Upper Gila Mountains	Arizona/New Mexico Mountains

[8] Classification codes and Level II and Level III names are from Griffith (2010). Level III ecoregions listed are those found within New Mexico.

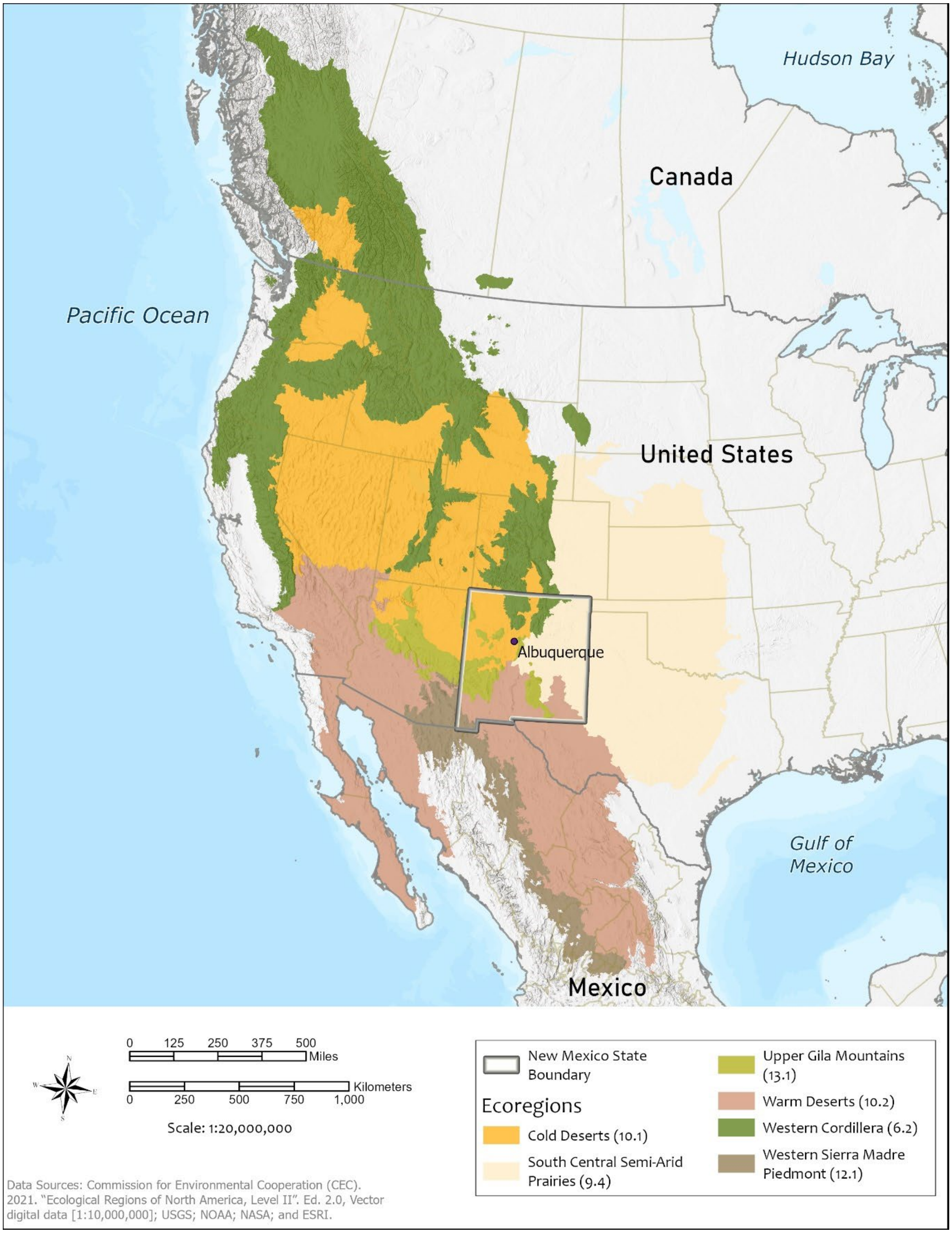


Figure 2. New Mexico at the crossroads of diversity.

Six ecoregions meet in New Mexico (the most of any state) and extend across 16 states, Canada, and Mexico. Classification codes used in most ecoregion maps are shown in parentheses.

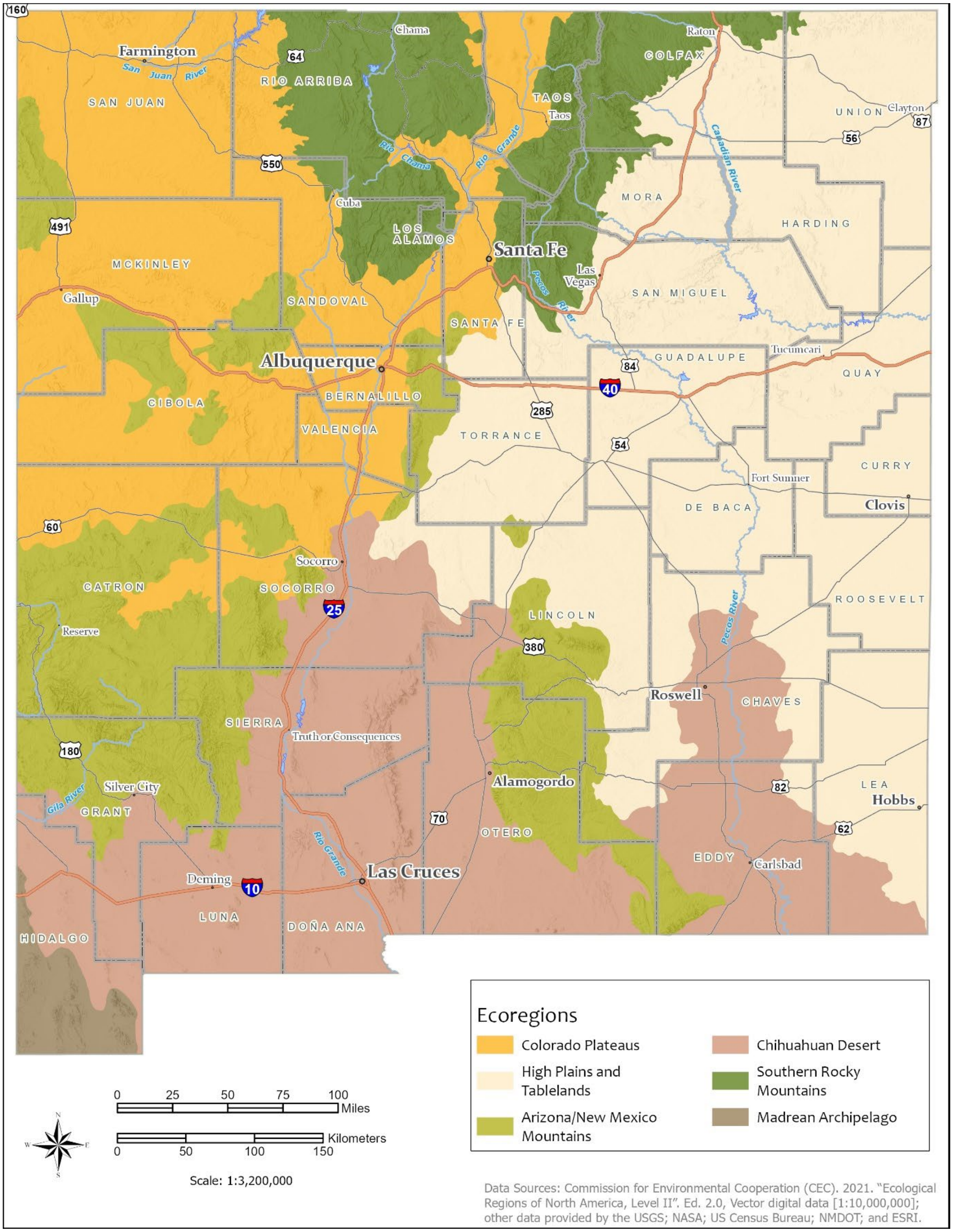


Figure 3. Ecoregions of New Mexico.

These are the main geographic units for the organization of this State Wildlife Action Plan and are based on CEC (2021).

TERRESTRIAL HABITATS

Terrestrial habitats were classified using the United States National Vegetation Classification system (USNVC Version 3.0; https://usnvc.org/), an eight-level, standardized, international system for grouping vegetation by shared floristic or physiognomic characteristics (Jennings et al. 2009, USNVC 2016, Faber-Langendoen et al. 2017; https://usnvc.org). Macrogroups (hereafter "habitats") are used for the naming convention, a mid-level classification based on dominant and diagnostic growth forms and species composition similarity. The base map for upland habitats (Figure 4) is the 2022 LandFire Existing Vegetation Map (LANDFIRE 2022), which was cross-walked from ecological systems to USNVC macrogroups and quality controlled by Natural Heritage New Mexico. Riparian and wetland vegetation were mapped using the New Mexico Riparian Habitat Map (Muldavin et al. 2023; https://nhnm.unm.edu/riparian/nmripmap), also aggregated to USNVC macrogroups (Figure 4). There are 34 terrestrial habitats and four miscellaneous land-cover types, which were grouped into the following seven general classes: (1) Alpine and Montane Vegetation (10 habitats), (2) Plains-Mesa Grasslands (four habitats); (3) Desert Grasslands and Scrub (eight habitats); (4) Cliff, Scree, and Rock Vegetation (one habitat); (5) Arroyo Riparian (two habitats); (6) Riparian Woodlands and Wetlands (nine habitats); and (7) Other Land Cover (four habitats) (Table 7).

Habitats were then grouped into five tiers that reflect their habitat value and needs for conservation (Tier 1 through 4: most to least urgent; Tier 5: non-native and ruderal [weedy] vegetation of least value) (Table 7). Tiers were based on rankings within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. The NatureServe assessment is comprised of five conservation status ranks: critically imperiled (N1), imperiled (N2), vulnerable (N3), apparently secure (N4), and secure (N5). Habitats were also categorized into the following four landscape patterns: (1) matrix (extensive and contiguous, 2,000-10,000 ha [4,942-24,710 ac], wide ecological tolerance, disturbances encompass <5%); (2) large patch (50-2000 ha [124-4,942 ac] of uninterrupted vegetation, disturbances may encompass >20% of individual patches); (3) small patch (distribution limited by local environmental features, 1-50 ha [2.47-124 ac]); and (4) linear (riparian zones along stream channels, 0.5-100 km [0.3-62 mi] long) (Faber-Langendoen et al., 2009). SWAP habitats were assigned to tiers as follows: Tier 1 = N1, N2, or N3 small patch/linear; Tier 2 = N3 large patch or N4 small patch/linear; Tier 3 = N3 matrix or N4 large patch; Tier 4 = N4 matrix; and Tier 5 = N5 ruderal vegetation linear/large patch. Other Land Cover Types were not assigned to tiers as they have minimal value for wildlife. Because of their limited extent and disproportionate importance to wildlife, all riparian woodlands and aquatic habitats were ranked as Tier 1 (top priority for conservation) and all introduced and ruderal vegetation types were ranked as Tier 5 because of their limited habitat value.

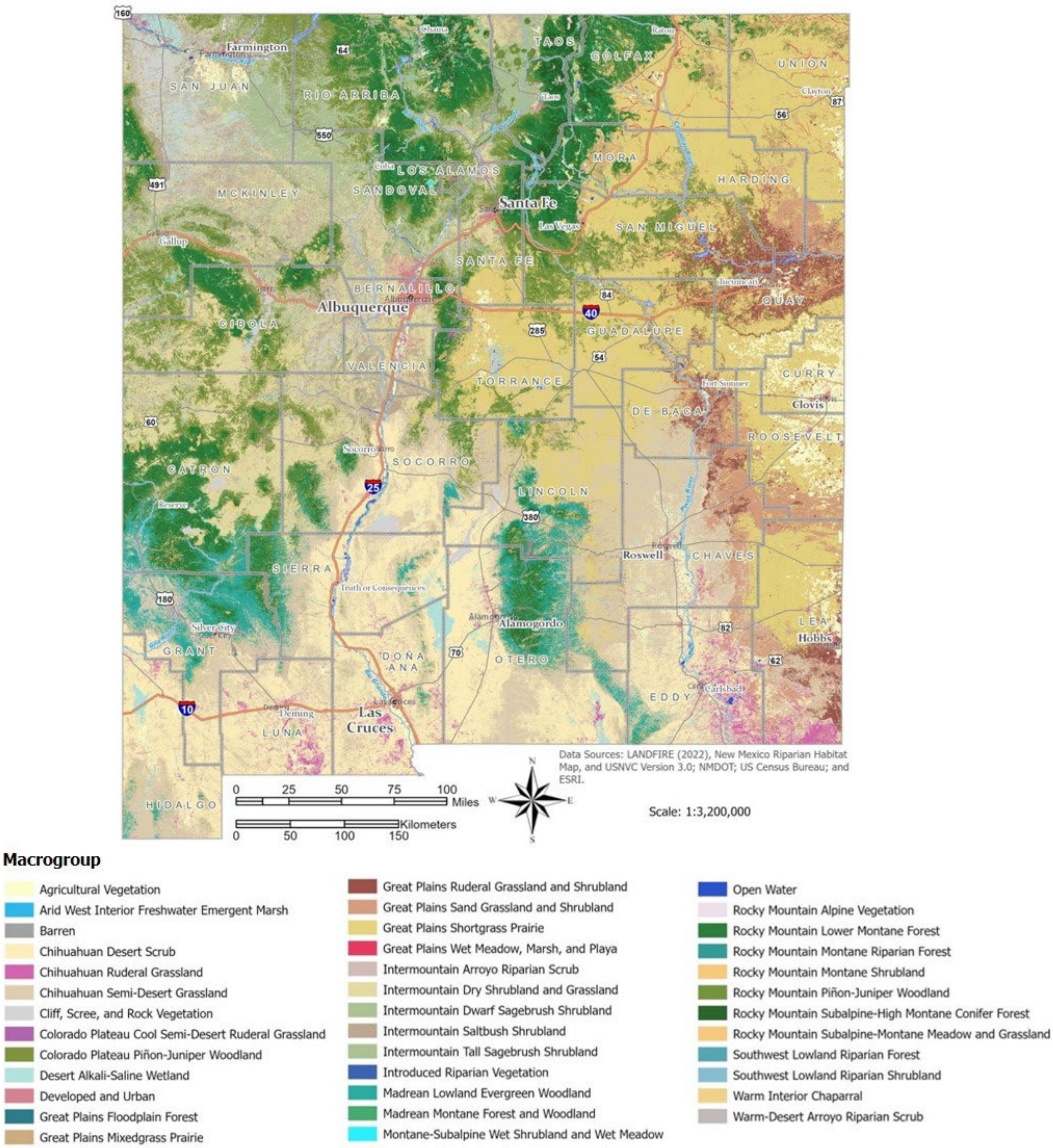


Figure 4. Terrestrial habitat map.

Map based on LandFire 2022 Existing Vegetation Map (LANDFIRE 2022) crosswalked to macrogroups from the United States National Vegetation Classification system and on vegetation types from the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap) grouped to macrogroups.

An overview of each habitat, derived from descriptions provided by USNVC Version 3.0 (https://usnvc.org/), is presented in the ecoregion chapter where the habitat is a dominant component. Exceptions to this are the Other Land Cover vegetation types (agricultural vegetation, barren ground, open water, developed and urban lands), which are not described because they lack natural vegetation and have limited wildlife habitat value.

Table 7. Terrestrial habitats[9].

Habitat Category	Habitat Name	Area (km^2)	Area (mi^2)	Spatial Pattern	Tier	USNVC Code	USNVC Macrogroup Name	Ecoregions	Description Location
Alpine and Montane Vegetation	Rocky Mountain Subalpine-Montane Meadow and Grassland	2,309	891	Small Patch	2	M547	Rocky Mountain Grassland and Meadow	**SRM**, HPT, AZNMM	SRM

[9] Terrestrial habitats are based on macrogroups of the United States Natural Vegetation Classification System (USNVC Version 3.0; https://usnvc.org/) except for the four Other Land Cover types; links to USNVC macrogroup descriptions are provided in the USNVC code column. Open water is included but not broken out among the various aquatic habitats (Figure 5). Habitats listed in order by Tier (see below) and then alphabetically. Distribution information and areas for upland habitat types are based on the 2022 LandFire Existing Vegetation Map for the continental US (LANDFIRE 2022), which was quality controlled by Natural Heritage New Mexico. Ecological systems in LANDFIRE (2022) were cross-walked to USNVC macrogroups. Distribution information and areas for riparian vegetation types are based on the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap), also aggregated to macrogroups and embedded in the LANDFIRE (2022) map. Tiers reflect the priority for conservation and are based on the degree of imperilment within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. Ranks: N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure. Spatial patterns: linear, small patch, large patch, and matrix. Tier 1: N1, N2, N3 small patch/linear; Tier 2: N3 large patch or N4 small patch/linear; Tier 3: N3 matrix or N4 large patch; Tier 4: N4 matrix; Tier 5: N5 ruderal vegetation linear/large patch. Ecoregions where habitats occur: CP = Colorado Plateaus; SRM = Southern Rocky Mountains; HPT = High Plains and Tablelands; CD = Chihuahuan Desert; MA = Madrean Archipelago; AZNMM = Arizona/New Mexico Mountains. Bold print identifies ecoregions where habitat primarily occurs. Habitats are described in the profile of the ecoregion listed in the last column.

Habitat Category	Habitat Name	Area (km²)	Area (mi²)	Spatial Pattern	Tier	USNVC Code	USNVC Macrogroup Name	Ecoregions	Description Location
	Madrean Montane Forest and Woodland	1,196	462	Large Patch	3	M011	Madrean Montane Forest and Woodland	CD, MA, **AZNMM**	AZNMM
	Rocky Mountain Alpine Vegetation	35	14	Matrix	3	M099	Rocky Mountain-Sierran Alpine Tundra	**SRM**	SRM
	Rocky Mountain Montane Shrubland	3,698	1,428	Large Patch	3	M049	Southern Rocky Mountain Montane Shrubland	CP, **SRM**, **HPT**, CD, AZNMM	SRM
	Colorado Plateau Piñon-Juniper Woodland	15,020	5,799	Matrix	4	M896	Intermountain Piñon-Juniper Woodland	**CP**, SRM, **AZNMM**	CP
	Madrean Lowland Evergreen Woodland	9,778	3,775	Matrix	4	M010	Madrean Lowland Evergreen Woodland	CD, MA, **AZNMM**	MA
	Rocky Mountain Lower Montane Forest	24,303	9,383	Matrix	4	M022	Southern Rocky Mountain Montane Forest and Woodland	CP, **SRM**, HPT, CD, **AZNMM**	SRM

Habitat Category	Habitat Name	Area (km^2)	Area (mi^2)	Spatial Pattern	Tier	USNVC Code	USNVC Macrogroup Name	Ecoregions	Description Location
	Rocky Mountain Piñon-Juniper Woodland	13,360	5,158	Matrix	4	M897	Southern Rocky Mountain Two-needle Piñon-One-seed Juniper Woodland	CP, **SRM**, **HPT**, AZNMM	SRM
	Rocky Mountain Subalpine-High Montane Conifer Forest	3,144	1,214	Matrix	4	M020	Rocky Mountain Subalpine-Upper Montane Forest and Woodland	**SRM**, **AZNMM**	SRM
	Warm Interior Chaparral	2,292	885	Large Patch	4	M091	Warm Interior Chaparral	**CD**, MA, **AZNMM**	AZNMM
Plains-Mesa Grasslands	Great Plains Mixedgrass Prairie	1,476	570	Large Patch	2	M051	Great Plains Mixedgrass and Fescue Prairie	SRM, **HPT**	HPT
	Great Plains Sand Grassland and Shrubland	7,984	3,083	Large Patch	3	M052	Great Plains Sand Grassland and Shrubland	**HPT**, CD	HPT
	Great Plains Shortgrass Prairie	55,189	21,308	Matrix	3	M053	Great Plains Shortgrass Prairie	CP, SRM, **HPT**, AZNMM	HPT
	Great Plains Ruderal Grassland and Shrubland	7,809	3,015	Large Patch	5	M498	Great Plains Ruderal Grassland and Shrubland	**HPT**, AZNMM	HPT
Desert Grassland and Scrub	Chihuahuan Semi-Desert Grassland	39,814	15,372	Matrix	2	M087	Chihuahuan Semi-Desert Grassland	**HPT**, **CD**, MA, AZNMM	MA

Habitat Category	Habitat Name	Area (km^2)	Area (mi^2)	Spatial Pattern	Tier	USNVC Code	USNVC Macrogroup Name	Ecoregions	Description Location
	Intermountain Dry Shrubland and Grassland	26,800	10,347	Large Patch	2	M171	Great Basin and Intermountain Dry Shrubland and Grassland	**CP**, SRM, CD, AZNMM	CP
	Intermountain Tall Sagebrush Shrubland	13,213	5,101	Matrix	3	M169	Great Basin-Intermountain Tall Sagebrush Steppe and Shrubland	**CP**, **SRM**, AZNMM	CP
	Chihuahuan Desert Scrub	41,121	15,877	Matrix	4	M086	Chihuahuan Desert Scrub	HPT, **CD**, MA, AZNMM	CD
	Intermountain Dwarf Sagebrush Shrubland	1,586	612	Large Patch	4	M170	Great Basin and Intermountain Dwarf Sagebrush Shrubland and Steppe	**CP**, SRM	CP
	Intermountain Saltbush Shrubland	9,170	3,540	Matrix	4	M093	Intermountain Saltbush Scrub	**CP**, SRM, HPT, AZNMM	CP
	Chihuahuan Ruderal Grassland	3,941	1,522	Large Patch	5	M512	North American Warm Desert Ruderal Scrub and Grassland	**CD**, MA, AZNMM	CD
	Colorado Plateau Cool Semi-Desert Ruderal Grassland	1,221	471	Large Patch/Matrix	5	M499	Western North American Cool Semi-Desert Ruderal Scrub and Grassland	**CP**, SRM, AZNMM	CP

Habitat Category	Habitat Name	Area (km²)	Area (mi²)	Spatial Pattern	Tier	USNVC Code	USNVC Macrogroup Name	Ecoregions	Description Location
Arroyo Riparian	Intermountain Arroyo Riparian Scrub	31	12	Linear	2	M095	Great Basin and Intermountain Xeric-Riparian Scrub	**CP**, SRM	CP
	Warm-Desert Arroyo Riparian Scrub	251	97	Linear	2	M092	North American Warm-Desert Xeric-Riparian Scrub	**HPT**, **CD**, MA, AZNMM	CD
Riparian Woodlands and Wetlands	Arid West Interior Freshwater Emergent Marsh	271	104	Small Patch	1	M888	Arid West Interior Freshwater Marsh and Wet Meadow	**CP**, SRM, **CD**, MA, AZNMM	CD
	Desert Alkali-Saline Wetland	4,435	1,712	Small Patch	1	M082	North American Desert Alkali-Saline Marsh, Playa, and Shrubland	**CP**, SRM, HPT, **CD,** MA, AZNMM	CP
	Great Plains Floodplain Forest	123	48	Linear	1	M028	Great Plains Flooded and Swamp Forest	**HPT**	HPT
	Great Plains Wet Meadow, Marsh, and Playa	667	257	Small Patch	1	M071	Great Plains Wet Meadow, Marsh, and Playa	SRM, **HPT**	HPT
	Montane-Subalpine Wet Shrubland and Wet Meadow	757	292	Small Patch	1	M893	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	CP, **SRM**, HPT, AZNMM	SRM

Habitat Category	**Habitat Name**	**Area (km^2)**	**Area (mi^2)**	**Spatial Pattern**	**Tier**	**USNVC Code**	**USNVC Macrogroup Name**	**Ecoregions**	**Description Location**
	Rocky Mountain Montane Riparian Forest	486	188	Linear	1	M034	Rocky Mountain-Great Basin Montane Riparian and Swamp Forest	CP, **SRM,** HPT, **AZNMM**	SRM
	Southwest Lowland Riparian Forest	486	190	Linear	1	M036	Western Arid Lowland Flooded Forest	**CP**, SRM, **CD**, MA, **AZNMM**	CD
	Southwest Lowland Riparian Shrubland	153	59	Linear	1	M076	Warm Desert Lowland Freshwater Marsh, Wet Meadow, and Shrubland	SRM, HPT, **CD**, MA, AZNMM	CD
	Introduced Riparian Vegetation	497	192	Linear	5	M298	Western Arid Ruderal Riparian Forest and Scrub	**CP**, SRM, HPT, **CD**, MA, AZNMM	CD
Cliff, Scree, and Rock Vegetation	Cliff, Scree, and Rock Vegetation	5,994	2,314	Small Patch	4	M887	Western North American Temperate Cliff, Scree, and Rock Vegetation	**CP**, SRM, HPT, CD, MA, AZNMM	CP
Other Land Cover	Agricultural Vegetation	8,696	3,357	N/A	N/A	N/A	Miscellaneous Type	N/A	N/A
	Barren	649	251	N/A	N/A	N/A	Miscellaneous Type	N/A	N/A
	Developed and Urban	5,815	2,245	N/A	N/A	N/A	Miscellaneous Type	N/A	N/A

Habitat Category	Habitat Name	Area (km^2)	Area (mi^2)	Spatial Pattern	Tier	USNVC Code	USNVC Macrogroup Name	Ecoregions	Description Location
	Open Water	596	230	N/A	N/A	N/A	Miscellaneous Type	N/A	N/A

AQUATIC HABITATS

Flowline and water body files of the National Hydrography Dataset Plus version 2.1 (https://www.usgs.gov/national-hydrography/national-hydrography-dataset; https://pubs.usgs.gov/of/2019/1096/ofr20191096.pdf) were used to display major rivers, lakes, and reservoirs (Figure 5). Some lakes and reservoirs were mapped from digital orthophotography (1 m resolution) produced in 2011-14 by the National Agriculture Imagery Program (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). Definitions of persistence considered in the descriptions of aquatic habitats provided below (perennial, ephemeral, intermittent) were from the New Mexico Administrative Code 20.6.4, “Standards for Interstate and Intrastate Surface Waters” (https://www.srca.nm.gov/parts/title20/20.006.0004.html). Surface water temperature (warm, cold) was defined based in part on these same surface water standards and in part on management and priority species information from the Department. These indicate the major classes of aquatic life (i.e., cold or warm) that the New Mexico Water Quality Control Commission designated as appropriate for those reaches. The Water Quality Standards have been developed and refined over decades based on elevation, field observations of temperature, terrestrial habitat in which they were located, and records of species occupancy. Persistence (i.e., ephemeral or perennial) is based in part on Water Quality Standards segment definitions and in part on records of species occupancy and field indictors of perennial conditions.

New Mexico has 170 perennial lakes and reservoirs that are accessible to the public. Cold-water lakes/reservoirs are most numerous (102) but cover the least area (11,144 ha [27,538 ac]). Conversely, warm-water lakes cover a larger total area (16,690 ha [41,242 ac]) but are less common (68). Total length of perennial streams was slightly less for warm-water (6,560 km [4,076 mi]) than cold-water (6,914 km [4,296 mi]) temperature regimes.

The aquatic habitats found in New Mexico do not function in isolation from adjoining terrestrial habitat. Extreme events including post-fire flooding, where ash is washed down into streams, lakes, and reservoirs, will impact the chemistry and morphology of aquatic habitats. If a strictly aquatic SGCN is susceptible to changes in water chemistry (e.g., Texas hornshell [*Popenias popeii*]; susceptible to high levels of salinity), the quality of adjoining terrestrial habitats can greatly influence the status of that species. Riparian habitat can provide shade and cover for many fish SGCN. Therefore, while fish SGCN habitat associations that are presented in each ecoregion include only their required aquatic habitats, the adjacent terrestrial habitats likely should be considered as well when planning conservation or restoration actions. Below are descriptions of eight types of aquatic habitats found in New Mexico.

Perennial Cold-Water Streams [**PCWS**] are natural courses of flowing water containing dissolved and suspended nutrients and other materials that normally support communities of plants and animals within the channel and the adjacent riparian vegetation zone. Water temperatures are generally cold enough to support species such as trout.

Perennial Warm-Water Streams **[PWWS]** are natural courses of flowing water containing dissolved and suspended nutrients and other materials that normally support communities of plants and animals within the channel and the adjacent riparian vegetation zone. Water temperatures generally are too warm to support trout and instead support species such as bass and catfish.

Perennial Lakes, Cirques, Ponds **[PLCP]**: A lake is a natural body of fresh or saline water > 8 ha (20 ac) that is completely surrounded by land, holds water year round, and remains relatively unchanged across years. A cirque is a body of standing water that occurs where valleys are shaped into structures resembling amphitheaters by the action of freezing and thawing ice. These formations are usually found in the upper portion of a glaciated area in mountains and always contain water. A pond is a natural or artificial body of standing water usually < 8 ha (20 ac) and characterized by a high ratio of littoral (shallow) zone relative to open water.

Perennial Marshes/Cienegas/Springs/Seeps **[PMCSS]**: Perennial marshes or cienegas are water-saturated, poorly drained wetlands permanently inundated up to a depth of 2 m (7 ft). Marshes support an extensive cover of emergent, non-woody vegetation without peat-like accumulations. Cienegas are associated with perennial spring and seep systems in isolated arid basins of the southwest. A perennial spring occurs where an underground source of water emerges from the ground, generally from a single point of origin, forming a stream, pond, marsh, or other type of water body. A seep is a generally small area where water comes slowly to the ground surface; seeps typically don't have a well-defined point of origin. Seeps generally have a lower flow rate than springs and rarely have enough water volume to form a substantial water body.

Perennial Cold-Water Reservoirs **[PCWR]** are human-created impoundments where water is collected, stored, regulated, and released for human use. Water temperatures generally are cold enough to support fish species such as trout. Examples include Eagle Nest, El Vado, and Heron Lakes.

Perennial Warm-Water Reservoirs **[PWWR]** are human-created impoundments where water is collected, stored, regulated, and released for human use. Water temperatures are generally too warm to support trout and instead support species such as bass and catfish. Examples include Brantley, Caballo, and Conchas Lakes, Lake Avalon, and Elephant Butte and Ute Reservoirs.

Ephemeral Marshes/Cienegas/Springs **[EMCS]:** Marshes and cienegas are water-saturated, poorly drained wetlands periodically inundated up to a depth of 2 m (7 ft). Marshes support an extensive cover of emergent, non-woody vegetation without peat-like accumulations. Cienegas are associated with ephemeral spring and seep systems in isolated arid basins of the southwest. Ephemeral springs are areas where groundwater intermittently flows naturally from a rock or soil substrate to the surface to form a stream, pond, marsh, or other body of water.

Tinaja

Ephemeral Catchments **[EC]** (playas, pools, tinajas, kettles, and tanks) are bodies of standing water formed in depressions, basins, or streams. A playa is an internally drained lake found in a sandy, salty, or muddy flat floor of an arid basin, usually filled with shallow water only after prolonged, heavy precipitation. A pool is formed in a small depression found in a marsh or on a floodplain. A tinaja is a pool in a seasonal stream that may support flora upon desiccation. A kettle is formed in a depression by melting ice blocks deposited in a glacial drift or in the glacier's outwash plain. A tank is an artificial pond built to hold water for livestock and wildlife (sometimes including fish) that contains water for short and irregular periods of time, usually after a heavy precipitation event.

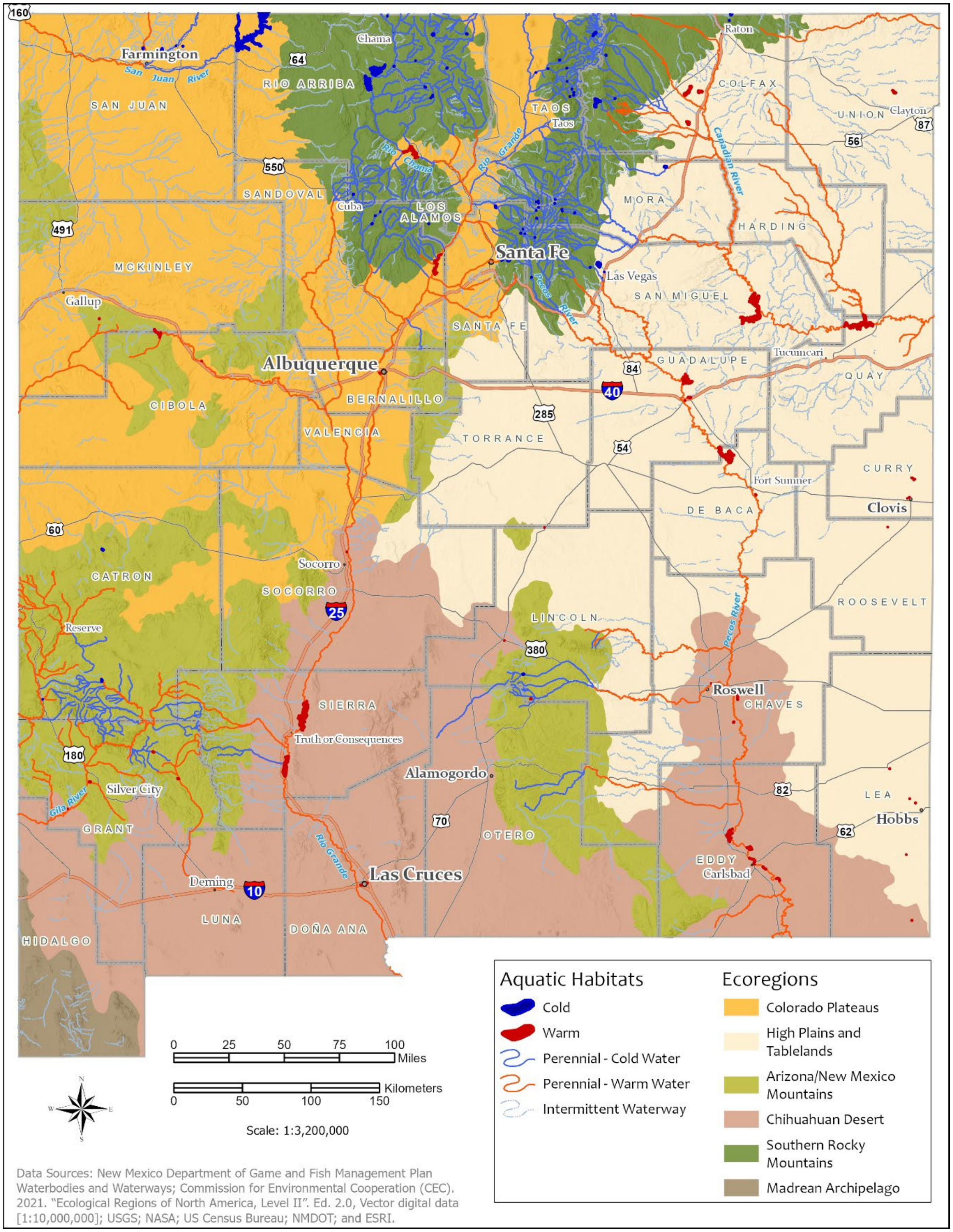


Figure 5. Aquatic habitats.

Data were from the New Mexico Department of Game and Fish (NMDGF 2022a).

Chapter 3: Threats, Conservation Actions, and Opportunities

Threats are defined as factors that can adversely affect the long-term persistence of Species of Greatest Conservation Need (SGCN). Many are anthropogenic, but they also may be associated with natural processes. Additionally, human activities may be positive or neutral for some species under certain conditions. Whether activities have positive or negative impacts to species depends on the length of occurrence (both intra- and inter-annual), period of the year in which a particular activity occurs, location where it occurs, its spatial extent, and its intensity. How severely an activity negatively impacts a SGCN also depends on the ability of the affected species to respond and adapt to the activity such that survival and reproduction are unaffected.

Conservation actions are measures that reduce, eliminate, or mitigate threats, thereby increasing the probability of persistence for affected SGCN. Threats and actions listed in the 2017 State Wildlife Action Plan (SWAP) for New Mexico were reviewed for currency and relevance. Threats and actions were categorized based on the hierarchy of threats developed by Salafsky et al. (2008) as adapted by the International Union for Conservation of Nature (IUCN) and the Conservation Measures Partnership (CMP) to classify threats to species throughout the world (IUCN 2022).

THREATS

Most wildlife species and habitats in New Mexico have been influenced by humans and likely will continue to be. Arguably, the role of conservation is to reduce or manage those influences to achieve, to the maximum extent possible, healthy and naturally functioning (i.e., neither assisted nor inhibited by humans) ecosystems that allow wildlife populations to persist. The challenge is: one human impact may encompass a suite of interacting factors (e.g., mine development encompasses noise from machinery, human activity, habitat fragmentation from roads, toxins leaching from waste rock) and the effect of these impacts may be additive (severity increases with number of impacts), cascading (one impact leads to initiation of another), or compensatory (one replaces the effect of another). The cause-and-effect relationships between human activities and wildlife responses may be neither clear nor direct. For instance, residential development at the edges of Albuquerque does not directly impact Rio Grande silvery minnows (*Hybognathus amarus*). However, increased demand for water by additional residents may reduce flows in the Rio Grande, which negatively impacts the ability of the minnow to survive and reproduce.

This section addresses nine of 10 categories of human activities identified by the IUCN that potentially threaten the persistence of SGCN in New Mexico (Table 8; Appendix E). The 10th potential threat category, climate change and severe weather, is discussed separately in Chapter 4. Positive and neutral impacts of some activities are discussed, but the focus is on negative impacts because they must be addressed with conservation actions to ensure recovery and persistence of SGCN.

Table 8. List of International Union for the Conservation of Nature (IUCN) and Conservation Measures Partnership (CMP) threats potentially effecting Species of Greatest Conservation Need (SGCN).

IUCN Level I and Level II Categories[10]	Description	Factors that could Adversely Affect SGCN in New Mexico
1. Residential and Commercial Development 1.1 Housing and Urban Areas 1.2 Commercial and Industrial Areas 1.3 Tourism and Recreation Areas	Human settlements or other non-agricultural land uses with a substantial footprint. Includes cities, towns, and settlements; factories and other commercial centers; and tourism and recreation sites with a substantial footprint.	Habitat loss/fragmentation/degradation, including of aquatic habitats and riparian areas, and behavior modification from noise and activity associated with: urban areas, suburbs, vacation homes, manufacturing plants, military bases, power plants, airports, ski areas, golf courses, and campgrounds.
2. Agriculture and Aquaculture 2.1 Annual and Perennial Non-Timber Crops 2.3 Livestock Farming and Ranching	Farming and ranching, including orchards, vineyards, and domestic terrestrial animals raised either in one farmed location or that utilize natural habitats.	Loss of nutrition and cover and habitat loss/degradation/fragmentation associated with various crops, cattle feed lots, dairy farms, and cattle ranching.
3. Energy Production and Mining 3.1 Oil and Gas Drilling 3.2 Mining and Quarrying 3.3 Renewable Energy	Production of non-biological resources including exploration, development, and production of petroleum and other liquid hydrocarbons, minerals, rocks, and renewable energy.	Habitat loss/fragmentation, behavior modification from noise and activity, and direct mortality from collisions with wind turbines or burns associated with solar concentrator power tower facilities (Lovich and Ennen 2011). Includes impacts of oil and gas wells (both surface impacts and effects on groundwater at drill sites), coal mines, rock quarries, wind farms, and solar farms.

[10] Threats are listed in the order presented by the International Union for the Conservation of Nature (IUCN) and Conservation Measures Partnership (CMP). The order does not reflect the relative severity of threats found in New Mexico. Categories developed by Salafsky et al. (2008) and maintained by the IUCN and CMP (IUCN 2022) as standards for determining threats to imperiled species worldwide. Categories used here are based on the 2022 version (version 3.3) from the IUCN and CMP. Only those threats relevant to conservation of SGCN in New Mexico are listed. Descriptions and examples draw from IUCN (2022).

IUCN Level I and Level II Categories	Description	Factors that could Adversely Affect SGCN in New Mexico
4. Transportation and Service Corridors 4.1 Roads and Railroads 4.2 Utility and Service Lines 4.4 Flight Paths	Long, narrow transport corridors, including roadways, utility lines, pipelines, and flight paths for transporting people, energy, and products. Includes impacts from vehicles using these corridors and of fencing along transportation corridors.	Habitat fragmentation, behavior modification from noise and activity, spread of invasive species, direct mortality from collisions with vehicles and utility lines, and raptor electrocution. Corridors include highways, secondary roads, logging roads, railroads, powerlines, cell phone towers connected by access roads, oil and gas pipelines, and airplane flight paths.
5. Biological Resource Use 5.1 Hunting and Collecting Terrestrial Animals 5.3 Logging and Wood Harvesting 5.4 Fishing and Harvesting Aquatic Resources	Consumptive use of non-cultivated biological resources, including both deliberate and unintentional harvesting effects. Includes killing or trapping terrestrial or aquatic animals for commercial, recreation, subsistence, control/persecution, or research purposes and associated accidental mortality. Also includes harvesting trees for timber, fiber, or fuel and associated forestry management practices.	Habitat loss/fragmentation and population perturbation from direct mortality and associated, indirect effects on other species. Includes poaching, trophy hunting, fur trapping, predator and pest control, commercial logging, and fuel wood collection.
6. Human Intrusions and Disturbance 6.1 Recreational Activities 6.2 War, Civil Unrest, and Military Exercises 6.3 Work and Other Activities (e.g., field research)	Human activities that may alter, destroy, or disturb habitats and species associated with non-consumptive uses of biological resources. Does not usually lead to permanent habitat destruction. Includes vehicle travel outside of established transport corridors; people spending time in nature for work, recreation, or illegal activities; actions by military forces outside of permanent military bases.	Habitat modification/disturbance and behavior modification from noise and activity. Activities include the use of off-highway vehicles, motorboats, jet-skis, snowmobiles, mountain bikes, ultralight planes, hangliders, and tanks and other military vehicles. Also include hiking, wildlife watching, caving, rock climbing, military training exercises, field-based species research and law enforcement, and illegal activities including vandalism.
7. Natural System Modifications 7.1 Fire and Fire Suppression 7.2 Dams and Water Management/Use 7.3 Other Ecosystem Modifications	Actions that convert or degrade habitat in order to manage natural or semi-natural systems for the benefit of humans. Includes fire suppression, inappropriate management of fires, modification of water flow patterns such that they deviate from their natural range of variation, and too much or too little management (e.g., mowing, abandoning managed lands).	Habitat loss/fragmentation/modification, changes in nutrients and cover, erosion, and alteration of sediment balance and hydroperiod. Impacts associated with fire suppression to protect property, escaped fires, arson, the construction and operation of dams and associated water releases, surface water diversion, groundwater pumping, channelization, snag removal from streams, and land reclamation projects.

IUCN Level I and Level II Categories	Description	Factors that could Adversely Affect SGCN in New Mexico
8. Invasive and Other Problematic Species, Genes and Diseases 8.1 Invasive Non-native/Alien Species/Diseases 8.2 Problematic Native Species/Diseases 8.3 Introduced Genetic Material 8.4 Problematic Species/Diseases of Unknown Origin 8.5 Viral/Prion-induced Diseases 8.6 Diseases of Unknown Cause	Non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread, and/or increase in abundance. Includes harmful organisms introduced or spread as a result of human activities; organisms and genes altered or transported by humans; disease-causing agents such as bacteria, viruses, prions, and fungi; and diseases of unknown origin or cause.	Habitat loss/fragmentation/degradation; pollution of gene pools of native species through hybridization with non-native species; and population reduction through competition, disease, and predation. Harmful organisms can include feral domesticated cattle, unrestrained pets, non-native mussels, non-native grasses and other plants, species introduced for biocontrol. Diseases include chytrid fungus in amphibians, the fungus that causes white-nose syndrome in bats, plague, rabies, hantavirus, ranavirus, tularemia, chronic wasting disease, and West Nile virus.
9. Pollution 9.1 Domestic and Urban Wastewater 9.2 Industrial and Military Effluents 9.3 Agricultural and Forestry Effluents 9.4 Garbage and Solid Waste 9.5 Airborne Pollutants 9.6 Excess Energy	Introduction of exotic and/or excess materials or energy from point and nonpoint sources. Includes sewage, nutrients, toxic chemicals, or sediment in runoff from housing and urban areas, industrial areas (including mines), and agricultural areas. Also includes solid waste that may entangle wildlife; atmospheric pollutants; and generation of heat, light, or sound from sources such as power plants, urban areas, and highways that disturb wildlife or ecosystems.	Habitat degradation, behavior modification from noise or light, direct mortality/reduced fecundity, and loss of food and water. Sources of pollution include leaking septic and fuel tanks, untreated sewage, oil or sediment on roads, lawn and agricultural fertilizers and herbicides, illegal chemical dump sites, mine tailings, and manure on feed lots. Solid waste includes road-side litter and construction-site debris. Air pollution can result from smoke from forest fires, wind erosion from disturbed areas/bare ground, and vehicle and industrial emissions, including ozone produced because of these emissions (Marsavin et al. 2024). Heat, light, or sound that can disturb wildlife can be released by highways, airplanes, power plants, and lights in urban areas.
11. Climate Change and Severe Weather 11.1 Habitat Shifting and Alteration 11.2 Droughts 11.3 Temperature Extremes 11.4 Storms and Flooding 11.5 Other Impacts	Long-term climatic changes, which may be linked to global warming, and other severe climatic/weather events that are outside of the natural range of variation or can destroy a vulnerable species or habitat. Include effects of changes in habitat composition or location; severe lack of rain and loss of surface water; heat waves; and extreme precipitation or wind events.	Habitat loss/fragmentation, loss of food and cover, and direct mortality from drought and extreme temperatures. Habitat alterations can include desertification, and drought can lead to a loss of surface water sources. Climate change can impact the timing of key life history events, inter-specific interactions, and the occurrence of extreme precipitation or wind events including thunderstorms, tornados, hailstorms, dust storms, and blizzards.

RESIDENTIAL AND COMMERCIAL DEVELOPMENT

New Mexico has two important characteristics favorable for conservation of wildlife: (1) it has a large land area; and (2) the human population is relatively small and localized (nearly half reside in 10 cities). According to the US Census, New Mexico's total population was 2,117,522 people in 2020 with 1,541,628 people living in urban areas (USCB 2020, ESRI 2023). Thus, urban sprawl and industrial development are relatively minor compared to smaller and/or more populous states. Nevertheless, when development does occur, it is more likely to do so in and near cities because of available infrastructure. Thus, species and habitats adjacent to or near metropolitan areas likely would be more vulnerable to loss due to development than those in more remote areas. However, the impacts of increasing residential and commercial development reverberate well beyond city boundaries. For example, water imported from the Colorado River basin to meet the needs of Santa Fe and Albuquerque residents contributes to reductions in amount and timing of flows in the San Juan River. Changes in flow have been linked to the near extirpation of native Colorado pikeminnow (*Ptyochocheilus lucius*) (Franssen et al. 2007, Valdez et al. 2023).

Growth of New Mexico's cities also has made formerly isolated wildlands readily accessible to more people, thereby exposing wildlife to more disturbances. More people are building homes in rural areas, thus directly eliminating, fragmenting, and more broadly degrading adjacent wildlife habitat. Disturbances that once were non-existent or temporary have become permanent. The wildland-urban interface (WUI) is the area where human developments meet or intermingle with undeveloped wildland vegetation. The WUI is an area of human and wildland/wildlife habitat conflict, which can manifest in the destruction of homes by wildfires or introduction of exotic species or as habitat fragmentation or biodiversity decline (Radeloff et al. 2005).

Wildlands and wildlife are also impacted by the development of facilities for tourism and recreation, including ski areas and campgrounds. Ski areas can affect water quality and quantity of aquatic organisms in nearby streams (Molles and Gosz 1980). Human activity at ski areas can have negative consequences for the fitness of wildlife populations and along ski trails can displace wildlife. Snow compaction associated with ski trails can impact inter-specific interactions, especially of local predator communities (Gaines et al. 2003). Some bird species are attracted to campgrounds, others avoid them (Gaines et al. 2003) and campgrounds with unsecured trash can attract predators, leading to human-wildlife conflict (Winslow and Harding 2006).

AGRICULTURE

Agriculture in New Mexico has a long and rich history starting with subsistence crop production by Native Americans thousands of years ago. Agricultural production diversified with the intermingling of Native American cropping and European settler knowledge, leading to the advent of new agricultural practices for crops and livestock (Schickedanz 1980). Currently, livestock grazing is broadly distributed across New Mexico, while crop production is more localized and relies upon irrigation water delivered along historic acequias; large-scale diversion and ditches; or by modern, high-efficiency irrigation systems pumping groundwater from aquifers.

Agricultural activities involve land uses such as tilling, draining, seeding, intercropping, rotation, weed and pest control, grazing, and irrigation that have significant implications for lands that serve as habitats for wildlife. Agriculture inherently involves domestication of formerly wild plants and animals and human domination and control to maintain agricultural landscapes. Industrial-scale agricultural practices are leading drivers of habitat loss, fragmentation, and biological diversity declines. However, the conservation-based agricultural movement strives to integrate wildlife and wildlands in a more sustainable agricultural model that reduces the need for continued large-scale conversion of wildlands and wildlife habitats to highly altered agricultural lands (Green et al. 2005, Imhoff and Baumgarter 2006). Agricultural practices can provide habitat or resources or protect habitat quality (e.g., reduce erosion) for SGCN. Beneficial practices include planting rows of trees between crops to reduce erosion, sequester carbon, and enhance biodiversity (McCarthy 2024). Pollinator-friendly practices may include planting pollinator habitat along field margins and underutilized areas, revegetating retired farmland with wildflowers, and including pollinator-friendly forbs in cover-crop seed mixes (O'Brien and Arathi 2021).

Some species of wildlife may benefit from agriculture-driven changes to the landscapes, while others do not. Agricultural lands may provide more suitable habitat for native wildlife than fragmented and extensively modified urban or suburban lands. Such lands often serve as a buffer between natural areas and more highly altered landscapes, providing food, cover, breeding habitat, and enabling movement and exchange of plant and animal populations (Freemark et al. 2002; Kerr and Cihlar 2004; Blann 2006) for species less sensitive to human presence and disturbance. More specifically, agricultural lands provide important food sources to migratory waterfowl and sandhill cranes (*Antigone canadensis*) during migration and overwintering periods. Livestock grazing programs, when managed sustainably, can provide multiple benefits to wildlife even while legacy effects of historic agricultural practices on wildlife habitats remain. Lands managed as part of a range livestock operation remain relatively free from development and conversion to alternate land uses that are not compatible with wildlife. For example, New Mexico wildlife utilize millions of acres of habitat on relatively undeveloped private rangelands, State Trust Lands, and federal public land, and can benefit from wildlife-friendly artificial water sources. Surface water is an important limiting factor for wildlife populations in desert environments where water sources are rare or non-existent (Rosenstock et al. 2005). Earthen and steel cattle tanks increase the distribution of water sources on the landscape and can benefit wildlife. The Chiricahua leopard frog (*Lithobates chiricahuensis*) is a native amphibian and SGCN that uses earthen, steel, and concrete livestock tanks as habitat (Degenhardt et al. 1996, USFWS 2007).

Conversely, wildlife inhabiting agricultural areas must be able to withstand the perturbations associated with managing land for human food production and/or find additional spaces on the landscape to supply their life history needs. Wildlife species utilizing agricultural lands may be limited directly by the disturbance associated with grazing, planting, and harvesting and indirectly by the reduced availability of plant and insect foods (McLaughlin and Mineau 1995). For example, when piñon (*Pinus* spp.) - juniper (*Juniperus* spp.) woodlands are reduced or removed to improve forage and habitat quality for livestock, it can lead to reduced abundance of local wildlife populations. In particular, mechanical removal of these trees has been shown to have negative impacts for local bird abundance, especially of woodland-associated species, and mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis nelsoni*) may avoid larger cleared patches due to the loss of protective cover (Bombaci and Pejchar 2016). Additionally, application and accumulation of pesticides used for agricultural practices are a potential cause of pollinator species decline; some insecticides used in agricultural areas or intreating seeds are highly toxic to bees, butterflies, and birds and can lead to fitness impacts in birds exposed over time; and herbicides can reduce the availability of food resources for pollinators, indirectly leading to population declines (Brittain et al. 2010, Sanchez-Bayo 2021, EPA 2023, Van Deynze et al. 2024). Another agricultural practice that may impact native insect pollinators, especially rare species or species of conservation concern, is the use of honey bees (*Apis mellifera*), both to pollinate crops and produce honey. Honey bees may transmit diseases to native bees, may compete with native species for floral resources, and their presence may negatively impact native bee reproduction, especially when honey bee hives are placed in natural areas. It is important to ensure there is sufficient high-quality forage available for honey bees within agricultural lands, thus removing the need to find forage in natural areas (Hatfield et al. 2018).

Consumption of crops and livestock by wild animals must be at a level that agriculture producers perceive as tolerable, or these animals may become the focus of control efforts to eradicate or reduce populations of wildlife on these working lands. The degree of compatibility between agricultural production and wildlife habitat depends upon a variety of factors, including the habitat requirements of the species involved, the sustainability of agricultural practices employed, and the willingness of land managers to allow for the presence of wildlife that may sometimes compromise maximum agricultural production. Science and understanding regarding the long-term viability of different types of agricultural operations has improved over time. Consequently, current approaches emphasize more sustainable uses of rangelands, irrigation water, and other resources.

Domestic livestock have been an important component of New Mexico’s agricultural economy since the arrival of Spanish settlers. Although cattle, sheep, goats, and horses accompanied early Spanish expeditions into the American southwest, the intentional introduction of livestock for production occurred with Oñate’s colonization of New Mexico in 1598. Widespread livestock influences on the rangelands of the southwest were not significant until the late 1700s (Jemison and Raish 2000). With approximately 98% of New Mexico’s land being considered unsuitable for crop production by early European settlers, domestic sheep grazing served as the primary agricultural use of the land through the late 19th century (Beck 1962). In the late 1800s, the development of railroads enabled ranchers to ship livestock to new and expanding markets, which led to intensified production of sheep and cattle (Jemison and Raish 2000). This period marked a decline in sheep husbandry and an increase in the cattle industry. Between 1880 and 1889, the number of cattle in New Mexico increased from about 137,000 to 1,380,000 (Wooten 1908). From 1891 to 1893, a severe drought resulted in high mortality of livestock on southwestern rangelands and a collapse of the cattle industry. While livestock numbers had peaked in 1891, livestock grazing exceeded the carrying capacity of southwestern plant communities from the 1880s through early 1900s (Milchunas 2006). United States Forest Service (USFS) land was heavily grazed through 1906 (Bahre 1991), and heavy grazing on US

Bureau of Land Management (BLM) lands continued until enactment of the Taylor Grazing Act in 1934 (Milchunas 2006).

Milchunas and Lauenroth (1993) identified a global pattern where rangeland habitats are more sensitive to large herbivore grazing when they lack an evolutionary history of grazing and/or with increased aridity. From a wildlife habitat-management perspective, there are habitats where livestock grazing should be encouraged in the absence of large native herbivores and other habitats where livestock grazing should be conservatively managed because these habitats are more sensitive (Milchunas 2006). Prairie grasslands of eastern New Mexico developed with the evolutionary influence of bison (*Bison bison*) as the primary, but not only, large herbivore present. Large herds of bison were mobile and grazed grassland habitats, both broadly and intensively, in some areas. Therefore, prairie grasslands of the High Plains and Tablelands ecoregion are probably more adapted to, and tolerant of, widespread, intensive grazing by livestock (Milchunas 2006). Although large herbivores that graze and browse are present throughout the State, most of New Mexico's other plant communities did not evolve with widespread and continuous grazing and generally were not exposed to higher levels of grazing pressure until Spanish settlers introduced and constrained the movements of domestic livestock in the mid-1500s. However, from a production standpoint, light to moderate grazing can be sustainable in the southwest (Milchunas 2006), especially when responsive to variable precipitation.

Riparian habitats in New Mexico are sensitive to grazing and habitat quality and function can be negatively impacted, especially in situations where grazing is passively managed (Leonard et al. 1997). Livestock and other ungulates may congregate in riparian areas because the vegetation is typically greener and more palatable than upland plants, especially later in the grazing season, and because the water and shade from taller plants (if present) offer refuge during hot summer months (Belsky et al. 1999, Mayer 2024). When ungulates are not excluded or actively managed, riparian habitats can become areas of continuous grazing pressure. Ungulates, including livestock, can alter stream conditions, including by trampling streambanks and causing erosion, sedimentation, and changes to the channel shape and water temperature (Kauffman et al. 1997, Belsky et al. 1999, Roper and Saunders 2021). When intensive grazing occurs, especially in the late part of the grazing season, it can also lead to a loss of vegetation alongside streams (Kauffman et al. 1997, O'Callaghan et al. 2018), further impacting water temperature as well as channel integrity and the ability of the system to dissipate energy during high-flow events.

Ecosystem degradation in the southwest during the late 1800s to the 1930s resulted from a combination of overstocking of livestock, changes in plant species composition, and a suppression of the natural fire regime that resulted from a reduction of fine fuels that carry fires (Savage and Swetnam 1990, Swetnam 1990, Swetnam and Baisan 1996, Jemison and Raish 2000). The loss of fine fuels provided by grasses limited shrub-killing fires. In the absence of fires, successional processes were altered and woody shrubs and less palatable plants increased across the landscape (Schlesinger et al. 1990, Jemison and Raish 2000, Whitford 2002).

In ponderosa pine (*Pinus ponderosa*) forests of the Jemez Mountains and other southwestern forests, tree ring fire scar data indicate that high frequency, low-intensity fires essentially stopped after the arrival of railroads in the southwest. Although livestock grazing was not the sole cause of a decrease in low-intensity fires, intensive grazing contributed to the loss of fine fuel grasses and tree densities greatly increased in the absence of grass competition (Allen 1989, Bogan et al. 1998). This steep decline in fire frequency occurred several decades before organized fire-suppression activities began (Allen 1989, Touchan et al. 1995).

High stocking levels continued into the 1930s. In 1934, regulatory management of public rangelands began under the Taylor Grazing Act, and the Soil Conservation Service provided assistance to private landowners through programs now considered as part of the Farm Bill. Despite efforts to reverse the impacts of intensive grazing, plant species and community restoration has proven to be slow. Many of the detrimental vegetation changes and much of the erosion attributed to grazing that we observe today occurred before these programs were implemented.

The BLM administers livestock grazing on allotments according to the New Mexico Standards for Public Land Health and Guidelines for Livestock Grazing Management. Standards describe conditions needed for healthy and sustainable public rangelands and were developed for upland and riparian habitats and Threatened, Endangered, and special status species. Guidelines for livestock grazing include management tools, methods, strategies, and techniques designed to maintain or achieve standards. These standards and guidelines were officially adopted in 2001, amending BLM Resource Management Plans covering the approximate 5.4 million ha (13.5 million ac) of BLM land in New Mexico (BLM 2001).

In 2023, the BLM proposed, and in 2024 it finalized, new regulations that, pursuant to the Federal Land Policy and Management Act of 1976 (FLPMA), as amended, and other relevant authorities, would advance the BLM's mission to manage public lands for multiple use and sustained yield by prioritizing the health and resilience of ecosystems across those lands. Specifically, under the proposed and finalized rules, the BLM will protect intact landscapes, restore degraded habitat, and make informed management decisions based on science and data. To support these activities, the final rule applies land health standards to all BLM-managed public lands and uses, identifies conservation tools to be used within the FLPMA's multiple-use framework, and revises existing regulations to better meet the FLPMA's requirement that the BLM prioritize designating and protecting Areas of Critical Environmental Concern (BLM 2023, BLM 2024).

Similarly, livestock grazing on the approximately 3.6 million ha (9.2 million ac) of National Forest System lands in New Mexico is managed under the Organic Act of 1897, and subsequent planning rules, to provide for timber production, forest and watershed protection, and wildlife habitat. The Forest Planning Rule, 36 CFR Part 219, requires that forest plans include standards and guidelines to maintain or restore ecological conditions that contribute to maintaining viable populations of species of conservation concern within the plan area. Implementation of grazing standards and guidelines on public lands thereby benefits a broad spectrum of native wildlife species.

New Mexico's arid climate presents challenges and opportunities for working with private landowners and managers to achieve wildlife conservation goals. Opportunities include developing innovative and effective initiatives that may attract private landowners to implement conservation measures while maintaining sustainable agricultural practices. The 2018 reauthorization of the Farm Bill (USC 2018) continues to support farmers, ranchers, and forest stewards through a variety of conservation programs. This bill provides voluntary conservation funds for farmers to protect and restore wildlife habitats, restore forests and wetlands, and reduce soil erosion (Figure 6). There are also state programs that support implementation of conservation actions by private landowners. For example, starting in 2024, Land of Enchantment Legacy Fund monies are being used to support the management and restoration of rangelands and projects aimed at conserving and improving soil resources and increasing the health and productivity of agricultural lands (WLA 2024).

Within arid and semi-arid areas, Holechek et al. (2006) reviewed grazing studies that compared carefully controlled intensity, timing, and frequency of grazing with grazing exclusion and concluded that "…grazing can have positive impacts on forage plants compared with exclusion if average long-term use levels do not exceed 40%." For example, plant and wildlife communities in one Chihuahuan Desert study were more diverse where the range was moderately (one third of the current year's growth) grazed than where it was ungrazed (Smith et al. 1996). Properly managed livestock grazing also creates a mosaic of vegetative cover that benefits multiple species with a range of habitat requirements. Vavra (2005) reports that livestock grazing use often results in a patchiness of utilization from ungrazed to relatively heavily grazed areas across large pastures common in the western US. This habitat mosaic created from variable levels of utilization can benefit more wildlife species than entirely ungrazed areas, as long as key habitats, such as riparian areas, are not disproportionately impacted.

In order for range livestock operations to remain economically viable, a scientifically based grazing program is required to ensure the land will continue to provide habitat needed to sustain both livestock and wildlife into the future. Poorly managed grazing can cause continued decreases in plant vigor, exacerbate soil erosion, and promote homogeneity of plant communities (Milchunas 2006). Cessation of grazing will do little to change the state of degraded plant communities, except potentially in riparian communities (Leonard et al. 1997, Milchunas 2006, George et al. 2011). Instead, moderate grazing should occur during periods that will not reduce reproduction and recruitment of both plants and wildlife (Smith et al. 1996, Holechek et al. 1998). Such an approach can result in mutual benefits to land-management goals for agricultural production and wildlife management.

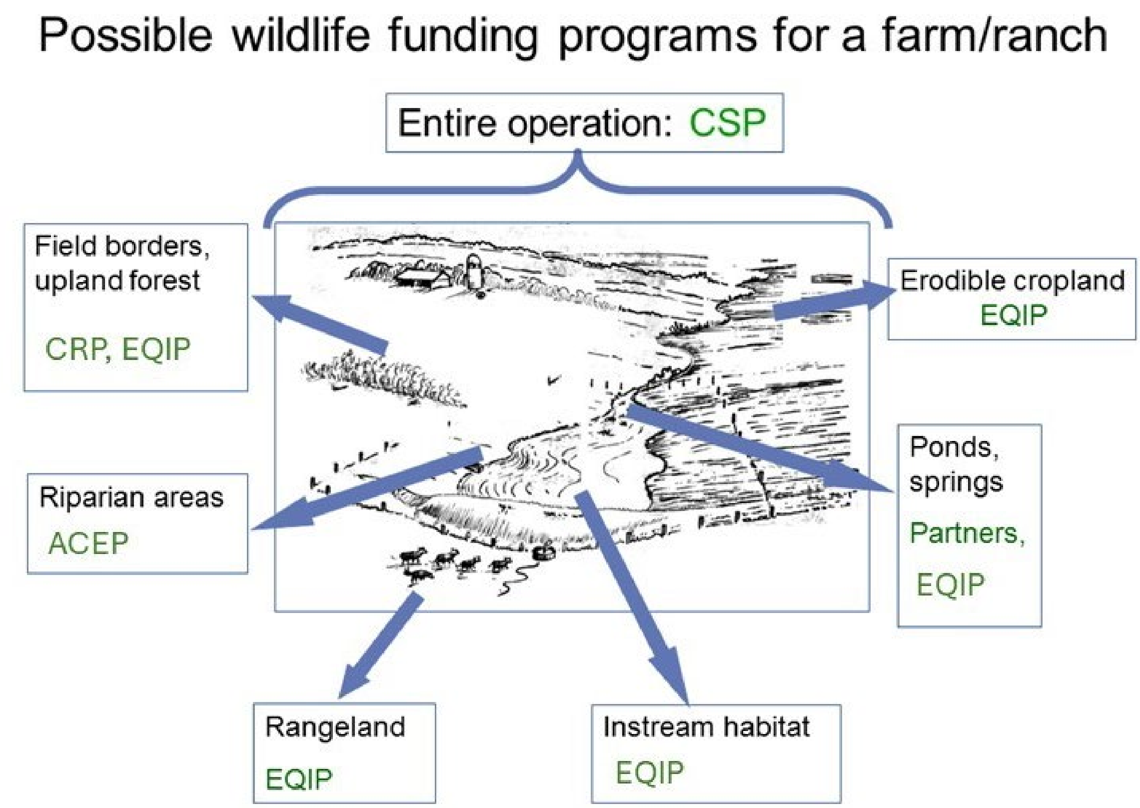


Figure 6. Farm Bill and other funding programs for wildlife conservation on a farm or ranch.

Program abbreviations are as follows: ACEP = Agricultural Conservation Easement Program; CRP = Conservation Reserve Program; CSP = Conservation Stewardship Program; EQIP = Environmental Quality Incentives Program; Partners = US Fish and Wildlife Service Partners for Fish and Wildlife Program. All programs listed here fall under the Natural Resources Conservation Service, except the Partners program.

ENERGY PRODUCTION AND MINING

Large amounts of oil and natural gas (in 2022, approximately 56,000 active wells [EMNRD 2024] provided 13% and six percent of the total production of oil and natural gas in the US, respectively; https://www.eia.gov/state/print.php?sid=NM, https://geoinfo.nmt.edu/resources/petroleum/home.cfml) are extracted from the San Juan and Permian Basins in northwestern and southeastern New Mexico, respectively (Figure 8). Federal and state regulations, along with the use of closed-loop drilling techniques, have significantly reduced the number of open wastewater pits associated with well development. Oil and gas companies have also consolidated the number of open wastewater pits by developing multi-well fluid management ponds where produced water from numerous well sites can be collected prior to disposal. In addition, belowground, multi-well wastewater and fracking ponds are being replaced by large, aboveground tank systems; this significantly reduces the potential for soil contamination. When they do occur, open wastewater pits, ponds, and tanks that are not properly covered or netted are potentially detrimental to migratory birds that cannot fly well or thermoregulate when their feathers have oil on them (Custer et al 1994, Ramirez 2010). Additionally, ingested petrochemicals can be toxic to both adults and embryos (Flickinger 1981, Hoffman 1990). Improved technology in directional drilling allows oil companies to access multiple reservoirs from the same surface location. This practice allows drilling multiple wells from a single pad site to help minimize the environmental impact of oil and gas development. Other potential impacts of well development are spills of oil, gas, and contaminated water from production. These spills may serve as sources of contamination that can impact soil, vegetation, and water bodies. Adherence to appropriate producer policies and state and federal regulations can reduce the incidence of spills and potential impacts of these releases.

The evolution of best management practices, more-restrictive lease requirements, and coordinated conservation efforts, such as the Western Association of Fish and Wildlife Agencies' Lesser Prairie-Chicken Range-Wide Plan and the Candidate Conservation Agreement with Assurances managed by the Center of Excellence for Hazardous Materials Management, have mitigated some of the impacts of energy development and ranching activities on the lesser prairie-chicken (*Tympanuchus pallidicinctus*) and dunes sagebrush lizard (*Sceloporus arenicolus*). However, the southern Distinct Population Segment of the lesser prairie-chicken in New Mexico and northwestern Texas was federally listed as Endangered by the US Fish and Wildlife Service (USFWS) in 2022 (USFWS 2022a) and the dunes sagebrush lizard was listed as Endangered in 2024 (USFWS 2024b). Many aspects of energy development, both renewable and non-renewable, are problematic for wildlife, including high densities of wells (up to 6 wells/km^2 [16 wells/mi^2]), access roads, and utility lines. Large patches of contiguous habitat are divided into small parcels, making resident species vulnerable to discovery by predators. Noise and disturbance from traffic and energy extraction elicit vigilance and flight behavior that needlessly taxes energy reserves of individuals (Hobbs 1989). Additionally, a strong and consistent multispecies pattern of physiological impacts and negative fitness consequences in response to increased noise levels associated with oil and gas infrastructure has been documented (Kleist et al. 2018). Given this, wildlife may abandon these areas or become locally rare or extinct because of poor recruitment and elevated mortality.

Hydropower is generated at four sites (Navajo, El Vado, Abiquiu, Elephant Butte) in New Mexico (Figure 7). The dams that produce it can adversely impact already limited stream habitat required by many aquatic SGCN, such as the Colorado pikeminnow (Franssen et al. 2007). Dams also act as barriers to movement for aquatic species, such as the Rio Grande silvery minnow, restricting their ability to migrate along waterways and thereby isolating populations (Platania et al. 2019).

The highest potential for wind energy lies mostly on the east side of the State (Figure 7). Currently, 29 active commercial sites produce 4,410 megawatts (MW) in New Mexico (USEIA 2024). Each site disturbs or directly eliminates on average 114 ha (282 ac) of habitat, with individual turbines and associated roads disturbing approximately 3 ha (7 ac) of habitat per turbine. Three more sites now under construction will more than double (4,850 MW) the State's current energy produced by wind (BER 2024; https://patternenergy.com/projects/sunzia/). The impact of wind-energy development is not restricted to habitat loss; turbines can cause direct mortality to birds and bats, which can vary from 0 to 30 mortalities per turbine per year (Kuvlesky et al. 2007) and has been estimated as ranging from 140,000 to 328,000 birds annually in the contiguous US (Loss et al. 2013a) and as many as 600,000 bats in one year in the US (Hayes 2013). The height of blades of newer wind turbines intersects the travel height of some bats and birds, thereby increasing the threat of mortality (Barclay et al. 2007). Factors affecting mortality rates include the speed of blades, weather, prey abundance, time and routes of migration, proximity to thermals used by soaring raptors, and speed of wind when turbines begin to operate (McCrary et al. 1983, Erickson et al. 2005, Hoover and Morrison 2006, Kuvlesky et al. 2007, Arnett et al. 2010). Changing the wind speed at which turbines begin to generate electricity from 3 m/second (6.7 mph) to 5-6.5 m/second (11.2-14.5 mph) resulted in a 44-93% reduction in bat mortalities with $\leq$1% loss of power generation (Arnett et al. 2010, Davy et al. 2020). Automated curtailment, where wind turbines are stopped or slowed automatically when wildlife approach and are at risk of collision, can be used to reduce wildlife collision mortality (McClure et al. 2021, McClure et al. 2022). Applying contrast painting to the rotor blades of wind turbines resulted in significantly reducing, by more than 70%, the annual fatality rate for a range of bird species (May et al. 2020). Acoustic deterrents resulted in 31.6%, 17.4%, and 66.7% additional reductions in bat mortality, when compared to curtailment at lower wind speeds alone, for eastern red bat (*Lasiurus borealis*), hoary bat (*Aeorestes cinereus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*), respectively (Good et al. 2022).

Currently, New Mexico has 81 commercial solar-power generation sites in New Mexico that produce ≥1 MW energy. Those on undeveloped lands encompass on average 30 ha (74 ac) each, though many solar installations are currently in developed or urban areas (Fujita et al. 2023, USEIA 2024). Until recently, the amount of habitat that has been impacted by solar-energy development in New Mexico was relatively small. However, the State ranks third in the nation for solar-energy potential, and large, utility-scale solar-energy projects are expected to increase significantly in the coming years and decades. While solar-energy development does not pose the same direct mortality risk to wildlife as do wind turbines, it does directly impact much larger amounts of habitat per MW generated than wind energy. These impacts include habitat loss (e.g., from vegetation removal; Grodsky and Hernandez 2020), habitat fragmentation, and preventing wildlife from accessing habitat due to the presence of perimeter security fencing at solar-energy facilities. Large solar-energy facilities can also alter wildlife movement and disrupt migration and other important movement corridors (Sawyer et al. 2022, Levin et al. 2023). Additionally, photovoltaic solar sites can disrupt the orientation and navigation of flying insects and birds and concentrator solar sites, which use mirrors or similar devices to efficiently concentrate sunlight onto solar panels, can kill individuals by burning (Lovich and Ennen 2011, Kagan et al. 2014). Potential impacts to wildlife from solar-energy development can be mitigated by appropriately siting installations to avoid important habitats and migration and other important movement corridors, installing wildlife-permeable fencing, retaining native vegetation by avoiding or minimizing blading at the site, and by dividing large solar sites into smaller fenced sub-sections to create wildlife passage corridors (e.g., Grodsky and Hernandez 2020, VDEQ 2021, Sawyer et al. 2022, Levin et al. 2023). Additionally, potential ecosystem benefits of retaining large patches of undisturbed soils and floral resources (Grodsky et al. 2021) and using native, pollinator-friendly reclamation seed mixes post-construction (Walston et al. 2021) should be explored further, especially for use in the desert southwest.

Shafts and adits of abandoned underground mines can provide valuable roosting habitat for bats (Altenbach and Pierson 1995), although gates erected to prevent entry by humans can deter bats from entering and leaving (Spanjer and Fenton 2005). This can be mitigated by using appropriate gate designs that prevent human entry while allowing bats to freely enter and exit abandoned mine shafts and adits. Direct loss of habitat from open-pit mines is relatively localized (hard rock more so than coal), but the impacts of these mines can extend beyond their permit boundaries. Access roads with attendant noise and disturbance can contribute to significant habitat fragmentation and abandonment by wildlife. Retention ponds, pits, and tanks collecting water impacted by mining operations may contain toxins particularly hazardous for wildlife. Appropriate covers and netting can be used to exclude wildlife from contaminated water and toxic chemicals. Large areas of contaminated water, such as mine pit lakes, are more problematic and may require the use of multiple methods to prevent or deter wildlife from coming into contact with hazardous water.

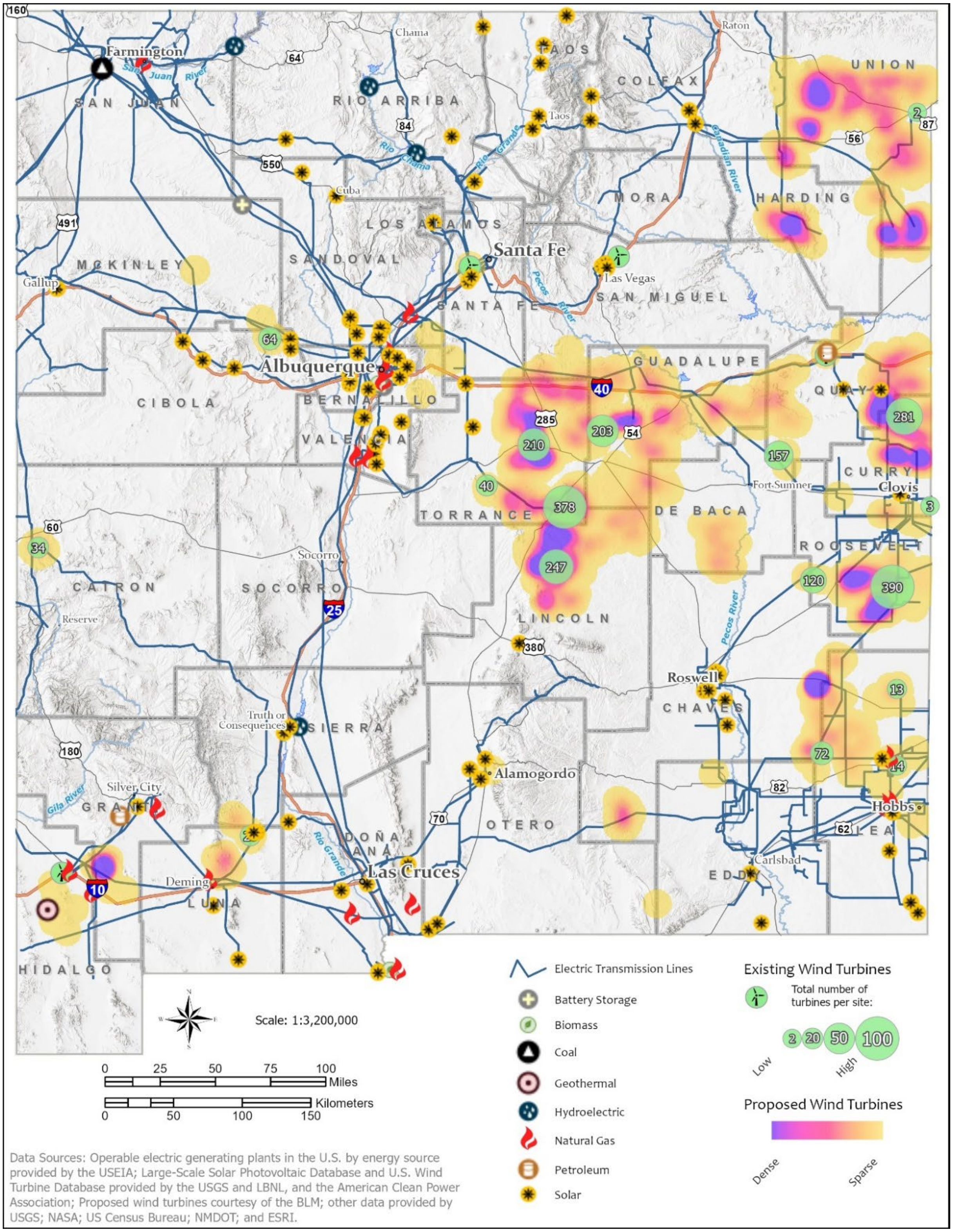
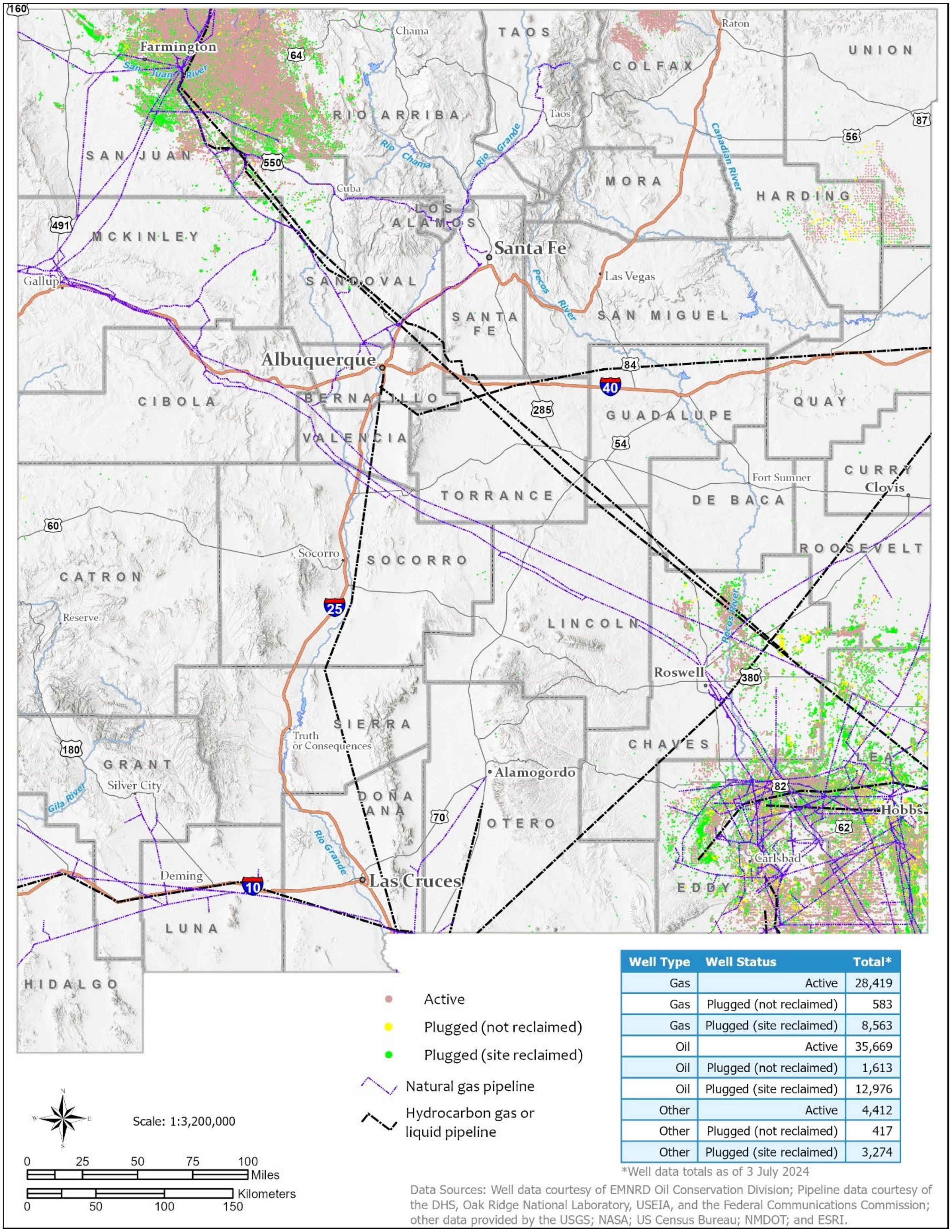


Figure 7. Energy sources.

Wind-energy data show both existing and proposed future wind-energy developments. Data obtained from Fujita et al. (2023) and USEIA (2024).



Well Type	Well Status	Total*
Gas	Active	28,419
Gas	Plugged (not reclaimed)	583
Gas	Plugged (site reclaimed)	8,563
Oil	Active	35,669
Oil	Plugged (not reclaimed)	1,613
Oil	Plugged (site reclaimed)	12,976
Other	Active	4,412
Other	Plugged (not reclaimed)	417
Other	Plugged (site reclaimed)	3,274

Figure 8. Oil and gas production wells and pipelines.

TRANSPORTATION AND SERVICE CORRIDORS

Transportation and service corridors present several problems for wildlife and the habitats they occupy. The first is a problem of geometry. Natural landscapes have a high degree of diversity per unit area (e.g., a mosaic of habitats), convoluted boundaries resulting in gradual transitions between patches of different habitats, and similar shapes and patterns across scales (e.g., characteristics of tributaries are similar to those of the mainstem they feed [Dunn et al. 2011]). Conversely, human-dominated landscapes are characterized by rectilinear shapes and straight, smooth boundaries. This results in the loss of nuances and subtleties of natural patterns, which may disrupt the natural processes that created those patterns. For example, convoluted boundaries between woodlands and meadows provide safe access to more forage for grazing wildlife. Meandering streams provide areas of flow resistance where nutrients are deposited that benefit plants and animals both within and adjacent to the stream (Malard et al. 2002).

Straight-line transportation corridors (Figure 9) are typically the most efficient means to transport goods, services, and humans. This approach may have long-term net costs if modified ecosystems need to be restored to a more natural state to provide services (e.g., flood and erosion control provided by wetlands) (Dahm et al. 1995).

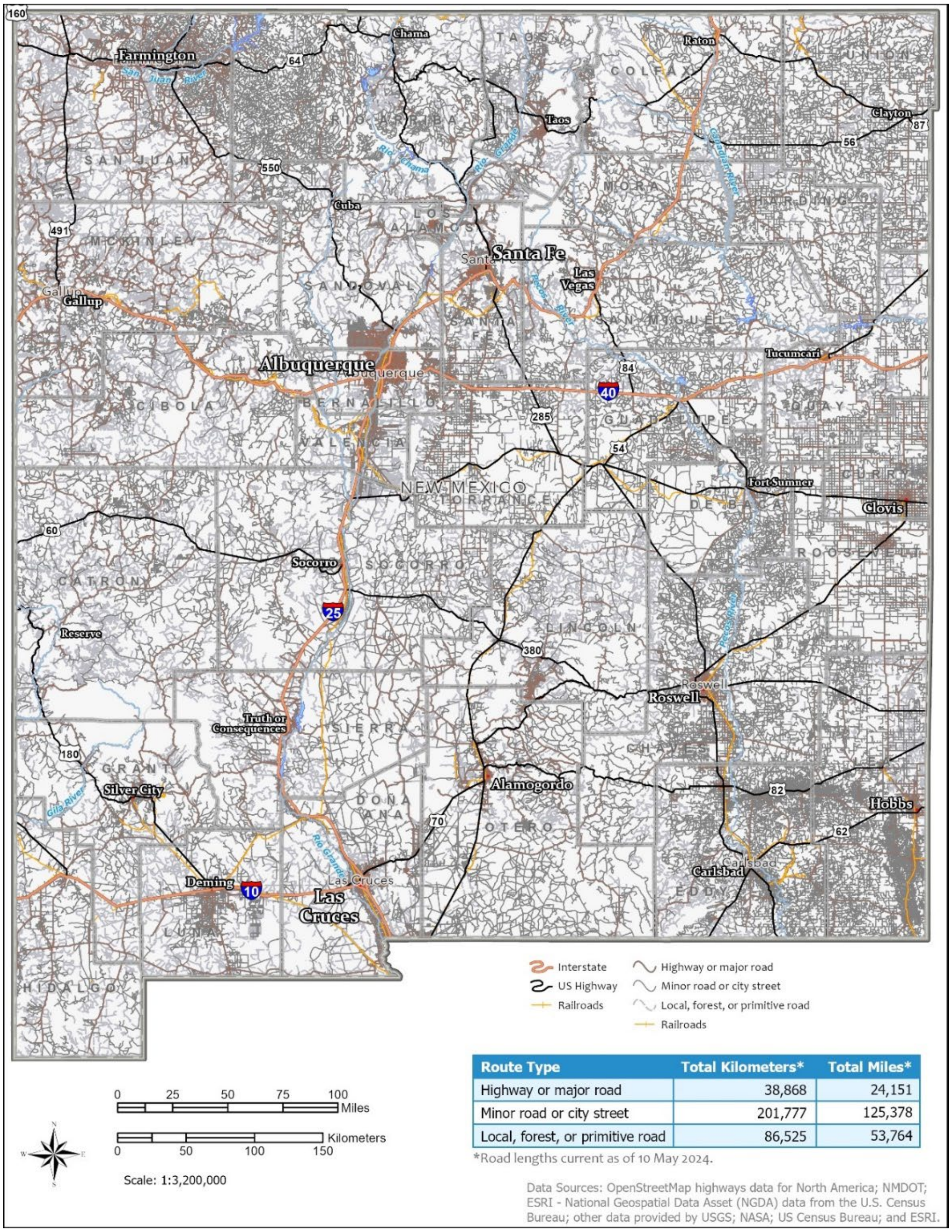
Individual animals and wildlife populations need to move across the landscape to follow seasonal food sources or disperse from their natal area, and human-created barriers pose a threat to these movements. Roads in particular fragment habitat, including aquatic habitats (e.g., culverts designed without considering the movement of aquatic organisms) (Franklin et al. 2024), and they may prevent animals from meeting their nutritional and life history requirements. The transportation sector is the most targeted form of development in policies focused on protecting wildlife corridors and enhancing landscape connectivity (Brammer et al. 2024). Wildlife-vehicle collisions (WVCs) not only present a well-documented risk to the safety of the traveling public; they can be a significant cause of mortality for some animal species. Planning and implementing effective mitigation and conservation measures for WVCs, including installation of effective wildlife crossings such as wildlife-dedicated overpasses and underpasses, require identification of the more heavily populated and traveled wildlife-movement corridors and the exact locations where these corridors are bisected by roads. Ensuring safe passage for wildlife among current (and potential future) suitable habitats is essential to supporting healthy wildlife populations over time. In 2019, the New Mexico Wildlife Corridors Act was enacted (https://www.nmlegis.gov/sessions/19%20Regular/final/SB0228.pdf), which mandated the development of a Wildlife Corridors Action Plan (WCAP) (Cramer et al. 2022). This plan provides comprehensive guidance to the New Mexico Department of Transportation (NMDOT) and New Mexico Department of Game and Fish (Department) to (1) identity, prioritize, and maintain important areas for wildlife movement across roads; and (2) develop a list of priority projects for building road-crossing structures designed to facilitate wildlife safe passage across roads and protect the traveling public from collisions with large wild animals. Species of concern selected for the WCAP because of their vulnerability to habitat fragmentation caused by highways and traffic and to mortality from WVCs that are also SGCN as identified in this SWAP include: Gila monster (*Heloderma suspectum*), northern Mexican gartersnake (*Thamnophis eques megalops*), ornate box turtle (*Terrapene ornata*), western massasauga (*Sistrurus tergeminus*), white-nosed coati (*Nasua narica*), white-sided jackrabbit (*Lepus callotis gaillardi*), and white-tailed jackrabbit (*Lepus townsendii campanius*). There are also efforts underway, spearheaded by the agencies and non-profit organizations in the New Mexico Aquatic Connectivity Team, to characterize culverts and other potential barriers to the movement of fish and other aquatic species in terms of the feasibility of improving or removing these barriers. This is part of a long history of efforts to restore connectivity at culverts and other barriers (Franklin et al. 2024) and in line with federal funding made available through the Infrastructure Investment and Jobs Act in 2021 for addressing culvert-related barriers to fish passage (Hance et al. 2024). The Department has guidelines regarding designing road stream crossings to mitigate impacts to fish and wildlife and retain the aquatic and riparian habitat connectivity important to the diversity of wildlife that move within these habitats (NMDGF 2024b).

There are also substantive instances of animals being struck by airplanes. From 1990 to 2023, 651 species of birds and 48 species of bats were documented as having been struck by planes in the US and over 19,000 strikes were recorded in 2023 alone. About 70% of bird airstrikes occur at below 152 m (500 ft) above ground level; the highest recorded bird strike was at 9754 m (32,000 ft) above ground level (FAA 2024). Airports are considered as commercial/industrial developments under the threat categorization used here (IUCN 2022) and most airstrike data are tied to specific airports (e.g., FAA 2024). There can be direct effects to terrestrial wildlife from airplanes (e.g., 56 species of terrestrial mammals and 35 species of reptiles struck by airplanes from 1990 to 2023; FAA 2024). There has also been documentation of air traffic volume impacts on wildlife behavior; wildlife became more active and abundant at airports when air traffic volume declined during the coronavirus disease 2019 (COVID-19) pandemic (Altringer et al. 2023).

Transportation and service corridors are reservoirs and conduits for invasive and problematic species, particularly plants in arid environments (Gelbard and Belnap 2003). Vehicles are a continuous source of non-native (particularly crop) seeds. Rights-of-way are particularly fertile grounds for weedy species that germinate and seed quickly. These areas receive supplemental water from pavement runoff and are subject to frequent disturbance (especially road and vegetation maintenance); these characteristics inhibit establishment of slower developing, native species (Hansen and Clevanger 2005, Christen and Matlack 2007). Habitats adjacent to rights-of-ways can resist invasion if their plant communities are healthy, although grasslands are more susceptible to the spread of invasives from rights-of-way than forested areas (Hansen and Clevenger 2005).

Disturbance of native vegetation when utility lines are built can provide a foothold for aggressive exotics such as cheatgrass *(Bromus tectorum)* in arid environments (Rafferty and Young 2002). Removing woody vegetation underneath utility lines for fire protection contributes to habitat fragmentation and may create a barrier to movement for some forest-dependent organisms (Burnett 1992, Bevanger 1998).

Collisions with electric utility and distribution lines have been estimated to kill >130 million birds each year in the United States, with many mortalities occurring when utility lines cross, or are near, where birds concentrate, such as wetlands and migration corridors (Brown 1992, Erickson et al. 2005). Birds that are particularly vulnerable have heavy bodies and small wings not designed for rapid maneuverability (e.g., grouse), do not fly in flocks (which afford increased detection of lines), or tend to fly at the level of the utility lines (e.g., cranes) (Bevanger 1998, Jenkins et al. 2010). Casualty rates are substantially reduced when ground wires are removed and large markers, with highly visible colors, are placed on lines that intersect bird flight paths (Brown and Drewien 1995, Jenkins et al. 2010).



Route Type	Total Kilometers*	Total Miles*
Highway or major road	38,868	24,151
Minor road or city street	201,777	125,378
Local, forest, or primitive road	86,525	53,764

Figure 9. Roads.

Lines represent all roads from unimproved dirt to interstate highways. Data obtained from ESRI (2024), NMDOT (2019), and OSMF (2024).

Electrocution occurs when a bird touches two phase conductors simultaneously or a phase conductor and a grounded device on electric distribution lines (Bevanger 1998). Birds most susceptible to electrocution are raptors who favor high structures to perch and search for prey and possess wingspans that allow simultaneous contact with more than one conductor or a conductor and grounded device (Bevanger 1998). Juveniles and sub-adults suffer higher mortality than adults (Benson 1980).

BIOLOGICAL RESOURCE USE

Biological resource use is defined as consumptive use of non-cultivated biological resources, such as forest and woodland habitats, including both deliberate and unintentional harvesting effects.

Historically, southwestern ponderosa pine forests were more open with canopy cover ranging from approximately 10 to 50% (Reynolds et al. 2013); many large and old, fire-resistant trees; and a frequent, low-intensity fire regime, with fire occurring every 0 to 35 years (Covington and Moore 1994, Covington et al. 1997, Bailey and Covington 2002, Reynolds et al. 2013). Dry mixed-conifer forests were also more open with more large, old trees; the same low-intensity fire return interval (0 to 35 years); and with some forests having a lower range of canopy cover values than ponderosa pine forests (13 to 22%). Wet mixed-conifer forests have a much longer fire return interval (35 to 100 years) and tend to experience mixed-severity fires (Reynolds et al. 2013). For ponderosa pine and dry mixed-conifer forests, these less-dense, more open forest conditions defined the evolutionary environment that wildlife adapted to for thousands of years (Dahms and Geils 1997, Hunter 1999, Kalies et al. 2012, Reynolds et al. 2013). Since the late 19th century, the density and structure of southwestern ponderosa pine and dry-mixed conifer forests have been significantly altered by the combined effects of livestock overgrazing, commercial logging, and fire suppression, all of which favored dense conifer regeneration (e.g., increases in tree density of five- to almost seven-fold over the 20th century) (e.g., Evans et al. 2011, Margolis et al. 2013, Reynolds et al. 2013, Remy et al. 2024). Livestock grazing removed understory grasses that provided fine fuels for frequent, low-intensity fires and competitively excluded tree seedlings. Large-scale timber harvesting in the late 19th century through the early 20th century removed many large diameter trees (Covington and Moore 1994, Covington et al. 1997, Dahms and Geils 1997). Timber harvest levels on National Forest System lands and private forests in the southwest steadily increased from the early 1900s through the 1980s and then began declining after 1990 (Dahms and Geils 1997, Evans et al. 2011). For many species of wildlife, the habitat value of ponderosa pine forests declined as forests became dominated by small trees and as large trees, forest openings, and snags were reduced (Dahms and Geils 1997, Reynolds et al. 2013). Dense stands block sunlight from reaching the forest floor, reducing understory plant diversity and abundance and food sources for wildlife (Moore et al. 1999, Bakker et al. 2010). Restoring ponderosa pine and dry mixed-conifer forests to conditions similar to those present prior to the initiation of industrial logging is expected to improve wildlife habitats and biodiversity (Reynolds et al. 2013). Conversely, activities that increase sunlight reaching the forest floor in wet-mixed conifer forests may reduce forest regenerative success and have a negative impact on local wildlife (Remke et al. 2021).

Twentieth-century forest-management approaches that suppressed almost all fires further densified ponderosa pine forests with smaller trees that constitute ladder fuels, carrying fire from the forest floor into the canopy (Smith 2000, Allen et al. 2002, Covington 2003). Fire suppression and other anthropogenic activities led to similar compositional changes in dry mixed-conifer forests, including increased tree densities, including of trees with dense, low-sweeping canopies, and fuel loads and the loss of old trees (Fule et al. 2009, Reynolds et al. 2013, Remy et al. 2024). Wildfires in southwestern US forests now burn with uncharacteristically high severity, frequency, and extent (Westerling et al. 2006, Allen et al. 2010, Crockett and Westerling 2018, Lydersen et al. 2017, Prichard et al. 2017, Singleton et al. 2018, Parks and Abatzoglou 2020). These uncharacteristically large high-severity wildfires kill wildlife and destroy wildlife habitat and can result in habitat conversion from forest to shrub or grassland habitats (vegetative type conversions) that may no longer provide the climatic conditions necessary to support forest regrowth (Guiterman et al. 2017, Parks and Abatzoglou 2020, Prichard et al. 2021, Guiterman et al. 2022) or seed sources for tree regeneration (Korb et al. 2019). Loss of old growth stands resulting from logging and high-severity fire negatively impacts the persistence of forest-dependent species such as the Mexican spotted owl (*Strix occidentalis lucida*) (USFWS 2013b) and some species, such as the mountain chickadee (*Poecile gambeli gambeli*), are negatively affected by fire of any severity (Block et al. 2016).

In forests and woodlands, logging and fuelwood cutting have reduced the abundance of large-diameter snags important for cavity-nesting birds, bats, and other wildlife (Thomas et al. 1979, Hejl 1994, Bogan et al. 1998) and reduced downed, decaying logs important for wildlife cover and ecosystem function (USFWS 2013b). Logging and fuelwood cutting is facilitated by existing or newly developed roads that promote vehicle traffic, fragment habitat, and increase wildlife disturbance.

Despite the impacts of historical logging, well-planned ponderosa pine and dry mixed-conifer forest-restoration and fuels-reduction projects benefit New Mexico forests and the wildlife that occupy them when combined with frequent, low-intensity prescribed burns or wildfire. Together, these management strategies can decrease fuels that contribute to destructive crown fires, increase productivity of grasses, enhance tree species diversity and retention of older trees (Remy et al. 2024), and enhance soil nutrients. It is important to consider factors such as prescribed fire size and frequency and treatment of slash from logging and thinning activities (Allen 1996, Remy et al. 2024). Restoration and fuels treatments should be designed to restore conditions, including forest structural characteristics and spatial patterns, to the historic range of variability and allow fire to return to its natural role (Covington et al.1997, Bailey and Covington 2002, Margolis et al. 2013, Reynolds et al. 2013). This includes leaving variable amounts of canopy and tree density, including sufficient sites with higher levels of canopy cover (within the historical range of 10 to 50% for ponderosa pine and potentially dry mixed-conifer forests) or tree density for canopy- or higher density-dependent wildlife, including the Mexican spotted owl (Evans et al. 2011, Reynolds et al. 2013). Local site conditions and history are important considerations when designing habitat-restoration treatments (Prichard et al 2021) and incorporating treatment heterogeneity, and increasing heterogeneity to approximate historic conditions, is crucial for wildlife (Allen et al. 2002, Evans et al. 2011). A diversity of forest structure and age classes, including forest openings and areas with dense cover (i.e., "clumpiness"), supports more species than does a homogeneous landscape (Horncastle et al. 2013, Evans et al. 2019). To maximize benefits for native wildlife, ponderosa pine forest-restoration treatments should focus on removing small-diameter trees, creating a clumpy or mosaic pattern of uneven age, multi-canopy layer leave-tree groups that includes the largest and oldest remaining trees, snags, and downed logs. Retaining interlocking crowns among groups of trees within the treatment area is important for some species (Lehmkuhl et al. 2007). Retaining Gambel oak (*Quercus gambelii*) in pine-oak stands can enhance bird diversity and large Gambel oak trees may be especially important to local bird populations when ponderosa pine tree densities are low (Rosenstock et al. 1997, Jentsch et al. 2008). Retaining shrub diversity in canopy openings is likely to benefit forest bird diversity, especially for those species that nest in shrubs (Latif et al. 2020). In mixed-conifer forests, examples of species-specific considerations include retaining downed logs for the Jemez Mountains salamander (*Plethodon neomexicanus*) and retention of large trees and 40% canopy cover for the Mexican spotted owl (Evans et al. 2011). In general, more information is needed on wildlife responses to treatments conducted in dry mixed-conifer forests (Margolis et al. 2013). Retention of overstory conifer trees spaced a maximum of 20 m (66 ft) apart or patches of trees such that openings are less than 60 m (197 ft) in width may facilitate forest regeneration by providing sufficient seed and ectomycorrhizal fungi sources (Simard et al. 2021).

Piñon and juniper woodlands are harvested for firewood and building products across ecoregions in New Mexico. There are three major types of piñon-juniper woodlands: persistent woodlands, which are found where environmental conditions are favorable for these tree species and fire is infrequent; piñon-juniper savannas, which are found where environmental conditions are suitable for trees and grasses and where low-severity fires may have historically maintained low tree densities; and wooded shrublands, which are found where conditions support shrublands but trees grow during moist climatic periods (Romme et al. 2009). Persistent piñon-juniper woodlands should not be treated unless needed for WUI protection (Reid 2019). In general, thinning may adversely affect woodland-dependent wildlife if it removes cover needed for successful reproduction by SGCN such as the gray vireo (*Vireo vicinior*) and pinyon jay (*Gymnorhinus cyanocephalus*) (Stake and Garber 2008, Johnson et al. 2018a).

Aside from the impacts of the harvest of woody plants on SGCN habitats, some SGCN are harvested directly, both legally and illegally. The harvest of some SGCN (e.g., Gila trout [*Oncorhynchus gilae*]) is statutorily limited and some amphibians and reptiles are commercially collected. For the fishing license year from spring 2023 through 2024, 52 Gila trout were harvested from nine different waters across New Mexico. For the fishing license years starting in spring 2015 and ending in spring 2024, a total of just over 2,800 Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*) were reported as harvested from six different waters; most of these were harvested in one creek with more typical harvest over this period ranging from 83 to 181 fish per water. From 2013 to 2024, 367 individuals of four 2025 SGCN were reported as being collected under commercial collection permits; the ornate box turtle was the most collected SGCN during that time at just under 300 individuals. Importantly, illegal collection and trade are considered serious threats to ornate box turtles (Hughes et al. 2024) and are compounded by potential disease exposure when turtles are collected and then shipped after being housed in unhealthy conditions (pers. comm. L. Pierce, Department). Hunting and fishing are tightly regulated, and limits are based on population monitoring and take that does not affect long-term viability of the species. Collecting amphibians and reptiles requires a State permit, but the number of animals taken is not regulated for species that are not State-listed nor on the Department Director's commercial collection list. Most commercial collecting is thought to occur along roads; thus, it may be limited. However, it is considered a threat for some reptile and amphibian SGCN including the Gila monster, gray-banded kingsnake (*Lampropeltis alterna*), pyro mountain kingsnake (*L. pyromelana*), New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*), and Sonoran Desert toad (*Incilius alvarius*) (Fitzgerald et al. 2004, NMDGF 2022b). Illegal collection for both personal and commercial purposes threatens North American tortoises, and recent recovery planning efforts focused on the Bolson's tortoise (*Gopherus flavomarginatus*) suggest collection is a threat for this species as well (Bury and Germano 1994; pers. comm. L. Pierce, Department).

HUMAN INTRUSIONS AND DISTURBANCE

Human intrusions lead to habitat disturbances related to off-highway vehicle use (OHV), military activities, and recreational use. Recreational OHV use occurs across the entire State. The long-term effects of OHV use on habitats and SGCN are poorly understood. In the short-term, OHV travel can cause damage to soils and vegetation (Holechek et al. 1998) and impact wildlife by destroying and fragmenting habitat, causing some direct mortality of wildlife, or altering behavior through stress, disturbance (e.g., of finding a mate, breeding, rearing young, foraging), and displacement (Busack and Bury 1974, Brattstrom and Bondello 1983, Gaines et al. 2003, Cretois et al. 2023). Snow compaction by snowmobiles can impact the movements of or kill small mammals that move beneath the snow's surface and impact species interactions (Gaines et al. 2003). The USFS published rules designating routes and areas for OHV use (USFS 2005) and requiring designation of roads, trails, and areas on USFS lands to provide for over-snow vehicles that run on a track, ski, or skis (USFS 2015). When the regulations are observed and enforced, negative impacts can be reduced.

The US Department of Defense (DOD) manages 4% of the land in New Mexico. White Sands Missile Range (WSMR) is the largest DOD installation in New Mexico, covering approximately 0.9 million ha (2.2 million ac). It operates primarily for the support of research, development, testing, and evaluation of weapon and space systems, subsystems, and components. Other DOD installations in New Mexico contain sites for: live bombing; air defense missile firing; mechanized brigade training exercises; battalion-size or smaller training exercises; ballistic missile testing; aircraft takeoff, landings, and training courses; maintenance of fighter wing capabilities; and general military training exercises. While restricted access to most military lands provides substantial benefits to many species of wildlife, military land uses can also destroy or fragment existing habitats for some species.

Border security measures are implemented throughout the New Mexico/Mexico borderlands region to intercept illegal drug shipments, illegal immigrants, and other unauthorized activities (USACE 2000). Associated road building and traffic in the borderlands region causes additional habitat loss and fragmentation; reduces usable habitat for wildlife populations; and increases roadkill, poaching, illegal collection of wildlife, and general habitat destruction (Forman et al. 2003). The impacts of border patrol activities are highly visible and pervasive. However, these activities may serve to reduce the damage associated with unauthorized entry to the US. The covert movement of people across the border results in dispersed human presence throughout the more remote sections of the border area. People covertly moving in these areas may disrupt wildlife, leave trash, and increase the potential for wildfires, which can significantly impact wildlife habitats. The combination of control and evasion activities has significant impacts throughout the border area.

With respect to US-Mexico border wall construction activities, these activities can lead to habitat fragmentation and loss when wildlife-impermeable pedestrian barriers are constructed. Construction of pedestrian barriers (i.e., bollard walls) near urbanized areas is unlikely to substantially adversely affect wildlife or sensitive wildlife habitats. However, replacement of relatively wildlife-permeable vehicle barriers with pedestrian barriers in undeveloped areas can have direct and secondary impacts that will become more serious as the length of installed barriers increases. Specifically, increasing numbers of state and federally listed species, SGCN, and other range-restricted wildlife that are sensitive to habitat loss and fragmentation will be adversely affected (Sayre and Knight 2010, Lasky et al. 2011, Peters et al. 2018).

There are both documented and projected adverse effects associated with pedestrian barrier construction along the US-Mexico border, related infrastructure (roads, lights), and increased vehicle traffic on wildlife, wildlife habitat connectivity, and genetic interchange. Pedestrian barriers and associated infrastructure and increased human activity eliminate or degrade native vegetation, cause increased direct mortality of wildlife, and subdivide wildlife populations into smaller populations more vulnerable to extirpation or extinction. They also eliminate habitat connectivity; erode soils; alter hydrologic processes and natural disturbance regimes (e.g., fire); and introduce invasive, non-native plant species (Forman et al. 2003, Flesch et al. 2010, Lasky et al. 2011, Trouwborst et al. 2016, Fowler et al. 2018, Peters et al. 2018). Pedestrian barriers preclude animals from accessing food, water, and breeding or birthing areas by disrupting annual or seasonal migration or dispersal routes (Peters et al. 2018). Limiting dispersal abilities of trans-boundary wildlife populations at the marginal extent of their range near the US-Mexico border could greatly increase the risk of species extirpation on either side of the border (Flesch et al. 2010, Lasky et al. 2011). Wildlife populations at range margins can be genetically important for species persistence due to their having an enhanced capacity to adapt to changing climate (Lasky et al. 2011). Extension of the pedestrian barriers at the US-Mexico border will likely compound the effects of climate change on wildlife species persistence by limiting their ability to shift northward as habitat conditions change (Lasky et al. 2011, Peters et al. 2018).

Skiing, hiking, mountain biking, rock climbing, camping, sightseeing, wildlife viewing, and picnicking are popular, non-consumptive recreational pursuits in New Mexico (Conner et al. 1990). Approximately 75% of surveyed wildlife viewers in New Mexico are interested in viewing land mammals and birds. These wildlife viewers commonly visit parks and natural areas, may also view wildlife at home, and a high percentage of them are likely to engage in conservation-oriented activities (e.g., picking up trash) (Sinkular et al. 2022). The overall impact of these activities is not yet fully understood, though globally more than 50% of documented impacts from recreation were negative and non-motorized recreational activities had more evidence than motorized activities of negative effects (Larson et al. 2016). These activities are dispersed across the landscape in time and space and, while they can be reasonably quiet, can still have negative impacts on wildlife including increased stress, changes in habitat use, lowered reproductive success, decreased abundance, and increased occurrence of anti-predator behaviors (Zeller et al. 2024). It is unclear how much and which combinations of recreational use can be tolerated before there are significant adverse effects on wildlife and/or wildlife habitat. However, recreational activities are increasing and their potential effects on habitats and species must be considered in conservation planning (Conner et al. 1990, Larson et al. 2016).

NATURAL SYSTEM MODIFICATIONS

Fire was an integral component in the evolution of both forests and prairie grassland ecosystems in New Mexico. The frequency and size of forest fires are related to elevation (e.g., 35- to 100-year interval in wet mixed-conifer forests and 0- to 35-year interval in ponderosa pine and dry mixed-conifer forests) and inter-annual variation in precipitation (Swetnam 1990, Swetnam and Betancourt 2010, Reynolds et al. 2013).

With settlement, heavy grazing reduced grass cover, which served as an ignition fuel when dry, so fire frequency decreased (e.g., Margolis et al. 2022) and tree and shrub densities increased. This was exacerbated with efforts beginning in the 1930s to suppress all fires as quickly as possible. Ultimately, fire frequency decreased, but intensity increased with the development of ladder fuels that carried the fire into the canopy. High-severity fires can cause forests that historically were a mixture of young and mature trees to become dominated by shrubs (Hessburg and Agee 2003). Higher spring and summer temperatures and earlier snowmelt associated with climate change have added to the intensity and size of fires. Further, individual fires occurring from 1986 to 2003, during which time substantial warming was documented, have averaged four times larger in area and lasted four weeks longer than those fires ignited during the 1970-86 period (Westerling et al. 2006). Comparing average acres burned annually from 1984-2002 to averages from 2003-2021, there has been an increase in average acres burned annually of over 43,706 ha (108,000 ac) (EPA 2024). Even from 2013 to 2022, there has been an increase in acres burned annually in New Mexico (Figure 10). There have also been increases in the area burned annually at high severity across western US forests (Parks and Abatzoglou 2020) and in the proportion of burned area that is affected by stand-replacing fires in the southwestern US (Parks et al. 2023b). Transition of landscapes from tree to shrub canopy may have adverse ramifications for forest-obligate species that have limited ranges, including the Jemez Mountains salamander. In recent decades, where the lack of infrastructure permits, the role of fire has been reintroduced through low-intensity prescribed fires and by allowing natural fires to burn, when fire weather conditions are appropriate (Prichard et al. 2021), and re-create a more natural mosaic of vegetative types and age classes. When reintroducing fire through prescribed or cultural burns, it is important to consider site conditions, history, season, and weather conditions and to focus on adapting forests to future climatic conditions, rather than trying to return to previous conditions or fire regimes (Fettig et al. 2010, Prichard et al. 2021).

Historically, fire has not occurred frequently or consistently in desert grasslands due to low biomass and discontinuity of fine fuels (Hastings and Turner 1965, York and Dick-Peddie 1969). However, it was more prevalent in the shortgrass prairies with greater rainfall and higher biomass production (Swetnam and Betancourt 1990). In particular, interaction between grazing and fire was a key characteristic of natural functioning prairie ecosystems (Knopf 1994). Bison and other large herbivores focused grazing on new growth of recently burned patches. Meanwhile, grass and litter increased in the patches they bypassed, resulting in growing fuel loads easily ignited by lightning. The result was a shifting mosaic of vegetation patches with varying plant composition, diversity, and productivity that supported a diversity of wildlife (Milchunas et al. 1988, Hobbs et al. 1991, Fuhlendorf and Engle 2001). The elimination of large wild grazers and European settlement essentially ended this process, resulting in increasingly homogeneous plant communities (Knopf 1994).

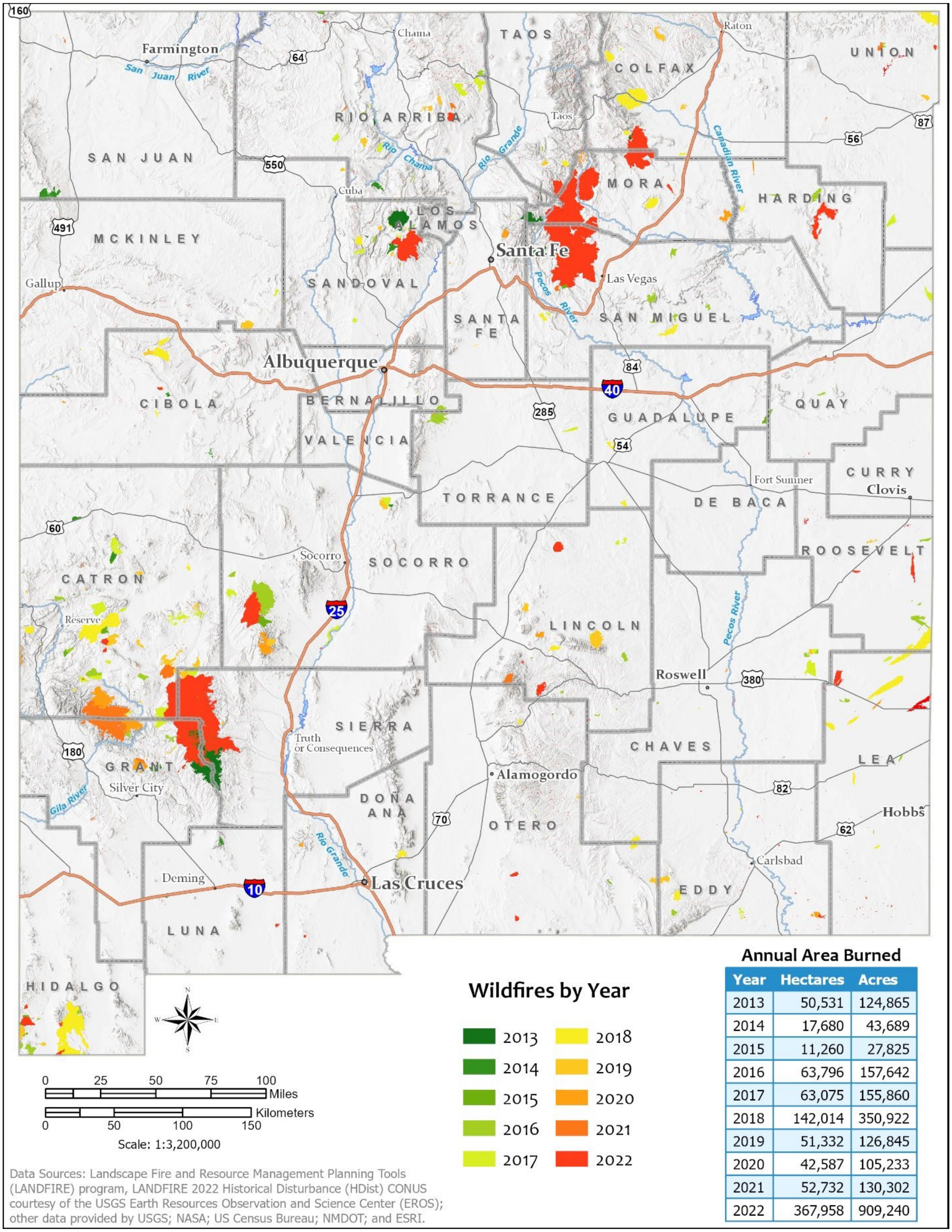
A large proportion of observed, climate change-induced impacts on wildlife habitat are a result of changing fire regimes. Increasing spring and summer temperatures, reduced soil and fuel moisture, and drought contribute to increased wildfire activity (Ryan et al. 2008). Wildfires are larger, more frequent, and more intense under recent conditions characterized by higher temperatures, earlier spring snowmelt, and drought (Westerling et al. 2006, Lettenmaier 2008. Westerling 2016). Future wildfire potential is expected to increase dramatically in southwestern forests (see climate change discussion in Chapter 4), accompanied by increasing lengths of fire seasons, as a result of projected drier and hotter conditions (Brown et al. 2004, Spracklen et al. 2009, Brown et al. 2021). Increasing temperatures are likely to increase the number of burn days, acres burned, and the frequency and intensity of wildfires (McKenzie et al. 2004, Brown et al. 2021). Though drought conditions tend to lead to increased frequency and extent of wildfires, they may also reduce wildfire risk through reduction of fine fuels (Ford et al. 2012).

Changes in wildfire regimes have many potential implications for New Mexico wildlife habitats. Drought-fire and aridification-fire interactions are very likely to disproportionately and adversely affect lowland forest communities. Where fires are very large or severe, forests and woodlands may suffer a loss of regeneration potential and change in local climatic conditions, leading to significant changes in forest composition and structure and sometimes to a transition to a different forest type or non-forest vegetation (Williams et al. 2010, Coop et al. 2020), otherwise known as vegetation type conversion. In many instances, semi-arid coniferous forests convert to shrublands following high-severity fire (Guiterman et al. 2022). Increased wildfire is likely to encourage the establishment of exotic grass species in fire-sensitive shrubland and desert habitats (Crist et al. 2014). Recently burned areas are at an increased risk of erosion from wind and rain, particularly in areas with high slopes (Enquist and Gori 2008). Burned areas may also release less water when snow melts due to higher rates of snow loss via sublimation (snow evaporates without melting first) in these areas during the winter season (Harpold et al. 2014). Not all systems are equally impacted by fire, however, and increased wildfire may be beneficial for some grassland habitats (Ford et al. 2012).

Dams and their associated reservoirs provide important benefits for society (irrigation, electricity, recreation, water for municipalities) but impose costs to some native fish, wildlife, and vegetation dependent on the affected riverine ecosystems. Most apparent are the substantial losses of riparian and aquatic habitats and fragmentation of fish populations by the impenetrable barriers dams can create. Fragmenting populations can be especially deleterious for rare or imperiled fish, which already suffer from reduced genetic diversity. To address this, fish passage structures have been installed at some dams to allow fish to bypass these instream barriers and migrate up- and downstream. However, the success of these fish passages is largely unknown and requires further research (Kelley et al. 2023). Water flow through dams tends to be highly regulated, resulting in substantially less volume and variability than observed for natural flows. Lack of flow variability is a primary reason for the decline of native fish in the southwest (Richter 1997). One link between flow and native fish is that high spring flows act as cues for spawning (Franssen et al. 2007, Propst and Bixby 2018). Special, planned releases of water from Navajo Dam on the San Juan River that mimicked the natural timing, amplitude, and volume of spring flows resulted in increased recruitment of native fish and in some cases suppressed recruitment of competing, non-native fish (Propst and Gido 2004). Dams can also adversely impact downstream riparian habitat by reducing sediment flows needed to replenish bank structure and maintain channel profile (Bednarek 2001). Sediment deposition along riverbanks is critical for the establishment of native riparian plant species (Kauffman et al. 1997). The combination of an altered flood regime and reduced sediment transport from dams can cause native riparian plants, including willows (*Salix* spp.) and cottonwoods (*Populus* spp.), which are adapted to and dependent on a natural flow regime, to decline. This can result in an increase in invasive plants and a decline of native wildlife (Molles et al. 1998; Stromberg 2001). Conversely, as flow velocity decreases and suspended sediment settles at the entrance of reservoirs, the accumulation of sediment upstream of dams can create deltas and new riparian habitat (Volke et al. 2019).

Groundwater depletion also has taken a toll on riparian and aquatic ecosystems. Technology to extract large volumes of groundwater became available in the mid-20th century and resulted in rapid growth of cities and agriculture (Konikow and Kendy 2005). Over the course of the 20th century, groundwater depletion nationwide totaled up to 800 km^3 (192 mi^3). From 2000 to 2008, an additional 200 km^3 (48 mi^3) was depleted (Konikow 2015). Groundwater depletion has been most severe in the Ogallala aquifer (also referred to as the High Plains aquifer) of the western Great Plains, which includes eastern New Mexico. One study estimated the rate of groundwater depletion from the Ogallala to be 12.5 km^3 (3 mi^3) per year (Famiglietti 2014). The decrease in its water volume may seem minor by some estimates, but it has already been enough to make irrigation cost-prohibitive in some locales (Dennehy et al. 2002). In New Mexico, seven investigated aquifers all shrank between 1900 and 2008. After the Ogallala, aquifers most depleted were the middle Rio Grande and Hueco Bolson aquifers, where Albuquerque and Las Cruces/El Paso are located, respectively. Withdrawals were highest for four of the seven aquifers in 2008 (the last year of the study), but depletion matched replenishment in the middle Rio Grande and Mimbres aquifers (Konikow 2013). A study by Perrone and Jasechko (2017) found that groundwater wells near Portales and Moriarty, New Mexico, went dry between 2013 and 2015, reflecting the extreme water stress faced by communities in eastern New Mexico.

Growth of cities and agriculture spurred by access to groundwater has reduced valuable SGCN habitat, especially surface water and attendant habitats where these resources are most rare. The San Simon Cienega in the Madrean Archipelago ecoregion of southwestern New Mexico is a prime example. It was once an isolated, but thriving, 486 ha (1,200 ac) wetland in a desert ecoregion but virtually dried up by the mid-1980s due to groundwater pumping for irrigation (Hendrickson and Minckley 1984, Dinerstein et al. 2000). When it was functional, a wide variety of SGCN were recorded at this cienega including multiple birds, the lowland leopard frog (*Lithobates yavapaiensis*), northern Mexican gartersnake (federally listed as Threatened), roundtail chub (*Gila robusta*), and western yellow bat (*Dasypterus xanthinus*).



Annual Area Burned

Year	Hectares	Acres
2013	50,531	124,865
2014	17,680	43,689
2015	11,260	27,825
2016	63,796	157,642
2017	63,075	155,860
2018	142,014	350,922
2019	51,332	126,845
2020	42,587	105,233
2021	52,732	130,302
2022	367,958	909,240

Figure 10. Recent, large wildfires.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES

Invasive species enter ecosystems and establish viable populations where they did not previously occur. Their arrival may be a result of natural immigration, but more frequently it is human caused, either deliberate or accidental (Brown and Sax 2004). Often, but not always, invasive species are non-native and reproduce prodigiously (Molles 2008).

Many ecologists recognize the problems caused by the introduction and potential invasion of non-native species into communities or ecosystems and the associated, negative effects on global patterns of biodiversity (Stohlgren et al. 1999). Once established, many invasive species have the ability to displace native plant and/or animal species (including Threatened and Endangered species), disrupt nutrient and fire cycles, and alter the character of the community by facilitating additional invasions (Cox 1999, DeLoach et al. 2000, Zavaleta et al. 2001, Osborn et al. 2002).

Noxious weed infestations are now the second-leading cause of native species being listed as Threatened or Endangered nationally. As of 1998, non-native species have been implicated in the decline of 42% of species federally listed under the Endangered Species Act (Flynn-O'Brien et al. 1999). Invasive plants and the gypsy moth (*Lymantria dispar*) were identified as posing a threat to native insect biodiversity and rare moths and butterflies in eastern North America, respectively (Wagner and Van Driesche 2010). In addition to environmental problems, invasive plants also pose a considerable economic concern. Rangelands infested with spotted knapweed (*Centaurea stoebe*), a serious problem in New Mexico, typically suffer reductions in livestock carrying capacity of 50% or more. The 2020 New Mexico Forest Action Plan includes strategies where important outcomes include the monitoring, management, and control of invasive, noxious, and exotic plants (EMNRD 2020).

Non-native, aquatic species can have considerable effects on native fish, molluscs, and crustaceans in New Mexico's aquatic habitats. The populations of native fauna are negatively affected by non-native species through resource competition, predation, hybridization, habitat alteration, and the introduction of diseases and toxins. Concern over aquatic invasive species, particularly zebra (*Dreissena polymorpha*) and quagga mussels (*D. bugensis*) and "rock snot" (*Didymosphenia geminata*) led the New Mexico State Legislature to approve the creation of a new position with the Department, an Aquatic Invasive Species Coordinator, in 2013. Additionally, the Department has implemented rules to combat the spread of aquatic invasive species, including requiring inspections of watercraft coming from out-of-state during periods when inspection stations are open.

The distribution of both native and exotic invasive species will be influenced by climate change. Within aquatic systems, warmer waters may help establish aquatic invasive species such as the zebra and quagga mussels and simultaneously reduce the effectiveness of biological and chemical control agents (Hellmann et al. 2008). Warming waters may facilitate the spread of cold-limited, invasive fish species. On the other hand, increased fragmentation of water bodies may act to reduce or slow the spread of some exotic species (Hellmann et al. 2008). Drought may increase the susceptibility of higher-elevation ecosystems to invasion by exotic grasses, which in turn increases wildfire risk (Ford et al. 2012). Increases in fire and insects also favor invasive plant species that dominate disturbed habitats. Changes in the timing of precipitation (from summer to winter-dominated rainfall) and increasing carbon dioxide (CO_2) are expected to increase the encroachment of woody plant species into grasslands (Morgan et al. 2007). These conditions may also exacerbate human-related disruptions to grasslands (Hansen et al. 2001, Jetz et al. 2007).

Non-native species can often outcompete native species, leading to a local population reduction in, extirpation of, or disruption to ecosystem processes that support these native species. For example, the dense, monotypic stands typical of invasive tamarisk (*Tamarix* spp.) can lead to reduced native plant and wildlife diversity in riparian habitats (Mosher and Bateman 2015). Tamarisk is also better adapted to high soil salinity and water stress, conditions that are common in New Mexico’s highly altered river systems, than native species (Busch and Smith 1995). It can also alter the fire ecology in riparian areas, leading to the recruitment of tamarisk rather than native vegetation (Webb et al. 2019).

As another example of non-native species outcompeting native species, cheatgrass, also known as downy brome, is an annual plant native to Eurasia. This aggressive, invasive weed was originally introduced to North America in soils brought by ocean-going vessels and is now a dominant species in the Intermountain West. Cheatgrass thrives in disturbed areas resulting from activities and occurrences including construction, fire, floods, excessive grazing, and intense recreation. It will also invade undisturbed areas and is hard to control once established. As this invasive species begins to dominate an area, it alters native plant communities and displaces native plants, ultimately impacting wildlife. This species also triggers changes in soil properties, declines in agricultural production, and altered fire frequencies. Cheatgrass is highly flammable, and densely growing populations provide ample, fine-textured fuel that can increase fire intensity and decrease the intervals between fires. Native plant communities in cheatgrass-infested areas can be substantively altered by the occurrence of fire, which may result in erosion and damage to water resources (CSUE 2024).

Problematic species cause changes that are unwanted, and often unanticipated. Not all invasive species are entirely undesirable: for example, while rainbow trout have contributed to extirpation of native Rio Grande cutthroat trout from several watersheds in New Mexico, they were introduced because of their high value as a harvested species (Sublette et al. 1990). Likewise, problematic species are not necessarily non-native. Some native species may become problems because they co-occur, their populations grow too large, and/or their behavior is incompatible with humans. Sometimes in these cases, regulated harvest has the potential to reduce conflicts. Woody plant encroachment in North American grasslands and savannas provides an example of native species expansions that can have negative impacts on local ecosystems, including declines in species richness (Ratajczak et al. 2012).

Exotic Phreatophytes

Tamarisk (also known as salt cedar) is a non-native shrub or tree that was intentionally introduced to the US from Eurasia in the 1800s, originally as an ornamental plant and later for erosion control in the arid west (Robinson 1965). Due to its deep root system, tolerance for saline conditions, and prolific seed production, tamarisk has naturalized throughout riparian areas, reservoir margins, and other wetlands of the west, particularly where hydrologic modifications (e.g., dams, withdrawals, diversions) have created conditions unfavorable for native riparian vegetation (e.g., cottonwood and willow) (Lovich and De Gouvenain 1998, Glenn and Nagler 2005, Shafroth et al. 2005). Tamarisk is one of the most dominant woody riparian species in the western US (Friedman et al. 2005) and is considered a noxious weed in many states, including New Mexico (NMDOA 2009). While tamarisk has expanded its range and dominance, native riparian woodlands have sharply declined due to agricultural conversion, urbanization, poorly managed grazing, and hydrologic alterations (Knopf et al. 1988, Graf 1992, Busch and Smith 1995). In some areas, tamarisk can form large monotypic stands that cover thousands of hectares (e.g., Pecos River) and can establish and survive and along highly altered rivers where native riparian trees cannot (Shafroth et al. 2008, Stromberg et al. 2009a, Nagler et al. 2010). The loss of native riparian vegetation has been linked to a decline in many southwestern riparian wildlife populations, particularly breeding and migratory birds (McGrath and van Riper 2005, McGrath et al. 2008, Johnson et al. 2010).

Although tamarisk likely has lower habitat value than native riparian vegetation, it can provide important habitat for some species, especially where degraded riparian conditions inhibit establishment and survival of native vegetation (USFWS 2002, Walker 2006). Forty-nine species of birds are known to use tamarisk as breeding habitat, and in Arizona and New Mexico, 11 bird species of regional or national concern breed in tamarisk (Sogge et al. 2008). Critical habitat for populations of the Threatened western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) and Endangered southwestern willow flycatcher (*Empidonax traillii extimus*) includes tamarisk-dominated, riparian woodland (USFWS 2013a, USFWS 2021), with approximately 28% of known southwestern willow flycatcher territories found in such habitat (Durst et al. 2007). Mammals and herpetofauna also occur in tamarisk (Hink and Ohmart 1984, Ellis et al. 1997, Bateman et al. 2008a, Bateman et al. 2008b, Bateman et al. 2009, Bateman and Ostoja 2012, Longland 2012), although the composition of these communities can be different from those found in stands of native riparian vegetation. There is evidence that tamarisk use by wildlife is most frequent among common, riparian generalists (Sogge et al. 2008, Bateman et al. 2013a). Although wildlife species diversity and abundance may be lower in tamarisk when compared to strictly native riparian vegetation, tamarisk may support larger local regional wildlife populations than would otherwise occur in the absence of native vegetation (Hunter et al. 1988).

Tens of millions of dollars have been spent on tamarisk control across the western US, including New Mexico (Hart et al. 2005, Pearce 2006, NMWTB 2015). Current, large-scale riparian restoration efforts in New Mexico have prioritized invasive plant removal (USFS 2020), including tamarisk. The primary stated reasons for controlling tamarisk are to increase water yield, improve wildlife habitat, restore native vegetation, and decrease riparian wildfire frequency and severity (Shafroth et al. 2005, Shafroth et al. 2008). In many cases, these objectives are difficult to achieve without rigorous restoration planning and implementation that considers tamarisk removal merely as a first step in a multi-factor, multi-phase restoration process. For example, follow-up treatments for multiple years are often necessary to control tamarisk re-sprouts. Additionally, detectable increases in water yield following tamarisk removal may not always occur and appear to be highly dependent upon replacement vegetation (Shafroth et al. 2005, Cleverly 2013, Nagler and Glenn 2013).

Tamarisk removal may have unintended consequences, including habitat loss and expansion of other exotic species (Zavaleta et al. 2000, Sogge et al. 2008). Removal sites may be unsuitable for the desired replacement vegetation if environmental conditions favoring tamarisk (e.g., soil salinity, deep groundwater, infrequent or absent flooding) preclude establishment and survival of native riparian plants (Briggs 1996, Glenn and Nagler 2005). Likewise, tamarisk removal may facilitate colonization or expansion of other exotic plants, including kochia (*Kochia scoparia*), that provide little habitat value (D'Antonio and Meyerson 2002, Harms and Hiebert 2006, Shafroth et al. 2008, Ostoja et al. 2014). Moreover, if desired replacement vegetation is not restored in the near term, tamarisk removal could lead to temporary habitat loss and a reduction or loss of local wildlife populations (Fleishman et al. 2003). For rare or Endangered species, even temporary habitat loss may jeopardize recovery (Paxton et al. 2011). Thus, tamarisk-removal projects should include additional measures to ensure successful establishment and survival of high-quality, native riparian vegetation (Shafroth et al. 2008).

Russian olive (*Elaeagnus angustifolia*) and Siberian elm (*Ulmus pumila*) are exotic tree species that also commonly occur in New Mexico's riparian and wetland areas. Restoration projects regularly include removal of these tree species along with tamarisk. Like tamarisk, Russian olive and Siberian elm can provide wildlife habitat, especially in areas where native riparian trees are scarce or absent. Projects that remove these species should consider the impacts on wildlife and include plans to restore desirable replacement vegetation. Tamarisk removal projects may facilitate expansion of Russian olive (Bloodworth et al. 2016) and Siberian elm. Some exotic phreatophytes, like the drought-tolerant tamarisk, may be favored under future climatic conditions, while others, like Russian olive, may begin to retreat from hot areas (Perry et al. 2012).

A further consideration when removing Russian olive is that it hosts symbiotic, nitrogen-fixing bacteria (*Frankia* spp.) (Miller et al. 1985). While this part of its physiology is well established, the significance for ecosystem function is important because lag effects on soil nitrogen may persist and hinder restoration efforts aimed at reestablishing willows or cottonwoods that evolved on relatively nutrient-poor soil. Russian olive litter decomposition has been shown to induce large spikes of the greenhouse gas nitrous oxide. The influence of plants, including Russian olive, on riparian soil properties is also persistent and accumulates over the life of a plant rather than being driven by a single input of litter (Duval et al. 2020). Duval et al.'s (2020) results are indicative of a lag effect on soil properties associated with invasive vegetation, as is the observation that arthropod communities differ in both taxonomic and functional diversity in stands of extant and former Russian olive (lower diversity) when compared to areas populated by native Rio Grande cottonwood (*Populus deltoides wislizeni*; higher diversity). Arthropod feeding groups exhibited variable response to soil nitrogen status. Detritivores were more abundant on extant Russian olive and removal plots potentially due to a nitrogen feedback where the organisms are attracted to the greater inorganic nitrogen content of litter material in these plots, then their excreted nitrogen becomes part of the local nitrogen cycle (Duval et al. 2024).

The tamarisk beetle (*Diorhabda* spp.) was introduced to the southwestern US in 2001 as a biocontrol for tamarisk. Tamarisk beetles are specialist herbivores that feed exclusively on tamarisk leaves, resulting in desiccated foliage that eventually falls from the tree (Lewis et al.

2003, Bloodworth et al. 2016). Repeat defoliations (over ~2-7 years) may result in tamarisk mortality, though mortality rates are highly variable and dependent on local site conditions. Plants exposed to additional stressors, such as drought or highly saline soils, may be more likely to die (Bloodworth et al. 2016).

The tamarisk beetle previously spread to occupy most of New Mexico's major waterways. In 2023, new records were documented along the middle Rio Grande and lower Pecos River (RiversEdge West 2024). Although the beetle is expected to reduce tamarisk populations and may help improve riparian habitat over time, it also can degrade or destroy large areas of existing habitat, especially where tamarisk is the dominant vegetation type or has completely replaced native riparian vegetation. Decreased tamarisk cover has been linked to a hotter, drier microclimate (Bateman et al. 2013b), which may lead to reduced abundance and diversity of herpetofauna (Bateman et al 2013b, Bateman et al. 2015) and avifauna. Studies have documented a decline in the fledgling success of Endangered southwestern willow flycatchers and yellow warblers in areas affected by the beetle (Dobbs et al. 2012). Defoliation can be an ecological trap for birds that nest in leafy tamarisk early in the summer, then their nests fail after beetle defoliation due to changes in microclimate, increased exposure to predators, or other related factors. Thus, wildlife species that use tamarisk extensively may experience significant population declines due to biocontrol (Paxton et al. 2011).

Unfortunately, beetle-defoliated and beetle-killed sites are often unsuitable for natural recruitment of native vegetation and require intensive restoration efforts to recover habitat (Harms and Hiebert 2006, Shafroth et al. 2008). Studies have shown that even active revegetation is likely to fail without further maintenance and management (Briggs et al. 1994, Bay and Sher 2008). Moreover, beetle-induced mortality of tamarisk can occur rapidly (within ~2-7 years), leaving little time to plan and implement habitat restoration at affected sites (Bloodworth et al. 2016). For example, the beetle arrived on the Department's William S. Huey Waterfowl Area along the Pecos River in 2014, and by the end of 2015, there was near complete mortality of tamarisk on the property. As of 2024, the tamarisk beetle can be found in all Department-managed Wildlife Management Areas. However, severe tamarisk die-off within a given watershed typically occurs every 4-6 years. Additionally, defoliated or beetle-killed tamarisk creates an elevated fire risk that further threatens riparian habitat (Hultine et al. 2010, Drus 2013). There is now an urgent need to restore habitat formerly and currently occupied by tamarisk to maintain local wildlife populations and prevent degradation of adjacent aquatic habitat, especially in the most hydrologically altered river systems where native riparian vegetation is rare.

Diseases, Pathogens, and Problematic Species

Diseases and pathogens are a growing concern for amphibian and reptile SGCN (Langwig et al. 2015). A particular form of a chytrid fungus (*Batrachochytrium dendrobatidis*; *Bd*) has been identified as being responsible for massive die-offs of amphibians in South and North America, including such SGCN as the Chiricahua leopard frog and boreal toad (*Anaxyrus boreas boreas*) (Wake and Vredenburg 2008). *Batrachochytrium salamandrivorans* (Bsal) is a fungal pathogen that is closely related to *Bd*, infects amphibians (AFWA 2024), and is associated with the emerging infectious disease Bsal chytridiomycosis. Bsal was discovered in Europe in 2013, following the discovery of ongoing mortality in fire salamanders (*Salamandra salamandra*) (Martel et al. 2013), though it likely originated in Asia and spread to Europe through the pet trade (AFWA 2024). The distribution of Bsal appears to be expanding (Spitzen-van der Sluijs et al. 2016). A 2014 experiment (Martel et al. 2014) revealed the susceptibility of salamanders from around the world to Bsal chytridiomycosis, including some North American species. More recent research shows mortality of 35% of North American amphibians tested (Gray et al. 2023, AFWA 2024). Other pathogens, such as various ranaviruses, which have led to massive die-offs in fish, frogs, and turtles, and snake fungal disease (*Chrysosporium* spp.), are also of concern (Allender et al. 2011, Lesbarreres et al. 2012, Sigler et al. 2013, Duffus et al 2015, Lorch et al. 2018).

Whirling disease in rainbow trout (*Oncorhynchus mykiss*) was confirmed in New Mexico in the spring of 1999. Since then, whirling disease has spread across much of North America (Elwell et al. 2009), including to numerous water bodies and state fish hatcheries across the State. Whirling disease can have variable impacts on wild salmonid populations, ranging from causing severe population declines to persisting for years without any observable effect (Elwell et al. 2009). New Mexico has adopted statutes, rules, and policies that mitigate risk associated with whirling disease by restricting the stocking or importation of fish infected with this disease. However, the potential for accidental introduction still exists. The Department's Fisheries Management Division conducts annual testing in its hatcheries and periodic testing of wild salmonid populations for whirling disease to prevent the spread of this disease to uninfected areas whenever possible.

Many of the bird and mammal SGCN are affected by diseases such as West Nile virus, rabies, hantavirus, pasturella, pneumonia, and bubonic plague. The growing WUI exposes wildlife to potentially infected domestic pets and may contribute to the spread of these diseases. Increased exposure to refuse, pesticides or other toxins, and parasites may also affect wildlife at this interface and more broadly across the State. It is generally accepted that Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which causes COVID-19 (Hu et al. 2021), spilled into the human population from a wildlife reservoir, likely from bats. Human-to-ferret (*Mustela* spp.), ferret-to-ferret, human-to-mink (*Mustela* spp. and *Neogale* spp.), mink-to-mink, and mink-to-human transmission all have been documented. The ability of an animal to become infected with COVID-19 pertains to the shape of certain receptors on cells in the lining of their respiratory tract. The shape of these receptors tends to be similar in related species. Thus, species closely related to ferrets and mink could potentially be at risk of infection (BWRC 2023). White-nose Syndrome (WNS), a fungal disease caused by *Pseudogymnoascus destructans* (*Pd*), has caused massive die-offs of millions of bats in eastern North America and is progressing westward. The *Pd* fungus was detected on bats in New Mexico in 2021 (pers. comm. J. Stuart, Department), and WNS was documented in 2023 in fringed myotis (*Myotis thysanodes thysanodes*) and cave myotis (*Myotis velifer*) bats found in caves in De Baca and Lincoln counties, New Mexico (WNSRT 2024). Multiple state and federal agencies formed the White-nose Syndrome Response Team in New Mexico and fund sampling and testing for *Pd* in the State. A new variant of a virus that causes rabbit hemorrhagic disease was detected in New Mexico in 2020 and mortalities were reported in southern New Mexico and areas near cities in central and northern New Mexico (NMDGF 2020).

Phytophagous (plant-eating) insect outbreaks cause tree mortality and reduced growth in New Mexico's forests and woodlands (Haack and Byler 1993). Bark beetles (e.g., *Dendroctonus* spp.) and inner bark borers are primary tree killers (Haack and Byler 1993) with the piñon Ips (*Ips confusus*) alone having killed 180,085 ha (445,000 ac) in New Mexico from 2012 to 2022 (EMNRD 2022). Altered forest conditions have likely increased the frequency, intensity, and extent of insect outbreaks and diseases (Haack and Byler 1993, Wilson and Tkacz 1994, EMNRD 2004). Environmental stresses such as drought, late spring frosts, wind throw, and air pollution can encourage insect outbreaks (Haack and Byler 1993). Although insect outbreaks occur naturally in forest ecosystems, they can cause shifts in plant community composition and structure (Haack and Byler 1993). Further, certain phytophagous insects are attracted to fire-damaged or fire-killed trees, and their build-up in weakened host trees can threaten adjacent, unburned stands (USFS 1999). The magnitude of disturbance from an outbreak depends on the particular insect or pathogen and the condition of the forest ecosystem affected (Wilson and Tkacz 1994). Closely spaced host trees are likely to trigger outbreaks of phytophagous insects and pathogens. Potential host trees can be harder for insects to locate among non-host trees in compositionally and structurally diverse forests, and vulnerable host trees may be relatively resistant to the small numbers of insects that find them in these forests (Waring and Pitman 1983, Hunter and Aarssen 1988).

Insect pest outbreaks are strongly influenced by environmental conditions. Drought-stressed forests and woodlands are more susceptible to insect outbreaks (Dale et al. 2001). In New Mexico, large outbreaks of bark beetle infestations caused extensive dieback in forests during two extreme drought events in the 1950s and 2000s (Allen and Breshears 1998, Breshears et al. 2005, Ryan et al. 2008). Warmer temperatures and longer growing seasons can boost insect populations by increasing overwinter survival, increasing developmental rates, and facilitating range expansions (Logan et al. 2003, Williams et al. 2008). At the same time, increasing temperatures, drought, and general trends towards aridification stress plants and increase their susceptibility to infestation. Increased tree mortality due to insect outbreaks may exacerbate fire risk by resulting in heavier fuel loads and can lead to increased erosion and sedimentation.

There are many plant diseases that are strongly influenced by environmental conditions (Sturrock et al. 2011). Several diseases that impact trees, including root pathogens (e.g., *Armillaria* sp.) and canker pathogens, are more likely to reach epidemic levels where trees are weakened by heat stress and drought (Sturrock et al. 2011). Warm midsummer temperatures have been linked to explosive growth in Cytospora cankers (*Valsa melanodiscus*) and increased mortality in thinleaf alder (*Alnus incana tenuifolia*) in southwestern Colorado. Sudden aspen decline, a disease of quaking aspen (*Populus tremuloides*), is an example of how climate may impact forest species. This disease is characterized by rapid, synchronous branch dieback and tree mortality at a very large scale. Drought is an important, initial condition leading to sudden aspen decline. Further, sudden aspen decline in Colorado is almost entirely limited to the edge of aspen's climate envelope, especially areas projected to become climatically unsuitable for the aspen in the future and more strongly impacted by drought (Rehfeldt et al. 2009, Sturrock et al. 2011). However, not all diseases will benefit from warming conditions. White pine blister rust (*Cronartium ribicola*), present within New Mexico's Sacramento and White Mountains, may decline if there are fewer wet periods in early spring and summer when temperatures are suitably cool for the spread of the basidiospore (Sturrock et al. 2011). Additionally, increased CO_2 concentrations can support increased plant growth, water efficiency, and disease resistance (Sturrock et al. 2011).

Based on an aerial detection survey conducted in 2022 in New Mexico, the total area of trees killed by bark beetle was 144,432 ha (356,900 ac) and area of defoliated trees was 104,814 ha (259,000 ac). These numbers contrast with 13,557 ha (33,500 ac) killed by bark beetle and 95,910 ha (237,000 ac) of defoliated trees documented in 2023. Defoliating agents include the western spruce budworm (*Choristoneura freemani*) and western tent caterpillar (*Malacosoma californicum*). Compared to 2021, there were increases in piñon Ips mortality and drought impacts in 2022 and substantial decreases in bark beetle-related mortality in 2023. Overall, most of the mapped forest and woodland damage in 2022 occurred north of I-40; most of the damage in 2023 was also in northern New Mexico. Increased bark beetle-induced piñon mortality in 2022 was observed around Santa Fe, Cuba, and within the communities in the East Mountains (e.g., Edgewood). Bark beetle-killed piñon trees in these areas were unable to produce adequate pitch (i.e., sap) to repel bark beetle colonization. Trees remained severely drought-stressed even though drought conditions improved in the state during 2022; there were lingering signs of drought and heat-related stress in 2023 (i.e., 8,093 ha [20,000 ac] of discolored ponderosa pine trees) (EMNRD 2022, EMNRD 2023).

POLLUTION

Wildlife in New Mexico may be exposed to pollutants in three primary forms: water pollution, air pollution, and solid wastes or materials; it is also important to consider noise and light pollution. Riparian and aquatic SGCN are most vulnerable because water is a major transport medium and reservoir for pollutants that come from these sources (Novotny 1999, Akcil and Koldas 2005, Johnson and Hallberg 2005). Water pollutants include organic, inorganic, and potentially toxic substances that are discharged (intentionally or through secondary runoff) into streams and waterways. In New Mexico, the largest number of stream or river water-quality impairments have been attributed to excessive temperature, *Escherichia coli*, and nutrients and associated eutrophication (NMED 2024). Pesticides have been shown to be highly toxic for amphibians, a likely driver of amphibian declines, and a cause of altered stress levels (Bruhl et al. 2013, Van Meter et al. 2019). Air pollution may include particulate matter, noxious gases, or emissions that lead to atmospheric changes or depositions that can lead to accumulation in wildlife through terrestrial or aquatic food chains. Vehicle fuel combustion, industrial sources, and power plants are considered to be major sources of air pollutants in New Mexico (NMED 2016). Air-quality modeling suggests that oil and gas production in the western United States may have significant negative impacts on air quality and ecosystem health in some national parks and other public lands (Thompson et al. 2017). Air pollutants released from unconventional oil and gas extraction, including directional drilling and hydraulic fracturing, may affect reproduction, development, and nervous system function in animals (Bolden et al. 2018).

Noise pollution can be generated by a variety of human activities and can be short term (e.g., noise generated by hikers and mountain bikers) (Zeller et al. 2024) or long term (e.g., noise associated with natural gas production) (Kleist et al. 2018). Impacts on wildlife can range from behavioral modifications and chronic stress to decreased abundance, reduced fitness, and habitat degradation (Kleist et al. 2018, Zeller et al. 2024). Artificial (i.e., human-generated) lighting can disorient, and alter distributions of, wildlife, including having adverse effects on foraging, reproduction, migration, and communication of night-migrating migratory birds (Longcore and Rich 2004). Artificial light has also caused insect declines as it disrupts the development, movement, foraging efficiency, and reproductive success of a variety of nocturnal insects and increases predation incidence by nocturnal insect-eating predators (Owens et al. 2020). To mitigate these unintended impacts to wildlife, facilities and equipment lighting should be down shielded to keep light within the boundaries of the site and minimize its potential attraction for birds and other wildlife.

Hazardous solid wastes may originate from the Department of Energy, the Department of Defense, or private commercial facilities. The majority of toxic chemical releases in New Mexico occur onto land surfaces, and individual facilities with the State's largest releases have been documented to occur from the metal mining, natural gas processing, and electric utility industries (EPA 2022). High levels of per- and polyfluoroalkyl substances (PFAS) were detected in tissues of 23 species of birds and mammals at an air force base in southeastern New Mexico, likely as a result of the accumulation of contaminants in wastewater catchment lakes, including components of aqueous film-forming foams used in fire-fighting training. PFAS can have detrimental impacts on wildlife including causing a decline in overall condition and immune system dysfunction (Witt et al. 2024). Discharges of all pollutant types are regulated through federal and/or state agencies and programs responsible for maintaining safe and clean human environments. However, impacts to wildlife populations depend upon individual species' sensitivities and responses to various substances, as well as their levels of exposure to these pollutants.

Sulfides, metals (iron, manganese, aluminum), and arsenic occur naturally in mineral deposits that are mined; they become pollutants when concentrated in tailings. All of these materials can be serious causes of mortality if they drain into rivers and streams. This is particularly true for sulfides, which become sulphuric acid when exposed to oxygen and water and then devastate aquatic invertebrate populations of waterbodies into which they drain (Akcil and Koldas 2005, Younger et al. 2005).

Petrochemicals contain an array of hydrocarbons (benzene, benzopyrene, toluene, methylcholanthrene), polychlorinated biphenyls (PCB), and heavy metals that are toxic to wildlife. If consumed, these may cause lesions, cell deformation, decreased brain size, suppression of the immune system, and genetic damage in wildlife and fish embryos (McBee et al. 1987, Bickham and Smolen 1994, Custer et al. 1994, Briggs et al. 1996, Propst et al. 1999). One of the most significant threats to waterfowl and other migratory birds from oil and gas development in the Rocky Mountain region is exposure to petrochemicals in produced water (Ramirez 2010). The best way to protect wildlife from coming into contact with produced water is to use closed containment systems. If pits or open-topped tanks are used instead, preferred materials to exclude wildlife include metal grating or extruded plastic, knit, or woven netting.

Both quantity and quality of available wetland and aquatic habitats influence the susceptibility of wildlife to pollutants and related factors. Waterfowl concentrated and crowded into reduced areas of remnant wetlands are increasingly susceptible to the spread of disease. Concentrated levels of pesticides, herbicides, and salts from irrigated fields that drain into wetlands have been a major contributor to the mortality of fish and waterfowl (Novotny 1999, Lemly et al. 2000).

CONSERVATION ACTIONS: AN OVERVIEW

Conservation actions for mitigating threats to aquatic SGCN and their habitats, especially ephemeral habitats, are listed here because these habitats, though of limited total area, are widely distributed across the State. The threats that affect them are present in all the ecoregions in the State. Conservation actions for perennial aquatic, riparian, and terrestrial habitats and SGCN are listed within ecoregion chapters because the associated threats often are unique to that specific ecoregion. Threats are listed according to the order presented by the IUCN (2022) and do not reflect relative severity in New Mexico. Within each potential threat category, actions are prioritized beginning with the most important to SGCN conservation. Those actions aimed at direct conservation or management of SGCN and their habitats generally received highest priority.

As new information becomes available, some actions will be modified to ensure optimal conservation outcomes. Of particular importance will be new and better information about climate change and factors related to it (e.g., emerging diseases, spatiotemporal changes in availability of food) that may test the adaptive capacities and resilience of SGCN.

The Department alone does not have the authority or resources to implement all conservation actions identified in this SWAP. Thus, collaboration with appropriate federal, Tribal, state, and local government agencies, non-profit organizations, private landowners, and interested and affected publics is key to the successful implementation of this SWAP. In some cases, the Department will depend on collaborators to take the lead in implementing conservation actions. Examples of specific collaborators are identified after some actions, but the lists are not exhaustive nor are they listed in order of importance.

Likewise, limited fiscal resources and staff also will preclude direct monitoring of the effect of all conservation actions. However, the Department will utilize and expand a variety of databases to gain needed information. For example, the Department plans to explore development of a Conservation Action Tracker, to document implementation of conservation actions using State Wildlife Grant (SWG) funds. A full discussion of how the Department will approach monitoring is described in Chapter 11.

Ultimately, the following list of Conservation Actions represents the Department’s best effort to identify potential actions that could be implemented to help conserve ephemeral aquatic habitats and associated SGCN in New Mexico. The Department anticipates that this list will serve as a foundation for further identification of actions that can assist these habitats and associated SGCN.

CONSERVATION ACTIONS FOR AQUATIC SPECIES AND ASSOCIATED EPHEMERAL HABITATS

NATURAL SYSTEM MODIFICATIONS:

- Document, monitor, protect, enhance, and restore ephemeral aquatic ecosystems (catchments, marshes/cienegas/springs, playas) to minimize the loss of these water bodies and any surrounding wetlands in New Mexico. Develop monitoring protocols and conservation actions for ephemeral aquatic habitats and associated SGCN. In particular, focus efforts on wetland-obligate species that use these habitats for all or part of their life cycle or during migration. Potential collaborators: BLM, US Natural Resources Conservation Service (NRCS), USFS, New Mexico Environment Department (NMED), New Mexico State Land Office (SLO), universities, non-profit organizations, private landowners.
- Re-connect ephemeral stream and wetland habitats that have been fragmented by roads, culverts, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Does not include structures that serve a beneficial role for wildlife (e.g., native fish barriers). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, US National Park Service (NPS), USFS, NMDOT, private landowners.
- Employ and support incentive programs, including those specifically designed for wetland conservation, to protect, enhance, and restore aquatic habitats. Potential collaborators: NRCS, private landowners.
- Consider appropriate policies to protect the biotic and abiotic resources of ephemeral aquatic ecosystems and to support higher water quality standards for wetlands. Potential collaborators: NMED.
- Identify SGCN within ephemeral aquatic ecosystems and isolated wetlands that lack federal protection under the Clean Water Act and identify actions to protect these SGCN and their habitats. Potential collaborators: BLM, DOD, NPS, USFS, USFWS, NMED, SLO, universities, non-profit organizations, Tribal natural-resource managers.
- Investigate the ecology of threats to and environmental conditions that limit SGCN that inhabit ephemeral aquatic habitats. Potential collaborators: BLM, NPS, USFS, US Fish and Wildlife Service (USFWS), SLO, universities, Tribal natural-resource managers.
- Develop and implement survey and monitoring protocols for aquatic and semi-aquatic SGCN in ephemeral habitats that currently are not monitored. Potential collaborators: BLM, DOD, NPS, USFS, USFWS, SLO, universities, Tribal natural-resource managers.
- Locate and protect SGCN that occur in high elevation, ephemeral aquatic ecosystems. Potential collaborators: USFS, private landowners.
- Identify at-risk populations of SGCN that utilize ephemeral aquatic habitats and develop actions to conserve them. Potential collaborators: BLM, DOD, NPS, USFS, USFWS, SLO, universities, Tribal natural-resource managers.
- Develop and maintain a database of the location and status of ephemeral aquatic habitats. Use standardized monitoring and survey methods and satellite imagery to classify and track

gains and losses of habitat. Potential collaborators: NMED, universities, non-profit organizations.

- Identify populations of aquatic, semi-aquatic, and riparian SGCN in ephemeral aquatic ecosystems that become isolated during dry periods. Work to protect interconnected wetland habitats and to connect currently isolated wetland patches to limit geographic isolation of wetland ecosystems that might lead to biodiversity loss. Potential collaborators: BLM, DOD, NPS, USFS, USFWS, NMED, SLO, New Mexico Bureau of Geology and Mineral Resources (NMBGMR), universities.
- Examine and quantify how geographically isolated wetlands and wetland complexes contribute hydrologically, chemically, and biologically to other waters. Includes assessing how they contribute to surface- and groundwater quality and how they differ in terms of biodiversity from interconnected wetland complexes. Potential collaborators: BLM, DOD, NPS, USFS, USFWS, NMED, SLO, universities, non-profit organizations.
- Create public awareness of the function, values, services, and products of ephemeral aquatic ecosystems. Potential collaborators: BLM, NPS, USFS, USFWS, SLO, non-profit organizations.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES:

- Investigate the current distribution of invasive and other problematic species and diseases with special emphasis on their impact to aquatic SGCN and associated ephemeral aquatic habitats. Identify ways to minimize the spread of these species and diseases. Potential collaborators: BLM, DOD, US Department of Energy (DOE), NPS, NRCS, USFS, USFWS, New Mexico Department of Agriculture (NMDA), NMED, SLO, universities, private landowners, Tribal natural-resource managers.
- Develop and implement protocols to detect, reduce, or eradicate non-native and invasive species in ephemeral aquatic habitats while encouraging repopulation by native species. When removing non-native riparian plants, prioritize removal of monoculture stands (e.g., Johnson et al. 2018b) and ensure that sufficient native riparian vegetation is locally available to SGCN and that local hydrological conditions support native vegetation regrowth. Stage and balance non-native plant removal and native habitat restoration over time, to avoid rapid loss of exotic woody riparian habitats for wildlife until native habitats can be developed (Sogge et al. 2013). Potential collaborators: BLM, DOD, DOE, NPS, NRCS, USFS, USFWS, NMDA, NMED, SLO, universities, private landowners, Tribal natural-resource managers.
- Restore aquatic SGCN reduced by the presence of non-native species in ephemeral aquatic habitats. Potential collaborators: BLM, DOD, NPS, USFS, USFWS, SLO, universities, private landowners, Tribal natural-resource managers.
- Maintain isolation between ephemeral aquatic habitats in cases where the presence of disease or invasive species in one habitat threatens to spread into neighboring, unaffected habitats. Potential collaborators: BLM, DOD, DOE, NPS, USFS, USFWS, SLO, universities, private landowners, Tribal natural-resource managers.

CONSERVATION OPPORTUNITY AREAS

Conservation Opportunity Areas (COAs) are areas in the State considered to have superior potential for conserving SGCN. Like all other components of the SWAP, COAs provide a non-regulatory tool to help focus and prioritize conservation action implementation to locations where conservation practitioners may maximize opportunities to prevent future listings of species and promote recovery of species that have already been listed. This landscape-level view of high biodiversity areas within New Mexico is not intended as a substitute for individual project decisions or to preclude the need for site-specific assessments that may be considered in funding decisions by the Department and other natural-resource managers. However, COAs can serve a vital function in prioritizing wildlife- and habitat-restoration efforts to address the most critical wildlife needs within the State.

The identification of potential COAs in New Mexico utilized ArcGIS Pro 3.3 (Environmental Systems Research Institute, Redlands, California, USA), ArcGIS 10.2.2 (Environmental Systems Research Institute, Redlands, California, USA), and R Programming 4.3.2. A Geographic Information System (GIS) layer of Priority Habitats one and two (2.56 km^2 [1 mi^2] hexagonal mapping units) from the Crucial Habitat layer in the New Mexico Crucial Habitat Assessment Tool (CHAT) (http:// nmchat.org/) provided the foundation for COA selection. These priority CHAT habitats are considered vital for the conservation of wildlife in New Mexico. Each hexagon was designated as Priority Habitat one or two for the CHAT Crucial Habitat layer if it contained at least one of the following:

- At least one federally or State-listed Threatened or Endangered species, or a federal candidate species, OR
- At least one species recognized by NatureServe as having a Global Rank of G1 (critically imperiled) or G2 (imperiled) species based on NatureServe's Conservation Status Ranks (https://www.natureserve.org/conservation-status-assessment), OR
- Modeled habitat for more than 15 SGCN, OR
- Observations of species protected under the Bald and Golden Eagle Protection Act, OR
- Habitat for aquatic and terrestrial species of economic and recreational importance (at least two terrestrial species, sportfish habitat of higher recreational value), OR
- A site identified by NMED, Natural Heritage New Mexico (NHNM), or Playa Lakes Joint Ventures (PLJV) as a wetland or riparian area having high conservation value. Includes aquatic features such as playas.

The Priority Habitat layer was intersected with following GIS layers:

- Features where SGCN were observed;
- Modeled habitat (i.e., species distribution models) representing potential presence of SGCN;
- Rasters (pixels) of terrestrial habitat (LANDFIRE 2022; quality controlled by NHNM);
- Vectors (lines or polygons) of perennial streams and lakes (NMDGF 2022a) (National Hydrography Dataset Plus, version 2.0; https://www.epa.gov/waterdata/nhdplus-national-data);
- PLJV polygons representing playas (PLJV Probable Playas, version 5.0; https:/pljv.org/playas/playas-tools/); and

- Polygons of large (>1000 ha [2470 ac]) contiguous natural areas (Large Natural Areas [LNAs] CHAT layer; http://nmchat.org/).

This intersection was used to calculate three key components, each tiered, normalized, and weighted to derive the final score for every hexagon in the analysis. The first component, species observations, quantified the number of species with documented occurrences in each hexagon. The second component, potential presence, accounted for the number of species with modeled potential habitat in each hexagon. The third component, habitat, reflected important habitat types within each hexagon, including terrestrial habitats (i.e., macrogroups as identified in the US National Vegetation Classification System), aquatic and wetland habitats, and whether a LNA intersected the hexagon.

Each component was scored using a tiered system. For SGCN, tiering was based on NatureServe Global Ranks, population trends, listing status, status as a harvested species, and funding sources. Tier 1 species (most at risk) earned three points each, Tier 2 species earned two points each, and Tier 3 species (most stable) earned one point each. For example, a hexagon intersecting both a Tier 1 and Tier 3 species received a total species observations score of four points. The same tiering approach was applied to the potential presence data.

For the habitat component, tiering focused on terrestrial habitats assigned to Tiers 1 through 3 (Table 7). As described in Chapter 2, these Tiers were assigned based on NatureServe Conservation Status Assessment National Ranks (https://www.natureserve.org/conservation-status-assessment) and landscape patterns of each terrestrial habitat. Similar to species-based scoring, Tier 1 habitats (most valuable and in need of conservation) earned three points each, Tier 2 habitats earned two points each, and Tier 3 habitats earned one point each. Hexagons intersecting aquatic layers earned three additional points, and those intersecting LNAs earned one additional point. For instance, a hexagon intersecting a Tier 1 and Tier 3 habitat, a playa, and an LNA received a habitat score of eight points.

The three scores (species observations, potential presence, and habitats) were normalized to a scale from one to 10 using the highest value[11] across all analyzed hexagons (n = 59,324). They were then weighted (50% species observations, 20% potential presence, and 30% habitat) and summed to produce the final score for each hexagon.

The Getis-Ord Gi* Cluster Analysis algorithm (Getis and Ord 1992, Ord and Getis 1995; https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-statistics/hot-spot-analysis.htm) with a spatial relationship based on shared edges and corners of analyzed hexagons, was used to identify statistically significant hot spots (high biodiversity and/or habitat value) and cold spots (low biodiversity and/or habitat value) across the dataset. Hexagons classified as hot spots but containing more than approximately 50% urban development were removed from the dataset. The top 10% of Z scores (pertain to deviation from the mean and identify where this deviation is statistically significant) were then evaluated; clusters containing 15 or more contiguous hexagons served as the foundation for COA delineation. Hexagons that were in the top 25% of Z scores, had statistically significant scores, and were adjacent to these foundation clusters were merged with these clusters. Additionally, hexagons with scores that are not statistically

[11] Ranges of values: SGCN observations (0-58); potential SGCN presence (0-82); habitat (0-30).

significant but are still in the top 25% of Z scores were used to connect smaller (<15 contiguous hexagons), statistically significant hot spot clusters if they were within five hexagons of the foundation clusters. To enhance their utility for conservation and ensure ecological similarity within each COA, very large COAs were subdivided along physiographic boundaries, including mountain ranges and watersheds.

The resulting 30 COAs were attributed based on whether they intersected polygons representing: (1) The Audubon Society's Important Bird Areas (IBA) for diverse or rare bird species (https://southwest.audubon.org/conservation/priority-ibas-new-mexico); and (2) US Geological Survey (USGS) Protected Areas to assess conservation management (https://www.usgs.gov/programs/gap-analysis-project/science/pad-us-data-overview). Additionally, COAs were attributed with their surface land ownership (https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-nm-surface-management-agency/about). Descriptions of each COA are detailed in COA summaries located within each ecoregion chapter; COAs appear in the chapter for the ecoregion that contains the highest percentage of the COA's area.

Of the 30 COAs that were selected, the Arizona/New Mexico Mountains ecoregion contains the most (10) and the Madrean Archipelago ecoregion the least (two). In total, COAs cover only 5.3% (16,656 km^2 [6,431 mi^2]) of New Mexico (Figure 11), yet support at least 50% (255 total SGCN with either documented observations [241], modeled potential habitat [88], or both [77] intersecting one or more COAs) of all SGCN (see Appendix G for more details). All 38 of the terrestrial habitats are represented in the COAs, including all four miscellaneous land-cover types. Land stewards include federal (10,818 km^2 [4,177 mi^2]; 65%), State (808 km^2 [312 mi^2]; 5%), private (4,438 km^2 [1,714 mi^2]; 27%), and Tribal (550 km^2 [212 mi^2]; 3%) entities. Eighty-one percent of federal lands are administered by USFS. Seventeen COAs encompass IBAs. Based on the USGS Protected Areas dataset, 26 of the 30 COAs contain lands that are at least partially protected. On average, 24% (range: 0-84%) of each COA is protected for the conservation of biodiversity.

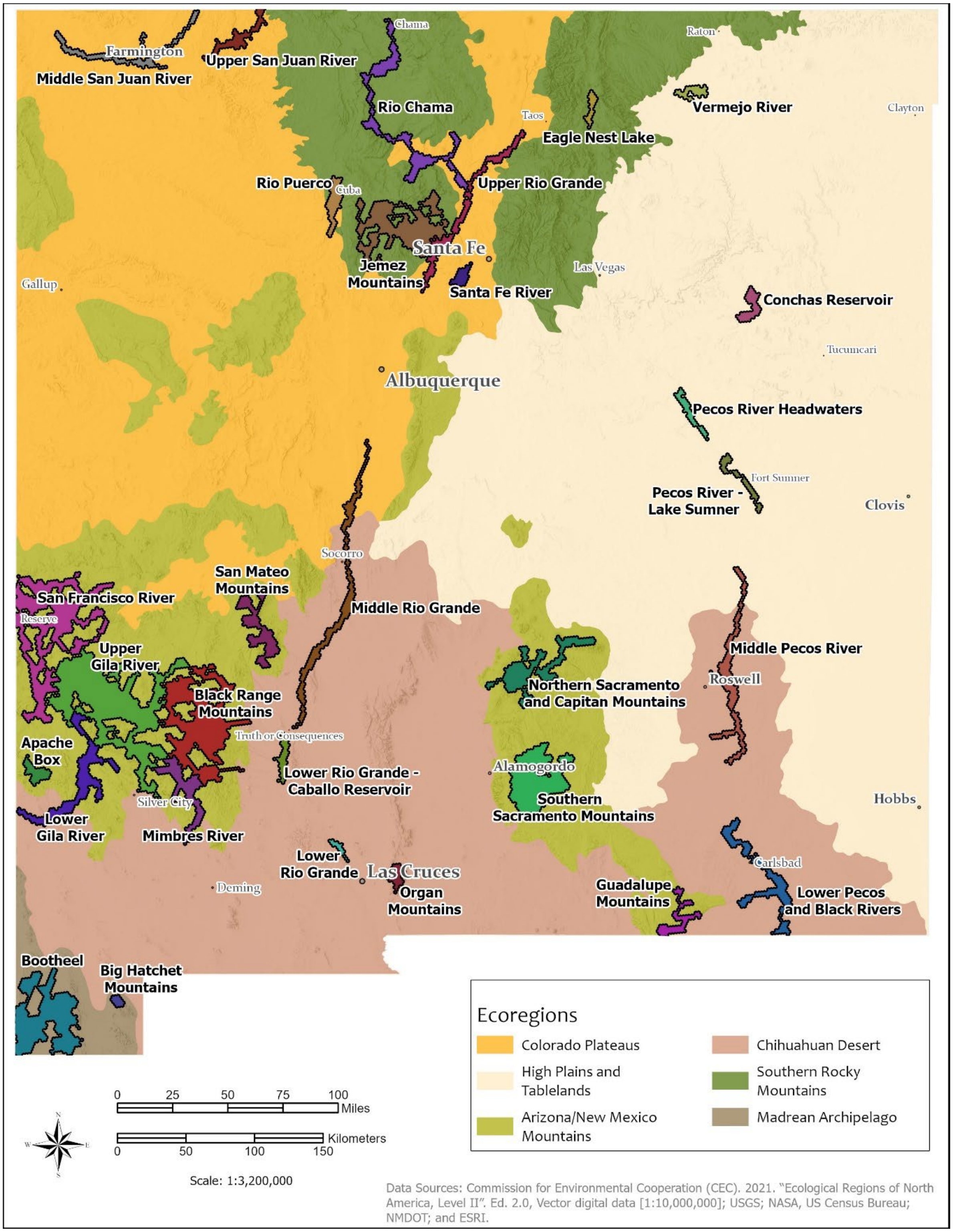


Figure 11. Conservation Opportunity Areas.

These are areas that have superior potential for conservation based on number and urgency for conservation of Species of Greatest Conservation Need and habitats they encompass.

RIPARIAN CONSERVATION OPPORTUNITY AREAS

Riparian Conservation Opportunity Areas (RCOAs) are sites along river corridors that can serve as targets for conservation and/or restoration actions that will lead to enhanced habitat quality for a diversity of animals, connectivity for wildlife movements, and provision of ecosystem services. RCOAs are delineated based on the distribution of four ecological components that were mapped across the landscape based on the New Mexico Riparian Habitat Map (NMRipMap; version 2.0 plus; https://nhnm.unm.edu/riparian/nmripmap). RCOAs are anchored by Riparian Strongholds (RSs), which are large blocks of high-quality habitat that is hydrologically connected and contain fully functional natural riparian vegetation (e.g., cottonwood riparian forest) (Figure 12). RCOAs also include Other Native Riparian Areas (ORAs), which are of lower ecological value than RSs such as drier shrublands or grasslands, and Potential Restoration Areas (PRAs), which are dominated by non-native species such as Russian olive or tamarisk but restoration efforts may enhance overall habitat quality, that are adjacent to RSs. RCOAs may also encompass Small Primary Riparian Areas (SRAs), small patches of high-quality riparian vegetation interspersed among the other three components that also contribute to habitat connectivity. Overall, RCOAs and their components can guide conservation action implementation and planning at a basin-wide scales.

To map RCOA components, NMRipMap riparian vegetation types were aggregated into three general categories: primary native riparian vegetation, dry-mesic riparian vegetation, and introduced riparian vegetation. RCOAs were built in a GIS using a consistent rule set that first identifies at least one RS along a stream reach, adds other adjacent components (ORAs and PRAs) if they are present, and finally incorporates any adjacent SRAs to complete the RCOA. ORAs and PRAs must touch at least one RS and they can link RSs but not other ORAs or PRAs. The minimum size of an RCOA was set at 5 ha (12 ac) to identify areas that are more likely to be large enough to make any implementation of conservation or restoration actions in an RCOA economically viable.

To support conservation planning, RCOAs were further categorized into three wetland subclasses. These have distinctive habitat and vegetation characteristics that present different conservation opportunities and challenges: (1) Headwater Complexes (high montane/alpine wetlands and wet meadows that typically occur at the tops of watersheds on gentle to moderate slopes above first-order streams); (2) Confined (confined river canyons with little floodplain that commonly support conifer forests and limited shrub and herbaceous wetlands along local streams or low-elevation canyons with limited riparian vegetation along local waterways; e.g., the Rio Grande Gorge); and (3) Unconfined (unconfined river valleys with broad floodplains dominated by a mosaic of riparian forests, shrublands, and herbaceous wetlands; example vegetation includes cottonwoods, willows, and introduced species such as Russian olive and tamarisk).

To help conservation practitioners in prioritizing the RCOAs for implementing on-the-ground action, each was rated from A (higher conservation value) to D (lower conservation value) based on size, component composition, and ecological diversity. For size, RCOAs that exceed 65 ha (160 ac) get the highest scores and those between 5 and 16 ha (12 and 40 ac) the lowest. RCOAs with a greater amount of RS relative to other components and a greater diversity of vegetation types present also receive a higher rating. A D rating would not be considered a poor, low-quality site but rather that it may have less conservation value relative to other RCOAs in the portfolio and may be a prime target for restoration action depending on its composition and ecological context.

There are supplemental layers intended to support conservation planning efforts that focus on riparian vegetation outside the RCOAs and connectivity in the riparian corridor as a whole: (1) Inter-connectivity Zones (IZs; small patches of higher-quality natural vegetation between RCOAs that, based on the movement abilities and home range sizes of multiple amphibians, reptiles, and terrestrial mammals associated with riparian areas, are likely to be close enough to RCOAs and large enough to be important to wildlife found in RCOAs); Supplemental Habitat Zones (SHZs; vegetation along irrigation ditches and pastures that provide additional, although sometimes marginal, habitat for wildlife forage and movement; these are further tiered based on habitat quality as remnant semi-natural vegetation [T1, higher quality] and agricultural and hay fields [T2, lower quality]); and Potential Connectivity Breaks (roads or urban/developed zones that may restrict wildlife movement by blocking passage or offering little habitat).

THE NEW MEXICO RCOA PORTFOLIO

A portfolio of 2,344 RCOAs has been built for the state that provides the foundation for planning and tracking conservation and restoration actions (Figure 13). The majority of the RCOAs are found in lowland and mid-montane Unconfined reaches (1,241), followed by Confined canyons (685), and then high-elevation Headwater Complexes (418). With respect to land ownership, the large majority of RCOAs in the Confined wetland subclass were on public lands (USFS and BLM). In contrast, the majority of RCOAs in Unconfined reaches were on private or Tribal lands. The Headwater Complex RCOAs intersected a mixture of private and public lands, including areas used for private ranching and recreational activities. RCOAs may have multiple ownerships, particularly in the Unconfined reaches; this will need to be taken into consideration when planning for conservation action implementation.

With respect to the conservation ratings of RCOAs, 264 RCOAs are rated as A's, 704 as B's, 1,249 as C's, and 127 as D's, but distribution is variable with respect to wetland subclass. Those in the Confined subclass had fewer C scores and more A- and B-rated sites, although their overall ecosystem diversity was lower. This likely reflects the typically lower amounts of development in these reaches. In contrast, the lowland Unconfined RCOAs tended to have lower scores resulting from fragmentation by developed areas but relatively high diversity scores.

While the portfolio provides operational targets for conservation, it was largely developed using automated GIS spatial modeling following an initial quality-control inspection of the underlying maps. As a result, site-level evaluations will still be needed prior to implementation of any on-the-ground conservation or restoration action. The ratings don't include some elements that may affect conservation and restoration actions but are not readily analyzed in a GIS at a fine spatial scale. For example, site access and land ownership are complex issues that can affect the feasibility of implementing conservation or restoration actions that are not considered in the ratings. Further, quality of vegetation around a given RCOA is not directly integrated into the ratings (e.g., if a site is surrounded by an urbanized area rather than upland natural land, this can affect conservation value and success). Lastly, the rating system does not account for dispersed land-use impacts including grazing or recreation.

Overall, the New Mexico RCOA portfolio provides spatial information that conservation practitioners can use in planning and implementing riparian habitat projects aimed at improving overall health and habitat connectivity in these highly biodiverse ecosystems. The RCOA layer and supplemental conservation planning layers are available for viewing and download online (https://nhnm.unm.edu/rcoas).

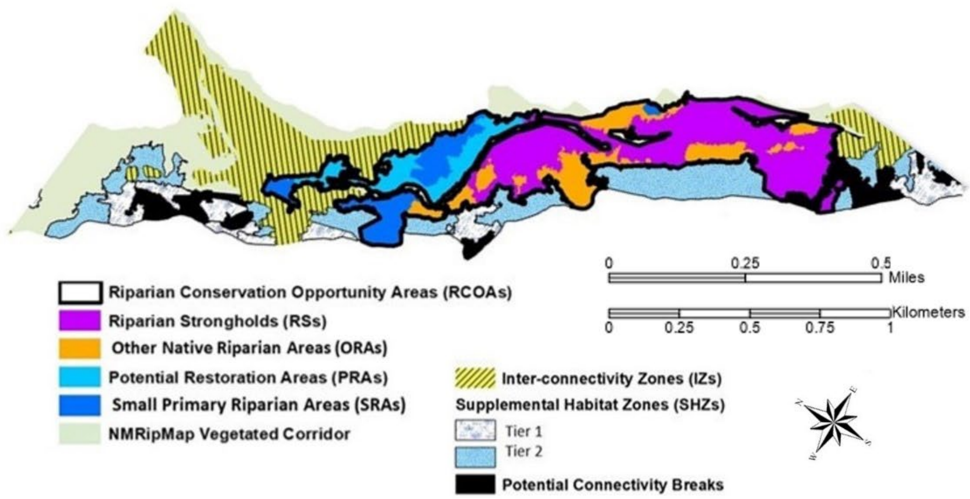


Figure 12. Riparian Conservation Opportunity Area (RCOA) components.

RSs represent the core of RCOAs. RCOA boundaries are then expanded to encompass adjacent patches of ORAs and non-native PRAs and then remaining adjacent SRAs that further increase the connectivity of high-quality riparian habitats. IZs and SHZs may offer additional habitat for wildlife and potential connectivity breaks may restrict wildlife movement.

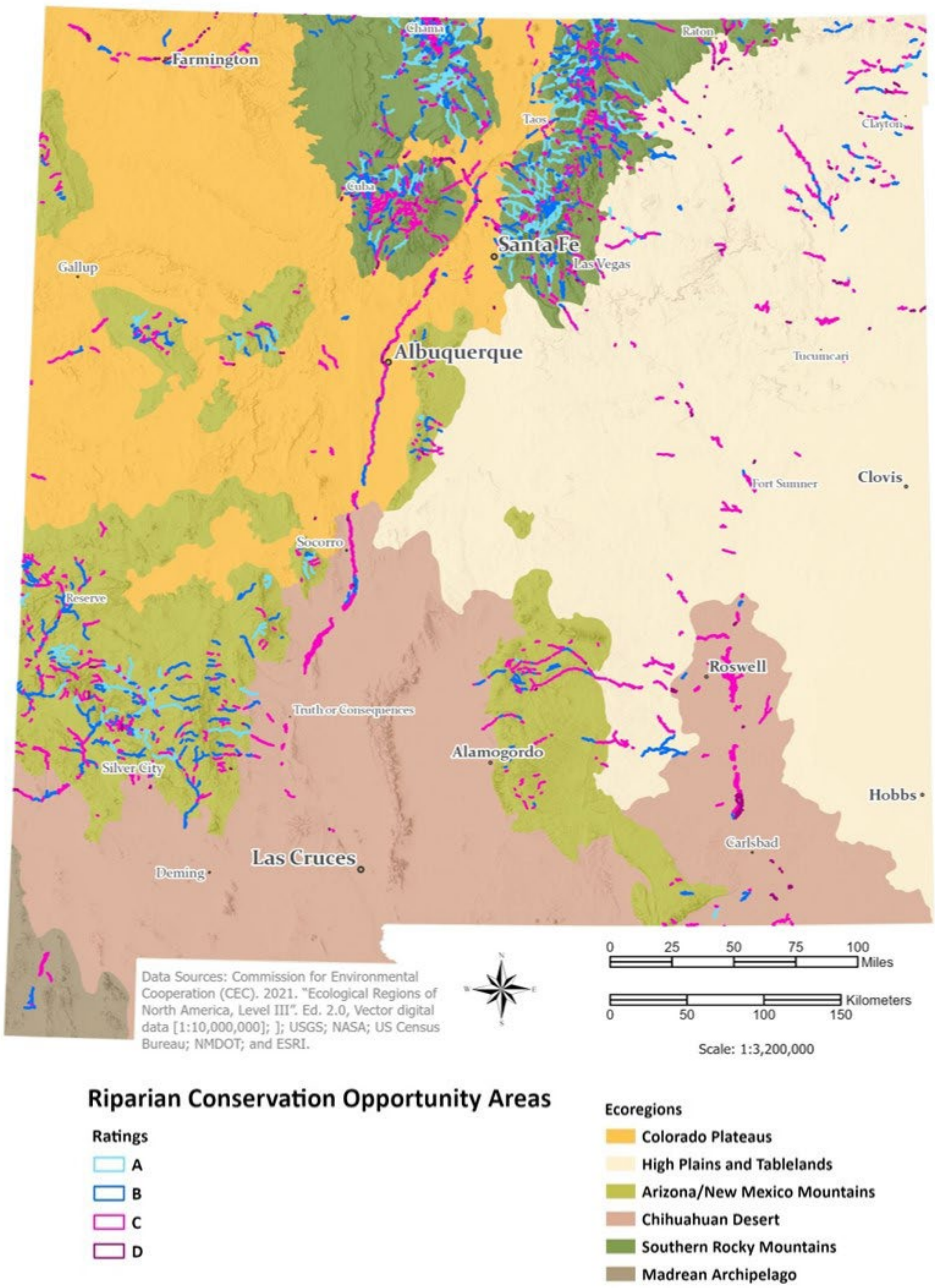


Figure 13. Riparian Conservation Opportunity Area (RCOA) distribution across New Mexico.

RCOAs are sites along river corridors that may be especially appropriate for conservation or restoration activities aimed at enhancing habitat quality for a diversity of SGCN, wildlife habitat connectivity, and ecosystem service provision. RCOA ratings can help in prioritizing action implementation across the state.

Chapter 4: Climate Change and Severe Weather

Climate change is a pervasive factor that has the potential to affect nearly every wildlife species and habitat. Because its causes and effects often function on a global scale, wildlife managers may have little ability to substantively influence a changing climate system that creates stressors or benefits for local wildlife populations. This document, while it recognizes the importance of efforts to address and mitigate the drivers of climate change and the role that all of us play, including natural-resource managers, it does not in any way create or direct policy with respect to these efforts. Rather, this State Wildlife Action Plan (SWAP) for New Mexico focuses on reviewing the current state of knowledge with respect to New Mexico's climate and potential climate-related changes in the state's habitats and on outlining the types of resource-management practices that can improve the resistance, resilience, and adaptability of wildlife populations and their habitats to climate change.

This chapter discusses projected changes in New Mexico's climate and associated changes in New Mexico's wildlife habitats and impacts on New Mexico's wildlife. It includes a summary of the results of a climate change-vulnerability analysis conducted for all vertebrate Species of Greatest Conservation Need (SGCN) (see Appendix F for full results). Climate change is considered in greater detail in this SWAP than other stressors due to its broad geographic effects and ability to interact with other factors including wildfire and insect outbreaks and because of the importance of integrating a consideration of climate change effects and adaptation into many conservation actions. The following information is modified and updated from a report prepared by Megan Friggens of the United States Forest Service (USFS) Rocky Mountain Research Station (RMRS), in collaboration with Karen Bagne and Jack Triepke, in 2015. Full text of the report is at http://www.bison-m.org/documents/48358_Friggens2015SWAPccFnl.pdf.

HISTORIC CLIMATE CHANGE

Historic temperature records show temperatures have been increasing. The average global surface temperature for 2023 was the hottest on record since 1850 and it was North America's warmest year on record (https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202313). Temperatures in the western US have been increasing (Spears et al. 2013), with a corresponding decrease in record-breaking cold months (Wuebbles et al. 2014). Summer daily maximum temperatures have been increasing in the southwestern US (Hicke et al. 2022). In New Mexico, mean surface air temperature increased by 1 °C (1.8 °F) from 1985 to 2005, though most of this warming occurred between 1995 and 2005 (Rangwala and Miller 2010). Average temperatures increased across New Mexico by approximately 0.8 °C (1.5 °F) from 2005 to 2024; maximum temperatures increased fractionally more (0.9 °C [1.7 °F]) (NCEI 2024). Comparing to earlier time periods, mean annual air temperatures were 3.4% higher from 1976 to 2017 than from 1920 to 1975 across New Mexico (Sawalhah et al. 2019). More locally, temperatures within the Rio Grande Basin during the period spanning 1995 to 2004 were more than 1.1 °C (1.9 °F) higher than those observed during the 1961 to 1990 period (D'Antonio and Watkins 2006).Seasonally, mean temperatures have increased more during winter than spring or summer months. The greatest increases in temperature have been observed in the southwestern, central, and northwestern regions of New Mexico, particularly within the Jemez Mountains in the northwest (Enquist and Gori 2008). Most other mountain ranges in the state have experienced increases in temperature with the exception of parts of the Gila River headwaters, the Zuni Mountains, and the Sangre de Cristo Mountains. Temperature increases are associated with lower streamflows; from 1913 to 2017, annual average discharge from the Colorado River decreased by 9.3% for each 1 °C (1.8 °F) of warming (White et al. 2023).

Changes in snowpack, and associated changes in streamflow, have been documented. There has been a marked increase in the percentage of precipitation falling as rain rather than snow across the western mountain region of the US. Specifically, since the 1950s, 74% of weather stations across the region recorded an increase in the percentage of precipitation falling as rain instead of snow, along with a 15-30% decline in snow-water equivalents (the amount of water contained within the snowpack) (Fields et al. 2007). Across the west, peak stream flows from snowmelt are arriving earlier than they did historically (McCabe and Wolock 2007, Lundquist et al. 2009), including in the upper Rio Grande basin in southern Colorado and northern New Mexico (Elias et al. 2021). The snowpack in the majority of New Mexico's mountain ranges has declined and peak flows from snowmelt now occur an average of one week earlier than they did 50 years ago (Enquist and Gori 2008). Importantly, these changes appear to be the result of warmer temperatures rather than changes in the amount of precipitation received (Fields et al. 2007, White et al. 2023), although some studies point to other factors including reduced snowfall and increased sublimation (snow evaporates without melting first) (Elias et al. 2021). In the upper Rio Grande basin, maximum snow-water equivalent declined by 0.4 cm (0.2 in) a year from 1980 to 2018 and timing of maximum snow-water equivalent was 18-48 days earlier (Elias et al. 2021). Loss of snowpack can be accelerated by deposition of dust and other light-absorbing particles (Elias et al. 2021, White et al. 2023) that warm the snow, hastening snowmelt. Decreased snowpack in the mountains and earlier onset of snowmelt reduce the likelihood of sufficient water availability during the summer months when both natural and anthropogenic demand is greatest. Further, as of 2023, drought conditions in the western US have persisted for decades and are more severe than any other droughts recorded in the last 1,200 years (Jay et al. 2023). Across most of the western US, annual precipitation declined by 2.3 mm (0.1 in) per decade from 1976 to 2019 and extreme-duration drought became more common (Zhang et al. 2021).

FUTURE CLIMATE CHANGE

Climate projections indicate that the southwest will dry over the 21st century and that this transition to a more arid climate is already underway (Seager et al. 2007, White et al. 2023). This includes a decline in groundwater recharge in multiple major aquifers in the southwestern US (Hicke et al. 2022). Increased temperatures will be accompanied by increased severity, duration, frequency, and geographic extent of droughts; increasing frequency, duration, and intensity of heat waves; greater variability in precipitation (with potential for decreases in total precipitation); increased rates of evapotranspiration (loss of water to the atmosphere from the ground surface and leaves of plants); increased frequency, intensity, and size of wildfires, and increased frequency and intensity of insect outbreaks (Easterling et al. 2000, Fields et al. 2007, Garfin and Lenart 2007, Crockett and Westerling 2018, Hicke et al. 2022, Jay et al. 2023, White et al. 2023). In New Mexico, summer temperatures are projected to increase by as much as 2.3 °C (4.1 °F) by 2050 (Figure 14) and average temperatures may increase by as much as 3.9 °C (7 °F) by 2070, with higher rises anticipated in the northwestern corner of New Mexico (NMBGMR 2022). While annual projections of future precipitation show no definite trends and some seasonal projections show varying trends in different parts of the State (further supported by Figure 14), precipitation is projected to decrease across the state during the spring (NMBGMR 2022). Any such decreases in precipitation will exacerbate many of the effects of increasing temperatures, including increased evapotranspiration rates and reduced snowpack (Figure 14) and water flow during the spring and summer. These changes will lead to overall more arid conditions in New Mexico (NMBGMR 2022). Higher temperatures and drought conditions are also expected to increase the number of dust storms (White et al. 2023).

While the number of precipitation events in New Mexico is expected to decline (Spears et al. 2013), individual precipitation events likely will become more intense, especially during the winter (Dominguez et al. 2010, Collins et al. 2013, NMBGMR 2022). The amount of precipitation falling during these intense events is projected to increase by 50 to 90%, with an increase in the likelihood of rain events over snow events. However, with anticipated future increases in evaporation and transpiration, both water runoff and recharge rates in New Mexico are expected to decline by 3 to 5% per decade moving forward (NMBGMR 2022).

Climate extremes will likely be intensified under global warming with an increased likelihood of more extreme dry and wet seasons (Wuebbles et al. 2014, Swain and Hayhoe 2015). Many areas are likely to experience novel climate regimes with mean climate conditions projected to be hotter and drier than previously recorded (Notaro et al. 2012) and the southwestern US is expected to experience hotter and more extreme heat events (White et al. 2023). Extreme climatic conditions may be more important for evaluating habitat and species response to climate change because these may be more limiting than average conditions.

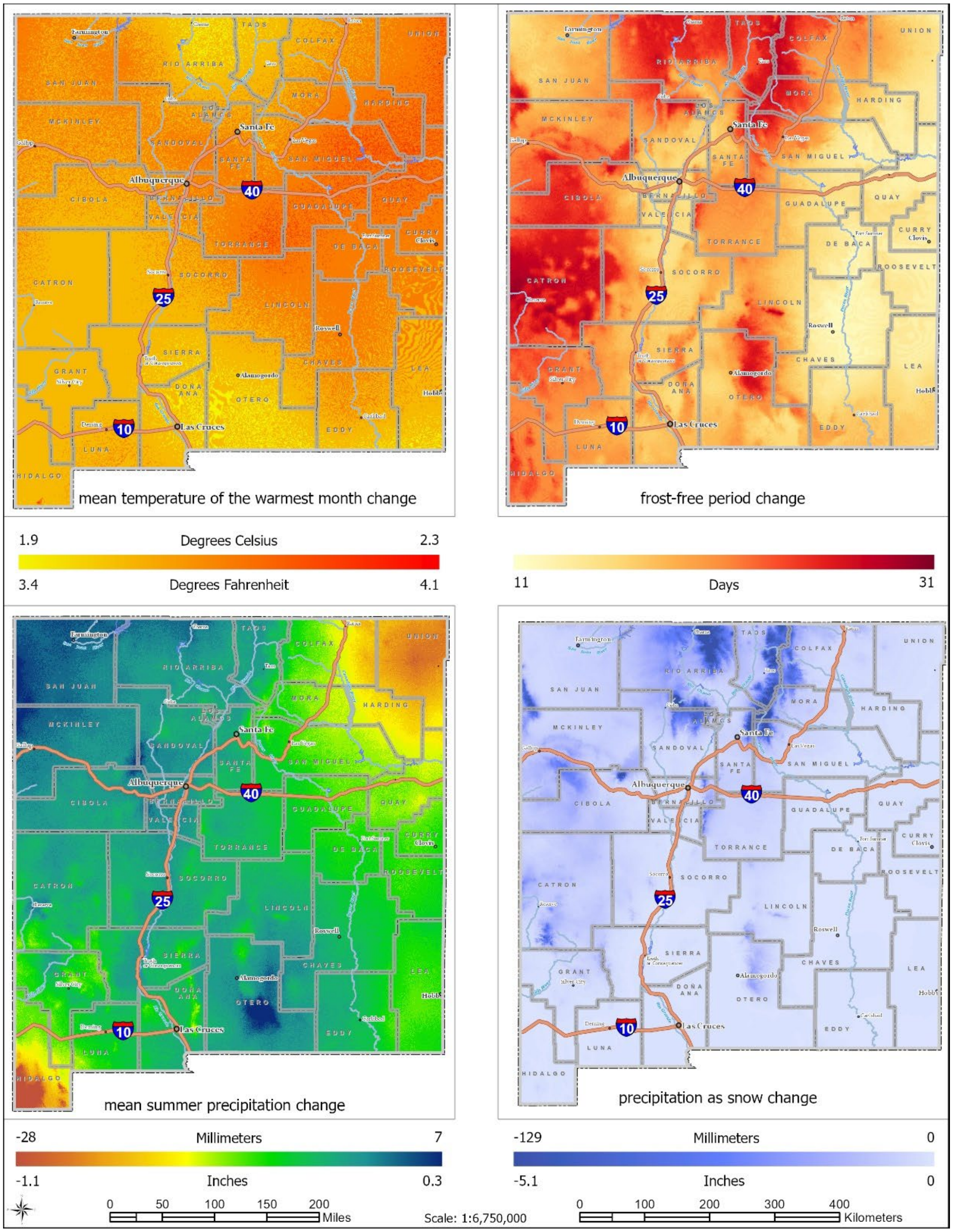


Figure 14. Projected changes in climate from 2001-2020 to 2041-2060.

The upper left map shows changes in mean temperature of the warmest month, the upper right map shows changes in the length of the frost-free period, the lower left map shows changes in mean summer (May to September) precipitation, and the lower right map shows changes in precipitation as snow. Data were obtained from the AdaptWest Project (2022) and represent the Coupled Model Intercomparison Project 6 (CMIP6) Shared Socioeconomic Pathway (SSP5)- Representative Concentration Pathway (RPC) 8.5 scenario for fossil fuel emissions.

CLIMATE CHANGE INTERACTIONS WITH OTHER THREATS

Climate change effects may intensify other stressors, including insect pest outbreaks, fire, and disease. A prominent example of climate change effects within western North America is the widespread die-off of conifer species driven by the interaction of drought, insects, and fire (Breshears et al. 2005) and the interaction between climate becoming unsuitable for tree regeneration and fires killing adult conifer trees (Davis et al. 2019). Climate change influences some processes directly and others indirectly, thus, few interactions between climate change and other stressors have a clear direction. For example, increased fire activity is likely to favor fire-adapted species causing shifts in plant communities (McKenzie et al. 2004). High-severity fire can lead to vegetation type conversions, including from forest to non-forest vegetation (e.g., semi-arid conifer forests to shrublands) and from shrublands to grasslands (e.g., sagebrush to non-native grasslands) (Coop et al. 2020, Guiterman et al. 2022). Temperature and moisture conditions affect tree host susceptibility to pathogens, pathogen transmission among trees, and the ranges of both hosts and pathogens. Drier conditions are likely to reduce plant productivity, but increased carbon dioxide (CO_2) concentrations may support increased growth, water use efficiency, and resistance to disease (Sturrock et al. 2011). A variety of diseases are likely to be affected by warming temperatures and increased occurrence of heavy rainfall and flooding, including fungal and waterborne diseases (Edelson et al. 2023).

Climate change is expected to exacerbate the effects of land-use change and habitat fragmentation on wildlife populations. For example, in southwest riparian ecosystems, future increases in periods of drought and intense heat, and generally increasing aridity, are expected to increase rates of habitat loss and fragmentation, processes that limit the capacity of wildlife populations to adapt to changing conditions. These processes are further compounded by surface and groundwater extraction and the spread of invasive species. The Rio Grande is already suffering from the effects of water extraction and is considered at risk of more extreme flood events due to the urbanization of its watersheds (Palmer et al. 2009), though some projections show that the probability of damaging floods occurring along the Rio Grande may actually not change significantly by 2100 (Wobus et al. 2014). The interactive effects of land use and land-use change, water withdrawal, species invasions, and climate change pose a real threat to the persistence of functional aquatic systems in the southwest and the wildlife communities that depend upon them (Meyer et al. 1999). For example, there are a number of invasive species found in the lower Rio Grande valley and the combination of higher temperatures, sea level rise, lower in-stream flows, and increased occurrence of harmful algal blooms are all likely to lead to changes in plant and animal communities (Leslie 2016). Further descriptions of interactions between climate change and other threats to SGCN and their habitats are provided in later sections.

FUTURE CHANGES TO TERRESTRIAL ECOSYSTEMS

Temperature and precipitation define the environmental and hydrological conditions that determine vegetation composition and distribution at large scales. At smaller scales, vegetation responds to topography, competition, and animal influences. The sensitivity of vegetation to climate change relates to the degree to which smaller-scale factors, such as changes in soil moisture (Li et al. 2022), ameliorate or exacerbate climate impacts. Direct impacts of climate change on vegetation result from conditions that limit plant establishment, growth, productivity (Kaplan et al. 2024), and life history events (e.g., reproduction, including timing of reproduction) (Wrobleski et al. 2023). Indirect effects include impacts from changing disturbance regimes (e.g., increased fire frequency and intensity, changes in flood regimes) (Stromberg et al. 2009b, Wasserman and Mueller 2023, Wrobleski et al. 2023). Changes in the timing of critical events, such as peak stream flows, and increases in the frequency of climate extremes, including heat waves and drought (Ploughe et al. 2019), will cause shifts in vegetation communities by disrupting ecological processes and interactions and impacting plant recruitment and survival. Water availability is the primary factor limiting plant growth and ecosystem productivity within dryland areas, such as the southwestern US (Wang et al. 2022). In areas where there is adequate water supply (e.g., high-elevation forests), temperature is the more important limiting factor (e.g., length of growing season).

Still, many studies indicate that temperature alone drives changes in a variety of variables including tree growth and mortality (Williams et al. 2010, Rosenblad et al. 2023), biodiversity (Currie 2001, Hansen et al. 2001), plant species distributions (Notaro et al. 2012), and community composition (Rosenblad et al. 2023). This is likely due to the influence of temperature on evapotranspiration, which can amplify water stress during drought (Williams et al. 2013). For most of New Mexico, future rising temperatures will increase evapotranspiration rates and the likelihood of water deficits, which will limit plant growth and favor drought- and heat-tolerant species (Raymond et al. 2014, Rosenblad et al. 2023).

Vegetation distributions across landscapes depend on climate and related factors (e.g., fire regimes). Shifts in vegetation distributions due to climate change are expected to be most dramatic at ecotones (the boundaries between ecosystems), particularly those in semi-arid landscapes (Allen and Breshears 1998, Kupfer et al. 2005, Joyce et al. 2008). For example, in northern New Mexico in the 1950s, the ecotone between ponderosa pine (*Pinus ponderosa*) forest and piñon (*Pinus* spp.)-juniper (*Juniperus* spp.) woodland shifted rapidly (<5 years) and extensively (≥2 km [≥1.2 mi]) following mortality of ponderosa pine forest in response to severe drought (Allen and Breshears 1998). Within the shift zone, forest patches became more fragmented, and soil erosion became more severe. This shift has persisted for over 40 years, indicating that the conditions resulting from these sudden changes may be comparatively long-lasting. Evidence of a similar shift was observed in the Jemez Mountains in 2014 (Sanderson 2015). Because regional droughts of greater magnitude and longer duration than the 1950s drought are expected under future climate change scenarios, the ecological effects of future droughts, especially those at ecotones, are likely to be even greater than those described here. As an example, rapid (< 5 year) ecotone shifts from semi-arid ponderosa pine forests to piñon-juniper woodlands are expected (Sanderson 2015).

Importantly, our understanding of climate impacts on New Mexico's wildlife habitats is still growing and subject to change and refinement. For example, while many upland vegetation types in Arizona and New Mexico assessed for climate vulnerability showed high vulnerability and low uncertainty in those assessments, there are still some vegetation types for which the uncertainty associated with the vulnerability assessment is moderate or high more than 50% of the time (Triepke et al. 2019). Climate projections can fall outside of known historical climatic ranges, thus preventing a perfect understanding of future conditions (Currie 2001, McKenney et al. 2007, Williams et al. 2013) and of how certain species may respond to those conditions. In addition, changes to atmospheric carbon dioxide concentrations, which not only drive changes in climate but also influence plant water use efficiency and growth, may modulate vegetation response to hotter and drier conditions (Notaro et al. 2012). Impacts of increasing carbon dioxide concentrations on water-use efficiency are likely to vary across land-cover types, with some (e.g., forests) showing increased water-use efficiency and others (e.g., grasslands) showing decreased efficiency (Umair et al. 2020), leading to differential outcomes for different upland vegetation types.

GRASSLANDS

Grasslands are likely to be highly vulnerable to invasive species under a changing climate (Chambers and Pellant 2008, Morgan et al. 2008). Of particular concern for grasslands is that climate change may increase invasion by woody species (Morgan et al. 2007, Enquist and Gori 2008, Hicke et al. 2022), especially in vegetation communities more vulnerable to climate change (Triepke et al. 2019). Since the early 1900s, creosote (*Larrea tridentata,* a shrub) has been spreading into grama grass (*Bouteloua* spp.)-dominated grasslands in central New Mexico (Gill and Burke 1999) and since the mid-1800s, honey mesquite (*Prosopis glandulosa*) and creosote have been spreading into black grama (*Bouteloua eriopoda*) grasslands in southern New Mexico (Buffington and Herbel 1965, Gibbens et al. 2005). Woody plant cover increases were higher for eastern than western New Mexico from 2000 to 2002 and again from 2015 to 2017 (Sawalhah et al. 2019). Drought and shifts towards increased winter precipitation seem to be the most important climatic drivers of woody plant encroachment into grassland environments (Brown et al. 1997, Pennington and Collins 2007, Báez et al. 2013, Munson et al. 2013). Warming winter temperatures can also favor shrubs, although temperature extremes during summer may actually increase mortality of shrub species (Backlund et al. 2008, Ryan et al. 2008). There is the potential for a positive feedback loop between shrub encroachment and microclimate in areas encroached by cold-sensitive shrubs such that shrublands have higher winter minimum temperatures, and also higher daytime surface temperatures, than adjacent grasslands, leading to local climatic conditions suitable for further shrub encroachment (He et al. 2014, Duman et al. 2021).

Studies simulating potential range changes of grasslands under future climate scenarios agree that grassland habitats are likely to decline. Notaro et al. (2012) projected widespread loss of grassland vegetation, particularly across central New Mexico. Grass die-off over the next 70 years was most strongly correlated with changes in precipitation. Model-projected changes include large spring-summer drying trends. Some grassland types, including semidesert grasslands and shortgrass prairies, show very high vulnerability to changing climatic conditions across more than 50% of their range across Arizona and New Mexico (Triepke et al. 2019). Declining grass growth has implications for future wildfire trends in rangeland areas (White et al. 2023). It may however be possible to use fire in some shrub-encroached areas to restore grasslands (Levi and Bestelmeyer 2016). Invasive plants are also likely to continue spreading in southwestern grasslands as the climate continues to change (Belesky and Malinowski 2016).

SHRUBLANDS

Temperature appears to be the most important climate variable for predicting shrub species distributions across the southwest. Shrublands will likely respond positively to increased mean annual temperature and increased minimum and mean winter temperatures (Notaro et al. 2012) and the spread of shrubs can lead to changes in local climate that support further shrub encroachment in to grassland areas (He et al. 2014). Shrubs spreading into grassland areas is more likely in vegetation types that are more vulnerable to climate change (Triepke et al. 2019). Projected increases in winter precipitation are also likely to lead to shrubland expansion. Increased precipitation during warm months could have positive effects on shrublands but may cause a transition to non-shrub habitat at grass-shrub transition zones (Crist et al. 2014). Increases in maximum temperatures induce stress on plants and may have a negative impact on shrublands when drought conditions limit water availability. Fire frequency is projected to increase within several shrubland types (Moritz et al. 2012), which is likely to favor grasslands. Invasion by drought-adapted, non-native grasses into desert shrublands may be facilitated by increased aridity and drought frequency and may also lead to increases in the number of large fires and area burned in these shrubland areas (Abatzoglou et al. 2011). However, increased occurrence of high-severity wildfires in semi-arid conifer forests is likely to lead to more vegetation type conversions from forests to shrublands (Guiterman et al. 2022).

FORESTS

Projections indicate that climate change will have profound impacts on forest ecosystems across western North America. Most woody species are expected to shift northward to track suitable climate conditions. Many higher-elevation species are projected to experience range contractions as suitable climates disappear. Alpine (above tree line) and subalpine (below tree line) habitats may experience dramatic changes, including movement of trees into alpine areas and an increase in tree density in subalpine areas. Lower elevation-forest species are likely to move upslope. Both bristlecone (*Pinus aristata*) and ponderosa pine forests and madrean encinal woodlands are expected to have high or very high vulnerability to climate change across more than half of their geographic range within Arizona and New Mexico (Triepke et al. 2019). However, the complexity introduced by terrain and differences in dispersal abilities of different species makes it unlikely that species and communities will be able to exactly track suitable climate conditions. Further, actual shifts in communities are likely to differ from projected responses because individual species will respond uniquely to climate change (e.g., Rehfeldt et al. 2006) and community composition may change, including shifts toward more heat-tolerant trees (Rosenblad et al. 2023). Alpine habitats are likely to all but disappear (Hansen et al. 2001). Mid- and lower-elevation forests and woodlands may expand upslope and will be more susceptible to increased fire and drought conditions, and generally increasingly arid conditions, at lower elevations.

Rising temperatures will increase evapotranspiration rates and amplify water limitations, leading to increased tree stress and mortality, particularly during drought periods (Williams et al. 2013). Drought-stressed forests are particularly sensitive to insect outbreaks, disease, and wildfire, all of which are expected to increase in frequency, intensity, and geographic extent with a warming climate. Since the mid 1980s, and especially in the early 2000s, intense droughts, insect outbreaks, and wildfires have resulted in widespread tree mortality across the southwest (Breshears et al. 2005, Williams et al. 2010). Williams et al. (2010) found that between 1984 and 2008, 18% of forests in New Mexico and Arizona experienced mortality related to these factors. These calculations were made prior to several major fires in both New Mexico and Arizona, including the Black, Calf Canyon/Hermits Peak, Las Conchas, Wallow, and Whitewater-Baldy fires; the largest wildfires in both of these states occurred since 2007 (White et al. 2023). High-severity forest fires can lead to a conversion to a different forest type or to non-forest vegetation (Coop et al. 2020), including grasslands (Hicke et al. 2022). Approximately half of vegetation type change from forests to grassland or shrubland is the result of high-severity fire (White et al. 2023). Vegetation transitions in low-elevation ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*) forests in the western US are driven by a combination of climate change and high-severity fire (Davis et al. 2019). If modeled predictions hold true, about half of the needle-leaved evergreen forest cover in the western US and across the northern hemisphere will be lost, with a coincident increase in shrub and grass cover in the western US, by the end of the 21st century (Jiang et al. 2013, McDowell et al. 2016). Given that forest mortality events are expected to continue to happen rapidly and over large areas, there is an urgent need to develop adaptive strategies that will address climate-related threats to these ecosystems in New Mexico.

PIÑON-JUNIPER WOODLANDS

Piñon-juniper woodlands (*Pinus edulis* and *Juniperus monosperma*) spread into ponderosa pine woodlands in north-central New Mexico in the 1950s and that shift persisted for at least 40 years (Allen and Breshears 1998). Juniper species have also expanded into grasslands in southwestern New Mexico (Romme et al. 2009). However, woodland species, especially piñon pine trees, are highly susceptible to attack by bark beetles (*Ips confusus*) and twig beetle (*Pityophthorus opaculus*). Warmer temperatures increase bark beetle survival, especially overwinter, and developmental rates, leading to more severe outbreaks (Bentz et al. 2010, Robbins et al. 2022). Drought conditions and delayed onset of monsoons have increased mortality in infested piñon pine (Gustafson et al. 2015). Although juniper is somewhat more drought-tolerant, it also experiences increased mortality rates during persistent or severe droughts (Breshears et al. 2005, Gaylord et al. 2013, Kannenberg et al. 2021). It is likely that these widespread mortality events will become more frequent as the climate changes. Wildfires are expected to increase in woodland habitats (Moritz et al. 2012) and may lead to a shift to grassland or shrubland habitats at woodland ecotones. Further, piñon-juniper woodlands are highly to very highly vulnerable to climate change across 50% of their geographic range within Arizona and New Mexico (Triepke et al. 2019).

RIPARIAN HABITATS

Flow dynamics have a strong influence on the composition of riparian plant communities. Climate changes that reduce stream flow are expected to reduce the abundance of cottonwoods (*Populus* spp.) and willows (*Salix* spp.), the structural dominants in the floodplains of many desert rivers (Stromberg et al. 2013). Conversely, reductions in stream flow will favor certain herbaceous, late-successional, and drought-tolerant woody species. Warmer and prolonged growing seasons will increase water use through increased evapotranspiration, potentially reducing water availability and lowering water tables, especially later in the growing season (Perry et al. 2012). The persistence of comparatively shallow-rooted cottonwood and willow is dependent on near-continuous availability of shallow groundwater. If water tables lower, or become more variable, in response to increasing aridity or groundwater extraction, the productivity and abundance of cottonwood-willow communities will decline. At the same time, lowering water tables encourage the establishment of deeper-rooted and drought-tolerant species, such as exotic tamarisk (*Tamarix* spp.) and Russian olive (*Elaeagnus angustifolia*) (Stromberg et al. 2013). Thus, potential shifts from perennial to intermittent flows in many riverine habitats may have large consequences for riparian plant community composition. Tamarisk is tolerant of intermittent flows, produces seed throughout the summer, and prefers disturbed sites (Perry et al. 2012), so it has the potential to be more competitive than native vegetation in these altered conditions. However, the tamarisk beetle has been expanding its range in New Mexico and will inhibit or kill tamarisk in these changed environments (Bloodworth et al. 2016, RiversEdge West 2024). Theobald et al. (2010) reviewed and analyzed threats to riparian ecosystems in the western US using a risk assessment approach that considered human modification, climate change, and hydrological systems. Southern Arizona and New Mexico received very high riparian threat scores. The threat of interruption of flows due to drying or other factors was among the worst for watersheds in Arizona and New Mexico.

Climate change is likely to disrupt phenology (timing of biological and ecological events, such as seed dispersal) within riparian plant communities, potentially increasing mortality of established communities and decreasing reproduction of native species. Early spring budburst and warmer autumns may increase productivity and growing season length for many plants but could also increase frost injuries to young plants when late spring frosts occur. Increased autumn temperatures could affect seed dispersal of autumn-fruiting riparian trees, like netleaf hackberry (*Celtis reticulata*), and slow the development of cold-hardiness in some species, like cottonwoods. Warmer spring temperatures may lead to early seed dispersal in species such as Fremont cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*). Spring floods are necessary for successful seedling establishment for these species, thus, earlier seed dispersal or earlier flooding, associated with earlier snowmelt, may reduce cottonwood-willow seedling recruitment if seed release and peak flows lose temporal synchrony. Changes in the timing of either seed dispersal or spring runoff events, and the magnitude of water flows and associated level of flooding, could therefore limit successful recruitment and persistence of the cottonwood-willow community, impacting the many species that depend upon riparian ecosystems for all or part of their life cycle (Perry et al. 2012, Smith and Finch 2017).

FUTURE CHANGES TO AQUATIC ECOSYSTEMS

River flow and reservoir and lake levels in New Mexico are strongly tied to rainfall during the monsoon season (July-September) and winter (November-March) snowpack (Enquist et al. 2008). Based on data from the 20th century, approximately 40% of annual precipitation in the State falls during the monsoonal storms in July and August. Another 20% falls during spring and fall months. Winter precipitation accounts for the remaining 40% (~75% of which falls as snow in mountainous areas) (Enquist and Gori 2008) and is driven by frontal activity over the Pacific

Ocean, which varies from year to year depending on the El Niño Southern Oscillation (ENSO). The Pacific Decadal Oscillation and Atlantic Multi-decadal Oscillation also influence winter precipitation, though they fluctuate over longer, multi-decadal scales and may either enhance or dampen ENSO-driven trends.

Climate change alters many factors that influence hydrological cycles, including the timing, amount, and intensity of precipitation events and rain-snow ratios (Figure 14; Collins et al. 2013). These factors have a number of cascading effects on water volume, quality, and erosion within watersheds in New Mexico. Despite variations among climate models, all support projections of less snow, earlier snowmelt, and increased variability in the timing and intensity of storms. Within New Mexico, most flowing streams depend upon winter snow accumulations for spring and summer flows. Reduced snowpack and earlier, more rapid snowmelt will result in earlier peak flows. Years with poor snowpack levels are likely to result in very low flows by the time monsoon storms begin (middle to late summer). Declines in streamflow totals in the Rio Grande have already been observed; they were 23% lower from 2001 to 2010 compared to average flows during the 1900s (Bennett et al. 2020).

Warm-season runoff is projected to decline substantially over the southwestern US and Southern Rockies, including in the Rio Grande basin (Spears et al. 2013, Bennett et al. 2020). Hoerling et al. (2009) estimated a 2-9% reduction in runoff for each degree Celsius increase in temperature in the Upper Colorado region. Hurd and Coonrod (2008) projected a 3.5-13.7% decrease in the mean annual flow of the Rio Grande in 2030 compared to the period spanning 1970-2000. Elias et al. (2015) projected between an 8% increase (wetter scenarios) and a 18% decrease (drier scenarios) in total annual runoff from the upper Rio Grande basin when comparing flows from 1990 to 1999 versus 2090 to 2099. Flow volumes in the major rivers in New Mexico (Chama, Gila, Pecos, Rio Grande, San Juan) are anticipated to decline by 16 to 28% by 2070 while increases in extreme precipitation events combined with occurrence of fires is projected to at least double the amount of sediment delivered to and transported by the State's rivers. The overall trend will be towards reduced holding capacity of reservoirs and river channel narrowing downstream of dams (NMBGMR 2022). Climate impacts have consequences for flowing stream bodies, seeps, and springs. Ephemeral water bodies will experience increased water temperatures and evaporation rates, thus reducing their value and availability as wildlife habitat. Increased water temperatures *Escherichia coli* concentrations and runoff following fire events are all climate-related threats to the future water quality of New Mexico's surface waters (NMBGMR 2022).

Rain-snow transition zones are projected to undergo dramatic shifts to higher elevations within New Mexico and nearly all of the State's mountain ranges are considered at risk with snowpack likely to decline substantially over the next century. By 2035-2065, mountain ranges within the Southern Rocky Mountains, Arizona/New Mexico Mountains, and the Colorado Plateaus ecoregions will have a much shorter period of snowfall and a greater amount of winter precipitation falling as rain. Only the northernmost mountains within the Colorado Plateaus ecoregion will continue to receive snow-dominated precipitation, although most months are projected to have a rain-snow mix even in this region. At the watershed level, projected changes to the amount of area dominated by snowfall, rain-snow mixes, and rainfall are dramatic. For example, the snow-dominated extent of the upper Pecos River watershed is expected to disappear, while its rain-dominated extent is expected to increase by 23%. Likewise, the rain-dominated extent of the Rio Grande–Elephant Butte watershed is estimated to increase by 51%, while the Gila River watershed will become entirely rain dominated. The snow-dominated extent of the Rio Grande headwaters is expected to decline by 29%. Although future temperatures in New Mexico are likely to mostly exceed those necessary for snowfall, the steep elevational gradients in some parts of the State may delay or reduce this loss at the local scale (Klos et al. 2014).

PERENNIAL COLD-WATER STREAMS

Climate change will decrease the availability of cold-water stream habitat suitable for cold-adapted species. Many reaches within lower-elevation and southern sites may no longer be suitable for cold-water species. The type of precipitation received (i.e., rain or snow) can influence spring snowpack, the risk of flooding associated with rain-on-snow events, and the timing of snowmelt-driven stream flows in mountain catchments (Klos et al. 2014). The reduction in freezing temperatures within New Mexico and increase in frost-free periods (Figure 14) has implications for the timing of spring snowmelt and the persistence of cold-water streams. Loss of snowpack is anticipated for most of New Mexico's mountain ranges, which will result in reduced frequency and magnitude of spring flood events and summer flows. Streams with lower flows are likely to warm more quickly in response to increasing air temperatures (Spears et al. 2013). Warming water will result in a reduction in the availability of habitat for species dependent upon cold-water habitats (Fang et al. 2004a, Fang et al. 2004b), resulting in range contractions (Lynch et al. 2016, Bell et al. 2021). For native species adapted to cold water, increased temperatures can increase thermal stress, create migration barriers, fragment habitat, lead to a decline in growth and abundance, and reduce reproductive success (Meyer et al. 1999, Perry et al. 2012, Lynch et al. 2016). At the same time, increases in water temperature will likely favor the expansion of invasive and/or non-native aquatic and riparian species (Rood et al. 2008, Theobald et al. 2010), which can lead to a declining occupancy by native species (Bell et al. 2021). Decreased precipitation and increased temperatures are also expected to decrease riparian vegetation cover and increase erosion, leading to increased sedimentation in many stream and river systems (Theobald et al. 2010). Extreme weather events and post-fire erosion and debris flows can also impair water quality and impact nutrient cycling (e.g., Rhoades et al. 2019a). A feedback between runoff volume, erosion, water quality, and evapotranspiration commonly leads to degradation of aquatic habitats (Lettenmaier 2008).

PERENNIAL WARM-WATER STREAMS

River corridors support a disproportionate amount of biodiversity in the southwest (Pase and Layser 1977), especially high concentrations and diversity of birds (Farley et al. 1994). Climate change will likely reduce the availability and quality of perennial warm-water systems, particularly in the southern part of New Mexico. In southwest riparian systems, drought and intense heat will likely reduce and fragment riparian habitat, issues compounded by surface and groundwater extraction and the spread of invasive species (Palmer et al. 2009). Milly et al. (2007) projected a substantial decrease in annual runoff in the southwest under warmer conditions. Several preexisting conditions increase the vulnerability of New Mexico's river systems to climate change. First, perennial river systems are largely supplied by snowpack, making them less buffered against the drying trends associated with a warming climate. Second, many of these systems are dammed or within logged or urbanized watersheds, reducing their resilience to increasing climate variability. In addition, dammed rivers tend to experience more drawdown of water, leaving little water available to sustain environmental flows (Palmer et al. 2009).

Higher water temperatures have multiple effects for temperature-dependent species (Eaton and Scheller 1996, Johnson et al. 2005), including the likely expansion of invasive species in both aquatic and riparian habitats (Rood et al. 2008, Theobald et al. 2010). Changes in species composition of fish communities may be greater in cool- to cold-water streams than in larger, warmer streams; these changes are driven by declines in cold and cool water fishes and increases in the distribution of some warm-water fishes (Lyons et al. 2010). Warming temperatures can have some positive effects for warm-water fishes (Zhao et al. 2023). Increased salinity as a result of increased evaporation rates may become a problem. In the western Great Plains, increased salinity is predicted to lead to a loss of endemic fish species (species that are found in a particular locality and nowhere else), many of which are already near their thermal tolerance limit (Meyer et al. 1999).

PERENNIAL LAKES, CIRQUES, AND PONDS

The responses of lakes to climate change are influenced by their thermal stratification and depth (Spears et al. 2013). Warmer waters may facilitate the establishment of aquatic invasive and/or non-native species, including non-native fish, while reducing the effectiveness of biological and chemical control agents (Hellmann et al. 2008, Lynch et al. 2016). Invasive non-native species can have divergent impacts on lakes, especially shallow lakes, sometimes causing ecosystem collapse (i.e., turbid, unvegetated, phytoplankton-dominated system), and sometimes delaying such collapse and prolonging the presence of clear water and vegetation (Reynolds and Aldridge 2021). Increases in salinity due to increased evaporation and reduced precipitation may exacerbate the rate of species invasions and lead to widespread changes in food webs (Meyer et al. 1999). Warmer water can encourage algae growth, leading to low oxygen conditions in lakes (Lettenmaier 2008). Higher water temperatures have multiple effects for temperature-dependent species (Eaton and Scheller 1996, Johnson et al. 2005), including encouraging the spread of non-native fishes that may compete with or prey on native species (Lynch et al. 2016). Endemic species in aquatic systems that become hydrologically isolated may face an increased risk of extinction due to climate change.

PERENNIAL MARSHES, CIENEGAS, SPRINGS, AND SEEPS

Wetland habitats (including marshes and cienegas) in New Mexico are currently threatened by drought and land disturbance. Wet grasslands, including wet meadows, globally are threatened by drying, extreme storms, and the spread of invasive species with warming temperatures (Joyce et al. 2016). In the semi-arid environment of New Mexico, the overall abundance of wetlands tends to be greater at higher elevations, though local physiographic characteristics can also impact wetland abundance. Temperature and precipitation strongly influence marsh formation, persistence, and function. As a result, marshes are very sensitive to climate fluctuations (Perry et al. 2012, Gage and Cooper 2013) and wetlands are projected to hold less water during critical periods for wildlife (e.g., waterfowl breeding seasons) under future hotter conditions (McKenna et al. 2021).

Changes in precipitation and elevated evaporation rates due to increased temperatures can change the seasonality, depth, and duration of marsh or wetland hydroperiods (periods of available surface water), with subsequent consequences for marsh function and vegetation dynamics. Specifically, hydrological variability is recognized as a predictor of vegetation patterns in marshes (Gage and Cooper 2013). Water tables lowering as a result of hotter and drier conditions will increase decomposition in wetland soils, thus reducing their carbon storage potential. Elevated atmospheric CO_2 may increase growth rates and biomass of wetland plants. Wetland hydrology may change considerably with changes to the timing of snowmelt, reduced snowpack, and increased winter flows resulting from increased rain versus snowfall. Increased frequency of summer drought periods will cause many wetlands to transition from permanent to more ephemeral (temporary) habitats (Poff et al. 2011). Wetlands are often widely dispersed across the landscape, limiting the capacity of wetland-dependent species to migrate to new locations as temperatures and water levels change and increasing the risk of extinction for wetland-endemic species. Alpine wetlands will likely be highly susceptible to negative impacts of climate changes because they are likely to lose species that cannot disperse to new sites.

PERENNIAL COLD-WATER RESERVOIRS

Cold-water reservoirs may be especially susceptible to changes in inflow resulting from climate change. Reservoirs within the Colorado River Basin are likely to be very sensitive to changes in inflow, with substantial drops in reservoir levels from small reductions in runoff (Christensen et al. 2004, Christensen and Lettenmaier 2007). Reservoirs on upper tributaries to the Colorado River are considered more vulnerable to changes in flow timing and snowmelt than those along lower-elevation systems (Spears et al. 2013). The Navajo Reservoir along the San Juan River in northwestern New Mexico is projected to have relatively stable storage levels through 2030, with increasing variability after that point and anticipated associated impacts on water deliveries downstream (Bennett et al. 2019). Increased water temperatures could promote productivity and expand habitat for warm-water species (Perry et al. 2012) at the expense of cold-adapted species (Raymond et al. 2014). For cold-adapted species, warmer temperatures can increase thermal stress, create migration barriers, lead to reductions in growth and abundance, and reduce reproductive success (Perry et al. 2012, Lynch et al. 2016). As climate conditions change, non-native species may spread into areas inhabited by native cold-water species, leading to predation on and competition with these native species (Lynch et al. 2016). Cold-water refugia may decrease substantially within reservoirs. Collectively, these impacts can change reservoir food web dynamics.

PERENNIAL WARM-WATER RESERVOIRS

Reservoirs and other open water habitats may be relatively buffered from climate change impacts because they are relatively stable over time compared to flowing water and ephemeral systems (Matthews 2008). Increases in water temperatures will be less severe in larger water bodies compared to catchments and ponds. Still, climate change impacts on reservoirs are influenced by their thermal stratification and depth (Spears et al. 2013). Water-column turnover periods, important for nutrient cycles within lake systems, could be disrupted by climate-related changes to water temperature and volume (Matthews 2008).

Warmer waters may facilitate the establishment of aquatic invasive species, such as the zebra mussel (*Dreissena polymorpha*) and quagga mussel (*D. bugensis*) and simultaneously reduce the effectiveness of biological and chemical control agents (Hellmann et al. 2008). Warmer water can also encourage algae growth and decomposition, leading to low oxygen conditions (Lettenmaier 2008). More specifically, warmer water temperatures can also lead to the increased occurrence of harmful algal blooms, especially blooms of toxic cyanobacteria. These harmful algal blooms often occur during peak summer temperatures and typically create high levels of either algal biomass or other organic matter that, when they are decomposed, lower oxygen levels and acidify the water (Gobler 2020). Higher water temperatures have multiple effects for temperature-dependent species (Eaton and Scheller 1996, Johnson et al. 2005) and could expand the habitat and promote productivity of warm-water species (Perry et al. 2012).

Demand for water is expected to increase under warming conditions (Perry et al. 2012), leading to increased water shortages. Declines in water storage in warm-water reservoirs have been recorded at three of four reservoirs along the Canadian River in New Mexico and Texas; these declines, which occurred between 1990 and 2009, were attributed to a decline in rainfall amounts (Brauer et al. 2015). Declines in water storage in warm-water reservoirs along the middle Rio Grande in New Mexico are projected, especially under drier climate change scenarios (Samimi et al. 2022). Efforts to maintain reservoir storage and supply under drier and hotter climates will decrease downstream flow variability and flow magnitude, exacerbating direct effects of climate change on river and riparian systems.

EPHEMERAL MARSHES, CIENEGAS, AND SPRINGS

Marshes/cienegas/springs are at high risk from the synergistic effects of human-related habitat disturbance and climate change (NMDGF 2006). These habitats are limited due to declining water tables, land-use changes, and surface and groundwater extraction. Increased temperatures will increase evapotranspiration, leading to greater rates of water loss and decreased availability of surface water. Increased variability in annual precipitation, delayed onset of monsoon precipitation, and potentially drier spring conditions will also reduce the availability of these habitats. Water quality also is likely to decrease where post-fire flooding and erosion cause increased water turbidity and sediment load. Wetlands may transition to being ephemeral under changing climatic conditions. Montane wetlands, including ephemeral wetlands, are anticipated to be especially vulnerable to changing climatic conditions and are impacted by reduced snowpack, higher evapotranspiration, and extended summer drought. Ephemeral wetlands are likely to experience earlier and faster drawdown rates, lower minimum water levels, and longer dry periods during summer months (Lee et al. 2015).

EPHEMERAL CATCHMENTS (PLAYAS, POOLS, TINAJAS, KETTLES)

The exclusive reliance of playas on direct precipitation and runoff (Gage and Cooper 2013) means that these systems are highly vulnerable to potential changes in precipitation. In eastern

New Mexico, playas may be especially vulnerable to climate impacts under future, drier conditions (Matthews 2008). Where they persist, increased variation in precipitation events, increased drought frequency, and increasingly arid conditions will reduce the hydroperiod of many catchments. Declines in numbers of wet playas have been recorded and invertebrate communities in playas are threatened by declines in playa inundation frequencies and increasing temperatures (Starr 2018). Increases in salinity due to increased rates of evaporation, along with decreased precipitation, may exacerbate the rates of species invasions (Meyer et al. 1999). Many of these systems are isolated, which increases the risk of endemic species extinction or local extirpation as a result of catchment loss or degradation. However, there are some projections of increased occurrence of runoff-producing storms, which could lead to greater playa-mediated groundwater recharge in the southwestern US in the future (McKenna and Sala 2018).

VULNERABILITY OF SGCN TO CLIMATE CHANGE

Climate change is already altering ecosystems and presents a substantial threat to the conservation of biodiversity both currently (Hughes 2000, Peñuelas and Filella 2001, Root et al. 2003) and into the future (Pereira et al. 2024). Climate-related change in extinction risk will vary by species, taxonomic group, region, and time elapsed, leading to questions about where to focus conservation efforts (Peterson et al. 2002, Thomas et al. 2004, MacLean and Wilson 2011). In the southwest, many climate change analyses have focused on rare or special-status species (Friggens et al. 2013). Increasingly, other taxa are being considered, including fish (Lynch et al. 2016) and butterflies (Forister et al. 2021, Halsch et al. 2021). Grasslands have also been underrepresented in climate-vulnerability assessments (Friggens et al. 2013), though an evaluation of climate vulnerability in upland vegetation communities across Arizona and New Mexico included multiple grassland types (Triepke et al. 2019).

Response of species to climate change is particularly important in the context of SGCN, because ongoing conservation efforts could be overwhelmed by additional climate-related impacts or new stressors may be overlooked, leading to missed opportunities for intervention. Below we outline how climate change affects species and discuss natural-resource management approaches in the face of changing climatic conditions.

DEFINING VULNERABILITY

Although there is some controversy over the precise use and meaning of vulnerability in the context of climate change, most think of it as the susceptibility of a species, community, or ecosystem to negative impacts (Füssel 2007, Hinkel 2011). It has also been defined as the "propensity or predisposition to be adversely affected" (Möller et al. 2022). The term "vulnerability" as used in this chapter has a narrower definition than the "vulnerable" criterion used in the SGCN selection process. Low vulnerability can be taken to mean low susceptibility or higher resilience to negative impacts. Some species may even experience increasing or expanding populations and distributions as the climate changes. Climate change vulnerability is sometimes defined by the effects of exposure, sensitivity, and adaptive capacity (Glick et al. 2011, Comer et al. 2019, Lyons et al. 2024). Exposure is based on projected changes in climate and climate-related phenomena (e.g., fire, floods) while sensitivity (degree to which a species is affected by a climate-related change) and adaptive capacity (species' ability to cope with or adjust to climate changes [Thurman et al. 2020]) are properties of the species that can help in evaluating how they are likely to respond to climate change. Difficulty in assessing the likely response of species arises, in part, because projections of exposure tend to be large in spatial scale (i.e., several km^2 or mi^2) while individual plants and animals often interact with their environment at much smaller spatial scales. Increasingly, tools to measure vulnerability are incorporating many facets of adaptive capacity, including factors related to dispersal and migration, genetic diversity, the extent to which the species has a specialized diet or habitat association, and life history factors related to mating and reproduction (Thurman et al. 2020, Lyons et al. 2024).

When species conservation is the goal, vulnerability is often measured by change in extinction risk and can be deduced from projected geographic shifts in suitable range, by identifying species traits that drive climate change response (i.e., changes in survival or reproduction), or through a combination of these approaches (Preston et al. 2008, Notaro et al. 2012, Bagne et al. 2014), including an increasing emphasis on the components of adaptive capacity (Thurman et al. 2020, Lyons et al. 2024).

SPECIES VULNERABILITY TO CLIMATE CHANGE

Many species are expected to incur negative impacts from climate change (Foden et al. 2009, Gardali et al. 2012, Bagne et al. 2014, Nooten et al. 2024) and impacts have already been documented in the form of climate-driven declines (e.g., Forister et al. 2021). Species already at risk of extinction may be particularly vulnerable to these impacts. A review of special status species in the Middle Rio Grande region revealed that at-risk terrestrial species were more vulnerable or likely to experience population declines, indicating that additional conservation efforts will be needed (NABCI 2010, Bagne et al. 2014). Similarly, a review of freshwater fish in California found that climate change vulnerability was positively correlated with current extinction risk (Moyle et al. 2013). It is important to note that while many factors used to assess climate vulnerability have a direct relationship with extinction risk (e.g., fecundity, breeding system, niche breadth), trait-based vulnerability assessments do not directly measure extinction risk or extent of population decline (Potter et al. 2017).

Mountainous regions and associated taxa are particularly vulnerable to change because precipitation and temperature vary rapidly across a relatively small area (Lawler et al. 2009). Importantly, mountains can create isolated islands of habitat, particularly where surrounding flatlands have very different environments, as is the case in the southwest. Wetland, riparian, and aquatic habitats, and associated species, also are particularly vulnerable in the southwest because their distribution is highly localized, and these habitats have already been heavily modified and degraded (Patten 1998). For example, as changing temperatures and reduced snowmelt runoff lead to hydrological changes in the middle Rio Grande, cottonwoods are anticipated to continue to decline; abundance of non-native, woody species, including Russian olive and tamarisk, are expected to increase; and the composition of riparian-nesting bird communities are expected to change (Smith and Finch 2017). Further, montane wetlands are expected to be especially sensitive to climate change given the relationship between wetland persistence and climate-driven factors such as precipitation, snowpack, and evaporation (Lee et al. 2015).

For all taxonomic groups, specialist and sedentary species are considered more vulnerable than generalist and highly mobile species (Foden et al. 2009, Gilman et al. 2010). Specialists are species that survive under a narrow range of environmental conditions and are thus more likely to be vulnerable to population declines than generalists, which can thrive under a wide variety of environmental conditions.

While species in every taxonomic group, and regardless of their status of SGCN, are likely to be impacted by climate change, vulnerability to climate change will vary by population, species, and taxonomic group due to differences in exposure, sensitivity, and adaptive capacity to environmental change (Glick et al. 2011, Lyons et al. 2024). Warmer water temperatures, earlier peak flows, increased rainfall variability, and lower summer base flows are expected to affect many fish and riparian species in New Mexico (Furniss et al. 2013). Increased frequency of winter high flows can negatively impact the extent of suitable habitat and species occurrence for different fishes (Wenger et al. 2011). Instream flows trigger important life history events, including fish spawning, and changes in river flows can impact aquatic species migration dates (Paukert et al. 2021). Timing of, and extent of temporal overlap in, the onset of spawning in different fish species has been observed to shift over time and has been modeled in response to altered flow regimes; these shifts have implications for inter-specific competition for resources during an energetically demanding phase of the fish life cycle (Krabbenhoft et al. 2014). Although most birds are highly mobile and can readily shift among habitats, migratory species are particularly vulnerable to mismatches between key life history events and resource availability. Birds also are vulnerable to different habitat changes on wintering grounds, breeding sites, and stopover sites (Visser et al. 2004, Visser 2008). Increasing temperatures and numbers of days above 25°C (77 °F) are associated with a decline in bird abundance and species richness with long-distance migrants, habitat specialists, and birds in drier areas, including the western US, more negatively impacted (Chen and Khanna 2024). Reptiles may be particularly vulnerable to increased temperatures, including reduction in hours where thermal conditions allow lizards to forage without exceeding their critical thermal maximum body temperature, and are typically poorly represented on species conservation-priority lists (Sinervo et al. 2010, Bagne et al. 2014). Amphibians in dryland areas are anticipated to lose habitat in response to changing climatic conditions, especially increasing temperatures and decreasing amounts of precipitation (de Albuquerque et al. 2024). Considering both amphibians and reptiles in desert environments, over a third of evaluated species are projected to go extinct by 2070, some due to thermal limits being exceeded, though forests and montane environments provide some refugia for these taxa (Sinervo et al. 2024). Mammals, though generally mobile, may be vulnerable to habitat change associated with climate change if they are geographically isolated (e.g., high elevation, riparian) or migratory. In an analysis considering 25 mammals across the US, climate variables were found to be important drivers of mammal abundance and mammal communities varied along a precipitation gradient in the western US; overall mammal abundance is also higher in wetter regions (Kays et al. 2024). For 10 mammals found in New Mexico, many were projected to experience declines in suitable habitat under changing climatic conditions, especially those associated with forested and shortgrass prairie habitats (Cartron et al. 2023).

Invertebrates are typically not as well represented in climate change assessments but, like most vertebrates, are expected to move northward and to higher elevations (Brantley and Ford 2012). Aquatic mollusc (e.g., snails) and crustacean (e.g., crayfish) species are also vulnerable to climate change as they tend to be narrowly restricted within freshwater habitats, which are already some of the most-threatened habitats worldwide (Dudgeon et al. 2006). Freshwater mussels' physiology (e.g., heart rate) can be impacted by higher water temperatures (Ganser et al. 2013) and changes in temperature can lead to shifts in freshwater community composition from thermally sensitive to thermally tolerant species (Galbraith et al. 2010). Average annual movement rates of freshwater mussels can be very small (e.g., 2.9 m [9.5 ft]) (Balfour and Smock 1994), though mussels that tend to move less may be more tolerant of desiccation (Mitchell et al. 2018), and their sedentary nature means that they are less able to seek refuge from local disturbances, including droughts or floods, and their delayed reproduction means that they cannot recover quickly from disturbance. Thus, freshwater mussels are highly vulnerable to environmental change (Galbraith et al. 2010). Terrestrial molluscs can be impacted by wildfire through direct mortality and impacts on habitat suitability (Wallace 2022); wildfires are becoming increasingly frequent and severe under drying climatic conditions. Many butterfly species have been found to be declining across the western US, likely in response to warming fall temperatures (Forister et al. 2021). Severe population declines have been observed in butterflies in high-elevation habitats (Halsch et al. 2021). Bees may be less able to detect floral scents during heat waves, potentially leading to bees being less able to locate food and associated declines in bee colonies and populations as the intensity and frequency of heat waves increases (Nooten et al. 2024).

Physiological requirements and limitations related to temperature and moisture determine critical components of energetics, survival, and reproduction (Helmuth et al. 2005, Bernardo and Spotila 2006, Sinervo et al. 2010). A species may be intolerant to new environmental conditions; become more restricted in activity; or become more sensitive to, or experience an interruption of key biotic interactions as a result of, increasingly extreme climate-related events such as fires, heat waves, or storms (Walsberg 2000, Bernardo and Spotila 2006, Sinervo et al. 2010, Nooten et al. 2024). Higher metabolic costs for ectotherms ("cold-blooded" organisms that rely mainly on external sources of energy to regulate their body temperature, including fish, reptiles, amphibians, and invertebrates) during warmer winters when food resources are limited could decrease survival within these populations (Kaspari et al. 2000, Brantley and Ford 2012). As an example of invertebrate limitations, bee declines at a Chihuahuan Desert site have been linked to heat and desiccation intolerance, with smaller-bodied bees experiencing more drastic declines than larger-bodied species (Kazenel et al. 2024). Species phenology (timing of key life history events) and interactions can also be impacted by climate change (Bagne et al. 2011, Edwards et al. 2024, Nooten et al. 2024). For many species, the timing of biological events (e.g., development, reproduction, migration) is triggered by temperature or moisture cues and is thus affected by a changing climate. When this timing is altered so that it no longer matches the timing and availability of critical resources or favorable conditions, then species survival and reproduction often decline (Dunn and Winkler 1999, Both et al. 2006, Gerard et al. 2020).

Trends in abundance of some species (e.g., at-risk butterflies) have been found to be associated with phenological shifts; species with less constant phenology are more likely to be experiencing rapid declines (Edwards et al. 2024). Further, the response of one species to climate change may trigger a population change in another via inter-specific interactions including predator-prey and host-disease relationships, pollination, parasitism, or mutualism (interactions between individuals of different species that benefit both species). These changes in interactions between species can further alter species vulnerability if they are tied to survival or reproduction (Freed et al. 2005, Memmott et al. 2007, Gilman et al. 2010). For example, the climate-mediated spread of a non-native, predatory fish can lead to declines in local prey populations and competition with native fish and shifts in both diet and growth potential of other predators (Lynch et al. 2016). Further, climate-driven changes in nutrients found in pollen can impact the stability of plant-pollinator interactions (Vaudo et al. 2024). Additionally, flowers that bloom earlier as a result of warming conditions may miss part of the activity window of their primary pollinators and experience decreased seed production (Gerard et al. 2020). Pollinators and the plants they currently pollinate can shift their morphologies over time in ways that are inconsistent with the successful continuation of their inter-specific interaction (Gerard et al. 2020). Traditional ecological knowledge can provide useful insights to detecting and tracking the impacts of changing climatic conditions on phenology (Bastian et al. 2022).

Analysis of Climate Change Vulnerability for Vertebrate SGCN

Researchers with the Natural Resources Institute (NRI) at Texas A and M University analyzed climate vulnerability for 295 vertebrate SGCN for the 2025 SWAP. Vertebrates were chosen as the focus for this analysis due to the greater availability of information for most of these species and as a result of the diversity of biological and ecological data required in completing the vulnerability analysis. Staff at NRI assembled natural history and distribution information for each focal species from a diversity of sources including the Biota Information System of New Mexico (BISON-M), NatureServe Explorer, Species Status Assessments (SSAs), peer-reviewed publications, books, and reports (NRI 2025). NRI staff used the Climate Change Vulnerability Index (CCVI) Version 4.0 to score the climate change vulnerability of each focal species (Lyons et al. 2024). The CCVI was created by NatureServe and the US Geological Survey and considers the following variables when evaluating a species' climate change vulnerability: (1) exposure to local climate change; (2) exposure to sea level rise; (3) overall adaptive capacity; (4) threat multipliers that affect climate change vulnerability (e.g., barriers to movement); and (5) documented or modeled response to climate change. This tool was originally based on Young et al. (2012) and has been updated to incorporate the framework for measuring adaptive capacity described by Thurman et al. (2020). The adaptive capacity factors considered in the CCVI are broken into the following seven categories: distribution, movement, life history, demography, evolutionary potential, ecological role, and abiotic niche. Mammals and birds, as species better able to persist in place or more mobile species, were typically found to be less vulnerable (at least 71% of bird SGCN and 72% of mammal SGCN) to climate change than species in other taxonomic groups. However, long-distance migration by birds is associated with having a low adaptive capacity associated with movement- and distribution-related factors. Fish and amphibians tended to have more specific ecological and life history requirements (e.g., association with perennial waters for fish and narrow climatic niches for amphibians) and tended to be more vulnerable to changing climatic conditions (at least 20% of amphibian SGCN are highly vulnerable and 54% of fish SGCN are highly or extremely vulnerable to climate change) (NRI 2025) (Table 9). In general, species found in higher altitudes or requiring specific aquatic environments (e.g., brown-capped rosy-finch [*Leucosticte australis*], American pika [*Ochotona princeps*], Pecos bluntnose shiner [*Notropis simus pecosensis*]) were generally ranked higher in climate change vulnerability. Full climate vulnerability analysis results can be viewed in Appendix F.

Table 9. Summary of Climate Change Vulnerability Index analysis results for 295 vertebrate SGCN under at Representative Concentration Pathway 4.5 scenario.

Climate Change Vulnerability Level	Amphibian	Bird	Fish	Mammal	Reptile	Total
Less Vulnerable	4	103	11	41	28	187
Moderately Vulnerable	8	34	7	10	8	67
Highly Vulnerable	3	8	8	4	1	24
Extremely Vulnerable	0	0	13	2	2	17
Totals	15	145	39	57	39	295

SPECIES RESILIENCE AND ADAPTIVE CAPACITY IN THE FACE OF CLIMATE CHANGE

Climate change may create more favorable conditions for a given species in a particular location. As some habitat types contract, others will expand, disproportionately benefiting species associated with expanding habitats. Elevated atmospheric CO_2 levels and warmer temperatures can enhance plant growth and lengthen growing seasons, providing more forage or longer breeding periods (Morgan et al. 2001). More variable and extreme weather can have positive effects on the availability of ephemeral waters, maintenance of spawning habitats, and prevention of woody plant encroachment. Species with distributions outside of New Mexico for which conditions may improve in the State may expand or shift their range into New Mexico, although these are unlikely to be current SGCN given the requirement for New Mexico to currently represent a core part of each SGCN's geographic range.

Several species traits are associated with resilience to or greater adaptive capacity in the face of climate change. Generalist species can switch to different prey or host species and thus are not as sensitive to changing conditions as species with more restricted resource requirements (Chessman 2013, Moyle et al. 2013). Similarly, wide-ranging species typically tolerate a larger array of environmental conditions. Any species can benefit when conditions that limit population growth (i.e., cold winters) are improved. Warm-water fishes, for example, may be more tolerant of warming conditions than cold-water species and may invade newly suitable locations further up cool water streams (Moyle et al. 2013) or in warming lakes (Lynch et al. 2016). Species that periodically experience inactive life stages and low metabolic rates have greater capacity to adapt to fluctuating resources (Humphries et al. 2002, Bronson 2009). For example, although warmer waters increase metabolic demands, aquatic insects that experience periodic dormancy can reduce energetic demands (Sweeney et al. 1992). Species with longer, more flexible, and more productive reproductive periods likely will be more resilient to increasingly variable and unpredictable conditions, although species with shorter reproductive periods may be favored during drought periods (Jiguet et al. 2007, Chessman 2013, Moyle et al. 2013). A species' level of adaptive capacity can be driven by several of the ecological and biological traits listed above (e.g., dietary breadth and habitat specialization) but is also related to a diversity of other traits, including those associated with dispersal, migration, inter-specific interaction, mating, and reproduction and to population characteristics (e.g., age structure) (Thurman et al. 2020).

COMBINING CLIMATE-RELATED EFFECTS WITH OTHER STRESSORS

As demonstrated by the process for selecting SGCN, there are many stressors on species populations and negative effects of climate change are just one subset to be considered when prioritizing species for conservation action or conservation actions themselves. Changing climatic conditions are important to consider because the associated additional stress that species may experience, especially if they are already prone to extinction, could overwhelm conservation efforts. Unfortunately, the very nature of SGCN populations makes them prone to the exacerbating effects of climate change. Many SGCN have very restricted ranges and are sometimes represented by only a single population. These species are particularly vulnerable to shifting climate and habitats because small, isolated ranges offer little habitat variability and little opportunity for dispersal (Opdam and Wascher 2004).

By adding to or altering impacts from other stressors already affecting species, climate change modifies extinction risk, causes declines in ecosystem health, and creates a complex challenge for conservation practitioners (McCarty 2001, MacNally et al. 2009, Pascual et al. 2022). Climate-driven threats, such as exceeding temperature thresholds, have often been overlooked in selecting special status species and need to be considered, especially in the context of impacts to future population trends (Bagne et al. 2014). Climate change effects can also exacerbate other stressors such as disease (e.g., Edelson et al. 2023), fire, invasive species spread, or landscape fragmentation that may already be implicated in species decline.

Climatic factors are strongly linked to the transmission of many infectious diseases, and vector- (organism that carries and transmits a disease to another living organism) and waterborne diseases, emerging infectious diseases, and antimicrobial resistance are all likely to be affected by changing climatic conditions (Edelson et al. 2023). Aquatic and riparian habitats are particularly vulnerable to stressors exacerbated by climate change. Higher temperatures and more variable rainfall will reduce already limited surface water supplies (Serrat-Capdevila et al. 2007, Theobald et al. 2010). Hotter, drier, and more variable conditions encourage fires that remove vegetation, favor invasive plant species such as tamarisk, and increase rates of sediment deposition, and nutrient concentrations (e.g., nitrates), in aquatic habitats (Swetnam and Betancourt 1990, Westerling et al. 2006, Rhoades et al. 2019a). Excessive forage removal and trampling from ungulate grazing is exacerbated during periods of higher temperatures and drier conditions when ungulates may preferentially graze near water (DelCurto et al. 2005, Mayer 2024). Higher water temperatures can lead to higher rates of algal growth, including toxic algae, and associated declines in water quality (e.g., lower oxygen levels), thus exacerbating water-quality issues resulting from ungulate manure or urine being directly deposited, or washed via runoff, into aquatic habitats (McDowell and Wilcock 2008, Derlet et al. 2010). Greater water withdrawal for both agricultural and residential uses is expected as temperatures increase (Foti et al. 2012). Shifting availability of suitable conditions exacerbates issues related to fragmentation and land conversion, potentially restricting movement of even highly mobile species and limiting the ability of species to respond to environmental change.

MANAGING CLIMATE CHANGE VULNERABILITY

Species conservation programs must consider climate change in order to be successful because changing climatic conditions aggravate other threats and produce new impacts. Exacerbation of other threats may require the application of intensified conservation efforts, while threats unique to climate change will require innovative strategies (Bagne et al. 2014). Consideration of climate change effects complements traditional conservation approaches, which have focused on threats that are ongoing or were historically responsible for species population declines. The key to finding effective management actions is to identify factors responsible for vulnerability, resilience, or adaptive capacity for a given species.

Summarizing Approaches to Managing for Climate Change Vulnerability

This section can be summarized to the following general recommendations for coping with climate change:

1. Implement management actions that enhance populations of SGCN (e.g., improve water supply and quality, implement appropriate prescribed or cultural fire programs) and reduce existing pressures on SGCN from sources other than climate change (e.g., control exotic species, prevent habitat loss and fragmentation).
2. Use short-term strategies that enhance the ability of natural systems to resist the effects of climate change and maintain ecosystem services (e.g., control woody plant encroachment into grassland ecosystems). Use longer-term strategies that enhance species and ecosystem resilience to and adaptive capacity in the face of climate-related stressors (e.g., conserve genetic diversity to enhance a species' ability to adapt to changing conditions, protect climate refugia that allow species more time to acclimate or adapt to changing conditions). Direct systems toward desired future conditions where change is unavoidable (e.g., assist organisms in moving to areas with more suitable conditions, plant species that are better adapted to hotter and drier conditions when restoring disturbed sites).
3. Accommodate future species range shifts by: (1) maintaining connectivity between protected areas and future suitable habitats for native species; and (2) planning invasive species monitoring and control efforts in areas where they are expected to expand.
4. Apply management actions when conditions are most favorable to native species and SGCN, and take advantage of climate-related stressors on invasive species when controlling or removing these species.
5. Expect long-term conservation of vulnerable SGCN to require intensified effort, innovative approaches, and flexibility.
6. Implement monitoring programs to detect population trends and evaluate the success of climate-related management actions.

Management actions designed to cope with climate change effects encompass four main strategies: *resistance*, *resilience*, *response* (or *direct)*, and *realignment* (or *accept)* (Millar et al. 2007, Peterson et al. 2011, Lynch et al. 2021). *Resistance* strategies include actions that enhance the ability of species, ecosystems, or environments to resist the forces of climate change and maintain values and ecosystem services in their present or desired states (including historical ecosystem structure and function) (Lynch et al. 2021) and conditions (e.g., use early detection and rapid response to control exotic species). Resistance strategies, including intensive and localized management of rare and isolated species, may only defer the effects of climate change for a short period of time (Heller and Zavaleta 2009). *Resilience* strategies enhance the capacity of ecosystems to withstand, absorb, or adapt to increasing effects without undergoing irreversible changes in important processes and functionality (e.g., reduce existing pressures on species from sources other than climate change, facilitate maintenance of or increases in genetic diversity). *Response* or *direct* strategies work directly with climate-induced changes to assist transitions to future desired states by mitigating and minimizing undesired and disruptive outcomes (e.g., assist with species or ecosystem migrations to areas projected to have suitable climatic conditions in future). The *realignment* or *accept* strategy refers to an adjustment in management or planning goals to account for substantially altered reference conditions, new ecosystem dynamics, new environmental conditions, and new community compositions (i.e., historical baselines may be inappropriate in the face of a changing climate and changes may be unavoidable or insufficiently undesirable to mandate action; infrastructure changes may be needed to accommodate accepted environmental changes) (Millar et al. 2007, Joyce et al. 2008, Peterson et al. 2011, Lynch et al. 2021).

The anticipated response of species to various climate-related factors can help identify the targets of climate-informed management actions. Habitats need to be managed with the expectation that they will change and shift over time. Specific components of wildlife habitats (e.g., snags, breeding ponds) also can be targeted for management if they are expected to decline. A species vulnerable to climate change due to its low dispersal ability may benefit from translocation or creation of habitat corridors. If a species is sensitive to extreme events, such as prolonged drought, high-severity wildfires, and intense flooding, then action plans can be developed to anticipate and specify necessary emergency actions to implement when such events occur (Bagne and Finch 2013). For example, natural-resource managers may augment natural regeneration of trees post-fire (Ziegler et al. 2017). Heat sensitivity of some species may be mitigated by providing buffered habitat elements, such as shade or deep pools. Management may need to target the responses of interacting species. Similarly, some traits generating resilience may be enhanced through management, including creation of reserves where suitable habitats are expanding or protection of vegetation or broader environmental conditions that buffer temperature changes (Case Study 1). The conservation or improvement of genetic diversity may also enhance species' resilience to physiologically limiting conditions (e.g., increased temperatures) (Heller and Zavaleta 2009) and their ability to evolve in response to changing conditions (i.e., evolutionary potential) (Thurman et al. 2020, Thurman et al. 2022).

Landscape or reserve planning needs to account for how habitats shift over time (Case Study 2; Hodgson et al. 2009). Selecting landscape units representing a diversity of topographic and soil attributes (and thus a diversity of species) that are well interspersed with one another and including landscape features that are comparatively rare may enhance reserve design in the context of changing climate conditions (Beier and Brost 2010). Greater connectivity between currently protected areas and future suitable habitats can facilitate movement of species as environmental conditions change. Establishment of migration corridors, management of areas surrounding corridors and protected areas, and expansion of protected areas can all improve habitat connectivity (McLachlan et al. 2007, Hodgson et al. 2009), as can inclusion of diverse landscape features (soil and topography) in linkages between protected areas (Beier and Brost 2010). Many current protected areas may experience a net loss of species and biodiversity as a result of climate-related species declines within these areas and insufficient climate connectivity (ability of the landscape to support climate-induced movement) limiting immigration of new species into these areas (Parks et al. 2023a). Further, hydrological connectivity of streams in the southwestern US is projected to decline, with a 17% increase in the frequency of stream drying events, and associated increases in event duration, anticipated (Jaeger et al. 2014). In the absence of connectivity or dispersal potential, assisted migration (movement of species or populations to areas likely to have suitable climatic conditions in the future) is a potential strategy for preventing species extinction and biodiversity loss (e.g., Parks et al. 2023a) but also is controversial. Assisted migration can include moving a species far outside its current range or simply moving them to a different climatic zone within, or just adjacent to, their current geographic range. Implementing assisted migration on a small scale and treating it as an experiment may make this conservation tool more palatable to natural-resource managers (Stanturf et al. 2024). Locally relevant research and effectiveness monitoring are needed to address knowledge gaps and appropriately apply assisted migration efforts. These knowledge gaps can include information on relationships among species (including competition, predation, and symbiosis), dispersal distance, detailed habitat requirements, and population- and community-level outcomes for target species (McLachlan et al. 2007, Twardek et al. 2023, Stanturf et al. 2024). Translocation, or movement of individuals to historically occupied locations, is less controversial and may help species cope with short-term habitat change, dispersal barriers, or increasing population fluctuations. Programs to move populations, however, tend to be costly and are often unsuccessful (Fischer and Lindenmayer 2000). Instances of assisted migration implementation are comparatively rare, especially outside an experimental framework, and plants and birds are the most common targets (Twardek et al. 2023).

Climate change can make some types of management more difficult. Individual threats may be harder to manipulate under changing climate conditions. One example is water supply, which will decline in response to warmer temperatures (and increased evapotranspiration), more variable rainfall, reduced snowpack, and greater demand. Fire management will also become more difficult as warmer weather, more frequent drought, and increasingly arid conditions limit the window for applying prescribed fire or cultural burns and make suppression more challenging. However, identification of factors associated with species vulnerability to climate change can lead to development of alternative conservation approaches. For example, it may be more practical and feasible to create new artificial water bodies to meet species habitat needs than to regulate water withdrawals driving the decline in availability of natural water bodies. In addition to a single-species focus, a list of species and their vulnerabilities can be used to identify management issues common among multiple species, making conservation efforts more efficient and comprehensive. For example, at Fort Huachuca in Arizona, management of fire and fuels, invasive species, natural and artificial waters, and landscape planning was found relevant for multiple species (Bagne and Finch 2013). It is important to balance addressing the needs of individual species, for example targeting especially vulnerable populations with conservation interventions, with taking actions that can benefit larger numbers of species and ecosystems, such as habitat management and site protection (Bowgen et al. 2022). Creating new patches of habitat close to existing habitat may be especially beneficial in the context of both habitat fragmentation and climate change for a range of species and landscapes (Synes et al. 2020).

When faced with uncertainty or few management options to target climate-related vulnerability, there are several possible approaches. “No-regrets” adaptation options are actions that increase population numbers or reduce stressors regardless of future climate change effects. Mitigation of other stressors (e.g., invasive species, habitat loss) is often recommended in lieu of addressing climate change effects. However, many impacts are interrelated, and the increasing vulnerability of many species indicates that conservation efforts will need to be intensified over time. “Win-win” options confer benefits under both current and future climate conditions (Peterson et al. 2011). Fire management, invasive species control, and watershed improvements often fall within this category. Habitat quality can be improved, and non-climate stressors reduced, through these types of actions, thus likely enhancing the resilience of species to climate change. Management frameworks such as Resist-Accept-Direct (RAD) are intended to help managers navigate the challenges, including a lack of predictability, associated with ecosystem transformations (emergence of ecological systems that are dramatically divergent from previous ecosystem structure and function) resulting from climate change and other forcings (Lynch et al. 2021). Population monitoring can be a useful tool when effects or management options are uncertain or funds are limited. Furthermore, monitoring is needed to determine the success of any implemented actions, especially those aimed at addressing climate change impacts (Bowgen et al. 2022).

Opportunities for improved species management can also arise with climate change and should be anticipated. Removal or control of exotic plants or animals may be more successful when they are stressed by climate extremes; their competitive ability may also decline to the point where they are no longer considered invasive (Finch et al. 2021). For example, low water levels can create barriers and stress exotic fish and amphibian populations. This can facilitate the removal of these species, which in turn may benefit native amphibians and fish, which may be more tolerant of drying conditions (Doubledee et al. 2003, Bagne and Finch 2013). Furthermore, invasive aquatic species may decline if they are intolerant of warmer or more saline waters (Higgins and Wilde 2005, Rahel and Olden 2008). Additionally, higher CO_2 concentrations may lead to higher sugar content in plants, thus enhancing biocontrol of invasive plants by inducing herbivores to increase the rate and volume of invasive plant biomass that they consume (Finch et al. 2021). Exploitation of the vulnerabilities of undesirable species can be summarized as a “kick them when they’re down” strategy and fits well with “no-regrets” and “win-win” strategies of climate change adaptation (Peterson et al. 2011, Bagne and Finch 2013). Preventative and early intervention programs to control invasive species can be applied in areas where range expansion is predicted. These programs tend to be cheaper and more effective (Davies and Johnson 2011) than programs implemented after an invasive species is well established. Climatic variation will also include wet or productive years and habitat-restoration or translocation programs can be timed to correspond with these events.

CLIMATE CHANGE REFUGIA

The concept of climate change refugia overlaps with some of the information presented previously in this chapter and deserves special attention given its relevance to the two case studies presented below. Climate change refugia (locations likely to facilitate species persistence under climate change) can be delineated based on a variety of variables including (1) climate exposure (areas likely to experience less severe climatic changes); (2) environmental diversity (locations with a greater diversity of physical and topographic features); (3) climate tracking (areas likely to retain suitable environmental conditions); and (4) climate-impacted disturbance regimes (areas likely to remain less impacted by disturbance) (Michalak et al. 2020, Rodman et al. 2023). The climate-tracking approach may or may not consider the climate associations of individual species. Different approaches capture different types of environments (e.g., topographically complex versus regions important for particular species); thus, it is important to clearly articulate the goals of climate refugia assessments and consider the use of a diversity of approaches, or at least acknowledge the limitations of the specific approach being applied (Michalak et al. 2020). Refugia can be identified for specific types of habitats (e.g., riparian refugia) and can be delineated with a goal of informing future restoration efforts (e.g., where to implement riparian restoration to enhance connectivity and climate resilience of riparian habitats (Szcodronski et al. 2024). They can also be delineated for specific types of disturbance that are likely to become more frequent under changing climate conditions (e.g., fire). Refugia from disturbances (e.g., areas burned less frequently or severely) may be especially important in ensuring the persistence of particular ecosystems (e.g., forests) (Rodman et al. 2023). Identification of refugia can benefit from the collaborative incorporation of Indigenous Knowledges and refugia should be designed to support indigenous uses and management practices wherever possible and especially when dealing with disturbances (e.g., fire) and resources (e.g., Douglas-fir) of particular relevance and interest to indigenous peoples (Hausam 2024).

Case Study 1: Identifying Climate Change Refugia in New Mexico

Climate change is expected to lead to increased stress and range shifts in, and habitat loss by, many of New Mexico's wildlife species. The concept of climate refugia has recently emerged as a potential method for identifying areas that might provide relatively stable climatic conditions that allow species and populations to persist through time. Researchers with the USFS's RMRS used a variety of methods to identify indicators of climate refugia within New Mexico's landscapes. For this work, refugia are areas that are expected to remain relatively stable in terms of climate (macrorefugia) or that contain features that are likely to buffer local conditions from changes occurring at larger geographic scales (microrefugia).

The USFS researchers compiled more than 70 indicators of macro- and microrefugia that fall into several broad categories, including biodiversity, climate indices, disturbance, future change, land-cover patterns, and topography. Both taxa-specific and overall composite scores for all taxa were developed based on different sets of indicators (Table 10). Data were obtained from the AdaptWest project, Bureau of Reclamation, DataBasin, EnviroAtlas, LandFire, US Geological Survey (USGS), USGS Gap Analysis Project, and WorldClim. Analysis was conducted using R 4.4.1 and ArcPro 3.2.2. To create composite indices representing climate refugia potential, the USFS: (1) determined which indicators were or were not applicable to terrestrial or aquatic ecosystems; (2) used Random Forest to identify the most important predictors of species richness; (3) used ordinary least squares and Generalized Linear Models to evaluate variable relevance and remove redundant variables; (4) calculated Z-scores to standardize data with varying ranges; (5) applied an optimization algorithm to ensure equal weighting across indicators; and, (6) calculated a composite score for each 12-digit Hydrologic Unit Code (HUC12) based on equally weighted Z-scores. Composite scores were mapped out across the State (Figure 15) with higher values representing HUC12s with higher potential to contain refugia. This distribution of HUC12s was then compared to the boundaries of 2025 SWAP Conservation Opportunity Areas (COAs) and ecoregions and used to determine the percent areas of COAs and ecoregions intersecting HUC12s with a high likelihood of containing climate refugia (Table 11,Table 12).

Table 10. List of indicators used to identify climate refugia[12].

Microrefugia are associated with soil properties, topography, vegetation, and landscape diversity. Macrorefugia represent expected changes in climatic conditions. Group abbreviations = Amphibian (A), Bird (B), Cold-water Fish (F), Mammal (M), and Reptile (R). Clas abbreviations = Aquatic (A) and Terrestrial (T).

Microrefugia Variable	Group	Macrorefugia Variable	Class
Soils		Backwards Velocity	A, T
Mean Soil Bulk Density	All	Change Heat Moisture Index	T
Pct Carbonate Karst	F	Change Snow Water Equivalent	A
Pct Volcanic Karst	F	Change Soil Moisture Content	T
Mean Water Storage (50 cm)	B, M	Change Stream Temp	A
Vegetation		Diff Max Temperature Warmest Month	A

[12] Datasets are derived from future climate projections for mid-century time periods (~2050) under a Coupled Model Intercomparison Project 5 (CMIP5), Representative Concentration Pathway 4.5 greenhouse gas emission scenario. Climate Novelty and Backwards Velocity are multidimensional (consider both precipitation and temperature) measures of climate. Variables were compared and selected through an iterative process using Random Forest and Linear Regression methods. Variable abbreviations: Diff=Difference, Evap = Evaporation, GAP = Gap Analysis Project, Max = Maximum, Pct = Percent, Precip = Precipitation, SDI = Shannon Diversity Index, Std Dev = Standard Deviation, and Temp = Temperature.

Microrefugia Variable	**Group**	**Macrorefugia Variable**	**Class**
Mean Riparian Canopy Height	F	Diff Evap Potential Natural Vegetation	A
Pct Marsh/Wet Meadow Riparian	F	Diff Annual Mean Temp	T
Pct Natural/Semi-Natural Riparian Woodland	F	Diff Temp Seasonality	T
Pct Tree Canopy in Stream Buffer	F	Diff Mean Temp Wettest Quarter	A, T
Landscape Diversity		Diff Mean Temp Driest Quarter	A, T
Climate Novelty	A, R	Pct Change Precip Coldest Quarter	A
Mean Roughness	M	Pct Change Precip Warmest Quarter	A
Mean SDI for GAP vegetation	M	Pct Change Mean Flow (June)	A
Mean SDI for Existing Vegetation Height	R	Pct Normal Precip Warmest Quarter	T
Mean SDI for Elevation	B		
Mean SDI for Aspect	F		
Std Dev of SDI for Geomorphology	F		
Topography			
Pct Northern Aspect	B, M		
Mean Heat Load Index	F		
Ratio of Low:High Heat Load Index	A, B, M, R		
Mean Topographic Wetness Index	R		
Mean Topographic Position Index	R		
Mean Elevation	F		

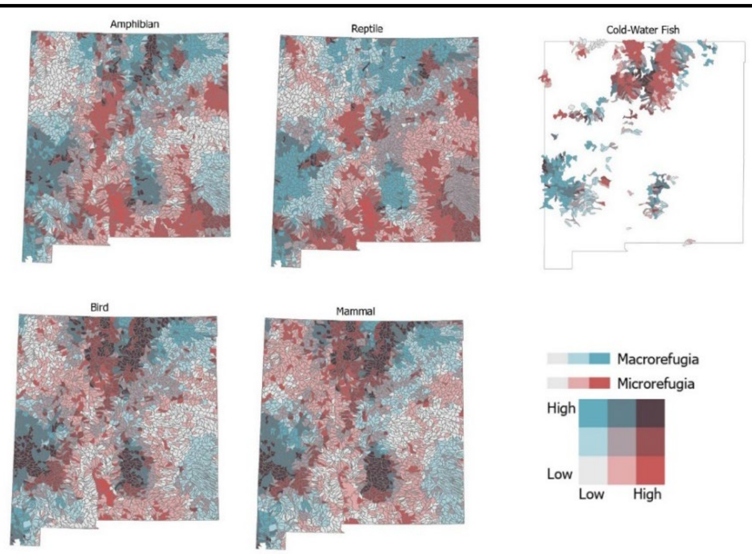


Figure 15. Potential for watersheds across New Mexico to contain refugia for different taxa.

Climate refugia outcomes for terrestrial taxonomic groups. Higher values indicated greater potential for 12-digit Hydrological Unit Codes to contain macro- (based on regional climate projections) and microrefugia (based on landscape diversity, soils, topography, and vegetation). Cold-water fish refugia potential is calculated only for watersheds containing perennial streams with current mean August stream temperature ≤ 17 °C (62.6 °F).

Table 11. Comparing climate change refugia potential among Conservation Opportunity Areas (COAs).

Percent area of each COA with high refugia scores (defined below). Index scores for microrefugia and taxa-specific microrefugia were scaled 0-1 and divided into five quantiles. Numbers shown below report the proportion of each COA that overlapped with 12-digit Hydrological Unit Codes (HUC12s) that held the highest 20% of scores. COAS with more than 90% (terrestrial) or 50% (aquatics) of their total areas overlapping landscapes with a high potential to contain refugia are indicated in bold. Blank indicates no overlap with areas with high potential to contain refugia. N/A indicates not applicable to that analysis because no evaluated HUC12s overlap the COA.

	Macrorefugia		**Microrefugia**				
	Terrestrial	**Aquatic**	**Amphibian**	**Bird**	**Mammal**	**Reptile**	**Cold-water Fish**
Apache Box	**100.0**	N/A		2.1	33.0		N/A
Big Hatchet Mountains		N/A					N/A
Black Range Mountains	8.2	0.2	27.6	**92.4**	69.6		3.0
Bootheel	88.8	N/A		8.5	23.6		N/A
Conchas Reservoir		N/A	81.6			81.6	N/A
Eagle Nest Lake	**100.0**		62.3	**100.0**	47.7	37.4	**100**
Guadalupe Mountains			37.4	82.9	**94.3**	3.0	
Jemez Mountains	4.3		69.8	**99.3**	**99.3**		48.6
Lower Gila River	27.6	0.6	10.1	49.8	57.7		
Lower Pecos and Black Rivers		N/A	**93.2**			**99.2**	N/A
Lower Rio Grande		N/A	54.2	1.3	1.3		N/A
Lower Rio Grande – Caballo Reservoir		N/A	84.8	3.4		61.8	N/A
Middle Pecos River		N/A	64.0	2.1	6.4	**91.2**	N/A
Middle Rio Grande		N/A	79.2	3.4	3.7	55.2	N/A
Middle San Juan River			29.9	3.7	53.0	30.2	
Mimbres River				64.3	63.7	0.9	
Northern Sacramento and Capitan Mountains	**93.2**	27.1	32.3	**91.3**	**98.4**		
Organ Mountains			67.7	54.6	54.6	1.6	
Pecos River – Lake Sumner		N/A	10.2			11.7	N/A
Pecos River Headwaters		N/A	18.6			18.6	N/A
Rio Chama	39.6	25.9	34.0	86.6	87.7	7.0	34.7
Rio Puerco	72.7	41.1		84.8	84..8		**57.0**
San Francisco River	**99.2**	**84.0**	11.5	78.8	57.9	2.1	6.9
San Mateo Mountains	30.0		30.2	87.7	80.2		0.2
Santa Fe River		N/A	41.5	57.7	68.4		N/A
Southern Sacramento Mountains	48.6	8.5	14.5	**99.8**	**100.0**	0.8	
Upper Gila River	82.3	**61.8**	14.0	82.3	69.5		1.2
Upper Rio Grande	31.6	14.2	33.2	78.6	86.2	8.2	40.2

	Macrorefugia		Microrefugia				
	Terrestrial	Aquatic	Amphibian	Bird	Mammal	Reptile	Cold-water Fish
Upper San Juan River	22.2		46.1	10.8	10.8	50.4	
Vermejo River	11.1	N/A	87.2			88.1	N/A

Table 12. Comparing climate refugia potential among ecoregions.

Percent area of each ecoregion with high refugia scores (defined below). Index scores for microrefugia and taxa-specific microrefugia were scaled 0-1 and divided into five quantiles. Numbers shown below report the proportion of each ecoregion that overlapped with 12-digit Hydrological Unit Codes (HUC12s) that held the highest 20% of scores. Ecoregions with more than 10% (terrestrial) or 5% (aquatics) of their total areas overlapping landscapes with a high potential to contain refugia are indicated in bold. N/A indicates not applicable to that analysis because no evaluated HUC12s overlap the ecoregion.

	Macrorefugia		Macrorefugia				
Ecoregion	Terrestrial	Aquatic	Amphibian	Bird	Mammal	Reptile	Cold-water Fish
Colorado Plateaus	1.2	3	1.1	1.1	1.5	1.1	3
Southern Rocky Mountains	9.6	3.1	5.0	13.8	**13.6**	0.2	**29.4**
High Plains and Tablelands	0.9	0.2	1.4	0.6	0.5	2.1	0.1
Chihuahuan Desert	0.3	0	2.9	0.7	0.4	3.5	0.6
Madrean Archipelago	1.3	N/A	0.02	0.1	0.2	0.04	N/A
Arizona/New Mexico Mountains	**19.5**	**17.7**	5.3	**22.2**	**20.1**	1.3	2.4

Case Study 2: Potential Future Climate Refugia for SGCN in Conservation Opportunity Areas

Integrating climate change into place-based conservation planning presents a pressing challenge for promoting future biodiversity conservation success. Natural Heritage New Mexico (NHNM) developed a portfolio of 16 Conservation Opportunity Areas (COAs) for the 2017 SWAP, which provided a place-based focus for where limited conservation funds can be applied to conserve a diversity of SGCN (see Chapter 3). However, these COAs do not currently account for the effects of climate change. To address this gap, NHNM conducted a limited study of the impacts of climate change on 10 terrestrial vertebrate SGCN from the 2017 SWAP that are found in one or more COAs and inhabit a range of environments across New Mexico (low-to-high elevations and from the northern to the southern parts of the State). Using species distribution modeling (SDM) techniques, NHNM modeled the potential current and projected future (2075) distribution of suitable environmental conditions for these species. Model results were then compared to the 2017 COA boundaries to gauge how well this 2017 COA portfolio might capture suitable conditions for a diversity of SGCN into the future.

NHNM built ensemble SDMs based on five modeling algorithms using a combination of environmental data (geology, topography, aspect, etc.) and future climate data downscaled to 90 m. The future climate data projections were based on a compilation of the Coupled Model Intercomparison Project's (CMIP5's) General Circulation Models (GCMs) and two greenhouse gas emission scenarios: (1) Representative Concentration Pathway (RCP) 8.5 where little is done to reduce carbon emissions worldwide over the 21st century; and (2) the more moderate RCP 4.5, where atmospheric carbon increases, but at slower rate relative to RCP 8.5, and stabilizes around 2075. The ensemble models were then intersected with COAs to determine how well these areas captured the overlap in suitable environmental conditions for the 10 target SGCN between present day and 2075 conditions (i.e., climate refugia).

Among the 10 modeled SGCN, results suggested that the conservation of at-risk species in New Mexico in the context of a changing climate over the next 50 years will present substantial challenges. Almost all selected species had significant projected overall loss of suitable environmental conditions. Losses tended to be less by approximately 15% under the moderate RCP 4.5 emission scenario versus the more extreme RCP 8.5 scenario. COAs from the 2017 SWAP followed a similar pattern of loss, but the amount of area suitable for SGCN that was captured within COAs was limited. COAs varied in their effectiveness at capturing suitable species habitat in the future and offering refugia.

Some COAs, such as the Jemez Mountains, encompass suitable environmental conditions for multiple SGCN but with differing patterns of refugia, represented by retention of suitable environmental conditions over time, as overall climatic conditions change (Figure 16; right). For the American pika, which is at the southern edge of its range in the Jemez Mountains, losses of suitable conditions were relatively small by 2075 under the moderate RCP 4.5, but the amount of actual refugia that was projected to occur within the COA compared to refugia across the rest of the pika's range was limited (7%). Gunnison's prairie dog (*Cynomys gunnisoni*), which is fairly widely distributed across northwestern New Mexico, had losses of about 33% of currently suitable conditions within the COA by 2075; these losses occurred at lower elevations. However, at higher elevations, the COA still offered a modest amount of refuge (67% of currently suitable habitat within the COA) for the species through 2075. Similarly, Grace's warbler (*Setophaga graciae*) is projected to lose suitable habitat in lower-elevation canyons within the COA (12% of currently suitable habitat), but overall, the COA offered refugia over much of its area for this species. The Grace's warbler is projected to lose much of its suitable environmental conditions in the southern part of the state; thus, this northern COA will be increasingly important for this species in the future. Lastly, Gray vireo (*Vireo vicinior*), typically associated with lower-elevation piñon-juniper woodlands, provided a contrasting scenario where losses at lower elevations outside of the COA were compensated for by potential gains in suitable conditions at higher elevations within the COA. Thus, COAs may provide novel opportunities for suitable conditions for species in the future. Combining these refugia patterns across species leads to refugia across 82% of the Jemez Mountains COA for at least one of the four SGCN with two to three of the species occupying 30% of this refugia habitat jointly (Figure 16; left).

In general, COAs will likely offer modest climate refugia for many SGCN and the 2017 COA portfolio generally captures relatively small percentages of the total geographic ranges of the SGCN for which SDMs were developed. Areas that may become suitable for one or more SGCN in the future and that are adjacent to or separate from 2017 COAs should be assessed to determine the appropriateness of including them within updated COA boundaries or as new COAs, respectively. The results of this project were used to add information on potential climate refugia within, and adjacent to, a subset of the updated, 2025 COAs to COA descriptions presented in Chapters 5 through 10. Further information on this project can be found in the final report prepared for the South Central Climate Adaptation Science Center by Muldavin (2024; https://www.sciencebase.gov/catalog/item/6720e8ccd34ed0f827eaa6a0).

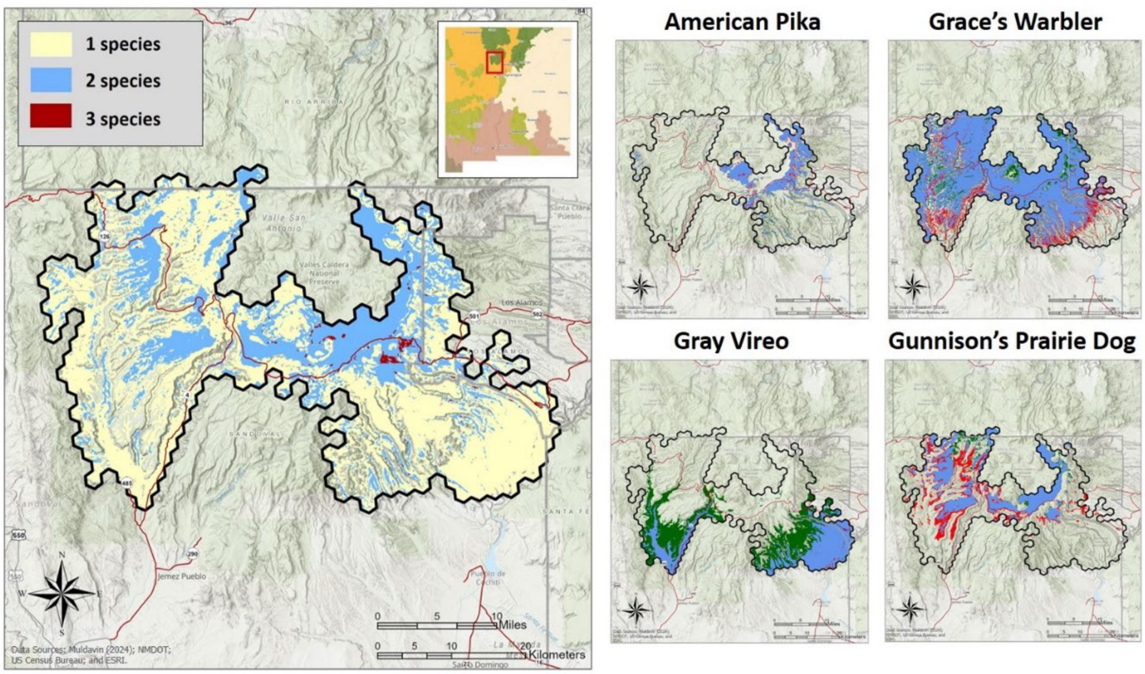


Figure 16. Modeled future conditions for four Species of Greatest Conservation Need (SGCN).

The distribution of suitable environmental conditions for four SGCN within the Jemez Mountains Conservation Opportunity Area; results combined across species (left) and results for individual species (right). Focal species are the American pika (*Ochotona princeps*), Grace's warbler (*Setophaga graciae*), gray vireo (*Vireo vicinior*), and Gunnison's prairie dog (*Cynomys gunnisoni)*. Conditions projected to 2075 under a more moderate greenhouse gas emissions scenario, Representative Concentration Pathway 4.5.

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Chapter 5: Colorado Plateaus Conservation Profile

SPECIES OF GREATEST CONSERVATION NEED (SGCN) AND THEIR HABITATS

The Colorado Plateaus ecoregion encompasses 64,452 km^2 (24,885 mi^2) of the northwestern quarter of New Mexico and is at the southeastern corner of 917,790 km^2 (354,359 mi^2) of contiguous cold desert that extends west across northern Arizona, Nevada, and Utah and north into western Colorado, southern Idaho, southeastern Oregon and Washington, and Wyoming (CEC 2021). In New Mexico, elevations range from 1,410-3,073 m (4,626-10,082 ft) (USGS 2024a) and terrain consists of large plains dissected by plateaus, mesas, arroyos, and canyons. The climate from 1991 to 2020 was dry (average annual precipitation: 29 cm [11.5 in]) and characterized by cold winters and hot summers, with frost-free periods ranging from approximately 81 to 195 days (AdaptWest Project 2022).

One hundred and forty SGCN occur in the Colorado Plateaus ecoregion; over half are birds (Table 13, Table 15). Fourteen percent of the SGCN within the Colorado Plateaus fall within category F (Current Focal Species), 15% are Conservation Impact Species, and 64% are Data Needs Species.

Table 13. Number of Species of Greatest Conservation Need in the Colorado Plateaus ecoregion.

Taxon \ Category[13]	F	I	D	L	Total
Amphibians	1	2	0	0	3
Bees	0	0	4	1	5
Birds	7	7	60	5	79
Crustaceans	0	0	5	0	5
Fish	9	5	0	2	16
Flies	0	0	1	0	1
Mammals	3	3	8	0	14
Molluscs	0	0	6	0	6
Moths and Butterflies	0	3	4	2	9
Reptiles	0	2	3	0	5
Total	20	22	91	10	143

In the Colorado Plateaus ecoregion, there are 18 naturally vegetated, terrestrial habitats that cover 61,171 km2 (23,618 mi^2) or 95% of the landscape (Table 14, Figure 17). The remainder of

[13]Category abbreviations are: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.

the landscape contains miscellaneous land-cover types: agricultural vegetation (1.5%), developed and urban (3%), and barren and open water (0.5%). Among the habitats, eight are characteristic of this ecoregion and make up about 84% of its total area (see full descriptions in this ecoregion chapter). Cliff, Scree, and Rock Vegetation is also described in this chapter as it is most prevalent in this ecoregion. At lower elevations of the flat plateau country, the primary habitats are cold desert shrublands and a mixture of shrub and grassland types that include Intermountain Dry Shrubland and Grassland, Intermountain Tall Sagebrush Shrubland, Intermountain Saltbush Shrubland, and Intermountain Dwarf Sagebrush Shrubland. Together, these four grassland and shrubland habitats cover over 67% of the ecoregion. In the lowland basins, Desert Alkali-Saline Wetland occupies about 3% of the area. The Colorado Plateau Cool Semi-Desert Ruderal Grassland, dominated by weedy, mostly introduced grass species, is intermixed among the shrublands and grasslands. Although it is mapped as covering only about 2% of the ecoregion (Figure 17), this vegetation type is probably more prevalent than this and increasing in disturbed areas. At higher elevations, on isolated mesas and foothills of the mountains of neighboring ecoregions, the grasslands and shrublands grade into Colorado Plateau Piñon-Juniper Woodland occupying 12% of the ecoregion. Intermountain Arroyo Riparian Scrub, found along mostly dry, ephemeral washes, occurs in less than 1% of the landscape but constitutes important wildlife habitat in this ecoregion (and in the adjacent ecoregions, particularly the High Plains and Tablelands). Along the floodplains of the San Juan River and Rio Grande and their tributaries are relatively large areas of native Southwest Lowland Riparian Forest intermixed with Introduced Riparian Vegetation (see the Chihuahuan Desert ecoregion chapter for descriptions of these riparian habitats).

Only 12 lakes and reservoirs occur in this ecoregion: four are warm water (total area: 1,233 ha [3,047 ac]) and eight are cold water (total area: 6,514.5 ha [16,097.5 ac]) (Figure 18). Navajo Lake represents most (82%) of the total water-surface area (6,359 ha [15,713 ac]) in the ecoregion. Most streams are ephemeral and only flow after summer thundershowers. However, 73 perennial streams flow through the ecoregion. Of these, 1,432 km (890 mi) are cold water and 1,630 km (1,013 mi) are warm water.

Table 14. Terrestrial habitat types of the Colorado Plateaus ecoregion.

Habitat Category	USNVC Code	Habitat Name[14]	Tier[15]	Climate Vulnerability[16]	Area (km²)	(mi²)
Alpine and Montane Vegetation	M049	Rocky Mountain Montane Shrubland	3	Moderate→High	626	242
	M896	Colorado Plateau Piñon-Juniper Woodland	4	Low→Very High	7,902	3,051
	M022	Rocky Mountain Lower Montane Forest	4	Low→Moderate	548	212
	M897	Rocky Mountain Piñon-Juniper Woodland	4	Very High	1,553	600
Plains-Mesa Grassland	M053	Great Plains Shortgrass Prairie	3	Very High	132	51
Desert Grassland and Scrub	M171	Intermountain Dry Shrubland and Grassland	2	Low→Very High	22,135	8,546
	M169	Intermountain Tall Sagebrush Shrubland	3	Low→Very High	10,906	4,211
	M170	Intermountain Dwarf Sagebrush Shrubland	4	Low→Very High	1,566	605
	M093	Intermountain Saltbush Shrubland	4	Very High	8,275	3,195
	M499	Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	--	998	385
Arroyo Riparian	M095	Intermountain Arroyo Riparian Scrub	2	--	29	11
Riparian Woodland and Wetland	M888	Arid West Interior Freshwater Emergent Marsh	1	--	105	41
	M082	Desert Alkali-Saline Wetland	1	Very High	2,060	795
	M893	Montane-Subalpine Wet Shrubland and Wet Meadow	1	--	100	39

[14] Terrestrial habitats are based on macrogroups of the United States Natural Vegetation Classification system (USNVC Version 3.0; https://usnvc.org/) except for the four Other Land Cover types; links to USNVC macrogroup descriptions are provided in the USNVC code column. Areas for upland habitat types are based on the 2022 LandFire Existing Vegetation Map for the continental US (LANDFIRE 2022), which was quality controlled by Natural Heritage New Mexico. Ecological systems in LANDFIRE (2022) were cross-walked to USNVC macrogroups. Areas for riparian vegetation types are based on the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap), also aggregated to macrogroups and embedded in the LANDFIRE (2022) map. Habitats listed in order by Tier (see below) and then alphabetically.

[15] Tiers reflect the priority for conservation and are based on the degree of imperilment within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. Ranks: N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure. Spatial patterns: linear, small patch, large patch, and matrix. Tier 1: N1, N2, N3 small patch/linear; Tier 2: N3 large patch or N4 small patch/linear; Tier 3: N3 matrix or N4 large patch; Tier 4: N4 matrix; Tier 5: N5 ruderal vegetation linear/large patch.

[16] Climate vulnerability levels were based on a vulnerability analysis performed for Ecological Response Units (ERUs) across New Mexico and Arizona (Triepke et al. (2014). The ERU classification system represents major ecosystem types of the southwest. Vulnerability for each ERU was calculated as the relative probability of type conversion. The ERUs were then cross-walked to the habitats shown here.

Habitat Category	USNVC Code	Habitat Name[14]	Tier[15]	Climate Vulnerability[16]	Area (km^2)	(mi^2)
	M034	Rocky Mountain Montane Riparian Forest	1	--	32	12
	M036	Southwest Lowland Riparian Forest	1	--	158	61
	M298	Introduced Riparian Vegetation	5	--	256	99
Cliff, Scree, and Rock Vegetation	M887	Cliff, Scree, and Rock Vegetation	4	Moderate→Very High	3,789	1,463
Other Land Cover	N/A	Agricultural Vegetation	5	--	972	375
	N/A	Barren	5	--	151	58
	N/A	Developed and Urban	5	--	1,922	742
	N/A	Open Water	5	--	177	68

Table 15. Species of Greatest Conservation Need (SGCN) in the Colorado Plateaus ecoregion.

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Boreal Chorus Frog	*Pseudacris maculata*	Amphibians	I	C, De, Di, V	EC, EMCS, M022, M034, M036, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	Amphibians	F	C, De, Di, V	EC, EMCS, M022, M034, M036, M298, M888, M893, PCWS, PLCP, PMCSS, PWWS
Northern Leopard Frog	*Lithobates pipiens*	Amphibians	I	C, De, Di, V	EC, EMCS, M022, M034, M049, M298, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Andrenid Bee	*Macrotera magniceps*	Bees	D	C, De, V	M093, M171
Dakota Leaf-cutter Bee	*Megachile dakotensis*	Bees	L	De, V	
Southwest Leaf-cutter Bee	*Megachile melanderi*	Bees	D	De, V	M082
Morrison's Bumble Bee	*Bombus morrisoni*	Bees	D	C, De, V	M022, M034, M049, M053, M082, M093, M169, M170, M171, M298, M888, M897
Sand Dune Wool-carder Bee	*Anthidium rodecki*	Bees	D	V	M169

[17] Hyperlinks are to species booklets in the Biota Information System of New Mexico (https://bison-m.org/) for each SGCN in the Colorado Plateaus ecoregion. Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.
[18] Reason to include indicates which of five criteria for inclusion on the SGCN list a particular species met. Abbreviations are as follows: C = Climate Change Vulnerability; De = Decline; Di= Disjunct; E = Endemic; K = Keystone; V = Vulnerable.
[19] Aquatic habitat abbreviations are as follows: PCWS = Perennial Cold-Water Streams; PWWS = Perennial Warm-Water Streams; PLCP = Perennial Lakes, Cirques, Ponds; PMCSS = Perennial Marshes/Cienegas/Springs/Seeps; PCWR = Perennial Cold-Water Reservoirs; PWWR = Perennial Warm-Water Reservoirs; EMCS = Ephemeral Marshes/Cienegas/Springs; EC = Ephemeral Catchments. Habitat codes refer to United States National Vegetation Classification System designations, which are identified in Table 14 above.

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
American Kestrel	*Falco sparverius sparverius*	Birds	D	De, V	EMCS, M022, M034, M036, M049, M053, M095, M169, M170, M171, M888, M893, M896, M897, PMCSS
American Pipit	*Anthus rubescens*	Birds	D	V	EC, M036, PCWS, PWWS
American Tree Sparrow	*Spizelloides arborea ochracea*	Birds	D	C, De, V	M036, M053, M169, M170, M896, M897
Aplomado Falcon	*Falco femoralis septentrionalis*	Birds	L	C, V	M053, M171
Bald Eagle	*Haliaeetus leucocephalus*	Birds	D	C, Di, V	EC, EMCS, M022, M034, M036, M049, M053, M082, M093, M169, M170, M171, M887, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS
Band-tailed Pigeon	*Patagioenas fasciata*	Birds	D	De, V	EC, M022, M034, M036, M049, M169, M170, M893, M896, M897, PCWS, PWWS
Bank Swallow	*Riparia riparia riparia*	Birds	D	C, De, Di, V	EC, EMCS, M034, M036, M888, PCWR, PCWS, PMCSS, PWWR, PWWS
Bendire's Thrasher	*Toxostoma bendirei*	Birds	F	C, De, V	M022, M053, M082, M093, M095, M169, M170, M171, M887, M896, M897

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Bewick's Wren	*Thryomanes bewickii*	Birds	D	C, De, V	M022, M034, M036, M049, M053, M095, M893, M896, M897
Black-chinned Sparrow	*Spizella atrogularis evura*	Birds	D	C, De, V	M036, M095, M887, M896, M897
Black-headed Grosbeak	*Pheucticus melanocephalus*	Birds	D	C, De, V	EC, EMCS, M022, M034, M036, M049, M095, M169, M170, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	D	C, V	M022, M034, M036, M049, M095, M171, M887, M893, M896, M897
Black-throated Sparrow	*Amphispiza bilineata*	Birds	D	De, V	M053, M095, M169, M170, M896, M897
Brewer's Sparrow	*Spizella breweri*	Birds	D	C, V	EMCS, M036, M053, M095, M169, M170, M171, M888, M896, M897, PMCSS
Broad-tailed Hummingbird	*Selasphorus platycercus platycercus*	Birds	D	De, V	M022, M034, M036, M049, M053, M095, M169, M170, M893, M896, M897
Brown Pelican	*Pelecanus occidentalis carolinensis*	Birds	L	V	EC, PCWS, PLCP, PWWS
Bullock's Oriole	*Icterus bullockii*	Birds	D	C, De, V	EC, EMCS, M034, M036, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Burrowing Owl	*Athene cunicularia hypugaea*	Birds	I	C, De, K, V	M036, M053, M082, M093, M169, M170, M171, M887, M896, M897
Canyon Towhee	*Melozone fusca*	Birds	D	De, V	M034, M036, M049, M053, M095, M169, M170, M896, M897
Canyon Wren	*Catherpes mexicanus conspersus*	Birds	D	De, Di, V	M887
Cassin's Finch	*Haemorhous cassinii*	Birds	D	C, De, K, V	M022, M034, M036, M169, M887, M893, M896, M897
Cassin's Sparrow	*Peucaea cassinii*	Birds	D	C, De, V	M049, M053, M082, M095, M169, M170, M171, M896, M897
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	F	C, De, V	M022, M053, M169, M170, M171, M896, M897
Clark's Grebe	*Aechmophorus clarkii*	Birds	D	Di, V	EC, EMCS, M888, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Clark's Nutcracker	*Nucifraga columbiana*	Birds	D	C, De, V	EC, M022, M034, M893, M896, M897, PCWS, PWWS
Cliff Swallow	*Petrochelidon pyrrhonota*	Birds	D	C, De, Di, V	EC, EMCS, M034, M036, M887, M888, M893, PCWR, PCWS, PMCSS, PWWR, PWWS
Common Black Hawk	*Buteogallus anthracinus anthracinus*	Birds	D	C, V	EC, EMCS, M022, M034, M036, M095, M887, M888, PCWS, PMCSS, PWWS

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Common Nighthawk	*Chordeiles minor*	Birds	D	C, De, V	EC, EMCS, M022, M034, M036, M049, M053, M095, M169, M170, M171, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS
Elf Owl	*Micrathene whitneyi whitneyi*	Birds	D	C, V	M036, M896, M897
Evening Grosbeak	*Coccothraustes vespertinus*	Birds	D	C, De, V	M022, M034, M036, M049, M169, M170, M887, M893, M896, M897
Ferruginous Hawk	*Buteo regalis*	Birds	D	C, Di, V	EMCS, M022, M036, M053, M095, M169, M170, M171, M887, M888, M896, M897, PMCSS
Field Sparrow	*Spizella pusilla arenacea*	Birds	D	De, V	M053
Flammulated Owl	*Psiloscops flammeolus*	Birds	D	C, V	M022, M034, M036, M049, M053, M170, M298, M887, M893, M896, M897
Golden Eagle	*Aquila chrysaetos canadensis*	Birds	D	C, Di, V	EC, EMCS, M022, M034, M036, M053, M095, M169, M170, M171, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS
Grace's Warbler	*Setophaga graciae*	Birds	I	C, De, V	M022, M034, M036, M049, M887, M893, M896, M897

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Gray Vireo	*Vireo vicinior*	Birds	I	C, De, Di, V	M022, M034, M036, M049, M082, M093, M169, M171, M887, M896, M897
Green-tailed Towhee	*Pipilo chlorurus*	Birds	D	C, De, V	EC, EMCS, M022, M034, M036, M049, M053, M095, M169, M170, M171, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Horned Lark	*Eremophila alpestris*	Birds	D	C, De, V	EC, M053, M169, M170, M171, M896, M897, PCWR, PCWS, PLCP, PWWR, PWWS
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	C, De, V	M022, M034, M036, M049, M053, M169, M170, M887, M893, M896, M897
Lark Sparrow	*Chondestes grammacus strigatus*	Birds	D	C, De, V	EMCS, M036, M053, M095, M169, M170, M171, M888, M896, M897, PMCSS
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	C, De, V	M034, M036, M049, M053, M082, M093, M095, M169, M170, M171, M298, M887, M896, M897
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	C, De, Di, V	M022, M034, M036, M049, M887, M888, M893
Mexican Whip-poor-will	*Antrostomus arizonae arizonae*	Birds	D	C, De, V	M022, M034, M036, M893, M896, M897

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Mountain Bluebird	*Sialia currucoides*	Birds	D	C, De, V	EMCS, M022, M034, M036, M049, M053, M169, M170, M171, M887, M888, M893, M896, M897, PMCSS
Mountain Plover	*Charadrius montanus*	Birds	F	C, De, Di, V	EC, M053, M082, M093, M169, M170, M171, M499, PCWS, PWWS
Northern Harrier	*Circus hudsonius*	Birds	D	Di, V	EC, EMCS, M034, M036, M053, M095, M169, M170, M171, M888, M893, M896, M897, PCWR, PCWS, PMCSS, PWWR, PWWS
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Birds	D	De, V	EC, EMCS, M034, M036, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Olive-sided Flycatcher	*Contopus cooperi*	Birds	D	C, De, V	M022, M034, M036, M887, M893, M896, M897
Peregrine Falcon	*Falco peregrinus*	Birds	D	C, De, Di, V	EC, EMCS, M022, M034, M036, M049, M053, M082, M169, M170, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS
Pine Siskin	*Spinus pinus*	Birds	D	C, De, V	M022, M034, M036, M049, M095, M169, M170, M893, M896, M897

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	F	C, De, K, V	EMCS, M022, M034, M049, M095, M169, M170, M171, M887, M893, M896, M897, PMCSS
Plumbeous Vireo	*Vireo plumbeus*	Birds	D	C, De, V	M022, M034, M036, M049, M893, M896, M897
Prairie Falcon	*Falco mexicanus*	Birds	D	C, De, Di, V	EC, EMCS, M022, M034, M036, M053, M095, M169, M170, M171, M887, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Purple Martin	*Progne subis*	Birds	D	C, De, V	M022, M034, M036, M893
Pygmy Nuthatch	*Sitta pygmaea melanotis*	Birds	D	C, De, V	M022, M034, M049, M887, M893, M897
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	Birds	L	De, V	M036
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Birds	D	C, V	M022, M034, M036, M049, M095, M893, M896, M897
Rock Wren	*Salpinctes obsoletus obsoletus*	Birds	D	C, De, Di, V	M036, M053, M169, M170, M171, M887
Sage Thrasher	*Oreoscoptes montanus*	Birds	D	C, De, V	M036, M053, M095, M169, M170, M896, M897
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Birds	D	C, De, V	M049, M053, M082, M093, M095, M169, M170, M171, M887

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Scott's Oriole	*Icterus parisorum*	Birds	D	De, V	M022, M036, M095, M896, M897
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	I	C, De, V	EC, EMCS, M034, M036, M082, M298, M888, M893, PCWS, PLCP, PMCSS, PWWS
Spotted Towhee	*Pipilo maculatus*	Birds	D	C, De, V	M022, M034, M036, M049, M095, M169, M170, M893, M896, M897
Sprague's Pipit	*Anthus spragueii*	Birds	F	C, De, V	M053, M171
Steller's Jay	*Cyanocitta stelleri macrolopha*	Birds	D	De, V	EC, M022, M034, M036, M095, M893, M896, M897, PCWS
Vesper Sparrow	*Pooecetes gramineus*	Birds	D	C, De, V	EMCS, M036, M049, M053, M095, M169, M170, M171, M499, M888, M896, M897, PMCSS
Violet-green Swallow	*Tachycineta thalassina lepida*	Birds	D	C, De, Di, V	EC, EMCS, M022, M034, M036, M049, M053, M095, M170, M887, M888, M893, M896, M897, PCWR, PCWS, PMCSS, PWWR, PWWS
Virginia's Warbler	*Leiothlypis virginiae*	Birds	F	C, De, V	M022, M034, M036, M049, M053, M095, M169, M170, M893, M896, M897

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Western Bluebird	*Sialia mexicana bairdi*	Birds	D	C, V	M022, M034, M036, M049, M095, M169, M170, M171, M887, M893, M896, M897
Western Grebe	*Aechmophorus occidentalis*	Birds	D	De, V	EC, EMCS, M888, PCWR, PCWS, PLCP, PMCSS
Western Kingbird	*Tyrannus verticalis*	Birds	D	C, De, V	EC, EMCS, M022, M034, M036, M049, M053, M095, M169, M170, M171, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Western Meadowlark	*Sturnella neglecta*	Birds	D	C, De, V	EMCS, M053, M095, M169, M170, M171, M888, M896, M897, PMCSS
Western Sandpiper	*Calidris mauri*	Birds	L	De, V	EC, EMCS, M095, M888, PCWS, PMCSS, PWWS
Western Wood Pewee	*Contopus sordidulus*	Birds	D	C, De, V	M022, M036, M049, M095, M896, M897
Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	Birds	D	C, K, V	M022, M034, M036, M887, M893, M896, M897
Wilson's Warbler	*Cardellina pusilla*	Birds	L	C, De, V	EC, EMCS, M022, M034, M036, M095, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	I	V	EMCS, M022, M034, M036, M049, M095, M169, M170, M888, M893, M896, M897, PMCSS

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	F	C, De, Di, V	EC, EMCS, M034, M036, M298, PCWS, PMCSS, PWWS
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Birds	D	C, De, V	EMCS, M053, M095, M169, M170, M888, PMCSS
Bowman's Fairy Shrimp	*Streptocephalus thomasbowmani*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Clam Shrimp	*Eulimnadia follisimilis*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Colorado Fairy Shrimp	*Branchinecta coloradensis*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Fuzzy Cyst Clam Shrimp	*Eulimnadia antlei*	Crustaceans	D	V	EC
Packard's Fairy Shrimp	*Branchinecta packardi*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Colorado Pikeminnow	*Ptychocheilus lucius*	Fish	F	C, De, Di, V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Desert Sucker	*Catostomus clarkii*	Fish	F	C, V	PWWS
Longnose Gar	*Lepisosteus osseus*	Fish	L	V	PWWS
Mexican Tetra	*Astyanax mexicanus*	Fish	I	C, Di, V	PMCSS, PWWS
Mottled Sculpin	*Cottus bairdii*	Fish	L	C, V	PCWS
Razorback Sucker	*Xyrauchen texanus*	Fish	F	C, De, Di, V	PWWS
Rio Grande Chub	*Gila pandora*	Fish	F	C, De, Di, V	PCWR, PCWS, PWWR, PWWS
Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	Fish	F	C, De, Di, V	PCWS
Rio Grande Shiner	*Notropis jemezanus*	Fish	I	C, Di, V	PWWS
Rio Grande Silvery Minnow	*Hybognathus amarus*	Fish	I	C, De, Di, V	PWWS
Rio Grande Sucker	*Catostomus plebeius*	Fish	F	C, De, V	PCWS, PWWS
Roundnose Minnow	*Dionda episcopa*	Fish	I	C, Di, V	PWWS

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Roundtail Chub	*Gila robusta*	Fish	F	C, De, Di, V	PCWS, PWWS
Sonora Sucker	*Catostomus insignis*	Fish	F	C, V	PWWS
Speckled Chub	*Macrhybopsis aestivalis*	Fish	I	C, Di, V	PWWS
Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	Fish	F	C, De, V	PWWS
Prairie Bee Fly	*Poecilognathus scolopax*	Flies	D	De, K, V	M171
Allen's Big-eared Bat	*Idionycteris phyllotis*	Mammals	D	Di, V	EMCS, M022, M036, M049, M887, M888, M893, M897, PMCSS
American Beaver	*Castor canadensis*	Mammals	I	C, De, Di, K, V	M022, M036, M049, M888, PCWS, PMCSS, PWWS
American Mink	*Neogale vison*	Mammals	D	C, Di, V	EC, EMCS, M034, M036, M888, M893, PCWS, PMCSS, PWWS
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	D	C, De, K, V	M053, M095, M169, M170, M171, M896
Big Free-tailed Bat	*Nyctinomops macrotis*	Mammals	D	C, Di, V	EMCS, M022, M034, M036, M049, M095, M171, M887, M888, M893, M896, M897, PMCSS
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	F	C, De, K, V	M036, M053, M169, M896, M897
Common Porcupine	*Erethizon dorsatum*	Mammals	D	C, De, Di, V	M022, M034, M036, M049, M053, M095, M169, M170, M171, M887, M896, M897

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Gunnison's prairie dog	*Cynomys gunnisoni*	Mammals	F	C, De, K, V	M022, M049, M053, M093, M095, M169, M170, M171, M499, M896, M897
Mexican Gray Wolf	*Canis lupus baileyi*	Mammals	I	C, De, V	EMCS, M022, M036, M049, M053, M095, M169, M170, M171, M887, M888, M896, M897, PMCSS
New Mexico Jumping Mouse	*Zapus hudsonius luteus (= Zapus luteus luteus)*	Mammals	I	C, De, Di, V	EMCS, M022, M034, M036, M053, M888, M893, M896, M897, PCWS, PMCSS, PWWS
North American River Otter	*Lontra canadensis*	Mammals	F	C, De, V	EC, EMCS, M022, M036, M053, M169, M170, M171, M888, M896, PCWS, PMCSS, PWWS
Southwestern Little Brown Myotis	*Myotis occultus*	Mammals	D	C, Di, V	EMCS, M022, M034, M036, M049, M053, M095, M169, M170, M171, M887, M888, M893, M896, M897, PMCSS
Spotted Bat	*Euderma maculatum*	Mammals	D	Di, V	EMCS, M022, M034, M036, M049, M053, M095, M169, M170, M171, M298, M887, M888, M893, M896, M897, PMCSS
White-tailed Jackrabbit	*Lepus townsendii campanius*	Mammals	D	C, V	M022, M169, M170, M171
Diablo Mountainsnail	*Oreohelix houghi*	Molluscs	D	C, Di, V	M093, M169, M171, M887, M896
Multirib Vallonia Snail	*Vallonia gracilicosta*	Molluscs	D	C, Di, V	M022
Rocky Mountainsnail	*Oreohelix strigosa depressa*	Molluscs	D	C, Di, V	M022

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
San Augustin Mountainsnail	*Oreohelix litoralis*	Molluscs	D	C, Di, E, V	M171, M896
Sangre de Cristo Woodlandsnail	*Ashmunella thomsoniana*	Molluscs	D	C, Di, V	M022, M034, M897
Socorro Mountainsnail	*Oreohelix neomexicana*	Molluscs	D	C, Di, V	M022, M887, M896, M897
Monarch	*Danaus plexippus*	Moths and Butterflies	L	C, De, Di, V	M022, M034, M036, M049, M053, M082, M169, M170, M171, M298, M888, M897
New Mexico Desert Blue	*Euphilotes ellisii anasazi*	Moths and Butterflies	I	V	M022, M093, M887, M896
Pogue's Flower Moth	*Schinia poguei*	Moths and Butterflies	I	E, V	M082
Questa Skipper	*Ochlodes yuma anasazi*	Moths and Butterflies	I	C, De, E, V	EMCS, M036, M888, PMCSS
Rhesus Skipper	*Polites rhesus*	Moths and Butterflies	D	C, V	M022, M034, M036, M053, M169, M171, M896, M897
Sacramento Mountains Borer Moth	*Papaipema dribi*	Moths and Butterflies	D	E, V	
West Coast Lady	*Vanessa annabella*	Moths and Butterflies	L	De, V	M022, M049, M053, M169, M171, M897
Yuma Skipper	*Ochlodes yuma yuma*	Moths and Butterflies	D	C, De, V	M034
Zuni Flower Moth	*Schinia zuni*	Moths and Butterflies	D	V	M170, M171, M893
Little White Whiptail	*Aspidoscelis arizonae gypsi*	Reptiles	D	De, E, V	
North American Racer	*Coluber constrictor*	Reptiles	D	C, De, Di, V	M022, M036, M053, M095, M170, M896, M897
Ornate Box Turtle	*Terrapene ornata*	Reptiles	I	C, V	M036, M053, M095, M896, M897

Common Name[17]	Scientific Name	Taxon	Category	Reason to Include[18]	Habitats[19]
Western Massasauga	*Sistrurus tergeminus*	Reptiles	I	De, Di, V	M053, M093, M896, M897
Western Painted Turtle	*Chrysemys picta bellii*	Reptiles	D	C, De, V	M888, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS

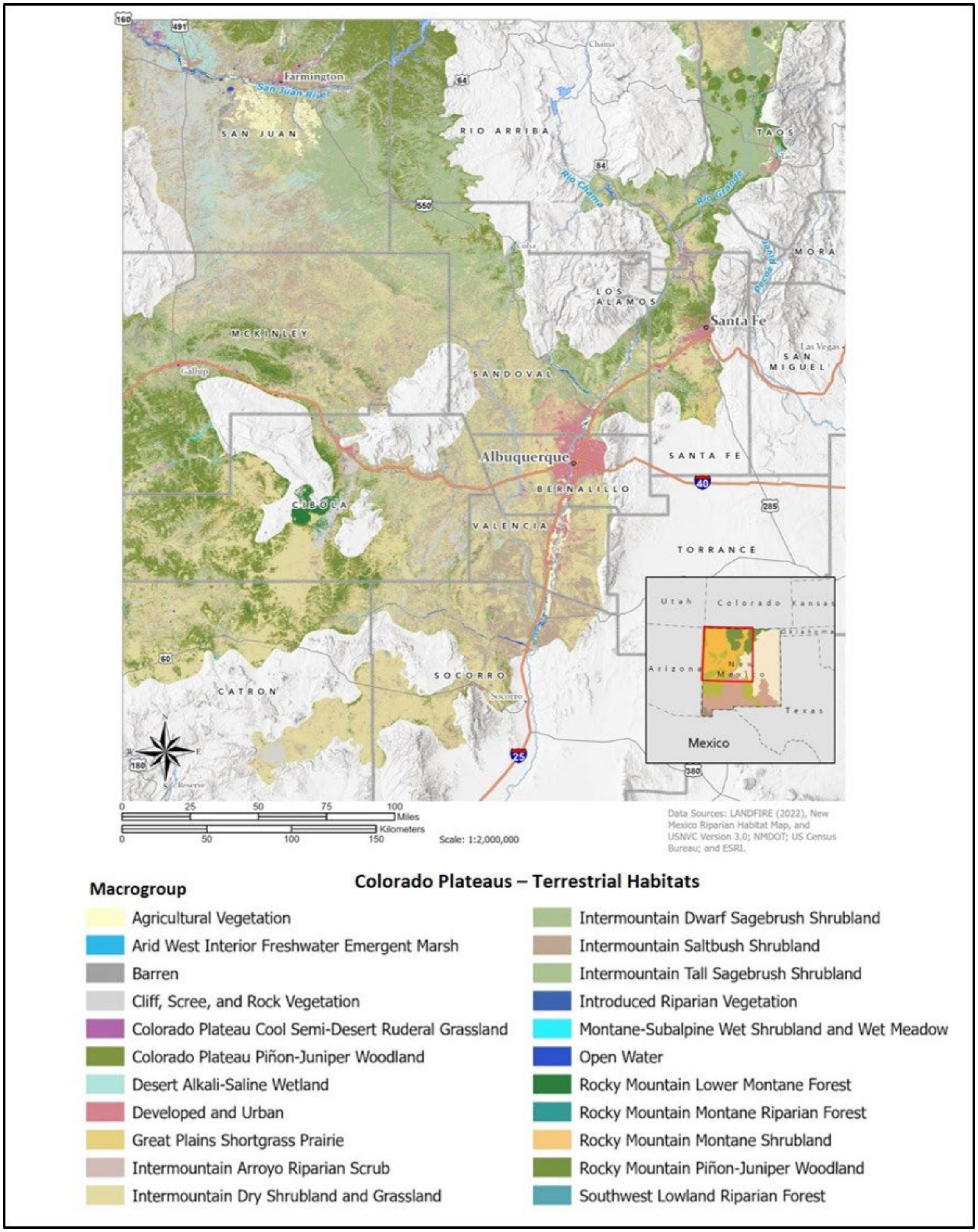


Figure 17. Terrestrial habitats in the Colorado Plateaus ecoregion.

Map based on LandFire 2022 Existing Vegetation Map (LANDFIRE 2022) crosswalked to macrogroups from the United States National Vegetation Classification system and on vegetation types from the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap) grouped to macrogroups.

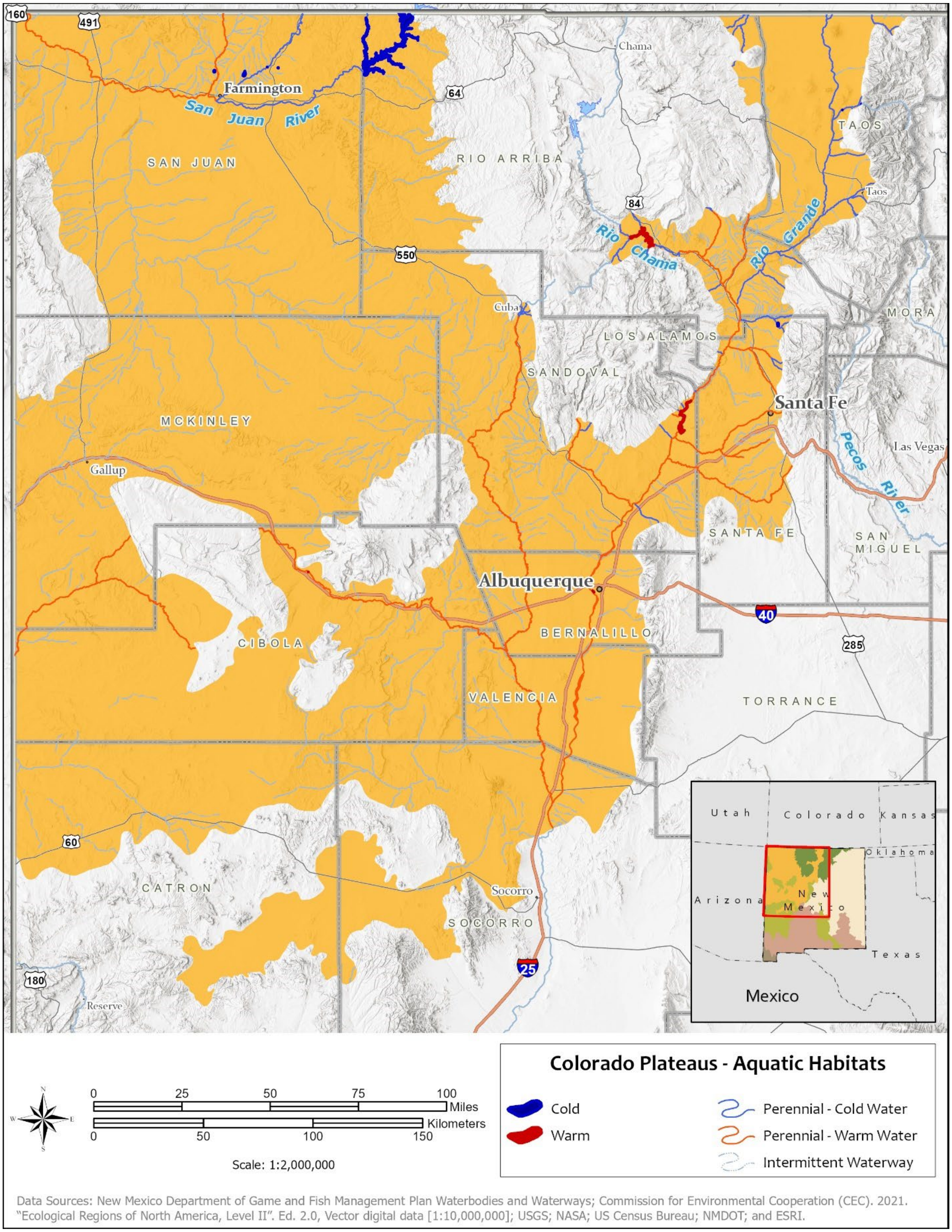


Figure 18. Aquatic habitats in the Colorado Plateaus ecoregion.

HABITAT DESCRIPTIONS

COLORADO PLATEAU PIÑON-JUNIPER WOODLAND

The Colorado Plateau Piñon-Juniper Woodland **[M896]** [20] occurs as open woodland savanna to moderately closed woodland on warm, dry, lower mountain and foothill slopes, mesas, and plateaus at elevations ranging from 1,800-2,600 m (5,910-8,530 ft). This habitat is most abundant in the Colorado Plateaus ecoregion but can be found at the margins of neighboring ecoregions.

- The tree canopies range from about 10% to over 60% cover and are dominated by Utah juniper (*Juniperus osteosperma*) near the Colorado border and one-seed juniper (*Juniperus monosperma*) elsewhere in the ecoregion within New Mexico. At higher elevations, two-needle piñon (*Pinus edulis*) is the dominant or co-dominant species with junipers (*Juniperus* spp.), but at lower elevations, it commonly grows within juniper canopies.
- Shrubs can be sparse to abundant (>25% cover) and occur primarily in the inter-tree spaces. The common dominants include big sagebrush (*Artemisia tridentata*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), rubber rabbitbrush (*Ericameria nauseosa*), and scrub oaks (*Quercus turbinella*, *Q. gambelii*, *Q.* x*pauciloba*).
- The herbaceous cover is usually dominated by a mixture of warm- and cool-season grasses including blue grama (*Bouteloua gracilis*), needle and thread grass (*Hesperostipa comata*), James' galleta (*Pleuraphis jamesii*), Idaho fescue (*Festuca idahoensis*), and muttongrass (*Poa fendleriana*). Cover can be sparse to dense depending on overstory tree density, soils, landscape position, and disturbance history. The highest grass cover occurs in the open savannas.
- Stands of mature, persistent woodlands are largely restricted to rocky outcrops, upper slopes and ridges, and rims of mesas and canyons that are fire resistant. More recently, younger seral stands have invaded adjacent shrublands and grasslands and now occur on lower slopes, valleys, and plains. In open savannas, periodic fire (at a 10- to 30-year interval) is important to maintaining vegetation structure. Juniper trees less than 1.2 m (4 ft) tall are easily killed by fires. Soils can be shallow and gravelly on slopes or deeper and fine-textured sandy and clay loams on flatter mesas and plateaus.

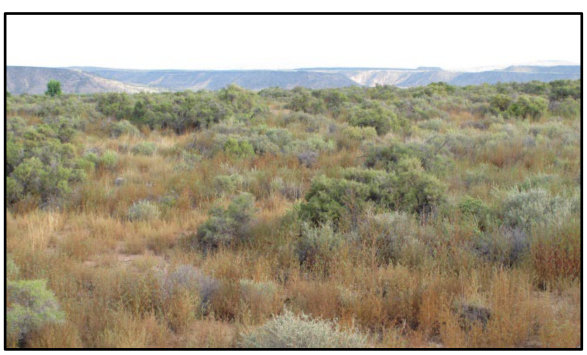
[20] Complete descriptions of habitats can be viewed by clicking on hyperlinked United States National Vegetation Classification System codes.

INTERMOUNTAIN DRY SHRUBLAND AND GRASSLAND

The Intermountain Dry Shrubland and Grassland [M171] occurs at 1,450-2,320 m (4,750-7,610 ft) elevation mostly in the Colorado Plateaus ecoregion and the northern margins of the Arizona/New Mexico Mountains ecoregion. It is typically dominated by grasses with scattered shrubs forming shrub steppes.

- In New Mexico, this is primarily a shrub steppe (shrubby grassland) that is commonly dominated by cool-season grasses that include Indian ricegrass (*Achnatherum hymenoides*) and needle and thread grass, but warm-season grasses can also be prevalent such as blue grama, James' galleta, alkali sacaton (*Sporobolus airoides*), and sand dropseed (*S. cryptandrus*).
- While shrubs are usually subordinate to grasses, they can be diverse and include big sagebrush, yellow rabbitbrush, Torrey's jointfir (*Ephedra torreyana*), Mormon tea (*E. viridis*), rubber rabbitbrush, winterfat (*Krascheninnikovia lanata*), sand sagebrush (*Artemisia filifolia*), and fourwing saltbush (*Atriplex canescens*).
- Forb cover is typically sparse but annual forbs can be abundant following wet winters. Representative species are fineleaf hymenopappus (*Hymenopappus filifolius*), hoary tansyaster (*Machaeranthera canescens* var. *ambigua*), and scarlet globemallow (*Sphaeralcea coccinea*).
- This habitat is found in a wide variety of environments that includes swales, playas, mesa tops, plateau parks, canyon bottoms and slopes, foothills, alluvial terraces, and sandy plains. Soils are generally shallow and calcareous and range from sandy to finer textured (clays to silt loams) that are often derived from limestone, sandstone, or shale. This habitat may have a high cover of cryptogams on the soil's surface in areas with sandy soils.

INTERMOUNTAIN SALTBRUSH SHRUBLAND



The Intermountain Saltbrush Shrubland [M093] occurs at 1,520-2,200 m (4,985-7,220 ft) elevation in the Colorado Plateaus ecoregion but extends southward into the Arizona/New Mexico Mountains and High Plains and Tablelands ecoregions. It is common in lowland valleys and on rolling hills and mesas.

- This shrubland is characterized by an open-to-moderately dense shrub cover dominated by saltbushes that may include fourwing saltbush, shadscale saltbush (*Atriplex confertifolia*), valley saltbush (*A. cuneata*), mat saltbush (*A. corrugata*), and mound saltbush (*A. obovata*).

- The herbaceous layer, including forb cover, is most often sparse, but occasionally grasses can be well represented, forming a shrub steppe. The common perennial grasses include Indian ricegrass, blue grama, saltgrass (*Distichlis spicata*), needle and thread grass, western wheatgrass (*Pascopyrum smithii*), and alkali sacaton. Introduced annual cheatgrass (*Bromus tectorum*) can be prevalent in some years.
- This widespread habitat can be found in a variety of environments including on valley bottoms, alluvial and alkaline flats, mesas and plateaus, and drainage terraces, and in washes, playas, and interdune basins. Substrates are typically saline, alkaline, fine-textured soils developed from shale or alluvium. Infiltration rates are typically low. Soils are shallow to moderately deep but poorly developed in New Mexico's semi-arid climate. The soil surface is often barren, although, in less disturbed areas, interspaces between the shrubs and grass clusters are commonly covered by a microphytic crust.

INTERMOUNTAIN TALL SAGEBRUSH SHRUBLAND

The Intermountain Tall Sagebrush Shrubland **[M169]** is found in the Colorado Plateaus, Southern Rocky Mountains, and Arizona/New Mexico Mountains ecoregions at 900-2,500 m (2,950-8,200 ft) elevation.

- This shrubland is characterized by an open-to-dense shrub canopy (10-80% cover) of big sagebrush. While commonly these are nearly monotypic stands of big sagebrush, many stands can have as co-dominant species fourwing saltbush, shadscale saltbush, rubber rabbitbrush, antelope bitterbrush (*Purshia tridentata*), greasewood (*Sarcobatus vermiculatus*), or spineless horsebrush (*Tetradymia canescens*).
- The herbaceous understory is variable and characterized by a sparse to dense (5-50%) cover of grasses such as Indian ricegrass and needle-and thread grass.
- Stands occur on a variety of terrains that include flat to steep upland slopes on alluvial fans and terraces, toeslopes, lower and middle slopes, draws, badlands, foothills, and rocky slopes. Soils vary from deep and well developed to shallow, rocky, and poorly developed.

COLORADO PLATEAU COOL SEMI-DESERT RUDERAL GRASSLAND

The Colorado Plateau Cool Semi-Desert Ruderal Grassland **[M499]** is associated with human-caused disturbance and found from low-elevation basins to foothills. It is dominated by non-native or ruderal native species.

- These dry grasslands are typically dominated by non-native grasses, such as crested wheatgrass (*Agropyron cristatum*) and cheatgrass, or grasses mixed with non-native forbs that include sophia (*Descurainia sophia*), redstem stork's bill (*Erodium* *cicutarium*), common St. Johnswort (*Hypericum perforatum*), and saltlover (*Halogeton glomeratus*).

- Remnant native grasses may still be present including Indian ricegrass, blue grama, and saltgrass along with shrubs such as big sage and fourwing saltbush.
- Stands occur on flat to moderately steep ground and can cover large areas or narrow strips adjacent to roadsides, under powerlines, and in other disturbed areas. Soils mostly are mineral, well drained, and may be compacted and eroded with biological crusts absent due to disturbance.

DESERT ALKALI-SALINE WETLAND

Desert Alkali-Saline Wetland **[M082]**, primarily of both the Chihuahuan Desert and Colorado Plateaus ecoregions, is a habitat that ranges from shrublands to luxuriant grasslands. This arid wetland habitat can be found at lower elevations on stream terraces or alluvial flats and may form rings around drying ponds or playas.

- The shrubs are dominated by salt-tolerant species such as greasewood, iodinebush (*Allenrolfea occidentalis*), and saltbush species (*Atriplex* spp.).
- The understory and intershrub spaces can be sparse or dominated by graminoids such as saltgrass, spikerush (*Eleocharis* spp.), rushes (*Juncus* spp.), and alkali sacaton.
- Sites are subject to intermittent, seasonal, or semi-permanent flooding, resulting in surface water retained into the growing season or throughout the year (except drought years). Sites that are seasonally dry develop exposed mudflats, which are colonized by annual wetland vegetation. Soils are alkaline to saline (depending upon soil moisture); soil type greatly affects species composition.

INTERMOUNTAIN DWARF SAGEBRUSH SHRUBLAND

Intermountain Dwarf Sagebrush Shrubland **[M170]** occurs at 1,500-2,450 m (4,920-8,035 ft) elevation in the Colorado Plateaus and Southern Rocky Mountains ecoregions on alluvial fans, foothills, and valley flats.

- Stands are characterized by an open-to-moderately dense shrub or dwarf-shrub layer with black sagebrush (*Artemisia nova*) as the characteristic dominant. Other shrub associates include Torrey's jointfir, Mormon tea, and antelope bitterbrush.

- The herbaceous layer is often sparse but, occasionally, a moderate-to-dense cover of perennial grasses can be present and species may include Indian ricegrass, blue grama, Idaho fescue, needle and thread grass, western wheatgrass, James' galleta, and muttongrass.
- Sites are generally xeric and may include wind-blown ridges and benches, gravelly alluvial fans, hilltops, canyons, gravelly draws, and dry flats. Soils are usually shallow, rocky, calcareous or alkaline. Substrates are variable, but are typically alluvium derived from limestone, shale, basalt, rhyolite, or other volcanics. Some sites have significant biological crust formation on the soil surface.

INTERMOUNTAIN ARROYO RIPARIAN SCRUB

Intermountain Arroyo Riparian Scrub **[M095]** occurs at 1,600-2,475 m (5,250-8,120 ft) elevation in the Colorado Plateaus and Southern Rockies ecoregions. It occurs within and along the edges of ephemeral, cold-desert washes.

- This is primarily an open shrubland habitat with patches of vegetation dominated by big sagebrush, fourwing saltbush, shadscale saltbush, skunkbush sumac (*Rhus trilobata*), or rubber rabbitbrush.
- Herbaceous cover is generally sparse, although species tolerant of repeated disturbance, such as foxtail barley (*Hordeum jubatum*), tarragon (*Artemisia dracunculus*), and western tansymustard (*Descurainia pinnata*), and non-native annuals, such as cheatgrass and prickly Russian thistle (*Salsola tragus*), can sometimes be abundant.
- This habitat is associated with flash flooding and rapid sheet and gully flows that scour channel bottoms. The vegetation is sparse due to the high impact of flooding and the lack of moisture outside of flood events.

CLIFF, SCREE, AND ROCK VEGETATION

Cliff, Scree, and Rock Vegetation **[M887]** habitat occurs in all ecoregions and at all elevations of New Mexico. It consists of near barren and sparsely vegetated landscapes occurring on a variety of substrates including mountain slopes, volcanic deposits, bedrock, badlands, outcrops, dunes, cliffs, narrow canyons, sandsheets, and unstable scree and talus that typically occur below cliffs.

- The vegetation is highly variable, but, typically, there is sparse cover of vascular species while lichens, mosses, and other nonvascular organisms can be abundant. Lower-elevation sites often have some herbaceous or shrub species present, and montane sites may also include scattered trees. Most of these species are more common in adjacent habitats, but some are endemic, perennial species that thrive in rocky habitats.
- Physical properties of substrates that may limit plant growth include active substrates, such as scree slopes; strong alkalinity and/or salinity with thin soils; unstable, eroding substrates; and heavy clay soils that reduce water infiltration or availability. Rocky substrates can concentrate water in cracks sufficiently to support vascular plants.

THREATS AND CONSERVATION ACTIONS

Ten threats could potentially impact SGCN in 25 habitats within the Colorado Plateaus ecoregion (Table 16). These threats are summarized below and listed in the order presented by the IUCN (2022). The list does not reflect the order of threat severity.

- Development: Surface and groundwater withdrawals for use by residents of Farmington and Albuquerque.
- Agriculture and Aquaculture: Grazing practices that impact SGCN habitat and groundwater withdrawal for crops.
- Energy and Mining: Habitat loss and fragmentation from oil, gas, and renewable energy development.
- Transportation and Service Corridors: Collisions with transmission lines, roads acting as barriers to movement, including along US-550 north of Cuba and US-550 and I-25 near Bernalillo, New Mexico (Cramer et al. 2022).
- Biological Resource Use: Wood harvesting in piñon-juniper woodlands.
- Human Intrusion and Disturbance: Disturbance by off-highway vehicles (OHVs) and unauthorized dispersed camping.
- Natural System Modifications: Degradation of riparian and perennial aquatic ecosystems.
- Invasive and Other Problematic Species, Genes, and Diseases: Cheatgrass invasion in sagebrush steppe; introduction of zebra (*Dreissena polymorpha*) and/or quagga (*Dreissena bugensis*) mussels in aquatic habitats; invasion of riparian habitats by tamarisk (*Tamarix* spp.) or other non-native plants; and potential infection of bats by *Pseudogymnoascus destructans*, which can cause white-nose syndrome, and of amphibians by chytrid fungus (*Batrachochytrium dendrobatidis*), which can cause chytridiomycosis.
- Pollution: Air, soil, and water contamination from industrial activities; noise and light pollution from the oil and gas industry.
- Climate Change: Reduction in crucial habitats (e.g., riparian) from prolonged drought and projected increasing aridity. Much of the Colorado Plateaus ecoregion has relatively lower potential to contain climate refugia (Table 12); there is some potential for both macro- and microclimate refugia in the eastern and northwestern edges of the ecoregion (Figure 15; Friggens et al. 2025).

Conservation concerns include invasion of cheatgrass in the sagebrush steppe, modification of riverine ecosystems because of water withdrawals, and habitat fragmentation and pollution from industrial activities, including oil and gas development. Oil and gas well pad development can cause temporary light and noise pollution, and gas compressor stations can cause long-term noise pollution that can, in turn, impact wildlife behavior. The anticipated expansion of renewable energy development will also add to the existing habitat fragmentation from oil and gas development.

Oil and natural gas development has resulted in a high-density network of roads and well pads over large areas of the northwestern part of this ecoregion that have reduced large patches of Intermountain Tall Sagebrush Shrubland and Colorado Plateau Piñon-Juniper Woodland habitats to small fragments. Traffic contributes to direct mortality of wildlife and traffic-related disturbance may disrupt normal behavior patterns of SGCN. As patches of habitat shrink, vulnerability of SGCN to predators increases. Conservation actions to address these threats include making efforts early in the planning of energy developments to minimize habitat fragmentation, removing unused roads, and restoring habitat to pre-development conditions.

Cheatgrass germinates earlier than native grasses and out-competes them for space and resources. More importantly, it serves as a fine fuel that increases the likelihood of unnaturally intense fires. Following wildfire, cheatgrass readily colonizes burned areas, thereby accelerating degradation of the sagebrush steppe to a state that is markedly less useful for livestock and wildlife (Knapp 1996, Ford et al. 2012). Conservation actions include determining and implementing strategies to eradicate cheatgrass.

Withdrawal of water from the San Juan River and Rio Grande for crops and municipalities reduces flows upon which several imperiled fish (Colorado pikeminnow [*Ptychocheilus lucius*], razorback sucker [*Xyrauchen texanus*], and Rio Grande silvery minnow [*Hybognathus amarus*]) and invertebrates depend. It also decreases the extent, composition, and functionality of riparian habitat, such as the cottonwood (*Populus* spp.)-dominated riparian forest along the Rio Grande. Aquatic and riparian species in this ecoregion are also threatened by the highly modified hydrological regime and river morphology (e.g., disconnected floodplain, confined channels) of the Rio Grande. These threats could be reduced by water-conservation measures, adjustment of reservoir water releases to mimic natural flow patterns, and restoration of channel structure and function.

The Colorado Plateaus ecoregion was warmer (with an increase of 0.95 °C [1.7 °F]) and drier (1.3 cm [0.5 in]) than normal from 1991 to 2020 when compared with 1961 to 1990 (AdaptWest Project 2022). With continued climate change, the ranges of big sagebrush and narrowleaf cottonwood (*Populus angustifolia*) are expected to contract substantially, and tree species, including two-needle piñon, Engelmann spruce (*Picea engelmannii*), and Utah juniper, may also sharply decline (Rehfeldt et al. 2006, Notaro et al. 2012). Additionally, distribution of two-needle piñon, ponderosa pine (*Pinus ponderosa*), Engelmann spruce, and Utah juniper may shift upslope by 100-500 m (328-1,640ft) (Rehfeldt et al. 2006). At least one species of plant among 66 that were modeled is expected to experience unsuitable climatic conditions by 2060 across much of the Colorado Plateaus ecoregion (Thomas et al. 2023). The habitats with very high vulnerability to climate change are Desert Alkali-Saline Wetland, Great Plains Shortgrass Prairie, Intermountain Saltbush Shrubland, and Rocky Mountain Piñon-Juniper Woodland (Table 14; Triepke et al. 2014).

Table 16. Potential threats to habitat and associated SGCN in the Colorado Plateaus ecoregion.

Threat categories were derived from IUCN (2022).

Habitat \ Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Arid West Interior Freshwater Emergent Marsh		X					X	X	X	X
Cliff, Scree, and Rock Vegetation			X	X		X				
Colorado Plateau Cool Semi-Desert Ruderal Grassland		X	X			X		X		
Colorado Plateau Piñon-Juniper Woodland	X	X	X	X	X	X	X	X	X	X
Desert Alkali-Saline Wetland		X	X					X	X	X
Ephemeral Catchments							X	X		
Great Plains Shortgrass Prairie		X	X			X	X	X		X
Intermountain Arroyo Riparian Scrub		X	X			X		X	X	X
Intermountain Dry Shrubland and Grassland		X	X			X		X	X	X
Intermountain Dwarf Sagebrush Shrubland		X				X		X	X	X
Intermountain Saltbush Shrubland		X				X		X	X	X
Intermountain Tall Sagebrush Shrubland		X	X					X	X	`
Introduced Riparian Vegetation										
Montane-Subalpine Wet Shrubland and Wet Meadow		X				X	X			X
Perennial Cold-Water Reservoirs	X						X	X		X
Perennial Cold-Water Streams	X	X	X	X	X	X	X	X	X	X

Habitat / Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Perennial Lakes, Cirques, Ponds							X	X		
Perennial Marsh/Cienega/Spring/Seep		X	X	X	X	X	X	X	X	X
Perennial Warm-Water Reservoirs		X					X	X	X	X
Perennial Warm-Water Streams		X					X	X	X	X
Rocky Mountain Lower Montane Forest	X	X	X	X	X	X	X			X
Rocky Mountain Montane Riparian Forest	X	X	X		X	X	X	X	X	X
Rocky Mountain Montane Shrubland	X	X	X			X	X			X
Rocky Mountain Piñon-Juniper Woodland	X	X	X	X	X	X	X	X	X	X
Southwest Lowland Riparian Forest		X	X	X	X	X	X	X	X	X

The following are proposed conservation actions for the Colorado Plateaus ecoregion, listed in order of priority within each IUCN threat category. Threat categories are listed according to the order presented by IUCN (2022).

DEVELOPMENT:

- Determine distribution and habitat needs of SGCN that reside in (e.g., Boakes et al. 2024) or near urban areas. This includes initiation and promotion of citizen or community science activities that document SGCN and other wildlife in and around urban areas. Inform municipal staff of nearby SGCN and how to minimize development-related impacts to SGCN and their habitats. Encourage community enrollment in programs designed to benefit particular SGCN or taxa (e.g., Monarch City USA; https://www.monarchcityusa.com/) and in wildlife habitat certification programs (e.g., National Wildlife Federation; https://certifiedwildlifehabitat.nwf.org/; Albuquerque Backyard Refuge Program; https://friendsofvalledeoro.org/abq-backyard-refuge/).Potential collaborators: universities, municipalities, non-profit organizations, private landowners.
- Investigate the potential impacts of current and future development on SGCN and their habitats and identify ways to mitigate those impacts. This includes working with municipalities to stay informed about new developments and initiate policies that will minimize negative impacts of future developments on SGCN. This also includes promoting the development of green spaces and green infrastructure in urban areas that, where appropriate, provide habitat and resources to SGCN (Gallo et al. 2017; Threlfall et al. 2017), including pollinators (Fukase and Simons 2016; Majewska and Altizer 2020). Potential collaborators: New Mexico Department of Transportation (NMDOT), universities, local governments, municipalities, non-profit organizations, private landowners.
- Participate in public-involvement opportunities when proposed developments might threaten the persistence of SGCN and their habitats. Potential collaborators: non-profit organizations, private landowners.

AGRICULTURE AND AQUACULTURE:

- Determine where habitat restoration would benefit SGCN and work with federal, state, Tribal, and private landowners to restore degraded rangelands to good or excellent condition. Monitor restoration results to develop and initiate any identified improvements to restoration practices. Potential collaborators: United States (US) Bureau of Land Management (BLM), US Forest Service (USFS), New Mexico State Land Office (SLO), private landowners, Tribal natural-resource managers.
- Establish baseline composition, condition, disturbance regimes, and function of major range habitats to inform habitat-restoration actions, particularly for piñon-juniper, sagebrush, and riparian habitats. Potential collaborators: BLM, USFS, New Mexico State Forestry Division (SFD), SLO, universities, private landowners, Tribal natural-resource managers.
- Determine how timing, intensity, and duration of livestock grazing affect SGCN and their habitats, including the interactions among grazing, fire, and the spread of invasive and other problematic species and among grazing, soil erosion (e.g., Pilon et al. 2017), and native riparian vegetation growth (e.g., Lucas et al. 2004). Potential collaborators: BLM, US Natural

Resources Conservation Service (NRCS), USFS, New Mexico Department of Agriculture (NMDA), SLO, universities, private landowners, Tribal natural-resource managers.

- Promote expanded use of appropriate, cost-effective grazing practices that ensure long-term ecological sustainability for SGCN and their habitats (especially riparian habitats). These include actions such as rest-rotation grazing management and conservation easements (Gripne 2005) that contribute to recovery of rangelands impacted by drought and allow restoration activities to be completed. May also include the use of virtual fencing to keep livestock in desired locations and out of sensitive areas (USFS 2024). Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.
- Promote grazing systems that address local needs of livestock and for SGCN habitat, including riparian areas. When particular habitat components need improvement, coordinate with ranchers and resource managers to identify and implement modifications that would provide the desired habitat outcomes. Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.
- Gather and assess current information on grazing practices and determine how the Department can support landowners that provide habitat for SGCN. Potential collaborators: BLM, NRCS, USFS, NMDA, SLO, private landowners, Tribal natural-resource managers.
- Work with private landowners to improve irrigation processes and infrastructure to conserve water. Includes promoting the use of devices and models that improve water conservation and irrigation efficiency (Schaible and Aillery 2012, Wang 2019) to help conserve the structure and function of aquatic and riparian habitats. Potential collaborators: NRCS, New Mexico Office of the State Engineer (NMOSE).
- Identify human-constructed water-retention structures (e.g., stock tanks, water troughs, and drinkers) that provide habitat for aquatic SGCN and other wildlife, particularly amphibians. Remove invasive species (e.g., bullfrogs [*Rana* (*Aquarana*) *catesbeiana*]) from these structures that may threaten native aquatic wildlife. Potential collaborators: BLM, USFS, universities, private landowners, Tribal natural-resource managers.
- Where appropriate, promote the use of flood irrigation for crops such as grass hay in historic riparian floodplains of upper watershed regions to mimic natural processes (i.e., seasonal flooding) and benefit SGCN and other wildlife (Donnelly et al. 2024). Potential collaborators: NRCS, NMDA, non-profit organizations, private landowners, Tribal natural-resource managers.
- Promote grazing systems that incorporate rested pastures and help improve overall range condition and enhance wildlife habitat health and function. In upland areas, these systems may include rest-rotation and/or deferred-rotation. In riparian areas, beneficial grazing practices may also include grazing in early spring and restricting summer grazing and redistribution practices such as herding and developing drinking water sources in upland areas. Especially during times of drought, rested pastures can provide forage reserves and relieve pressure on grazed pastures or allotments. Potential collaborators: BLM, NRCS, USFS, US Fish and Wildlife Service (USFWS), SLO, private landowners, Tribal natural-resource managers.
- Promote use of ecoregion-appropriate agricultural practices that provide habitat or resources or protect habitat quality (e.g., reduce erosion) for SGCN, including planting rows of trees between crops (McCarthy 2024) and pollinator-friendly practices such as planting

pollinator habitat along field margins and underutilized areas, revegetating retired farmland with wildflowers, including pollinator-friendly forbs in cover-crop seed mixes (O'Brien and Arathi 2021), and conserving semi-natural habitat near agricultural fields (Shi et al. 2024). Potential collaborators: NRCS, USFWS, NMDA, private landowners, Tribal natural-resource managers.

ENERGY AND MINING:

- Determine where energy development and mineral extraction currently, and in the future, may affect SGCN. Work with regulatory agencies to develop permitting guidelines and policies that result in siting new development in areas that minimize impacts to SGCN. Potential collaborators: BLM, USFS, New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), New Mexico Bureau of Geology and Mineral Resources (NMBGMR), SLO, energy and mining companies.
- Identify and promote best management practices that minimize the impacts (especially habitat fragmentation and direct SGCN mortality) of energy development (including of renewable energy sources [Lovich and Ennen 2011, Copping et al. 2020, Levin et al. 2023]) and mining on SGCN and their aquatic and terrestrial habitats. This includes informing and supporting resource managers in the implementation of measures to prevent direct take of SGCN associated with energy extraction and mining (e.g., use of appropriate exclusionary netting and/or fencing, bird balls, and closed containment systems at toxic sites). May also include increased use of small, localized installations (e.g., community solar development) rather than utility-scale developments (Bowlin et al. 2024). Potential collaborators: BLM, EMNRD, SLO, universities, energy and mining companies, municipalities.
- Reclaim disturbed habitats impacted by resource extraction as close as possible to pre-development conditions. Rehabilitate abandoned well pads, mining sites, and associated access roads. Remove unneeded roads, transmission lines, and any other abandoned infrastructure and equipment (e.g., pits, pipelines, unused machinery). Restore native vegetation. Where feasible, maintain abandoned mines as habitat for bats and snakes by constructing appropriate bat gates on mine shafts and adits (Spanjer and Fenton 2005). Potential collaborators: BLM, USFS, USFWS, EMNRD, SLO, energy and mining companies, private landowners.
- Maintain and expand open communication with mining and energy companies and land-management agencies to minimize adverse impacts of development to SGCN. Potential collaborators: BLM, USFS, EMNRD, SLO, energy and mining companies.

TRANSPORTATION AND SERVICE CORRIDORS:

- Site, consolidate, and maintain utility corridors to minimize adverse effects to SGCN and their habitats. Reduce avian powerline collisions by using line markers and illumination with ultraviolet lights and by burying powerlines (Bateman et al. 2023). Avoid mowing rights-of-way during peak SGCN pollinator larvae abundance and avoid mowing patches of nectar resources important for pollinator SGCN (e.g., Xerces Society 2018). Potential collaborators: BLM, SLO, interested and affected members of the public, local governments, utility companies.

- Determine where roads, vehicle traffic, and utility lines are inhibiting or preventing movement of SGCN, including during migration. Identify and conserve natural habitat corridors, especially those at risk from future fragmentation by roads or utility lines. This may include reconnecting stream and wetland habitats that have been fragmented by roads, culverts, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Does not include structures that serve a beneficial role for wildlife (e.g., native fish barriers). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, USFS, New Mexico Department of Transportation (NMDOT), universities, non-profit organizations, private landowners, utility companies.
- Work with collaborators to complete mitigation measures that will increase the probability of safe passage across roads and near utility lines for affected SGCN. These include modifying barrier fences along roadways, constructing road crossings, placing warning signs for motorists, marking utility lines so they can be readily seen by birds, and placing safeguards that will reduce the probability of electrocution. Integrate benefits to SGCN in projects primarily designed and implemented to enhance safe passage for large mammals (e.g., projects implemented under the Wildlife Corridors Action Plan) (Cramer et al. 2022). Monitor the efficacy of mitigation measures and initiate any identified maintenance and improvements. Potential collaborators: BLM, USFS, NMDOT, SLO, private landowners, utility companies, Tribal natural-resource managers.
- Work with appropriate agencies to develop and enforce road-management plans (Crist et al. 2005). Potential collaborators: BLM, USFS.

BIOLOGICAL RESOURCE USE:

- Determine the distribution (historic, current, and future), composition, disturbance regimes, and function of piñon-juniper woodlands and savannas needed by SGCN and SGCN prevalence in these habitats. Potential collaborators: BLM, USFS, USFWS, universities, private landowners, Tribal natural-resource managers.
- Work with landowners and land-management agencies to use woodlands and savannas in a manner that maintains healthy, and returns degraded, vegetation to an improved composition and function for SGCN, while protecting grassland communities surrounding piñon-juniper woodlands from woody plant invasion. Potential collaborators: BLM, USFS, SFD, SLO, private landowners.
- Inform natural-resource law enforcement staff of the distribution, life history, and habitat needs of SGCN. Partner with them to enforce laws to protect SGCN populations and habitats. Potential collaborators: BLM, US National Park Service (NPS), USFS, USFWS.

HUMAN INTRUSIONS AND DISTURBANCE:

- Identify and characterize areas and routes frequented by OHVs, including snowmobiles, and used by other recreationists, and use that information to assess the potential impacts to SGCN, other wildlife, and their habitats (e.g., Larson et al. 2016, Cretois et al. 2023, Zeller et al. 2024). This includes identifying and characterizing areas used for and impacts from unauthorized dispersed camping (Marion et al. 2018) and winter recreation activities (e.g., downhill and cross-country skiing, snowmobiling, and snowshoeing) (Morris 2024). Potential collaborators: BLM, NPS, USFS, SLO, universities.

- Identify, designate, and promote areas for OHV and other recreational use, including dispersed camping, that avoid disturbance to, or modification of, SGCN habitats. Potential collaborators: BLM, NPS, USFS, SLO.
- Initiate a public-information campaign to inform and educate OHV users and other recreationists of both permitted and prohibited activities that can impact SGCN and other wildlife. This may include public-service announcements, print advertising, public meetings, and signs in areas frequented by OHV users and other recreationists. Ensure that the campaign presents information in ways, and using languages, accessible to a diverse public (LCJF 2022). Potential collaborators: BLM, NPS, USFS, SLO, local governments, non-profit organizations.
- Work with public land-management agencies to regularly review and update OHV travel routes and recreational trails open to the public and appropriate restrictions on recreation necessary to protect SGCN and other wildlife. Potential collaborators: BLM, NPS, USFS, SLO.
- Work with land-management agencies to improve OHV and other recreational law enforcement with passive measures (e.g., strategically located barricades) and active measures (e.g., monitoring and enforcement patrols) to reduce negative impacts of OHVs and other recreational activities on SGCN and other wildlife. Potential collaborators: BLM, NPS, USFS, SLO.
- Work with the public to educate residents and recreationists about restrictions on and potential negative impacts of free-ranging, domestic pets, especially both domestic and feral cats (Loss et al. 2013b), on SGCN and other wildlife. Potential collaborators: universities, municipalities, non-profit organizations.

NATURAL SYSTEM MODIFICATIONS:

- As appropriate to local site conditions (e.g., topography, prevailing winds, disturbance history, infrastructure) (Urza et al. 2023) and not in persistent piñon-juniper woodlands (Romme et al. 2009, Darr et al. 2022), thin stands of trees in forests and woodlands to natural or historic densities that reduce the probability of insect and disease outbreaks and stand-replacing wildfires. Avoid unnecessary removal of large old-growth trees and snags, which serve as important wildlife habitat (Kalies and Rosenstock 2013); use best practices to maintain soil health (e.g., Tomao et al. 2020), including retaining sufficient seed trees and sources of mycorrhizal inoculum (Simard et al. 2021); implement landscape- and regional-scale heterogeneity in treatment design (Bradley 2009); and evaluate treatment effectiveness (e.g., McKinney et al. 2022, Davis et al. 2024, Hood et al. 2024), including monitoring local SGCN populations. Potential collaborators: BLM, USFS, New Mexico State Forestry Division (SFD), SLO, non-profit organizations.
- Design and implement riparian and aquatic habitat-restoration projects to benefit SGCN. This may include establishing priorities for habitat restoration and developing reach-specific plans. May also include designing and implementing low-tech, process-based restoration techniques (Wheaton et al. 2019) to restore degraded headwater stream systems and

improve SGCN habitat or specific actions such as reintroducing keystone species including American beavers (*Castor canadensis*) (Baker and Cade 1995, McKinstry et al. 2001, Grudzinski et al. 2022) and restoration and monitoring of self-sustaining populations of North American river otters (*Lontra canadensis*) and native fishes. Monitor restoration projects to determine effectiveness (Block et al. 2001, Holste et al. 2022) and inform adaptive management. Potential collaborators: BLM, US Bureau of Reclamation (BOR), US Army Corps of Engineers (USACE), USFS, USFWS, New Mexico Environment Department (NMED), SFD, SLO, universities, non-profit organizations, private landowners, Tribal natural-resource managers.

- Assess the impacts of stream-flow magnitude, frequency, timing, duration, and rate of change on riparian ecosystems and the effects of hydrologic alterations on these ecosystems. Determine flows needed to sustain SGCN and their habitats and the effects of flow modification by upstream dams and of upland disturbances in local watersheds (Goeking and Tarboton 2022). Work with agencies that manage dams and reservoirs to ensure released environmental flows match amounts and timing of flow needed for persistence of native riparian communities and associated SGCN, including allowing for overbank flows to coincide with seed dispersal from native vegetation (e.g., Greco 2013) and when saturated soil can best benefit SGCN prey. Potential collaborators: BOR, USACE, USFWS, US Geological Survey (USGS), NMED, NMOSE, universities, private industry.
- Determine beneficial fire frequencies and intensities and work with land-management agencies, sovereign Tribal entities, and private landowners to develop fire management plans that thoroughly consider local environmental conditions (e.g., weather, fuel conditions, landscape characteristics, local wildlife) (Russell et al. 2024) and implement prescribed burns or cultural burns (Parks et al. 2023b, Eisenberg et al. 2024) that avoid disturbing SGCN during sensitive periods (e.g., nesting); maintain condition of sensitive habitats (e.g., riparian habitat), ecosystem components (e.g., soil microbiotic community [Dove and Hart 2017, Brady et al. 2022, Nelson et al. 2022], regenerating seedlings [Owen et al. 2020]), and ecosystem function (e.g., soil carbon storage, nutrient cycling) (Brady et al. 2022, Nelson et al. 2022); enhance local diversity (Bowman et al. 2016, Eisenberg et al. 2024) and gene flow (Jones et al. 2023), including of SGCN such as pollinating insects; and protect people and property (USFS 2022). Potential collaborators: BLM, NPS, USFS, SFD, SLO, universities, private landowners, Tribal natural-resource managers.
- Determine responses of upland, and associated riparian/aquatic, communities that include SGCN to prescribed burns and wildfires (e.g., Saab et al. 2022). Where appropriate, integrate low-intensity fire and fuels reduction management into riparian ecosystem conservation. Design and implement projects that reduce unnaturally high fire risk associated with increased fuel loads or lack of moist soils in riparian areas. Methods may include flooding and/or implementing environmental flows, mechanical removal of non-native woody plants (e.g., tamarisk) and woody debris (Ellis 2001, Webb et al. 2019), and replanting native riparian vegetation (Queheillalt and Morrison 2006, Mosher and Bateman 2016). Potential collaborators: BLM, BOR, NPS, USACE, USFS, USFWS, SFD, SLO, universities, private landowners, water-management districts.
- Promote post-fire management activities that are beneficial to SGCN. Includes minimizing ash flow into streams and other post-fire impacts to water quality (Rhoades et al. 2019a,

Rhoades et al. 2019b), augmenting natural plant regeneration (e.g., planting tree seedlings in areas with appropriate microclimatic conditions) (Marchall et al. 2023) and protecting natural seed sources (Stevens et al. 2021), and encouraging heterogeneity (Ziegler et al. 2017, Owen et al. 2020). Potential collaborators: NRCS, NPS, USFS, NMED, SFD, SLO, non-profit organizations, private landowners, Tribal natural-resource managers.

- Determine amount, status, and trend of upland, aquatic, and riparian habitats; levels of fragmentation; and how SGCN might be affected. Identify appropriate locations and implement projects to enhance habitat quality and connectivity or prevent further fragmentation. This may include re-connecting streams and aquatic habitats that have been fragmented by dams, diversions, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Remove structures when feasible; otherwise, improve existing infrastructure by incorporating passage features for aquatic organisms (e.g., fish ladders). May also include protecting and promoting the natural establishment, development, and succession of native riparian vegetation by addressing any locally limiting hydrological conditions (e.g., ensuring overbank flooding occurs at optimal times and establishment of early successional vegetation) (Hatten et al. 2010, Greco 2013, Stanek et al. 2021, Wohner et al. 2021). May further include emphasizing restoration in areas that will enhance connectivity between native riparian habitat patches (e.g., migratory stopover sites) (McNeil et al. 2013). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, BOR, USACE, USFS, USFWS, NMDOT, NMED, SFD, SLO, Soil and Water Conservation Districts (SWCDs), universities, non-profit organizations, private landowners, Tribal natural-resource managers, water-management districts.
- Restore and protect aquatic, riparian, wetland, and wet meadow habitats, particularly springs and cienegas, and the surface and groundwater that supports them. Minimize activities that lead to gully formation, soil erosion, or a loss of soil health (e.g., soil fungal diversity) (Wagner 2023). Potential collaborators: BLM, BOR, NRCS, USACE, USFS, USFWS, NMED, SLO, private landowners, Tribal natural-resource managers.
- Encourage aquatic habitat-improvement projects, such as creating ponds and oxbows near stream systems and stock tank improvements, to benefit aquatic SGCN (Stuart and Ward 2009, Stone et al. 2022). Potential collaborators: BLM, BOR, NRCS, USACE, USFS, USFWS, NMED, SLO, private landowners, Tribal natural-resource managers.
- Survey and monitor perennial marshes/cienegas/springs/seeps habitats and the SGCN that inhabit them to determine changes in habitat quantity and quality and the status and trend of SGCN populations. Promote conservation efforts, such as protecting groundwater resources, that enhance the persistence and quality of these perennial aquatic habitats. Potential collaborators: BLM, USFS, USFWS, NMED, SLO, universities, Tribal natural-resource managers.
- Restore, protect, and monitor important disjunct wildlife habitats, such as caves, limestone outcrops, and talus slopes. Potential collaborators: BLM, NRCS, USFS, USFWS, EMNRD, SLO, non-profit organizations, private landowners.
- Encourage sustainable groundwater use to protect aquatic and riparian habitats from lowered groundwater tables. Promote water conservation, such as use of devices and models that facilitate optimal irrigation (Schaible and Aillery 2012, Storm et al. 2024) and estimate water consumption and withdrawal (Zhou et al. 2021) or temporary field fallowing

(DBSA 2022) and dryland farming, especially of drought-adapted crops (McCarthy 2024), to conserve the structure and function of aquatic and riparian habitats. Promote the use of water data from groundwater monitoring networks (Pine et al. 2023) to inform water conservation and management strategies. Potential collaborators: NRCS, NMBGMR, New Mexico Department of Agriculture (NMDA), SLO, municipalities, water-management districts.

- Promote public participation in restoration and conservation of watersheds. Potential collaborators: BOR, USACE, USFS, USFWS, NMED, SFD, universities, private landowners, non-profit organizations.
- Inform interested and affected members of the public about the value of aquatic and riparian systems and maintaining in-stream flows to build support for the conservation of aquatic and riparian species and habitat-restoration efforts. Potential collaborators: BOR, NRCS, USACE, USFS, USFWS, NMED, universities, non-profit organizations, private landowners.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES:

- Work with appropriate agencies to enforce regulations to prevent the introduction and spread of non-native species. Potential collaborators: USFWS, NMDA.
- Identify historic and current SGCN habitats infested with cheatgrass. Work with landowners and land-management agencies to restore these areas to native vegetation. Promote land-management strategies that will inhibit the further spread of cheatgrass. Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.
- Continue current efforts to prevent the infestation of aquatic habitats in New Mexico by zebra and quagga mussels and other aquatic invasive species. This includes informing anglers and boaters of the importance of not introducing invasive and other problematic species and providing them with information on how to prevent the spread of aquatic invasive species. Potential collaborators: BLM, BOR, USACE, USFS, NMED, New Mexico State Parks (NMSP), universities, non-profit organizations.
- As needed, gather additional information regarding the distribution of tamarisk and other exotic plants in riparian habitats (e.g., NHNM 2023). Determine the impact of exotic plants, and their removal and reduction, on SGCN and their habitats. Create and implement site-specific plans, with measurable goals and objectives, to restore the historic structure and composition of riparian habitats while minimizing negative impacts on SGCN and soil health (Wagner 2023). Prioritize removal of monoculture stands of non-native plants (e.g., Johnson et al. 2018b) and ensure that sufficient native riparian vegetation is locally available to SGCN and that local hydrological conditions support native vegetation regrowth. Since pollinating insects may use exotic riparian plants (e.g., Pendleton et al. 2011), minimize impacts of removing these plants on pollinating insect SGCN, including by avoiding herbicide application when plants are in bloom and treating the focal area in stages. Include post-implementation monitoring and maintenance for all riparian restoration projects. Document and report restoration approaches used, including successes and failures (Shafroth et al. 2008, Sogge et al. 2013). Potential collaborators: BOR, BLM, NRCS, USACE, USFS, USFWS, NMDA, SLO, SWCDs, universities, non-profit organizations, private landowners.

- Determine the distribution of all invasive and other problematic species, including feral ungulates (Beever 2003, Beschta et al. 2013, Sedinger et al. 2025), and diseases found in New Mexico, assess related threats to SGCN, and develop and implement strategies to address these threats, including eradicating or controlling existing populations of non-native and invasive and other problematic species when appropriate. When removing non-native vegetation, ensure that any SGCN that use this vegetation have suitable alternate habitat present (e.g., Sogge et al. 2013) and that site conditions support the restoration of native plants. If herbicide application cannot be avoided, limit impacts to pollinating insect SGCN by applying to smaller patches within the treatment area (e.g., Black et al. 2011) and spraying before target plants bloom (Hopwood et al. 2015). Potential collaborators: BLM, BOR, NPS, NRCS, USACE, USFS, USFWS, NMDA, NMED, SLO, universities, non-profit organizations, private landowners.
- Develop strategies to prevent emerging diseases from getting into New Mexico and develop and implement strategies that will inhibit the spread of ones already present (e.g., Clemons et al. 2024). This includes working with land-management agencies to control human access for recreation or other purposes as needed (Reynolds and Barton 2013), educating the public about what they can do to mitigate disease spread (e.g., Olson and Pilliod 2022), implementing appropriate hygiene guidelines for field researchers (e.g., Shapiro et al. 2024), and incorporating principles related to the interconnectedness of humans with local flora, fauna, and the natural environment (i.e., One Health) (AFWA 2023). Potential collaborators: BLM, NPS, USFS, NMED, SLO, universities.
- Design and implement protocols for early detection of invasive and other problematic species, including feral ungulates, and diseases. Quickly respond to detection. Potential collaborators: BLM, NPS, NRCS, USFS, USFWS, NMDA, NMED, SLO, universities, private landowners.
- Restore native riparian plants (e.g., cottonwood and willow [*Salix* spp.]) and natural riparian ecosystem processes and functions following the removal or biocontrol of tamarisk and other non-native plants. Ensure maintenance of adequate water supply for native plants. At sites with low water availability, restoration of native xeric plants may be more appropriate than hydroriparian and wetland plants. Stage and balance non-native plant removal and native habitat restoration over time, to avoid rapid loss of exotic woody riparian habitats for wildlife until native habitats can be developed (Sogge et al. 2013), and minimize herbicide use. Potential collaborators: BLM, BOR, USFS, USACE, USFWS, NMED, SLO, universities, non-profit organizations, private landowners, Tribal natural-resource managers.
- Proactively restore native riparian vegetation in areas likely to be most altered by the tamarisk beetle (*Diorhabda* spp.; i.e., large tamarisk monocultures [Johnson et al. 2018b] in river systems where the hydrology has been highly altered). Protect and sustain existing stands of native riparian vegetation that may serve as important refugia in areas currently or likely to be affected by the tamarisk beetle (Paxton et al. 2011, Sogge et al. 2013). Potential collaborators: BLM, BOR, USACE, NMED, SLO, universities, non-profit organizations, private landowners.
- Where feasible, reestablish native aquatic communities in perennial streams and restored aquatic habitats. Potential collaborators: BLM, BOR, USACE, USFWS, USFS, NMED, SLO, non-profit organizations, private landowners.

- Consider the impact of honeybee apiaries on wildlands and restrict their placement in areas where native bee SGCN occur. Honeybees can pose a disease spillover risk for wild bees (Tehel et al. 2016). Potential collaborators: universities, non-profit organizations, private landowners.

POLLUTION:

- Work with appropriate agencies that enforce mining and energy development regulations, Best Management Practices, and safeguards to protect water quality and minimize SGCN mortality associated with mining and energy development. Assess impacts to SGCN and their habitats from industrial activities, including mining and energy development. These impacts may include direct mortality, pollution from produced wastewater (including brine and hydraulic injection fluids) or from transport of extracted products, noise and light pollution from energy development activities, and sediment runoff from roads. Potential collaborators: BLM, USFS, EMNRD, NMED, SLO, energy and mining companies, local governments.
- Evaluate and mitigate the effects of air pollution from industrial activities, including methane released by flaring associated with oil and gas extraction and leaking from old oil and gas wells, and in urban areas on SGCN and their habitats (e.g., Duque and Dewenter 2024). Evaluate and mitigate the effects of other types of pollution, including excess generation of heat, light, and/or sound from industrial activities, urban areas, and highways on SGCN and their habitats. Potential collaborators: BLM, EMNRD, NMDOT, NMED, energy and mining companies, municipalities, utility companies.
- Determine effects of, and implement actions to mitigate negative effects from, agro- (e.g., neonicotinoids, other pesticides) (Sanchez-Bayo 2021, EPA 2023) and petrochemicals, synthetic chemicals (e.g., per- and polyfluoroalkyl substances [PFAS]), microplastics, urban runoff, and other pollutants (e.g., sewage, nutrients, toxic chemicals, sediment) on SGCN, especially fish and pollinating insects, and their habitats. This includes solid waste that may entangle wildlife. Potential collaborators: US Environmental Protection Agency (EPA), NMDA, NMED, universities, local governments, municipalities, private industry.
- Where appropriate, develop green infrastructure and nature-based solutions (Warnell et al. 2023) in urban areas that catch and slow stormwater runoff to prevent pollution from entering aquatic ecosystems and promote groundwater recharge. Potential collaborators: NMDOT, local governments, municipalities, private landowners.

CLIMATE CHANGE AND SEVERE WEATHER:

- Determine how regional and global climate change will affect SGCN, vegetation patterns (e.g., Davis et al. 2019, Coop et al. 2020, Guiterman et al. 2022, Davis et al. 2023), and community (e.g., Rosenblad et al. 2023) and ecosystem processes and dynamics, including disturbance regimes. This includes identifying SGCN (e.g., Glick et al. 2011) and associated habitats that are most likely to be negatively affected by climate change, including impacts on travel corridors, habitat connectivity, and species and habitat ranges. Identification of environmental conditions or thresholds that could limit SGCN is especially important. Potential collaborators: BLM, NPS, USFS, USFWS, USGS, EMNRD, SLO, universities.

- Identify climate change (e.g., Michalak et al. 2020) or disturbance refugia (e.g., Rodman et al. 2023) for SGCN and their habitats and implement conservation actions to conserve, expand, or enhance these refugia. As appropriate, consider refugia when implementing conservation actions (e.g., focus on refugia when planting native plants to encourage reforestation following a fire) (Hennessy et al. 2024). Potential collaborators: BOR, USFS, USGS, universities.
- Identify and implement actions to mitigate the effects of climate change on SGCN and their habitats. These may include actions that assist in enhancing carbon sequestration in natural environments (e.g., appropriate forest conservation and management [Mo et al. 2023]), improving climate resilience of species and communities (e.g., Dyshko et al. 2024), or climate-smart projects that help maintain, or accommodate for or facilitate climate-related shifts in (e.g., Stanturf et al. 2024, USFWS 2024a), the distribution and natural functioning, including disturbance regimes, of these impacted species and habitats. Potential collaborators: BLM, NPS, USFS, USFWS, USGS, EMNRD, SLO, universities, Tribal natural-resource managers.
- Promote land-management practices, standards, and guidelines to conserve and/or restore structure and function of corridors that provide important habitat for SGCN and ability for animals to move as climate conditions change. This should include both mesic and xeric riparian communities that serve as important migratory corridors for birds and other wildlife while providing ecosystem services and wildlife corridors that link isolated mountain ranges (Powledge 2003) and coniferous forest patches. Potential collaborators: BLM, NPS, USFS, USFWS, SLO, universities, private landowners, Tribal natural-resource managers.
- Develop new species recovery plans that consider the current status of and limiting factors for species, as well as projected future conditions for both species and their habitats. Consider full life cycles for migratory species when feasible (e.g., KFF 2021). Potential collaborators: USFWS, non-profit organizations, species working groups.
- Inform the public about the potential adverse effects of continued climate change on SGCN and their habitats and encourage development of, and data collection under, citizen and community science projects focused on SGCN and their habitats. Potential collaborators: BOR, USFS, USFWS, USGS, NMSP, SLO, universities, non-profit organizations.
- Monitor SGCN to determine long-term trends that correlate to ecosystem dynamics and habitat changes (e.g., Shirk et al. 2023). If feasible, identify potential limiting factors and develop and implement strategies to mitigate them. Potential collaborators: BLM, DOD, NPS, USFS, USFWS, SLO, universities, Tribal natural-resource managers.

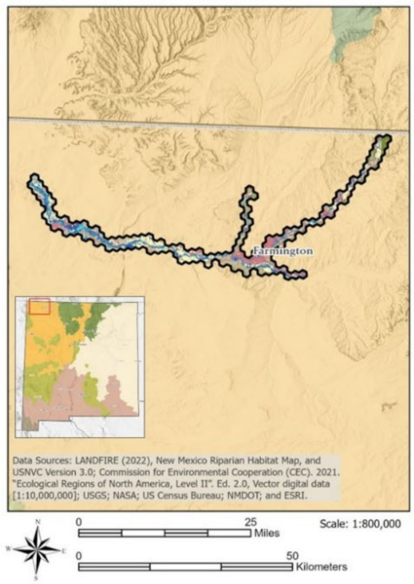
ACTIONS THAT ADDRESS MULTIPLE THREATS:

- Determine life history needs, ecology, distribution, movements, status, and trends of and threats to SGCN (especially invertebrates that are not currently monitored, riparian-obligate species, herpetofauna [Pierce et al. 2016, Olson and Pilliod 2022], and rare native fishes) and their habitats. Consider full annual cycles for migratory species when appropriate and logistically feasible (KFF 2021) and interactions with lower trophic levels that may drive SGCN status (e.g., EPA 2023). Use this information to develop and implement effective monitoring protocols and conservation actions, including actions to mitigate identified threats. Potential collaborators: BOR, BLM, NPS, USFS, USFWS, SLO, universities, non-profit organizations, private industry, species working groups, Tribal natural-resource managers.

- Assess the synergistic effects between climate change and other threats to SGCN and their habitats (e.g., Friggens et al. 2019, Parks et al. 2019). Incorporate appropriate climate adaptation strategies and frameworks into projects designed to address these synergistic effects. This may include enhancing connectivity (CEQ 2023), facilitating a species' innate adaptive capacity (Thurman et al. 2022), enhancing genetic diversity (Powell 2023), considering local adaptation (Meek et al. 2023), or considering whether it is most appropriate to resist, accept, or direct ecosystem transformation (Lynch et al. 2021, Stevens et al. 2021). Projects should acknowledge ecosystem dynamism and incorporate Indigenous Knowledge (e.g., Roos et al. 2022, Eisenberg et al. 2024), nature-based solutions (Warnell et al. 2023), and experimentation (Guiterman et al. 2022) when appropriate. Potential collaborators: BLM, NPS, USFS, USFWS, USGS, universities, Tribal natural-resource managers.
- Identify or develop an accessible, jointly used database to document the status and condition of, threats to, and conservation actions implemented across aquatic, riparian, and upland habitats. Identify data gaps (e.g., Ganey et al. 2017) and implement standardized methods to gather habitat data (e.g., Vollmer et al. 2018, Shirk et al. 2023) and to monitor the success of conservation actions (e.g., Davis and Pinto 2021), including impacts on local SGCN populations. Synthesize existing information (e.g., Jain et al. 2021) and apply modeling techniques to aid in evaluating success when appropriate (e.g., Parks et al. 2018). Adjust future conservation actions as needed based on observed outcomes. Potential collaborators: BLM, BOR, NPS, USACE, USFS, USFWS, USGS, NMED, SFD, SLO, universities.
- Evaluate the effectiveness of public education and outreach efforts regarding threats to SGCN and their habitats and the ways that the public can assist in threat mitigation (KFF 2021). Modify outreach activities as needed in response to evaluation outcomes. Potential collaborators: BOR, BLM, NPS, USACE, USFS, USFWS, USGS, NMED, NMSP, SFD, SLO, universities, municipalities, non-profit organizations.
- Where appropriate, incorporate native, pollinator-friendly plants (Glenny et al. 2022) or native plants adapted to projected future climatic conditions at the restoration site (e.g., Meek et al. 2023, Stanturf et al. 2024) into seed mixes and live plantings used in the restoration of lands affected by grazing, fire, resource extraction, energy development, or urban development. Consider reclamation site conditions, genetic diversity, and resilience to local threats when producing seedlings (Davis and Pinto 2021) and consider appropriate climate analogs when identifying appropriate seed sources (e.g., Richardson et al. 2024). When focused on benefiting pollinators, prioritize plants that are attractive to pollinators, especially SGCN; support pollinators throughout the growing season (Glenny et al. 2023); provide food for caterpillars of insect SGCN (e.g., Dumroese et al. 2016); and produce pollen with high nutritional diversity (Vaudo et al. 2024). Potential collaborators: BLM, NPS, NRCS, USFS, SFD, SLO, energy and mining companies, non-profit organizations, private landowners, Tribal natural-resource managers.

CONSERVATION OPPORTUNITY AREAS

MIDDLE SAN JUAN RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*7468.7*
Arid West Interior Freshwater Emergent Marsh	*1*	*841.4*
Barren	*N/A*	*164.2*
Cliff, Scree, and Rock Vegetation	*4*	*800.7*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*426.2*
Colorado Plateau Piñon-Juniper Woodland	*4*	*2174.0*
Desert Alkali-Saline Wetland	*1*	*1961.4*
Developed and Urban	*N/A*	*7423.7*
Intermountain Arroyo Riparian Scrub	*2*	*77.7*
Intermountain Dry Shrubland and Grassland	*2*	*1996.1*
Intermountain Dwarf Sagebrush Shrubland	*4*	*400.7*
Intermountain Saltbush Shrubland	*4*	*2893.0*
Intermountain Tall Sagebrush Shrubland	*3*	*502.7*
Introduced Riparian Vegetation	*5*	*3837.7*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*219.1*
Open Water	*N/A*	*935.8*
Rocky Mountain Lower Montane Forest	*4*	*2.7*
Rocky Mountain Montane Riparian Forest	*1*	*20.5*
Rocky Mountain Montane Shrubland	*3*	*32.6*
Southwest Lowland Riparian Forest	*1*	*2265.8*

Figure 19. Middle San Juan River Conservation Opportunity Area.

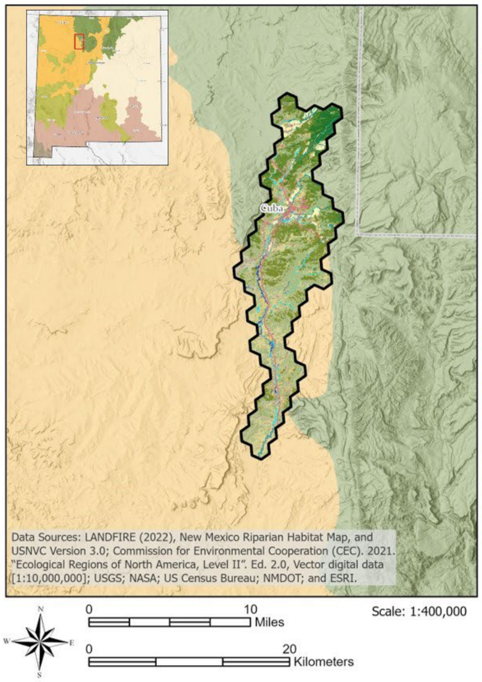
The Middle San Juan River Conservation Opportunity Area (COA) (Figure 19) spans approximately 34,494 ha (85,236 ac) and is located in the northwestern corner of the state. It encompasses a large portion of the Middle San Juan riparian corridor, as well as the lower reaches of the La Plata and Animas Rivers, and the adjacent upland areas.

Approximately 52% of the land in this COA is privately owned, while 36% consists of Tribal lands. The remaining 12% is made up of lands managed by the BLM (9%), the SLO (1.5%), and the New Mexico Department of Game and Fish (Department) and the NPS, each accounting for less than 1%. This COA includes the B-Square Ranch Important Bird Area, and approximately 2% of the COA is currently protected.

The COA supports 14 native vegetation habitats and two ruderal or introduced vegetation types, as well as agricultural vegetations, barren areas, developed and urban spaces, and open water. Agricultural vegetation (22%) and developed and urban areas (22%) dominate, together comprising 44% of the land cover. The remaining 56% consists of a diverse mix of vegetation types, with the most abundant being: Introduced Riparian Vegetation (11%), Intermountain Saltbush Shrubland (8%), Southwest Lowland Riparian Forest (7%), and Colorado Plateau Piñon-Juniper Woodland (6%). Perennial aquatic habitats include 93 km (58 mi) of warm-water streams, 71 km (44 mi) of cold-water streams, and 18 ha (44 ac) of cold-water reservoirs.

A total of 36 SGCN are found (either observed or with potential habitat) within the COA, including six classified as Conservation Impact Species (I) and 11 as F (Appendix G). This COA has some potential to contain microclimate refugia for amphibians and reptiles and high potential to contain microclimate refugia for mammals (Table 11).

RIO PUERCO



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*620.7*
Arid West Interior Freshwater Emergent Marsh	*1*	*91.8*
Barren	*N/A*	*7.8*
Cliff, Scree, and Rock Vegetation	*4*	*285.0*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*105.5*
Colorado Plateau Piñon-Juniper Woodland	*4*	*2254.6*
Desert Alkali-Saline Wetland	*1*	*68.6*
Developed and Urban	*N/A*	*853.7*
Intermountain Arroyo Riparian Scrub	*2*	*10.8*
Intermountain Dry Shrubland and Grassland	*2*	*2378.2*
Intermountain Dwarf Sagebrush Shrubland	*4*	*192.8*
Intermountain Saltbush Shrubland	*4*	*280.2*
Intermountain Tall Sagebrush Shrubland	*3*	*6403.5*
Introduced Riparian Vegetation	*5*	*169.6*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*372.4*
Open Water	*N/A*	*23.2*
Rocky Mountain Lower Montane Forest	*4*	*906.6*
Rocky Mountain Montane Riparian Forest	*1*	*310.3*
Rocky Mountain Montane Shrubland	*3*	*664.6*
Rocky Mountain Piñon-Juniper Woodland	*4*	*2409.1*
Rocky Mountain Subalpine-High Montane Conifer Forest	*4*	*2.1*
Rocky Mountain Subalpine-Montane Meadow and Grassland	*2*	*168.8*
Southwest Lowland Riparian Forest	*1*	*66.7*

Figure 20. Rio Puerco Conservation Opportunity Area.

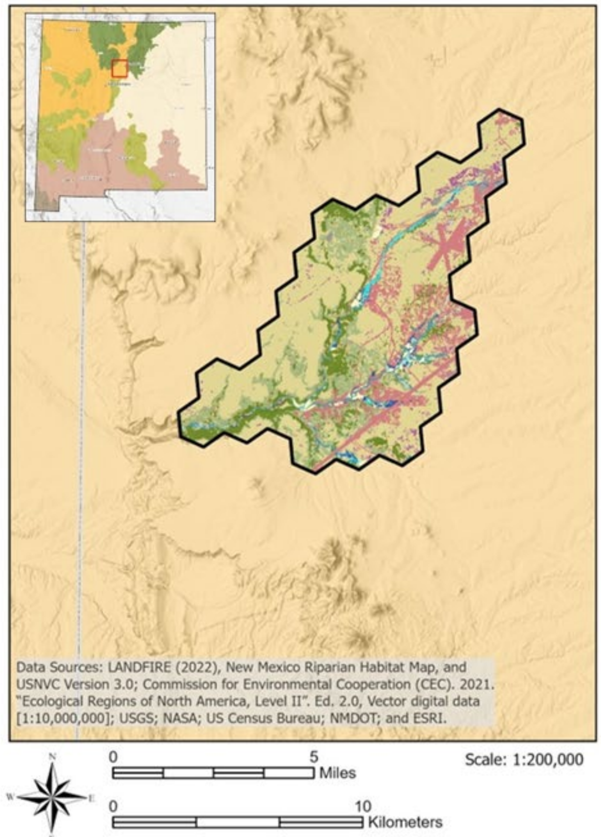
The Rio Puerco COA (Figure 20) covers approximately 18,647 ha (46,079 ac) and extends from about 8 km (5 mi) north of to approximately 25 km (16 mi) south of Cuba. It encompasses portions of the Rio Puerco and includes surrounding riparian and upland habitats.

The majority of this COA is privately owned (54%) and 34% is managed by the BLM. The remaining areas are managed by the USFS (6%), the SLO (5.5%), and less than 1% is Tribal land. Only 2% of the COA is currently protected.

The COA supports 17 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitat is Intermountain Tall Sagebrush Shrubland (34%), while Rocky Mountain Piñon-Juniper Woodland (13%), Intermountain Dry Shrubland and Grassland (13%), and Colorado Plateau Piñon-Juniper Woodland (12%) are also prevalent habitats, each representing relatively equal percentages across the COA. The riparian corridor, though relatively narrow, is primarily comprised of Montane-Subalpine Wet Shrubland and Wet Meadow (2% of total COA) and Rocky Mountain Montane Riparian Forest (2% of total COA). Perennial aquatic habitats within the COA include 33 km (21 mi) of warm-water streams and 53 km (33 mi) of cold-water streams.

A total of 33 SGCN are found (either observed or with potential habitat) within the COA, including seven classified as I and eight as Current Focal Species F (Appendix G). This COA has high potential to contain macroclimate refugia for terrestrial species and microclimate refugia for birds, cold-water fish, and mammals. It has some potential to contain macroclimate refugia for aquatic species (Table 11).

SANTA FE RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*105.9*
Arid West Interior Freshwater Emergent Marsh	*1*	*13.3*
Barren	*N/A*	*68.9*
Cliff, Scree, and Rock Vegetation	*4*	*20.0*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*235.0*
Colorado Plateau Piñon-Juniper Woodland	*4*	*36.3*
Desert Alkali-Saline Wetland	*1*	*88.7*
Developed and Urban	*N/A*	*1179.5*
Intermountain Arroyo Riparian Scrub	*2*	*25.5*
Intermountain Dry Shrubland and Grassland	*2*	*4729.1*
Intermountain Dwarf Sagebrush Shrubland	*4*	*8.3*
Intermountain Saltbush Shrubland	*4*	*30.2*
Intermountain Tall Sagebrush Shrubland	*3*	*1269.1*
Introduced Riparian Vegetation	*5*	*69.7*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*39.6*
Open Water	*N/A*	*10.1*
Rocky Mountain Lower Montane Forest	*4*	*0.1*
Rocky Mountain Montane Riparian Forest	*1*	*7.3*
Rocky Mountain Montane Shrubland	*3*	*81.8*
Rocky Mountain Piñon-Juniper Woodland	*4*	*862.4*
Southwest Lowland Riparian Forest	*1*	*188.9*

Figure 21. Santa Fe River Conservation Opportunity Area.

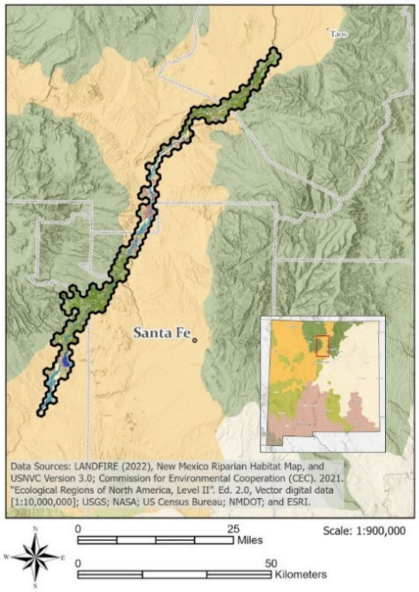
The Santa Fe River COA (Figure 21) spans approximately 9,060 ha (22,388 ac) and is located about 16 km (10 mi) southwest of Santa Fe. It includes portions of the Santa Fe River corridor and surrounding upland areas.

Approximately 55% of this COA is privately owned, 36% is managed by the BLM, 5.5% by the SLO, 2.5% by the USFS, and less than 1% is Tribal land. This COA also includes the Caja del Rio Important Bird Area and 40% of the COA is currently protected.

The COA supports 15 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitat is Intermountain Dry Shrubland and Grassland (52%), while Intermountain Tall Sagebrush Shrubland (14%) and Rocky Mountain Piñon-Juniper Woodland (10%) are also prevalent habitats in the COA. Additionally, 13% of the COA consists of developed and urban spaces. Perennial aquatic habitats within the COA include 27 km (17 mi) of warm-water streams.

A total of 26 SGCN are found (either observed or with potential habitat) within the COA, including seven classified as I and six as F (Appendix G). This COA has high potential to contain microclimate refugia for birds and mammals and some potential to contain microclimate refugia for amphibians (Table 11).

UPPER RIO GRANDE



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	2859.8
Arid West Interior Freshwater Emergent Marsh	1	229.8
Barren	N/A	51.6
Cliff, Scree, and Rock Vegetation	4	89.2
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	318.3
Colorado Plateau Piñon-Juniper Woodland	4	324.1
Desert Alkali-Saline Wetland	1	778.1
Developed and Urban	N/A	3768.8
Intermountain Arroyo Riparian Scrub	2	217.3
Intermountain Dry Shrubland and Grassland	2	5560.6
Intermountain Dwarf Sagebrush Shrubland	4	563.5
Intermountain Saltbush Shrubland	4	554.9
Intermountain Tall Sagebrush Shrubland	3	7361.2
Introduced Riparian Vegetation	5	706.1
Montane-Subalpine Wet Shrubland and Wet Meadow	1	415.2
Open Water	N/A	1196.1
Rocky Mountain Lower Montane Forest	4	238.3
Rocky Mountain Montane Riparian Forest	1	35.5
Rocky Mountain Montane Shrubland	3	1103.2
Rocky Mountain Piñon-Juniper Woodland	4	12865.8
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	65.7
Southwest Lowland Riparian Forest	1	2394.9
Southwest Lowland Riparian Shrubland	1	2.8

Figure 22. Upper Rio Grande Conservation Opportunity Area.

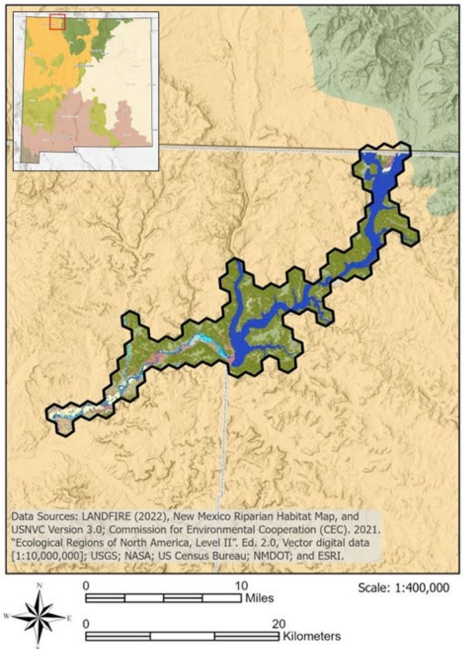
The Upper Rio Grande COA (Figure 22) spans approximately 41,676 ha (102,984 ac) and extends from the Pueblo of Santo Domingo to about 50 km (31 mi) upstream of Española. It encompasses portions of the Rio Grande corridor along with surrounding upland areas.

Land ownership within this COA is diverse, with 40% managed by Tribal entities. The BLM oversees 21% while 14% is privately owned. The NPS manages 10%, the USFS 9%, the US Department of Energy 4%, and the SLO 1%. This COA also encompasses two Important Bird Areas: Bandelier National Monument and Los Luceros. Approximately 40% of the COA is currently protected.

The COA supports 17 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitat is Rocky Mountain Piñon-Juniper Woodland (31%), followed by Intermountain Tall Sagebrush Shrubland (18%) and Intermountain Dry Shrubland and Grassland (13%), which are also prevalent upland habitats within the COA. The riparian corridor is primarily composed of Southwest Lowland Riparian Forest (6% of total COA). Additionally, given its relatively urban setting, this COA includes 9% developed and urban spaces and 7% agricultural vegetation. Perennial aquatic habitats within the COA include 71 km (44 mi) of warm-water streams, 84 km (52 mi) of cold-water streams, and 489 ha (1,209 ac) of warm-water reservoirs.

A total of 53 SGCN are found (either observed or with potential habitat) within the COA, including 13 classified as I and 10 as F (Appendix G). Upper and central portions of this COA may represent a climate refugia for the gray vireo (*Vireo vicinior*) through 2075, and areas directly east and west of this COA may become suitable for this species over the next 50 years (NHNM 2024). This COA has high potential to contain microclimate refugia for birds in general and mammals and some potential to contain microclimate refugia for amphibians and cold-water fish and macroclimate refugia for terrestrial species in general (Table 11).

UPPER SAN JUAN RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	528.6
Arid West Interior Freshwater Emergent Marsh	1	81.5
Barren	N/A	151.2
Cliff, Scree, and Rock Vegetation	4	100.1
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	243.5
Colorado Plateau Piñon-Juniper Woodland	4	10100.7
Desert Alkali-Saline Wetland	1	244.4
Developed and Urban	N/A	581.1
Intermountain Arroyo Riparian Scrub	2	98.4
Intermountain Dry Shrubland and Grassland	2	536.1
Intermountain Dwarf Sagebrush Shrubland	4	86.4
Intermountain Saltbush Shrubland	4	525.4
Intermountain Tall Sagebrush Shrubland	3	2211.0
Introduced Riparian Vegetation	5	202.9
Montane-Subalpine Wet Shrubland and Wet Meadow	1	140.6
Open Water		4423.0
Rocky Mountain Lower Montane Forest	4	0.6
Rocky Mountain Montane Riparian Forest	1	18.1
Rocky Mountain Montane Shrubland	3	53.2
Southwest Lowland Riparian Forest	1	195.5

Figure 23. Upper San Juan River Conservation Opportunity Area.

The Upper San Juan River COA (Figure 23) covers approximately 20,990 ha (51,866 ac) in the northwestern corner of the state. It begins about 17 km (11 mi) upstream of Bloomfield and extends along the San Juan River to the Colorado state line. This COA includes portions of the San Juan River corridor, its surrounding landscapes, and the Navajo Reservoir.

Approximately 41% of this COA is managed by the BOR, 31% by the BLM, and 21% is privately owned. The remaining 8% falls under the management of the SLO, while a negligible portion (<0.5%) is overseen by the Department. Only about 6% of the COA is currently protected.

The COA supports 14 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitat is Colorado Plateau Piñon-Juniper Woodland (48%), with Intermountain Tall Sagebrush Shrubland (11%) also prevalent in upland areas. Although relatively narrow within the COA, the riparian corridor primarily consists of Desert Alkali-Saline Wetland (1% of total COA), Introduced Riparian Vegetation (1% of total COA), and Southwest Lowland Riparian Forest (0.9% of total COA). Given the COA's proximity to urban areas, developed and urban spaces (3%) and agricultural vegetation (3%) are also somewhat common. Perennial aquatic habitats within the COA include 27 km (17 mi) of cold-water streams and 4,491 ha (11,096 ac) of cold-water reservoirs.

A total of 29 SGCN are found (either observed or with potential habitat) within the COA, including five classified as I and nine as F (Appendix G). This COA has high potential to contain microclimate refugia for reptiles and some potential to contain microclimate refugia for amphibians (Table 11).

Chapter 6: Southern Rocky Mountains Conservation Profile

SPECIES OF GREATEST CONSERVATION NEED (SGCN) AND THEIR HABITATS

The Southern Rocky Mountains ecoregion encompasses 26,479 km^2 (10,223 mi^2) and includes the Sangre de Cristo, Jemez, and San Juan Mountains in New Mexico. These ranges are at the southern end of a 144,349 km^2 (55,733 mi^2) contiguous segment that extends to southern Wyoming (CED 2021). In New Mexico, elevations range from 1,657-4,013 m (5,438-13,163 ft) (USGS 2024a); terrain is characterized by steep, rugged mountains, complex masses of peaks, and some intermontane valleys. The climate is mostly characterized as mid-latitude continental but is subarctic at high elevations. From 1991 to 2020, summers were cool to warm; winters were cold (averaging -2 ^oC [28 ^oF]). Precipitation averages for the same time period were 56 cm (22 in) (range: 25-120 cm [9-47 in]) (AdaptWest Project 2022). Precipitation occurs as snow in winter and thundershowers in summer.

One hundred and forty-two SGCN occur in the Southern Rocky Mountains ecoregion; almost half are birds (Table 17, Table 19). Most SGCN in the ecoregion fall within the Data Needs Species (60%), Conservation Impact Species (16%), or Current Focal Species (15%) categories.

Table 17. Number of Species of Greatest Conservation Need in the Southern Rocky Mountains ecoregion.

Taxon \ Category[21]	F	I	D	L	Total
Amphibians	2	2	0	0	4
Bees	0	0	1	1	2
Birds	8	7	51	5	71
Crustaceans	0	0	4	0	4
Fish	7	0	0	3	10
Mammals	4	2	16	2	24
Molluscs	0	0	11	0	11
Moths and Butterflies	0	11	1	3	15
Reptiles	0	1	2	0	3
Total	21	23	86	14	144

In the Southern Rocky Mountains ecoregion, there are 24 natural terrestrial habitats that cover 25,789 km^2 (9957 mi^2) or 97% of the landscape (Table 18, Figure 24). The remainder of the

[21]Category abbreviations are: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.

landscape contains miscellaneous land-cover types including agricultural vegetation (1%) and developed and urban (1%). There are eight natural habitats characteristic of this ecoregion and that comprise 85% of the area (see full descriptions in this ecoregion chapter). Below 2,400 m (7,800 ft), open-to-moderately closed stands of Rocky Mountain Piñon (*Pinus* spp.) – Juniper (*Juniperus* spp.) Woodland dominate the foothills and mesas. At mid elevations, these woodlands give way to Rocky Mountain Lower Montane Forest from about 2,400-3,000 m (7,800-9,800 ft) elevation. From approximately 3,000-3,500 m (9,800-11,500 ft) elevation, the mountain slopes are typically dominated by dense stands of Rocky Mountain Subalpine-High Montane Conifer Forest (including aspen [*Populus* spp.]) that border on Rocky Mountain Alpine Vegetation consisting of low shrubs, sedges, and krummholz (conifer trees shaped by heavy, persistent winds). Intermixed among the forests and woodlands are Rocky Mountain Montane Shrubland and Rocky Mountain Subalpine-Montane Meadow and Grassland and with riparian and wetland habitats (Rocky Mountain Montane Riparian Forest and Montane-Subalpine Wet Shrubland and Wet Meadow).

This ecoregion contains 62% of cold-water habitats and almost half of all lakes and reservoirs in New Mexico (Figure 25). The 47 waterbodies are all cold water and cover 3,987 ha (9,852 ac). Three reservoirs (Heron, El Vado, Eagle Nest) account for 91% of the total water-surface area in the ecoregion. The Southern Rocky Mountains also contain 4,736 km (2,943 mi) of streams (35% of the total length for New Mexico), 86% of which are cold-water habitats (59% of the statewide total).

Table 18. Terrestrial habitat types of the Southern Rocky Mountains ecoregion.

Habitat Category	USNVC Code	Habitat name[22]	Tier[23]	Climate Vulnerability[24]	Area (km^2)	(mi^2)
Alpine and Montane Vegetation	M547	Rocky Mountain Subalpine-Montane Meadow and Grassland	2	Low→Moderate	1,664	642
	M099	Rocky Mountain Alpine Vegetation	3	--	35	14
	M049	Rocky Mountain Montane Shrubland	3	Moderate	1,091	421
	M896	Colorado Plateau Piñon-Juniper Woodland	4	Low→Moderate	1,123	434
	M022	Rocky Mountain Lower Montane Forest	4	Low→Moderate	12,650	4,884
	M897	Rocky Mountain Piñon-Juniper Woodland	4	Moderate	3,250	1,255
	M020	Rocky Mountain Subalpine-High Montane Conifer Forest	4	Moderate	2,902	1,120
Plains-Mesa Grasslands	M051	Great Plains Mixedgrass Prairie	2	--	30	12
	M053	Great Plains Shortgrass Prairie	3	Moderate	18	7
Desert Grassland and Scrub	M171	Intermountain Dry Shrubland and Grassland	2	Low→High	282	109
	M169	Intermountain Tall Sagebrush Shrubland	3	Low→Moderate	1,660	641
	M170	Intermountain Dwarf Sagebrush Shrubland	4	Low→Moderate	20	8
	M093	Intermountain Saltbush Shrubland	4	--	22	8
	M499	Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	--	11	4

[22] Terrestrial habitats are based on macrogroups of the United States Natural Vegetation Classification system (USNVC Version 3.0; https://usnvc.org/) except for the four Other Land Cover types; links to USNVC macrogroup descriptions are provided in the USNVC code column. Areas for upland habitat types are based on the 2022 LandFire Existing Vegetation Map for the continental US (LANDFIRE 2022), which was quality controlled by Natural Heritage New Mexico. Ecological systems in LANDFIRE (2022) were cross-walked to USNVC macrogroups. Areas for riparian vegetation types are based on the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap), also aggregated to macrogroups and embedded in the LANDFIRE (2022) map. Habitats listed in order by Tier (see below) and then alphabetically.

[23]Tiers reflect the priority for conservation and are based on the degree of imperilment within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. Ranks: N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure. Spatial patterns: linear, small patch, large patch, and matrix. Tier 1: N1, N2, N3 small patch/linear; Tier 2: N3 large patch or N4 small patch/linear; Tier 3: N3 matrix or N4 large patch; Tier 4: N4 matrix; Tier 5: N5 ruderal vegetation linear/large patch.

[24] Climate vulnerability levels were based on a vulnerability analysis performed for Ecological Response Units (ERUs) across New Mexico and Arizona (Triepke et al. (2014). The ERU classification system represents major ecosystem types of the southwest. Vulnerability for each ERU was calculated as the relative probability of type conversion. The ERUs were then cross-walked to the habitats shown here.

Habitat Category	USNVC Code	Habitat name[22]	Tier[23]	Climate Vulnerability[24]	Area (km^2)	(mi^2)
Arroyo Riparian	M095	Intermountain Arroyo Riparian Scrub	2	--	2	1
Riparian Woodlands and Wetlands	M888	Arid West Interior Freshwater Emergent Marsh	1	--	5	2
	M082	Desert Alkali-Saline Wetland	1	--	9	3
	M071	Great Plains Wet Meadow, Marsh, and Playa	1	--	4	1
	M893	Montane-Subalpine Wet Shrubland and Wet Meadow	1	--	499	193
	M034	Rocky Mountain Montane Riparian Forest	1	--	399	154
	M036	Southwest Lowland Riparian Forest	1	--	16	6
	M076	Southwest Lowland Riparian Shrubland	1	--	2	1
	M298	Introduced Riparian Vegetation	5	--	9	4
Cliff, Scree, and Rock Vegetation	M887	Cliff, Scree, and Rock Vegetation	4	Moderate→High	86	33
Other Land Cover	N/A	Agricultural Vegetation	5	--	307	119
	N/A	Barren	5	--	22.30	8.61
	N/A	Developed and Urban	5	--	291	112
	N/A	Open Water	5	--	54	21

Table 19. Species of Greatest Conservation Need (SGCN) in the Southern Rocky Mountains ecoregion.

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Boreal Chorus Frog	*Pseudacris maculata*	Amphibians	I	C, De, Di, V	EC, EMCS, M020, M022, M034, M036, M051, M071, M076, M547, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWS
Boreal Toad	*Anaxyrus boreas boreas*	Amphibians	F	C, De, Di, V	EC, M020, M022, M034, M171, M547, M888, M893, M896, PCWS, PLCP, PMCSS, PWWS
Jemez Mountains Salamander	*Plethodon neomexicanus*	Amphibians	F	C, De, Di, E, V	M020, M022, M034, M099, M547, M887
Northern Leopard Frog	*Lithobates pipiens*	Amphibians	I	C, De, Di, V	EC, EMCS, M020, M022, M034, M049, M071, M298, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWS
Mighty Leaf-cutter Bee	*Megachile fortis*	Bees	L	V	M022
Western Bumble Bee	*Bombus occidentalis*	Bees	D	De, V	M022, M049, M053, M099, M171, M897

[25] Hyperlinks are to species booklets in the Biota Information System of New Mexico (https://bison-m.org/) for each SGCN in the Southern Rocky Mountains ecoregion. Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.
[26] Reason to include indicates which of five criteria for inclusion on the SGCN list a particular species met. Abbreviations are as follows: C = Climate Change Vulnerability; De = Decline; Di= Disjunct; E = Endemic; K = Keystone; V = Vulnerable.
[27] Aquatic habitat abbreviations are as follows: PCWS = Perennial Cold-Water Streams; PWWS = Perennial Warm-Water Streams; PLCP = Perennial Lakes, Cirques, Ponds; PMCSS = Perennial Marshes/Cienegas/Springs/Seeps; PCWR = Perennial Cold-Water Reservoirs; EMCS = Ephemeral Marshes/Cienegas/Springs; EC = Ephemeral Catchments. Habitat codes refer to United States National Vegetation Classification System designations, which are identified in Table 18 above.

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
American Dipper	*Cinclus mexicanus unicolor*	Birds	D	C, V	EC, M034, M893, PCWR, PCWS, PLCP, PWWS
American Kestrel	*Falco sparverius sparverius*	Birds	D	De, V	EMCS, M020, M022, M034, M036, M049, M051, M053, M071, M076, M095, M169, M170, M171, M547, M888, M893, M896, M897, PMCSS
American Pipit	*Anthus rubescens*	Birds	D	V	EC, M020, M036, M076, M099, PCWS, PWWS
American Tree Sparrow	*Spizelloides arborea ochracea*	Birds	D	C, De, V	M036, M053, M076, M099, M169, M170, M896, M897
Bald Eagle	*Haliaeetus leucocephalus*	Birds	D	C, Di, V	EC, EMCS, M020, M022, M034, M036, M049, M051, M053, M071, M076, M082, M093, M099, M169, M170, M171, M547, M887, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS
Band-tailed Pigeon	*Patagioenas fasciata*	Birds	D	De, V	EC, M020, M022, M034, M036, M049, M076, M169, M170, M893, M896, M897, PCWS, PWWS
Bank Swallow	*Riparia riparia riparia*	Birds	D	C, De, Di, V	EC, EMCS, M034, M036, M071, M076, M888, PCWR, PCWS, PMCSS, PWWS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Black Rosy-Finch	*Leucosticte atrata*	Birds	F	C, De, Di, V	M020, M022, M099, M169, M170, M547, M896, M897
Black Swift	*Cypseloides niger*	Birds	L	C, De, Di, V	EC, EMCS, M020, M022, M034, M547, M887, M888, M893, M897, PCWS, PMCSS
Black-billed Magpie	*Pica hudsonia*	Birds	D	De, V	EMCS, M034, M036, M049, M053, M071, M076, M093, M169, M170, M888, M893, PMCSS
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	D	C, V	M020, M022, M034, M036, M049, M076, M095, M171, M887, M893, M896, M897
Boreal Owl	*Aegolius funereus*	Birds	L	C, V	M020, M022, M547, M893
Broad-tailed Hummingbird	*Selasphorus platycercus platycercus*	Birds	D	De, V	M020, M022, M034, M036, M049, M051, M053, M076, M095, M169, M170, M547, M893, M896, M897
Brown-capped Rosy-Finch	*Leucosticte australis*	Birds	F	C, De, Di, V	M020, M022, M051, M099, M169, M170, M547, M887, M897
Bullock's Oriole	*Icterus bullockii*	Birds	D	C, De, V	EC, EMCS, M034, M036, M071, M076, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
[Burrowing Owl]()	*Athene cunicularia hypugaea*	Birds	I	C, De, K, V	M036, M051, M053, M071, M076, M082, M093, M169, M170, M171, M547, M887, M896, M897
[Canyon Towhee]()	*Melozone fusca*	Birds	D	De, V	M034, M036, M049, M053, M076, M095, M169, M170, M547, M896, M897
[Cassin's Finch]()	*Haemorhous cassinii*	Birds	D	C, De, K, V	M020, M022, M034, M036, M076, M169, M887, M893, M896, M897
[Chipping Sparrow]()	*Spizella passerina arizonae*	Birds	D	C, De, K, V	EMCS, M020, M022, M034, M036, M049, M051, M053, M071, M076, M095, M169, M170, M171, M547, M888, M893, M896, M897, PMCSS
[Clark's Nutcracker]()	*Nucifraga columbiana*	Birds	D	C, De, V	EC, M020, M022, M034, M547, M893, M896, M897, PCWS, PWWS
[Common Nighthawk]()	*Chordeiles minor*	Birds	D	C, De, V	EC, EMCS, M020, M022, M034, M036, M049, M051, M053, M071, M076, M095, M169, M170, M171, M547, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Evening Grosbeak	*Coccothraustes vespertinus*	Birds	D	C, De, V	M020, M022, M034, M036, M049, M076, M169, M170, M887, M893, M896, M897
Ferruginous Hawk	*Buteo regalis*	Birds	D	C, Di, V	EMCS, M022, M036, M051, M053, M071, M076, M095, M169, M170, M171, M547, M887, M888, M896, M897, PMCSS
Flammulated Owl	*Psiloscops flammeolus*	Birds	D	C, V	M020, M022, M034, M036, M049, M053, M076, M170, M298, M547, M887, M893, M896, M897
Golden Eagle	*Aquila chrysaetos canadensis*	Birds	D	C, Di, V	EC, EMCS, M020, M022, M034, M036, M051, M053, M071, M076, M095, M169, M170, M171, M547, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS
Grace's Warbler	*Setophaga graciae*	Birds	I	C, De, V	M020, M022, M034, M036, M049, M076, M887, M893, M896, M897
Gray Vireo	*Vireo vicinior*	Birds	I	C, De, Di, V	M022, M034, M036, M049, M051, M082, M093, M169, M171, M887, M896, M897

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	Birds	F	C, Di, V	M020, M099
Green-tailed Towhee	*Pipilo chlorurus*	Birds	D	C, De, V	EC, EMCS, M020, M022, M034, M036, M049, M053, M071, M076, M095, M169, M170, M171, M547, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWS
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	C, De, V	M020, M022, M034, M036, M049, M051, M053, M076, M169, M170, M547, M887, M893, M896, M897
Killdeer	*Charadrius vociferus vociferus*	Birds	D	De, Di, V	EC, EMCS, M051, M053, M071, M095, M169, M170, M171, M888, PCWR, PCWS, PMCSS, PWWS
Lark Sparrow	*Chondestes grammacus strigatus*	Birds	D	C, De, V	EMCS, M036, M051, M053, M071, M076, M095, M169, M170, M171, M547, M888, M896, M897, PMCSS
Lazuli Bunting	*Passerina amoena*	Birds	L	De, V	EC, EMCS, M034, M036, M049, M071, M076, M095, M169, M170, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Lewis's Woodpecker	*Melanerpes lewis*	Birds	D	C, De, V	M020, M022, M034, M036, M076, M169, M170, M893, M896, M897
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	C, De, V	M034, M036, M049, M051, M053, M076, M082, M093, M095, M169, M170, M171, M298, M547, M887, M896, M897
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	C, De, Di, V	M020, M022, M034, M036, M049, M547, M887, M888, M893
Mountain Bluebird	*Sialia currucoides*	Birds	D	C, De, V	EMCS, M020, M022, M034, M036, M049, M051, M053, M071, M076, M099, M169, M170, M171, M547, M887, M888, M893, M896, M897, PMCSS
Mountain Chickadee	*Poecile gambeli gambeli*	Birds	D	C, De, V	M020, M022, M034, M036, M076, M547, M893, M896, M897
Mountain Plover	*Charadrius montanus*	Birds	F	C, De, Di, V	EC, M051, M053, M071, M082, M093, M169, M170, M171, M499, M547, PCWS, PWWS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Northern Harrier	*Circus hudsonius*	Birds	D	Di, V	EC, EMCS, M034, M036, M051, M053, M071, M076, M095, M099, M169, M170, M171, M547, M888, M893, M896, M897, PCWR, PCWS, PMCSS, PWWS
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Birds	D	De, V	EC, EMCS, M034, M036, M071, M076, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWS
Olive-sided Flycatcher	*Contopus cooperi*	Birds	D	C, De, V	M020, M022, M034, M036, M076, M887, M893, M896, M897
Peregrine Falcon	*Falco peregrinus*	Birds	D	C, De, Di, V	EC, EMCS, M020, M022, M034, M036, M049, M051, M053, M071, M076, M082, M099, M169, M170, M547, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS
Pine Grosbeak	*Pinicola enucleator montana*	Birds	D	C, De, V	M020, M022
Pine Siskin	*Spinus pinus*	Birds	D	C, De, V	M020, M022, M034, M036, M049, M076, M095, M169, M170, M547, M893, M896, M897

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	F	C, De, K, V	EMCS, M020, M022, M034, M049, M051, M071, M095, M169, M170, M171, M887, M893, M896, M897, PMCSS
Plumbeous Vireo	*Vireo plumbeus*	Birds	D	C, De, V	M020, M022, M034, M036, M049, M076, M893, M896, M897
Prairie Falcon	*Falco mexicanus*	Birds	D	C, De, Di, V	EC, EMCS, M022, M034, M036, M051, M053, M076, M095, M099, M169, M170, M171, M547, M887, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWS
Pygmy Nuthatch	*Sitta pygmaea melanotis*	Birds	D	C, De, V	M020, M022, M034, M049, M076, M887, M893, M897
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	Birds	L	De, V	M036, M076
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Birds	D	C, V	M020, M022, M034, M036, M049, M076, M095, M893, M896, M897
Sage Thrasher	*Oreoscoptes montanus*	Birds	D	C, De, V	M036, M053, M076, M095, M169, M170, M547, M896, M897

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Birds	D	C, De, V	M049, M051, M053, M082, M093, M095, M169, M170, M171, M547, M887
Savannah Sparrow	*Passerculus sandwichensis*	Birds	D	C, De, V	EC, EMCS, M051, M053, M169, M170, M171, M547, M888, M896, M897, PCWS, PMCSS
Short-eared Owl	*Asio flammeus flammeus*	Birds	D	C, De, V	EMCS, M071, M095, M099, M888, PMCSS
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	I	C, De, V	EC, EMCS, M034, M036, M071, M076, M082, M298, M547, M888, M893, PCWS, PLCP, PMCSS, PWWS
Spotted Towhee	*Pipilo maculatus*	Birds	D	C, De, V	M020, M022, M034, M036, M049, M076, M095, M169, M170, M893, M896, M897
Steller's Jay	*Cyanocitta stelleri macrolopha*	Birds	D	De, V	EC, M020, M022, M034, M036, M076, M095, M893, M896, M897, PCWS
Vesper Sparrow	*Pooecetes gramineus*	Birds	D	C, De, V	EMCS, M036, M049, M051, M053, M071, M076, M095, M169, M170, M171, M499, M547, M888, M896, M897, PMCSS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Violet-green Swallow	*Tachycineta thalassina lepida*	Birds	D	C, De, Di, V	EC, EMCS, M020, M022, M034, M036, M049, M053, M071, M076, M095, M170, M547, M887, M888, M893, M896, M897, PCWR, PCWS, PMCSS, PWWS
Virginia's Warbler	*Leiothlypis virginiae*	Birds	F	C, De, V	M020, M022, M034, M036, M049, M053, M076, M095, M169, M170, M547, M893, M896, M897
Western Bluebird	*Sialia mexicana bairdi*	Birds	D	C, V	M020, M022, M034, M036, M049, M051, M076, M095, M169, M170, M171, M547, M887, M893, M896, M897
Western Grebe	*Aechmophorus occidentalis*	Birds	D	De, V	EC, EMCS, M071, M888, PCWR, PCWS, PLCP, PMCSS
Western Wood Pewee	*Contopus sordidulus*	Birds	D	C, De, V	M020, M022, M036, M049, M076, M095, M896, M897
White-tailed Ptarmigan	*Lagopus leucura altipetens*	Birds	F	C, De, V	M099, M547, M893

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
White-throated Swift	*Aeronautes saxatalis saxatalis*	Birds	D	C, Di, V	EC, EMCS, M020, M022, M034, M036, M053, M071, M076, M095, M169, M170, M547, M887, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWS
Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	Birds	D	C, K, V	M020, M022, M034, M036, M076, M887, M893, M896, M897
Wilson's Warbler	*Cardellina pusilla*	Birds	L	C, De, V	EC, EMCS, M020, M022, M034, M036, M071, M076, M095, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWS
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	I	V	EMCS, M020, M022, M034, M036, M049, M076, M095, M169, M170, M547, M888, M893, M896, M897, PMCSS
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	F	C, De, Di, V	EC, EMCS, M034, M036, M071, M298, PCWS, PMCSS, PWWS
Yellow-billed Cuckoo	*Coccyzus americanus americanus*	Birds	D	C, De, V	M034, M036, M298, PCWS
Colorado Fairy Shrimp	*Branchinecta coloradensis*	Crustaceans	D	V	EC, M020, PCWR, PCWS, PLCP, PWWS
Knobblip Fairy Shrimp	*Eubranchipus bundyi*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Scud	*Hyalella azteca*	Crustaceans	D	C, V	EC, PCWR, PCWS, PLCP, PWWS
Versatile Fairy Shrimp	*Branchinecta lindahli*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWS
Arkansas River Shiner	*Notropis girardi*	Fish	F	C, De, Di, V	EC, PCWS, PWWS
Colorado Pikeminnow	*Ptychocheilus lucius*	Fish	F	C, De, Di, V	EC, PCWR, PCWS, PLCP, PWWS
Mottled Sculpin	*Cottus bairdii*	Fish	L	C, V	PCWS
Plains Minnow	*Hybognathus placitus*	Fish	L	C, De, Di, V	PWWS
Rio Grande Chub	*Gila pandora*	Fish	F	C, De, Di, V	PCWR, PCWS, PWWS
Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	Fish	F	C, De, Di, V	PCWS
Rio Grande Sucker	*Catostomus plebeius*	Fish	F	C, De, V	PCWS, PWWS
Roundtail Chub	*Gila robusta*	Fish	F	C, De, Di, V	PCWS, PWWS
Sonora Sucker	*Catostomus insignis*	Fish	F	C, V	PWWS
Southern Redbelly Dace	*Chrosomus erythrogaster*	Fish	L	C, De, V	PCWS
American Mink	*Neogale vison*	Mammals	D	C, Di, V	EC, EMCS, M034, M036, M071, M076, M888, M893, PCWS, PMCSS, PWWS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
American Pika	*Ochotona princeps*	Mammals	L	C, De, Di, V	M020, M022, M099, M547, M887
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	D	C, De, K, V	M053, M095, M169, M170, M171, M896
Big Free-tailed Bat	*Nyctinomops macrotis*	Mammals	D	C, Di, V	EMCS, M022, M034, M036, M049, M076, M095, M171, M887, M888, M893, M896, M897, PMCSS
Black-footed Ferret	*Mustela nigripes*	Mammals	F	C, De, V	M020, M022, M049, M051, M053, M169, M170, M171, M499, M897
Canada Lynx	*Lynx canadensis*	Mammals	L	C, De, Di, V	M020, M034, M099, M887, M893
Common Porcupine	*Erethizon dorsatum*	Mammals	D	C, De, Di, V	M020, M022, M034, M036, M049, M051, M053, M076, M095, M099, M169, M170, M171, M887, M896, M897
Ermine Weasel	*Mustela richardsonii*	Mammals	D	C, De, Di, V	EMCS, M020, M022, M034, M049, M099, M547, M887, M893, PMCSS
Fringed Myotis	*Myotis thysanodes thysanodes*	Mammals	I	C, Di, K, V	EMCS, M022, M034, M036, M049, M051, M053, M076, M171, M887, M888, M893, M896, M897, PMCSS

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Gunnison's prairie dog	*Cynomys gunnisoni*	Mammals	F	C, De, K, V	M020, M022, M049, M051, M053, M093, M095, M169, M170, M171, M499, M547, M896, M897
Heather Vole	*Phenacomys intermedius intermedius*	Mammals	D	C, De, Di, V	M020, M022, M034, M049, M099, M547, M893
New Mexico Jumping Mouse	*Zapus hudsonius luteus (= Zapus luteus luteus)*	Mammals	I	C, De, Di, V	EMCS, M020, M022, M034, M036, M053, M076, M547, M888, M893, M896, M897, PCWS, PMCSS, PWWS
North American River Otter	*Lontra canadensis*	Mammals	F	C, De, V	EC, EMCS, M022, M036, M053, M076, M169, M170, M171, M547, M888, M896, PCWS, PMCSS, PWWS
Pacific Marten	*Martes caurina*	Mammals	F	C, De, Di, K, V	M020, M022, M034, M049, M099, M547, M887, M893
Prairie Vole	*Microtus ochrogaster haydenii*	Mammals	D	C, V	EMCS, M051, M053, M071, M888, PMCSS
Snowshoe Hare	*Lepus americanus bairdii*	Mammals	D	C, De, V	M020, M034, M099, M547, M893
Southern Red-backed Vole	*Myodes gapperi*	Mammals	D	C, V	M020, M022, M034, M099, M547, M887, M893

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Southwestern Little Brown Myotis	*Myotis occultus*	Mammals	D	C, Di, V	EMCS, M020, M022, M034, M036, M049, M051, M053, M071, M076, M095, M169, M170, M171, M547, M887, M888, M893, M896, M897, PMCSS
Spotted Bat	*Euderma maculatum*	Mammals	D	Di, V	EMCS, M020, M022, M034, M036, M049, M053, M071, M076, M095, M169, M170, M171, M298, M547, M887, M888, M893, M896, M897, PMCSS
Thirteen-lined Ground Squirrel	*Ictidomys tridecemlineatus*	Mammals	D	De, V	M051, M053, M171, M547
Western Jumping Mouse	*Zapus princeps princeps*	Mammals	D	De, V	EMCS, M020, M022, M034, M547, M893, PMCSS
Western Water Shrew	*Sorex navigator*	Mammals	D	C, De, V	EMCS, M020, M034, M893, PCWS
White-tailed Jackrabbit	*Lepus townsendii campanius*	Mammals	D	C, V	M020, M022, M099, M169, M170, M171, M547
Yellow-bellied Marmot	*Marmota flaviventris*	Mammals	D	C, De, Di, V	M020, M022, M034, M099, M547, M887
Jemez Woodlandsnail	*Ashmunella ashmuni*	Molluscs	D	C, Di, E, V	M020, M022, M034, M887, M897

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Lake Fingernailclam	*Musculium lacustre*	Molluscs	D	C, V	PCWS
Lilljeborg's Peaclam	*Pisidium lilljeborgi*	Molluscs	D	C, V	PLCP
Long Fingernailclam	*Musculium transversum*	Molluscs	D	C, V	PWWS
Multirib Vallonia Snail	*Vallonia gracilicosta*	Molluscs	D	C, Di, V	M020, M022
Rocky Mountainsnail	*Oreohelix strigosa depressa*	Molluscs	D	C, Di, V	M020, M022
Ruidoso Snaggletooth Snail	*Gastrocopta ruidosensis*	Molluscs	D	C, Di, V	M022, M049
Sangre de Cristo Woodlandsnail	*Ashmunella thomsoniana*	Molluscs	D	C, Di, V	M020, M022, M034, M897
Socorro Mountainsnail	*Oreohelix neomexicana*	Molluscs	D	C, Di, V	M020, M022, M887, M896, M897
Star Gyro	*Gyraulus crista*	Molluscs	D	C, V	EMCS, M071, M888, PCWS, PMCSS
Wrinkled Marshsnail	*Stagnicola caperata*	Molluscs	D	C, V	EMCS, M888, PCWS, PMCSS, PWWS
Anicia Checkerspot	*Euphydryas anicia*	Moths and Butterflies	I	C, V	M020, M022, M049
Capulin Mountain Alberta Arctic	*Oeneis alberta capulinensis*	Moths and Butterflies	I	C, De, Di, V	M547
Colorado Melissa Arctic	*Oeneis melissa lucilla*	Moths and Butterflies	I	C, De, V	M099, M887

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
Colorado Rita Dotted-blue	*Euphilotes rita coloradensis*	Moths and Butterflies	I	C, De, V	M051, M053, M896, M897
Magdalena Alpine Butterfly	*Erebia magdalena magdalena*	Moths and Butterflies	I	C, V	M099
Monarch	*Danaus plexippus*	Moths and Butterflies	L	C, De, Di, V	M020, M022, M034, M036, M049, M051, M053, M082, M169, M170, M171, M298, M888, M897
Raton Mesa Boisduval's Blue	*Icaricia icarioides nigrafem*	Moths and Butterflies	I	C, V	M022, M049, M897
Raton Mesa Northwestern Fritillary	*Argynnis hesperis ratonensis*	Moths and Butterflies	I	V	M022, M049, M896, M897
Raton Mesa Silvery Blue	*Glaucopsyche lygdamus erico*	Moths and Butterflies	I	C, De, V	M022, M049, M053, M896, M897
Rhena Crossline Skipper	*Polites origenes rhena*	Moths and Butterflies	L	C, V	M022
Rocky Mountain Polixenes Arctic	*Oeneis polixenes brucei*	Moths and Butterflies	I	C, De, V	M099
Sacramento Mountains Borer Moth	*Papaipema dribi*	Moths and Butterflies	D	E, V	
Snow's Lustrous Copper	*Lycaena cupreus snowi*	Moths and Butterflies	I	C, V	M099

Common Name[25]	Scientific Name	Taxon	Category	Reason to Include[26]	Habitats[27]
West Coast Lady	*Vanessa annabella*	Moths and Butterflies	L	De, V	M020, M022, M049, M053, M169, M171, M897
Western Hobomok Skipper	*Lon hobomok wetona*	Moths and Butterflies	I	C, V	M022, M049, M896, M897
North American Racer	*Coluber constrictor*	Reptiles	D	C, De, Di, V	M022, M036, M051, M053, M076, M095, M170, M547, M896, M897
Ornate Box Turtle	*Terrapene ornata*	Reptiles	I	C, V	M036, M051, M053, M076, M095, M896, M897
Plains Gartersnake	*Thamnophis radix*	Reptiles	D	V	EC, EMCS, M071, PCWR, PCWS, PLCP, PMCSS, PWWS

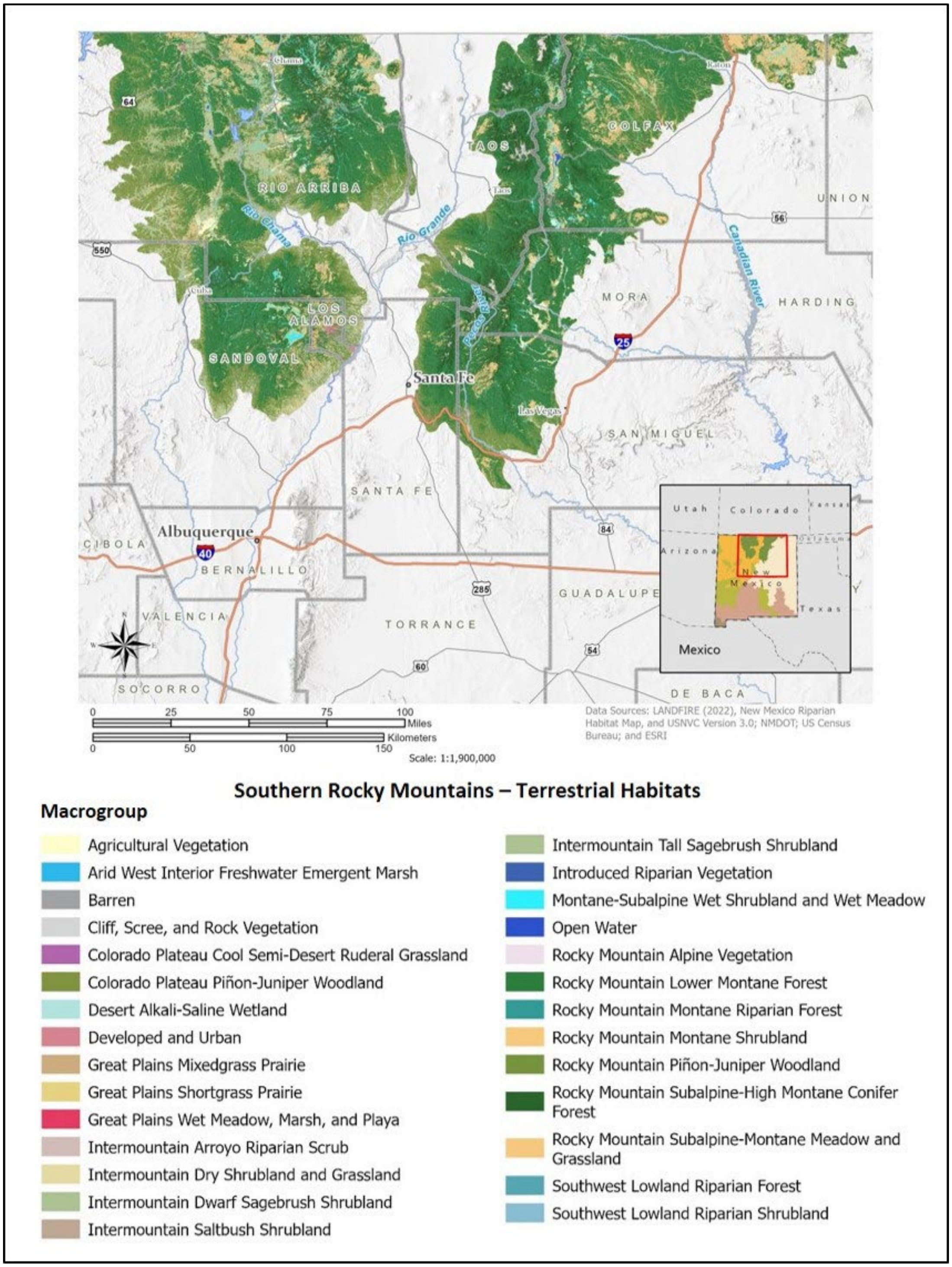


Figure 24. Terrestrial habitats in the Southern Rocky Mountains ecoregion.

Map based on LandFire 2022 Existing Vegetation Map (LANDFIRE 2022) crosswalked to macrogroups from the United States National Vegetation Classification system and on vegetation types from the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap) grouped to macrogroups.

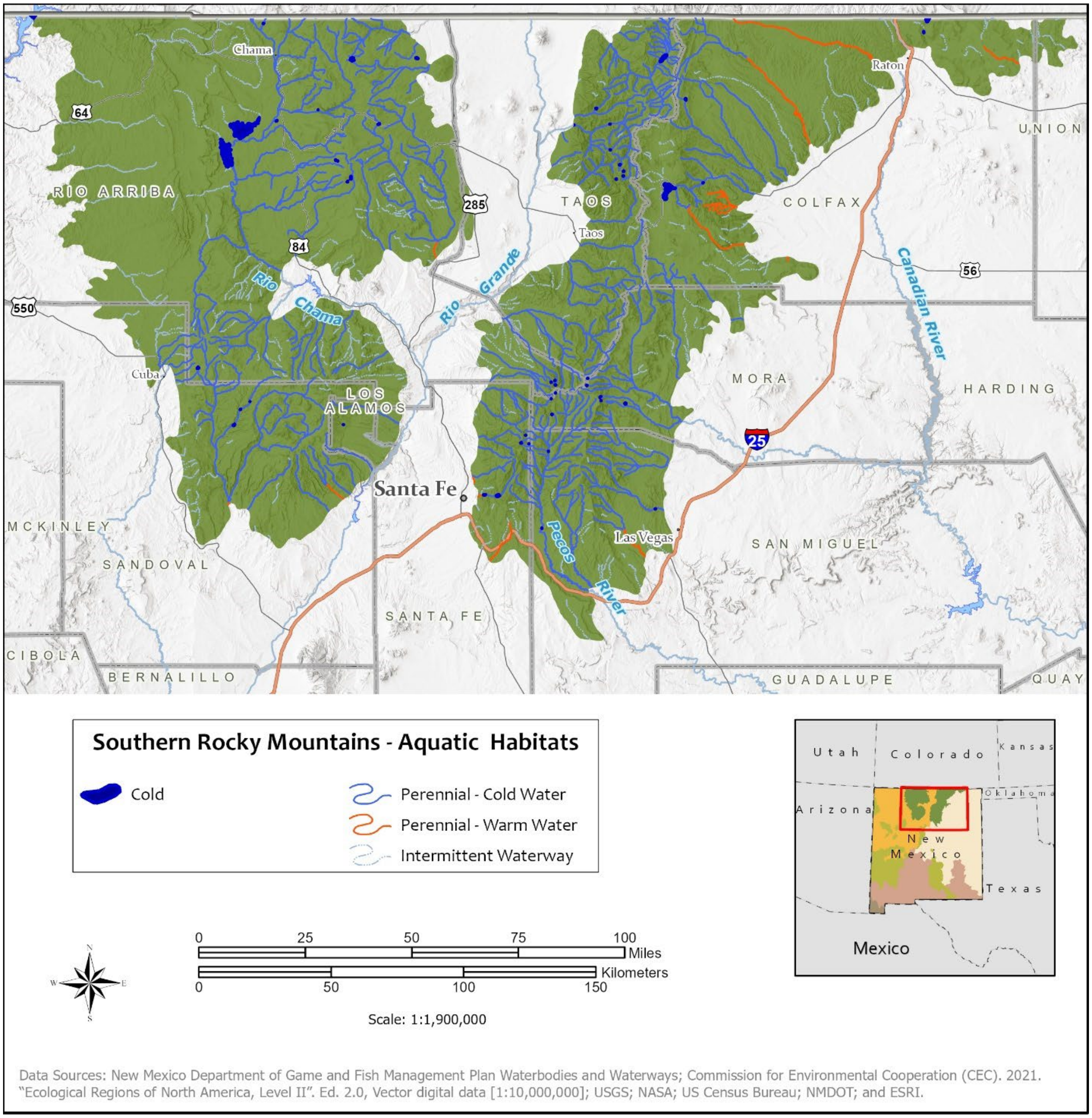


Figure 25. Aquatic habitats in the Southern Rocky Mountains ecoregion.

HABITAT DESCRIPTIONS

ROCKY MOUNTAIN LOWER MONTANE FOREST

The Rocky Mountain Lower Montane Forest **[M022]**[28] is a mid-elevation(2,350-3300 m [7,700-10800 ft]) forest, woodland, and savanna habitat that occurs primarily in the Southern Rocky Mountains and Arizona/New Mexico Mountains ecoregions with scattered occurrences in the Colorado Plateaus, High Plains and Tablelands, and Chihuahuan Desert ecoregions. This habitat is composed of mixed-conifer and ponderosa pine (*Pinus ponderosa*) forests that encompass much of the mid-elevations of New Mexico's mountains.

- Characteristic trees are predominantly conifers and include white fir (A*bies concolor*), Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine, blue spruce (*Picea pungens*), southwestern white pine (*Pinus strobiformis*), with Rocky Mountain juniper (*Juniperus scopulorum*) in the sub-canopy. Cold-deciduous trees can be co-dominants in the canopy, including quaking aspen (*Populus tremuloides*), Gambel oak (*Quercus gambelii*), and bigtooth maple (*Acer grandidentatum*). At the lower-elevation margins, two-needle piñon (*Pinus edulis*) and one-seed juniper (*J. monosperma*) may be present in the subcanopy.
- Cold-deciduous, broad-leaved shrubs can be common in the undergrowth, e.g., Rocky Mountain maple (*A. glabrum*)*,* the shrub form of Gambel oak, rockspirea (*Holodiscus dumosus*), fivepetal cliffbush (*Jamesia americana*)*,* mountain snowberry (*Symphoricarpos oreophilus*), and New Mexico locust (*Robinia neomexicana*). The conifer common juniper (*J. communis*) can be a common subshrub, particularly on drier sites.
- In closed-canopy conditions, the understory may be sparse with only scattered occurrences of grasses and subshrubs such as Ross' sedge (*Carex rossii*) and creeping barberry (*Mahonia repens*), respectively. Under more open canopies, grasses can be abundant, leading to the formation of savanna-like woodlands. Representative grasses include mountain muhly (*Muhlenbergia montana*), blue grama (*Bouteloua gracilis*), and Arizona fescue (*Festuca arizonica*). On more moist and cool sites, mesic forbs and grasses can be abundant, including fringed brome (*Bromus ciliatus*), woodland strawberry (*Fragaria vesca*), Fendler's meadow-rue (*Thalictrum fendleri*), and American vetch (*Vicia americana*).
- This widespread forest habitat occurs across a broad range of soils, geology, and topography, from mesa tops and foothills to steep, north-facing slopes and ridges. Fire regimes vary from mixed severity (surface and canopy fires) to low severity (mostly frequent

[28] Complete descriptions of habitats can be viewed by clicking on hyperlinked United States National Vegetation Classification System codes.

surface fires in savannas). In general, fire suppression has led to encroachment of more shade-tolerant, less fire-tolerant species, resulting in an associated increase in fire hazard.

ROCKY MOUNTAIN PIÑON-JUNIPER WOODLAND

The Rocky Mountain Piñon-Juniper Woodland **[M897]** occurs at 1,980-2,600 m (6,500-8,500 ft) in elevation as an open savanna to closed-canopy woodland in dry mountains and foothills of the Southern Rocky Mountains, Arizona/New Mexico Mountains, Colorado Plateaus, and High Plains and Tablelands ecoregions.

- The canopies are characterized by shorter, dwarf conifer trees (3-15 m [9.8-49.2 ft] tall), with tree canopies from 10% to more than 60% cover. These include one-seed juniper and/or two-needle piñon with Rocky Mountain juniper replacing one-seed juniper at higher elevations.
- Some of these woodlands are characterized shrubby understories or inter-canopy spaces that are typified by the presence of alderleaf mountain mahogany (*Cercocarpus montanus*), wavyleaf oak (*Quercus* x*pauciloba*), soapweed yucca (*Yucca glauca*), and skunkbush sumac (*Rhus trilobata*). Succulents include tree cholla (*Cylindropuntia imbricata*), tulip pricklypear (*Opuntia phaeacantha*), and plains pricklypear (*O. polyacantha*) and can be particularly abundant in disturbed woodland habitat.
- The herbaceous layer varies from sparse to dense depending on overstory tree density, soils, landscape position, and disturbance history. The highest grass covers occur in the open savannas that are dominated by sideoats grama (*Bouteloua curtipendula*), blue grama, needle and thread (*Hesperostipa comata*), and James' galleta (*Pleuraphis jamesii*). In closed-canopied, persistent woodlands, forest grasses prevail such as Scribner needlegrass (*Achnatherum scribneri*), prairie Junegrass (*Koeleria macrantha*), and muttongrass (*Poa fendleriana*). Forbs may be diverse but are generally present in low abundance; representative species include wholeleaf Indian paintbrush (*Castilleja integra*), James' buckwheat (*Eriogonum jamesii*), fineleaf hymenopappus (*Hymenopappus filifolius*), and manyflowered ipomopsis (*Ipomopsis multiflora*).
- Stands of mature, persistent woodlands are largely restricted to higher elevations, upper slopes and ridges, rocky outcrops, and rims of mesas and canyons that are fire resistant. Younger stands of woodlands have invaded adjacent shrublands and grasslands and now occur on lower slopes, valleys, and plains. In open savannas, periodic fire (at a 10-to 30-year interval) is important to maintaining vegetation structure. Juniper trees less than 1.2 m (4 ft) tall are readily killed by fires. Substrates range from deep loams to shallow, skeletal soils on rocky sites.

ROCKY MOUNTAIN SUBALPINE-HIGH MONTANE CONIFER FOREST

The Rocky Mountain Subalpine-High Montane Conifer Forest **[M020]** occurs on mountain slopes at the highest elevations (3,250-3,670 m [10,660-12,040 ft]) of any forest in the Southern Rocky Mountains and Arizona/New Mexico Mountains ecoregions. It is also known as a spruce (*Picea* spp.)-fir (*Abies* spp.) forest zone and is intermingled with aspen groves that grow following forest fires. This habitat type ranges from dry-mesic forests growing on upper slopes and ridges with southerly aspects to moist-mesic stands growing on lower slopes with northerly aspects.

- This forest habitat ranges from tall, nearly closed-canopy stands to very open or patchy woodlands or ribbons with intervening grasslands or shrublands. Characteristic trees are the conifers corkbark fir (*Abies lasiocarpa* var. *arizonica*) and Engelmann spruce (*Picea engelmannii*) along with the broadleaf deciduous quaking aspen. Limber pine (*Pinus flexilis*) and bristlecone pine (*P. aristata*) are common associates on drier sites.
- The shrub layer, when present, may be represented by tall shrubs such as Rocky Mountain maple and fivepetal cliffbush on moist-mesic sites or common juniper, kinnikinnick (*Arctostaphylos uva-ursi*), and whortleberry (*Vaccinium myrtillus*) in drier locations.
- Herbaceous cover can range from nearly absent under closed-canopy conditions to luxuriant and diverse on more open and moist sites. Representative species include dryspike sedge (*Carex siccata*), sprucefir fleabane (*Erigeron eximius*), starry false lily of the valley (*Maianthemum stellatum*), and sickletop lousewort (*Pedicularis racemosa*).
- This habitat can be found on gentle to very steep mountain slopes and ridgetops and along alluvial stream terraces. At the highest elevations, trees can be weakened or damaged by blowing snow and ice crystals and severe cold. This habitat is subject to stand-replacing disturbances, including avalanches, crown fires, insect outbreaks, disease, and occasional windthrow. Fire regimes are generally mixed severity or stand replacing with long return intervals (150 to 500 years). Seral, clonal aspen stands often get established following fires. Insect outbreaks are more frequent, every 30-50 years in some forest types, and can alter both the structure and composition of stands.

ROCKY MOUNTAIN SUBALPINE-MONTANE MEADOW AND GRASSLAND

Rocky Mountain Subalpine-Montane Meadow and Grassland **[M547]** is comprised of graminoid- or forb-dominated mesic meadows and subalpine grasslands at 2,200-3,350 m (7,200-11,000 ft) elevation mostly in the Southern Rocky Mountains and Arizona/New Mexico Mountains ecoregions.

- Characteristic grass species in montane and subalpine grasslands include Parry's oatgrass (*Danthonia parryi*), Arizona fescue, Idaho fescue (*Festuca idahoensis*), Thurber's fescue (*F. thurberi*), and mountain muhly.

- Grasslands can sometimes have a diverse set of relatively dry forbs such as Indian paintbrush species (*Castilleja* spp.), pingue rubberweed (*Hymenoxys richardsonii*), sidebells penstemon (*Penstemon secundiflorus*), woolly cinquefoil (*Potentilla hippiana*), and Rocky Mountain goldenrod (*Solidago multiradiata*). The meadows tend to have more mesic species including common yarrow (*Achillea millefolium*), bluebell bellflower (*Campanula rotundifolia*), fireweed (*Chamerion angustifolium*), aspen fleabane (*Erigeron speciosus*), largeleaf avens (*Geum macrophyllum*), common cowparsnip (*Heracleum maximum*), and arrowleaf ragwort (*Senecio triangularis*). In the meadows, graminoids form a minor component and are usually mesic taxa with relatively broad and soft blades including California brome (*Bromus carinatus*), smallwing sedge (*Carex microptera*), and tufted hairgrass (*Deschampsia caespitosa*).
- Broadleaf deciduous shrubs such as shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*) and snowberry (*Symphoricarpos* spp.) are often present but do not dominate or are invasive following disturbance.
- Grasslands occur on flat to rolling plains, in intermontane parks, and on dry sideslopes, especially with south and west aspects. Mesic meadows occur in swales that lose their snow cover relatively late in the season. Across the wide variety of environments where these habitats occur, fine-textured soils, snow deposition, or windswept, dry conditions limit tree establishment.

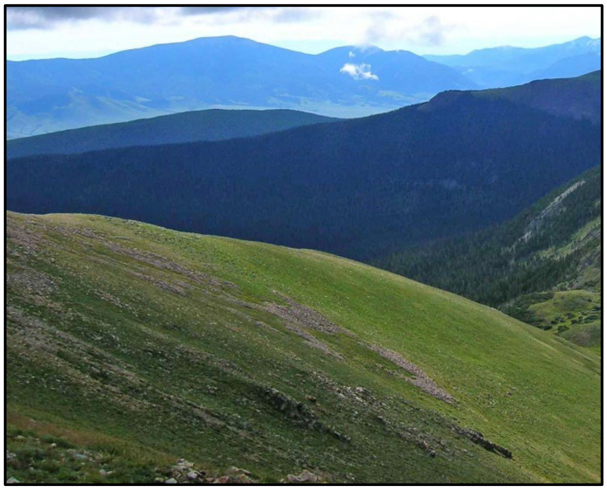
ROCKY MOUNTAIN MONTANE SHRUBLAND

Rocky Mountain Montane Shrubland **[M049]** is found from 1,800-2,700 m (5,900-8,860 ft) elevation in the foothills and on canyon slopes of the Southern Rocky Mountains and Arizona/New Mexico Mountains ecoregions with isolated occurrences in the Colorado Plateaus, Chihuahuan Desert, and High Plains and Tablelands ecoregions.

- Vegetation is characterized by an open-to-dense, broad-leaved deciduous shrub canopy dominated by alderleaf mountain mahogany and/or oaks (Gambel, wavyleaf, or Sonoran scrub oak [*Quercus turbinella*]). Other shrubs may be codominant such as big sagebrush (*Artemisia tridentata*), Fendler's ceanothus (*Ceanothus fendleri*), chokecherry (*Prunus virginiana*), skunkbush sumac, wax currant (*Ribes cereum*), New Mexico locust, Woods' rose (*Rosa woodsii*), mountain snowberry, and roundleaf snowberry (*Symphoricarpos rotundifolius*).
- The herbaceous layer is sparse to moderately dense and dominated by perennial graminoids and a mix of scattered forbs. Graminoids are characterized by species that are also common in adjacent woodlands and forests, including Scribner needlegrass, threeawns (*Aristida* spp.), sideoats grama, blue grama, long-stolon sedge (*Carex inops*), Geyer's sedge (*C. geyeri*), needle and thread grass, New Mexico feathergrass (*Hesperostipa*

neomexicana), prairie junegrass, and mountain muhly. Representative forbs include common yarrow, geraniums (*Geranium* spp.), starry false lily of the valley, Fendler's meadow-rue, and American vetch.
- This habitat most commonly occurs following fires in piñon-juniper woodland and lower montane forests and can be persistent over long periods, particularly on drier, rockier sites and in large fire scars (particularly with clonal oak species [*Quercus* spp.] present).

ROCKY MOUNTAIN ALPINE VEGETATION



Rocky Mountain Alpine Vegetation **[M099]** occurs at and above timberline in the Southern Rocky Mountains ecoregion (>3360 m [>11,000 ft]) and includes wind-scoured fell fields, dry turf, and dwarf shrublands.

- Fell fields are dominated by cushioned or matted, frequently succulent, forb species with cover that ranges from 15 to-50% (exposed rocks covered with crustose lichens make up the rest). Example indicator species are twinflower sandwort (*Minuartia obtusiloba*), varileaf cinquefoil (*Potentilla diversifolia*), and moss campion (*Silene acaulis*). Dry turf is dominated by moderate-to-dense cover of low-growing sedges and grasses such as curly sedge (*Carex rupestris*), alpine fescue (*Festuca brachyphylla*), and Drummond's rush (*Juncus drummondii*). Other common species of fell fields and dry turf are Ross' avens (*Geum rossii*), Bellardi bog sedge (*Kobresia myosuroides*), and alpine clover (*Trifolium dasyphyllum*).
- Dwarf shrubland stands are characterized by a semi-continuous layer of dwarf willows less than 0.5 m (1.6 ft) in height dominated by snow willow (*Salix nivalis*).
- Wind and its movement of snow has a strong local effect, producing wind-scoured fell fields, dry turf, snow accumulation willow (*Salix* spp.) communities, and short growing season snowbed sites. Fell fields are typically free of snow during the winter as they are found on ridgetops, upper slopes, and exposed saddles. Dwarf shrubland sites tend to be in level or concave areas; water needs are met with late-melting snow and subirrigation from surrounding slopes. Dry turf is found on gentle to moderate slopes, flat ridges, valleys, and basins where the soil is relatively stable and the water supply is fairly constant.

MONTANE-SUBALPINE WET SHRUBLAND AND WET MEADOW

Montane-Subalpine Wet Shrubland and Wet Meadow **[M893]** occurs in the Colorado Plateaus, Southern Rocky Mountains, High Plains and Tablelands, and Arizona/New Mexico Mountains ecoregions. It is associated with springs and fens and high mountain stream terraces at elevations generally above 2,400 m (8,000 ft).

- These herbaceous wetlands and wet meadows are typically graminoid-dominated, but forbs may be prevalent. Dominant graminoids include bluejoint (*Calamagrostis canadensis*), water sedge (*Carex aquatilis*), Northwest Territory sedge (*C. utriculata*), smallwing sedge, and tufted hairgrass. Dominant forb species are represented by white marsh marigold (*Caltha leptosepala*), heartleaf bittercress (*Cardamine cordifolia*), arrowleaf ragwort, and creeping sibbaldia (*Sibbaldia procumbens*).
- Shrublands form open-to-closed canopies dominated by wetland-obligate shrubs and subshrubs such as gray alder (*Alnus incana*), water birch (*Betula occidentalis*), redosier dogwood (*Cornus sericea*), Bebb willow (*Salix bebbiana*), Booth's willow (*S. boothii*), Drummond's willow (*S. drummondiana*), and park willow (*S. monticola*).
- The wetlands are commonly associated with perennial groundwater seeps, fens, and isolated springs on hill slopes and present as narrow bands along streambanks and alluvial terraces along low-gradient streams in montane valley bottoms. Wet meadows tend to be drier and more dependent on snowmelt and may dry out by the end of the growing season. Shrublands are commonly found along high-mountain streams in matrix with Rocky Mountain Montane Riparian Forest **[M034]**.

ROCKY MOUNTAIN MONTANE RIPARIAN FOREST

Rocky Mountain Montane Riparian Forest **[M034]** is predominantly found in the Southern Rocky Mountains and Arizona/New Mexico Mountains ecoregions and peripherally in the Colorado Plateaus and High Plains and Tablelands ecoregions. Elevations range from 1,600 to 3,475 m (5,250 to 11,400 ft). These are forested wetlands along mountain streams and rivers that are dominated by obligate and facultative wetland trees, shrubs, and herbs.

- These riparian forests and woodlands are dominated by broadleaf deciduous trees, montane evergreen conifers, or a mixture of the two. The typical broadleaf dominants are narrowleaf cottonwood (*Populus angustifolia*), lanceleaf cottonwood (*P. acuminata*), Arizona alder (*Alnus oblongifolia*), and boxelder (*Acer negundo*). Conifers are represented by upland species that have extended their distribution into the riparian zone and may include corkbark fir, Engelmann spruce, blue spruce, and ponderosa pine.
- The understories are typically shrubby and may include gray alder, redosier dogwood, peachleaf willow (*Salix amygdaloides*), and Bebb willow that line the stream channels.
- Herbaceous layers can be dominated by forbs or graminoids or be sparsely vegetated, depending on the amount of shading, soil moisture, and disturbance history. Representative species include bluejoint, horsetails (*Equisetum* spp.), and arrowleaf ragwort. Introduced forage species, such as creeping bentgrass (*Agrostis stolonifera*), Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), and smooth brome (*Bromus inermis*), can be abundant.
- This forest type is mostly comprised of montane to subalpine riparian communities occurring as narrow bands lining streambanks in confined canyons to stands on alluvial terraces of unconfined, open valley floodplains. American beavers (*Castor canadensis*) cut younger cottonwoods (*Populus* spp.) and willows and frequently dam side channels. Hence, they are thought to play an important role in maintaining the hydrological regime for these communities in unconfined floodplains. The habitat is commonly found in a mosaic with Montane-Subalpine Wet Shrubland and Wet Meadow **[M893]**.

THREATS AND CONSERVATION ACTIONS

Ten threats could potentially impact SGCN in 31 habitats within the Southern Rocky Mountains ecoregion (Table 20). These threats are summarized below and listed in the order presented by the IUCN (2022). The list does not reflect the order of threat severity.

- Development: Vacation-home developments in forest and riparian habitats.
- Agriculture and Aquaculture: Cattle and elk grazing in sensitive meadow and riparian habitats.
- Energy and Mining: Solar- and wind-energy development and hard-rock mining.
- Transportation and Service Corridors: Fragmentation of forest habitat from utility corridors and forest roads in sensitive habitats.
- Biological Resource Use: Firewood and timber harvest that reduces cover, forage, and important habitat features for SGCN.
- Human Intrusion and Disturbance: Off-highway vehicles (OHVs) used off of designated roads, unauthorized dispersed camping, and increasing recreation in National Forests and designated wilderness areas, especially in alpine habitats and during SGCN breeding seasons.
- Natural System Modifications: Unnaturally dense forests and woodlands and catastrophic wildfire due to fire suppression.
- Invasive and Other Problematic Species, Genes, and Diseases: Insect and disease outbreaks in forest stands; invasion of riparian habitats by tamarisk (*Tamarix* spp.) or other non-native plants; and potential infection of bats by *Pseudogymnoascus destructans*, which can cause white-nose syndrome, and of amphibians by chytrid fungus (*Batrachochytrium dendrobatidis*), which can cause chytridiomycosis.
- Pollution: Toxic runoff from mines and light pollution from lights on wind turbines.
- Climate Change: Drought, higher temperatures, and projected increasing aridity heighten the probability of disease outbreaks and catastrophic wildfires in forests. The eastern portion of the Southern Rocky Mountains ecoregion has comparatively high potential to contain macro- and microclimate refugia for amphibians; both the eastern and western portions have high potential to contain both macro- and microclimate refugia for birds, mammals, and cold-water fish (Figure 15; Friggens et al. 2025). Overall, this ecoregion has comparatively high potential to contain microrefugia for amphibians, birds, mammals, and cold-water fish relative to most other ecoregions (Table 12). However, the southern- and easternmost edges of the Jemez Mountains Conservation Opportunity Area (COA) may not support the Grace's warbler (*Setophaga graciae*) and other SGCN with similar habitat needs in future and Pacific marten (*Martes caurina*) may lose most of its current habitat in this COA. Some areas in the southern portion of the Rio Chama COA may not support the gray vireo (*Vireo vicinior*) in future (NHNM 2024).

Conservation concerns include development in the wildland-urban interface, tree diseases, fire, vegetation conversion following severe wildfire, and poorly managed grazing.

Urban development is comparatively light in this ecoregion, with most development consisting of small villages and towns that are relatively far apart. The continued expansion of vacation home developments is of concern as these homes are often located in forested areas, including near riparian habitat.

The need for low-intensity fires in maintaining healthy forests in the southwest has been well documented. However, fire suppression and removal of fine fuels by large herbivore grazing has contributed to the growth of dense forests prone to insect mortality and destructive, high-intensity fires. Warmer temperatures tied to climate change have exacerbated the spread of insect infestation in forests and are contributing to the intensity of fires (Parks and Abatzoglou 2020). Allowing low- to moderate-severity wildfires to burn (Parks and Abatzoglou 2020), or setting prescribed fires or cultural burns (Roos et al. 2022, Parks et al. 2023b), where and when they pose no danger to humans or their property or sensitive wildlife habitats, reduces fuel loads and can lower the probability of a subsequent high-severity fire event (Parks and Abatzoglou 2020). Forests characterized by fewer, larger trees with a healthy herbaceous understory and other important habitat features (e.g., clumps of trees with interlocking crowns; NMDGF 2024c) will be key to healthy SGCN populations.

The Southern Rocky Mountains ecoregion was warmer (by an increase of 0.9 °C [1.7 °F]) and wetter (with an increase of 5 cm [2 in] of precipitation) from 1991 to 2020 when compared to 1961 to 1990 (AdaptWest Project 2022). This ecoregion supports the highest number of drought-sensitive species that will be vulnerable to decline under continued climate change. Availability of suitable habitat for Douglas-fir is expected to decline in this ecoregion, and up to 14 tree species are expected to experience stressful environmental conditions, by the end of the 21st century (Mathys et al. 2016). Ponderosa pines are anticipated to have a low likelihood of regeneration across many sites burned at high severity in the eastern edge of the Sangre de Cristo Mountains (Haffey et al. 2018) and in future, both ponderosa pines and Douglas firs are anticipated to have low or no post-fire recruitment across many areas of the Southern Rocky Mountain ecoregion (Rodman et al. 2020). The habitat with moderate-to-high vulnerability to climate change is Cliff, Scree, and Rock Vegetation (Table 18; Triepke et al 2014).

Table 20. Potential threats to habitat and associated SGCN in the Southern Rocky Mountains ecoregion.

Threat categories were derived from IUCN (2022).

Habitat \ Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Arid West Interior Freshwater Emergent Marsh		X					X	X	X	X
Cliff, Scree, and Rock Vegetation			X	X		X				
Colorado Plateau Cool Semi-Desert Ruderal Grassland		X	X			X		X		
Colorado Plateau Piñon-Juniper Woodland	X	X	X	X	X	X	X	X	X	X
Desert Alkali-Saline Wetland		X	X					X	X	X
Ephemeral Catchments							X	X		
Ephemeral Marshes/Cienegas/Springs							X	X		
Great Plains Mixedgrass Prairie		X	X	X						X
Great Plains Shortgrass Prairie		X	X			X	X	X		X
Great Plains Wet Meadow, Marsh, and Playa		X	X				X	X	X	X
Intermountain Arroyo Riparian Scrub		X	X			X		X	X	X
Intermountain Dry Shrubland and Grassland		X	X			X		X	X	X
Intermountain Dwarf Sagebrush Shrubland		X				X		X	X	X
Intermountain Saltbush Shrubland		X				X		X	X	X
Intermountain Tall Sagebrush Shrubland		X	X					X	X	X
Introduced Riparian Vegetation										
Montane-Subalpine Wet Shrubland and Wet Meadow		X				X	X			X
Perennial Cold-Water Reservoirs	X						X	X		X
Perennial Cold-Water Streams	X	X	X	X	X	X	X	X	X	X
Perennial Lakes, Cirques, Ponds							X	X		
Perennial Marsh/Cienega/Spring/Seep		X	X	X	X	X	X	X	X	X

Habitat \ Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Perennial Warm-Water Streams		X					X	X	X	X
Rocky Mountain Alpine Vegetation		X						X		X
Rocky Mountain Lower Montane Forest	X	X	X	X	X	X	X			X
Rocky Mountain Montane Riparian Forest	X	X	X		X	X	X	X	X	X
Rocky Mountain Montane Shrubland	X	X	X			X	X			X
Rocky Mountain Piñon-Juniper Woodland	X	X	X	X	X	X	X	X	X	X
Rocky Mountain Subalpine-High Montane Conifer Forest	X			X	X	X	X			X
Rocky Mountain Subalpine-Montane Meadow and Grassland	X			X	X	X	X			X
Southwest Lowland Riparian Forest		X	X	X	X	X	X	X	X	X
Southwest Lowland Riparian Shrubland		X	X	X	X	X	X	X	X	X

The following are proposed conservation actions for the Southern Rocky Mountains ecoregion, listed in order of priority within each IUCN threat category. Threat categories are listed according to the order presented by IUCN (2022).

DEVELOPMENT:

- Reduce impacts of housing developments by establishing development standards that ensure habitat integrity and functionality while minimizing wildfire threats to private residences in the wildland-urban interface. Potential collaborators: local governments, municipalities.
- Investigate the potential impacts of current and future development on SGCN and their habitats and identify ways to mitigate those impacts. This includes working with municipalities to stay informed about new developments and initiate policies that will minimize negative impacts of future developments on SGCN. This also includes promoting the development of green spaces and green infrastructure in urban areas that, where appropriate, provide habitat and resources to SGCN (Gallo et al. 2017; Threlfall et al. 2017), including pollinators (Fukase and Simons 2016; Majewska and Altizer 2020). Potential collaborators: New Mexico Department of Transportation (NMDOT), universities, local governments, municipalities, non-profit organizations, private landowners.
- Determine distribution and habitat needs of SGCN that reside in (e.g., Boakes et al. 2024) or near urban areas. This includes initiation and promotion of citizen or community science activities that document SGCN and other wildlife in and around urban areas. Inform municipal staff of nearby SGCN and how to minimize development-related impacts to SGCN and their habitats. Encourage community enrollment in programs designed to benefit particular SGCN or taxa (e.g., Monarch City USA; https://www.monarchcityusa.com/) and in wildlife habitat certification programs (e.g., National Wildlife Federation; https://certifiedwildlifehabitat.nwf.org/; Albuquerque Backyard Refuge Program; https://friendsofvalledeoro.org/abq-backyard-refuge/). Potential collaborators: universities, municipalities, non-profit organizations, private landowners.
- Participate in public-involvement opportunities when proposed developments might threaten the persistence of SGCN and their habitats. Potential collaborators: non-profit organizations, private landowners.

AGRICULTURE AND AQUACULTURE:

- Determine where habitat restoration would benefit SGCN and work with federal, state, Tribal, and private landowners to restore degraded rangelands to good or excellent condition. Monitor restoration results to develop and initiate any identified improvements to restoration practices. Potential collaborators: United States (US) Bureau of Land Management (BLM), US Forest Service (USFS), New Mexico State Land Office (SLO), private landowners, Tribal natural-resource managers.
- Establish baseline composition, condition, disturbance regimes, and function of major range habitats to inform habitat-restoration activities, including addressing tree invasion into grassland meadows and activities in riparian habitats. Potential collaborators: BLM, USFS, SLO, universities, private landowners, Tribal natural-resource managers.

- Determine how timing, intensity, and duration of livestock grazing affect SGCN and their habitats, including the interaction between grazing, fire, and the spread of invasive and other problematic species. Potential collaborators: BLM, US Natural Resources Conservation Service (NRCS), USFS, New Mexico Department of Agriculture (NMDA), SLO, universities, private landowners, Tribal natural-resource managers.
- Promote expanded use of appropriate, cost-effective grazing practices that ensure long-term ecological sustainability for SGCN and their habitats (especially riparian habitats). These include actions such as rest-rotation grazing management and conservation easements (Gripne 2005) that contribute to recovery of rangelands impacted by drought and allow restoration activities to be completed. May also include the use of virtual fencing to keep livestock in desired locations and out of sensitive areas (USFS 2024). Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.
- Promote grazing systems that address local needs of livestock and for SGCN habitat, including riparian areas. When particular habitat components need improvement, coordinate with ranchers and resource managers to identify and implement modifications that would provide the desired habitat outcomes. Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.
- Gather and assess current information on grazing practices and determine how the Department can support landowners that provide habitat for SGCN. Potential collaborators: BLM, NRCS, USFS, NMDA, SLO, private landowners, Tribal natural-resource managers.
- Work with private landowners to improve irrigation processes and infrastructure to conserve water. Includes promoting the use of devices and models that improve water conservation and irrigation efficiency (Schaible and Aillery 2012, Wang 2019), to help conserve the structure and function of aquatic and riparian habitats. Potential collaborators: NRCS, New Mexico Office of the State Engineer (NMOSE).
- Identify human-constructed water-retention structures (e.g., stock tanks, water troughs, and drinkers) that provide habitat for aquatic SGCN and other wildlife, particularly amphibians. Remove invasive species (e.g., bullfrogs [*Rana* (*Aquarana*) *catesbeiana*])) from these structures that may threaten native aquatic wildlife. Potential collaborators: BLM, USFS, universities, private landowners, Tribal natural-resource managers.
- Where appropriate, promote the use of flood irrigation for crops such as grass hay in historic riparian floodplains of upper watershed regions to mimic natural processes (i.e., seasonal flooding) and benefit SGCN and other wildlife (Donnelly et al. 2024). Potential collaborators: NRCS, NMDA, non-profit organizations, private landowners, Tribal natural-resource managers.
- Promote grazing systems that incorporate rested pastures and help improve overall range condition and enhance wildlife habitat health and function. In upland areas, these systems may include rest-rotation and/or deferred-rotation. In riparian areas, beneficial grazing practices may also include grazing in early spring and restricting summer grazing and redistribution practices such as herding and developing drinking water sources in upland areas. Especially during times of drought, rested pastures can provide forage reserves and relieve pressure on grazed pastures or allotments. Potential collaborators: BLM, NRCS, USFS, SLO, private landowners, Tribal natural-resource managers.

- Promote use of ecoregion-appropriate agricultural practices that provide habitat or resources or protect habitat quality (e.g., reduce erosion) for SGCN, including planting rows of trees between crops (McCarthy 2024) and pollinator-friendly practices such as planting pollinator habitat along field margins and underutilized areas, revegetating retired farmland with wildflowers, including pollinator-friendly forbs in cover-crop seed mixes (O'Brien and Arathi 2021), and conserving semi-natural habitat near agricultural fields (Shi et al. 2024). Potential collaborators: NRCS, USFWS, NMDA, private landowners, Tribal natural-resource managers.

ENERGY AND MINING:

- Determine where energy development and mineral extraction currently, and in the future, may affect SGCN. Work with regulatory agencies to develop permitting guidelines and policies that result in siting new development in areas that minimize impacts to SGCN. Potential collaborators: BLM, USFS, New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), NM Bureau of Geology and Mineral Resources (NMBGMR), SLO, energy and mining companies.
- Identify and promote best management practices that minimize the impacts (especially habitat fragmentation and direct SGCN mortality) of energy development (including of renewable energy sources [Lovich and Ennen 2011, Copping et al. 2020, Levin et al. 2023]) and mining on SGCN and their aquatic and terrestrial habitats. This includes informing and supporting resource managers in the implementation of measures to prevent direct take of SGCN associated with energy extraction and mining (e.g., use of appropriate exclusionary netting and/or fencing, bird balls, and closed containment systems at toxic sites). May also include increased use of small, localized installations (e.g., community solar development) rather than utility-scale developments (Bowlin et al. 20240. Potential collaborators: BLM, EMNRD, SLO, universities, energy and mining companies, municipalities.
- Reclaim disturbed habitats impacted by resource extraction as close as possible to pre-development conditions. Rehabilitate abandoned well pads, mining sites, and associated access roads. Remove unneeded roads, transmission lines, and any other abandoned infrastructure and equipment (e.g., pits, pipelines, unused machinery). Restore native vegetation. Where feasible, maintain abandoned mines as habitat for bats and snakes by constructing appropriate bat gates on mine shafts and adits (Spanjer and Fenton 2005). Potential collaborators: BLM, USFS, US Fish and Wildlife Service (USFWS), EMNRD, SLO, energy and mining companies, private landowners.
- Maintain and expand open communication with mining and energy companies and land-management agencies to minimize adverse impacts of development to SGCN. Potential collaborators: BLM, USFS, EMNRD, SLO, energy and mining companies.

TRANSPORTATION AND SERVICE CORRIDORS:

- Site, consolidate, and maintain utility corridors to minimize adverse effects to SGCN and their habitats. Reduce avian powerline collisions by using line markers and illumination with ultraviolet lights and by burying powerlines (Bateman et al. 2023). Avoid mowing rights-of-way during peak SGCN pollinator larvae abundance and avoid mowing patches of nectar resources important for pollinator SGCN (e.g., Xerces Society 2018). Potential collaborators: BLM, USFS, SLO, interested and affected members of the public, local governments, utility companies.

- Determine where roads, vehicle traffic, and utility lines are inhibiting or preventing movement of SGCN, including during migration. Identify and conserve natural habitat corridors, especially those at risk from future fragmentation by roads or utility lines. This may include reconnecting stream and wetland habitats that have been fragmented by roads, culverts, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Does not include structures that serve a beneficial role for wildlife (e.g., native fish barriers). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, US National Park Service (NPS), USFS, New Mexico Department of Transportation (NMDOT), universities, non-profit organizations, private landowners, utility companies.
- Work with collaborators to complete mitigation measures that will increase the probability of safe passage across roads and near utility lines for affected SGCN. These include modifying barrier fences along roadways, constructing road crossings, placing warning signs for motorists, marking utility lines so they can be readily seen by birds, and placing safeguards that will reduce the probability of electrocution. Integrate benefits to SGCN in projects primarily designed and implemented to enhance safe passage for large mammals (e.g., projects implemented under the Wildlife Corridors Action Plan) (Cramer et al. 2022). Monitor the efficacy of mitigation measures and initiate any identified maintenance and improvements. Potential collaborators: BLM, USFS, NMDOT, SLO, private landowners, utility companies, Tribal natural-resource managers.
- Identify and conserve natural habitat corridors, especially those at risk from future fragmentation. Potential approaches include conservation easements. Potential collaborators: BLM, USFS, universities, non-profit organizations.
- Work with appropriate agencies to develop and enforce road-management plans (Crist et al. 2005). Potential collaborators: BLM, USFS.

BIOLOGICAL RESOURCE USE:

- Develop and implement strategies to sustainably harvest wood products while retaining pine-oak regeneration, old-growth trees, large diameter snags, and coarse woody debris at densities needed by SGCN. Potential collaborators: BLM, USFS, New Mexico State Forestry Division (SFD), SLO, private landowners.
- Work with landowners and land-management agencies to use forests and woodlands in a manner that maintains healthy, and returns degraded, stands to an improved composition and function for SGCN. Potential collaborators: BLM, NPS, USFS, SFD, SLO, private landowners.
- Inform natural-resource law enforcement officers of the distribution, life history, and habitat needs of SGCN. Partner with them to enforce laws to protect SGCN populations and habitats. Potential collaborators: BLM, NPS, USFS.

HUMAN INTRUSIONS AND DISTURBANCE:

- Identify and characterize areas and routes frequented by OHVs, including snowmobiles, and used by other recreationists, and use this information to assess the potential impacts to SGCN, other wildlife, and their habitats (e.g., Larson et al. 2016, Cretois et al. 2023, Zeller et al. 2024). This includes identifying and characterizing areas used for and impacts from unauthorized dispersed camping (Marion et al. 2018) and winter recreation activities (e.g., downhill and cross-country skiing, snowmobiling, and snowshoeing) (Morris 2024). Potential collaborators: BLM, NPS, USFS, SLO, universities, private landowners.
- Identify, designate, and promote areas for OHV and other recreational use, including dispersed camping, that avoid disturbance to, or modification of, SGCN habitats. Potential collaborators: BLM, NPS, USFS, SLO.
- Initiate a public-information campaign to inform and educate OHV users and other recreationists of both permitted and prohibited activities that can impact SGCN and other wildlife. This may include public-service announcements, print advertising, public meetings, and signs in areas frequented by OHV users and other recreationists. Ensure that the campaign presents information in ways, and using languages, accessible to a diverse public (LCJF 2022). Potential collaborators: BLM, NPS, USFS, SLO, local governments, non-profit organizations.
- Work with public land-management agencies to regularly review and update OHV travel routes and recreational trails open to the public and appropriate restrictions on recreation necessary to protect SGCN and other wildlife. Potential collaborators: BLM, NPS, USFS, SLO.
- Work with land-management agencies to improve OHV and other recreational law enforcement with passive measures (e.g., strategically located barricades) and active measures (e.g., monitoring and enforcement patrols) to reduce negative impacts of OHVs and other recreational activities on SGCN and other wildlife. Potential collaborators: BLM, NPS, USFS, SLO.
- Work with the public to educate residents and recreationists about restrictions on and potential negative impacts of free-ranging, domestic pets, especially both domestic and feral cats (Loss et al. 2013b), on SGCN and other wildlife. Potential collaborators: universities, municipalities, non-profit organizations.
- Discourage recreation development in aspen stands to reduce exposure of aspens to injury and fungal infections. Potential collaborators: USFS.

NATURAL SYSTEM MODIFICATIONS:

- As appropriate to local site conditions (e.g., topography, prevailing winds, disturbance history, infrastructure) (Urza et al. 2023) and not in persistent piñon-juniper woodlands (Romme et al. 2009. Darr et al. 2022), thin stands of trees in forests and woodlands to natural or historic densities that reduce the probability of insect and disease outbreaks and stand-replacing wildfires. Avoid unnecessary removal of large old-growth trees and snags, which serve as important wildlife habitat (Kalies and Rosenstock 2013); use best practices to maintain soil health (e.g., Tomao et al. 2020), including retaining sufficient seed trees and sources of mycorrhizal inoculum (Simard et al. 2021); implement landscape- and regional-scale heterogeneity in treatment design (Bradley 2009); and evaluate treatment effectiveness (e.g., McKinney et al. 2022, Davis et al. 2024, Hood et al. 2024), including monitoring local SGCN populations. Potential collaborators: BLM, NPS, USFS, SFD, SLO, non-profit organizations.

- Design and implement riparian and aquatic habitat-restoration projects to benefit SGCN. This may include establishing priorities for habitat restoration and developing reach-specific plans. May also include designing and implementing low-tech, process-based restoration techniques (Wheaton et al. 2019) to restore degraded headwater stream systems and improve SGCN habitat or specific actions such as reintroducing keystone species including American beavers (*Castor canadensis*) (Baker and Cade 1995, McKinstry et al. 2001, Grudinski et al. 2022) and restoration and monitoring of self-sustaining populations of North American river otters (*Lontra canadensis*) and native fishes. Monitor restoration projects to determine effectiveness (Block et al. 2001, Holste et al. 2022) and inform adaptive management. Potential collaborators: BLM, US Bureau of Reclamation (BOR), NPS, US Army Corps of Engineers (USACE), USFS, New Mexico Environment Department (NMED), SFD, SLO, universities, non-profit organizations, private landowners, Tribal natural-resource managers.
- Restore and protect aquatic, riparian, wetland, and wet meadow habitats, particularly springs and cienegas, and the surface and groundwater that supports them. Minimize activities that lead to gully formation, soil erosion, or a loss of soil health (e.g., soil fungal diversity) (Wagner 2023). Potential collaborators: BLM, BOR, NPS, NRCS, USACE, USFS, NMED, SLO, private landowners, Tribal natural-resource managers.
- Determine beneficial fire frequencies and intensities and work with land-management agencies, sovereign Tribal entities, and private landowners to develop fire management plans that thoroughly consider local environmental conditions (e.g., weather, fuel conditions, landscape characteristics, local wildlife) (Russell et al. 2024) and implement prescribed or cultural burns (Parks et al. 2023b, Eisenberg et al. 2024) that avoid disturbing SGCN during sensitive periods (e.g., nesting); maintain condition of sensitive habitats (e.g., riparian habitat), ecosystem components (e.g., soil microbiotic community [Dove and Hart 2017, Brady et al. 2022, Nelson et al. 2022], regenerating seedlings [Owen et al. 2020]), and ecosystem function (e.g., soil carbon storage, nutrient cycling) (Brady et al. 2022, Nelson et al. 2022); enhance local diversity (Bowman et al. 2016, Eisenberg et al. 2024) and gene flow (Jones et al. 2023), including of SGCN such as pollinating insects; and protect people and property (USFS 2022). Potential collaborators: BLM, NPS, USFS, SFD, SLO, universities, private landowners, Tribal natural-resource managers.
- Determine responses of upland, and associated riparian/aquatic, communities that include SGCN to prescribed burns and wildfires (e.g., Saab et al. 2022). Where appropriate, integrate low-intensity fire and fuels reduction management into riparian ecosystem conservation. Design and implement projects that reduce unnaturally high fire risk associated with increased fuel loads or lack of moist soils in riparian areas. Methods may include flooding and/or implementing environmental flows, mechanical removal of non-native woody plants (e.g., tamarisk) and woody debris (Ellis 2001, Webb et al. 2019), and replanting native riparian vegetation (Queheillalt and Morrison 2006, Mosher and Bateman

2016). Potential collaborators: BLM, BOR, NPS, USACE, USFS, SFD, SLO, universities, private landowners, water-management districts.

- Promote post-fire management activities that are beneficial to SGCN. Includes minimizing ash flow into streams and other post-fire impacts to water quality (Rhoades et al. 2019a, Rhoades et al. 2019b), augmenting natural plant regeneration (e.g., planting tree seedlings in areas with appropriate microclimatic conditions) (Marchall et al. 2023) and protecting natural seed sources (Stevens et al. 2021), and encouraging heterogeneity (Ziegler et al. 2017, Owen et al. 2020). Potential collaborators: NRCS, NPS, USFS, NMED, SFD, SLO, non-profit organizations, private landowners, Tribal natural-resource managers.
- Assess the impacts of stream-flow magnitude, frequency, timing, duration, and rate of change on riparian ecosystems and the effects of hydrologic alterations on these ecosystems. Determine flows needed to sustain SGCN and their habitats and the effects of flow modification by upstream dams and of upland disturbances to local watersheds (Goeking and Tarboton 2022). Work with agencies that manage dams and reservoirs to ensure released environmental flows match amounts and timing of flow needed for persistence of native riparian communities and associated SGCN, including allowing for overbank flows to coincide with seed dispersal from native vegetation (e.g., Greco 2013) and when saturated soil can best benefit SGCN prey. Potential collaborators: BOR, USACE, USFWS, US Geological Survey (USGS), NMED, NMOSE, universities, private industry.
- Encourage aquatic habitat-improvement projects, such as creating ponds and oxbows near stream systems and stock tank improvements, to benefit aquatic SGCN (Stuart and Ward 2009, Stone et al. 2022). Potential collaborators: BLM, BOR, NPS, NRCS, USACE, USFS, NMED, SLO, private landowners, Tribal natural-resource managers.
- Survey and monitor perennial marshes/cienegas/springs/seeps habitats and the SGCN that inhabit them to determine changes in habitat quantity and quality and the status and trend of SGCN populations. Promote conservation efforts, such as protecting groundwater resources, that enhance the persistence and quality of these perennial aquatic habitats. Potential collaborators: BLM, USFS, NMED, SLO, universities, Tribal natural-resource managers.
- Determine amount, status, and trend of upland, aquatic, and riparian habitat; levels of fragmentation; and how SGCN might be affected. Identify appropriate locations and implement projects to enhance habitat quality and connectivity or prevent further fragmentation. This may include re-connecting streams and aquatic habitats that have been fragmented by dams, diversions, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Remove structures when feasible; otherwise, improve existing infrastructure by incorporating passage features for aquatic organisms (e.g., fish ladders). May also include protecting and promoting the natural establishment, development, and succession of native riparian vegetation by addressing any locally limiting hydrological conditions (e.g., ensuring overbank flooding occurs at optimal times and establishment of early successional vegetation) (Hatten et al. 2010, Greco 2013, Stanek et al. 2021, Wohner et al. 2021). May further include emphasizing restoration in areas that will enhance connectivity between native riparian habitat patches (e.g., migratory stopover sites) (McNeil et al. 2013). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, BOR, NPS, USACE, USFS, NMDOT, NMED, SFD, SLO, Soil

and Water Conservation Districts (SWCDs), universities, non-profit organizations, private landowners, Tribal natural-resource managers, water-management districts.
- Restore, protect, and monitor important disjunct wildlife habitats, such as caves, limestone outcrops, and talus slopes. Potential collaborators: BLM, NPS, NRCS, USFS, EMNRD, SLO, non-profit organizations, private landowners.
- Encourage sustainable groundwater use to protect aquatic and riparian habitats from lowered groundwater tables. Promote water conservation, such as use of devices and models that facilitate optimal irrigation (Schaible and Aillery 2012, Storm et al. 2024) and estimate water consumption and withdrawal (Zhou et al. 2021) or temporary field fallowing (DBSA 2022) and dryland farming, especially of drought-adapted crops (McCarthy 2024), to conserve the structure and function of aquatic and riparian habitats. Promote the use of water data from groundwater monitoring networks (Pine et al. 2023) to inform water conservation and management strategies. Potential collaborators: NRCS, NMBGMR, NMDA, SLO, municipalities, private landowners, water-management districts.
- Promote public participation in restoration and conservation of watersheds. Potential collaborators: BOR, NPS, USACE, USFS, NMED, SFD, universities, private landowners, non-profit organizations.
- Inform interested and affected members of the public about the value of aquatic and riparian systems and maintaining in-stream flows in order to build support for the conservation of riparian species and habitat-restoration efforts. Potential collaborators: BOR, NPS, NRCS, USACE, USFS, NMED, universities, non-profit organizations, private landowners.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES:

- Work with appropriate agencies to enforce regulations to prevent the introduction and spread of non-native species. Potential collaborators: USFWS, NMDA.
- Determine the distribution of all invasive and other problematic species, including feral ungulates (Beever 2003, Beschta et al. 2013, Sedinger et al. 2025), and diseases found in New Mexico, assess related threats to SGCN, and develop and implement strategies to address these threats, including eradicating or controlling existing populations of non-native and invasive and other problematic species when appropriate. When removing non-native vegetation, ensure that any SGCN that use this vegetation have suitable alternate habitat present (e.g., Sogge et al. 2013) and that site conditions support the restoration of native plants. If herbicide application cannot be avoided, limit impacts to pollinating insect SGCN by applying to smaller patches within the treatment area (e.g., Black et al. 2011) and spraying before target plants bloom (Hopwood et al. 2015). Potential collaborators: BLM, BOR, NPS, NRCS, USACE, USFS, NMDA, NMED, SLO, universities, non-profit organizations, private landowners.
- Continue current efforts to prevent the infestation of aquatic habitats in New Mexico by zebra and quagga mussels and other aquatic invasive species. This includes informing anglers and boaters of the importance of not introducing invasive and other problematic species and providing them with information on how to prevent the spread of aquatic invasive species. Potential collaborators: BLM, BOR, USACE, USFS, NMED, New Mexico State Parks (NMSP), universities, non-profit organizations.

- As needed, gather additional information regarding the distribution of tamarisk and other exotic plants in riparian habitats (e.g., NHNM 2023). Determine the impact of exotic plants, and their removal and reduction, on SGCN and their habitats. Create and implement site-specific plans, with measurable goals and objectives, to restore the historic structure and composition of riparian habitats while minimizing negative impacts on SGCN and soil health (Wagner 2023). Prioritize removal of monoculture stands of non-native plants (e.g., Johnson et al. 2018b) and ensure that sufficient native riparian vegetation is locally available to SGCN and that local hydrological conditions support native vegetation regrowth. Since pollinating insects may use exotic riparian plants (e.g., Pendleton et al. 2011), minimize impacts of removing these plants on pollinating insect SGCN, including by avoiding herbicide application when plants are in bloom and treating the focal area in stages. Include post-implementation monitoring and maintenance for all riparian restoration projects. Document and report restoration approaches used, including successes and failures (Shafroth et al. 2008, Sogge et al. 2013). Potential collaborators: BLM, BLM, NPS, NRCS, USACE, USFS, NMDA, SFD, SLO, SWCDs, universities, non-profit organizations, private landowners.
- Develop strategies to prevent emerging diseases from getting into New Mexico and develop and implement strategies that will inhibit the spread of ones already present (e.g., Clemons et al. 2024). This includes working with land-management agencies to control human access for recreation or other purposes as needed (Reynolds and Barton 2013), educating the public about what they can do to mitigate disease spread (e.g., Olson and Pilliod 2022), implementing appropriate hygiene guidelines for field researchers (e.g., Shapiro et al. 2024), and incorporating principles related to the interconnectedness of humans with local flora, fauna, and the natural environment (i.e., One Health) (AFWA 2023) Potential collaborators: BLM, NPS, USFS, NMED, SLO, universities.
- Design and implement protocols for early detection of invasive and other problematic species, including feral ungulates, and diseases. Quickly respond to detection. Potential collaborators: BLM, NPS, NRCS, USFS, NMDA, NMED, SLO, universities, private landowners.
- Where feasible, reestablish native aquatic communities in perennial streams and restored aquatic habitats. Potential collaborators: BLM, BOR, NPS, USACE, USFS, NMED, SLO, non-profit organizations, private landowners.
- Restore native riparian plants (e.g., cottonwood and willow) and natural riparian ecosystem processes and functions following tamarisk removal or biocontrol, and ensure maintenance of adequate water supply for native plants. At sites with low water availability, restoration of native xeric plants may be more appropriate than hydroriparian and wetland plants. Stage and balance tamarisk removal and native habitat restoration over time, to avoid rapid loss of exotic woody riparian habitats for wildlife until native habitats can be developed (Sogge et al. 2013), and minimize herbicide use. Potential collaborators: BLM, BOR, NPS, USACE, USFS, NMED, SLO, universities, non-profit organizations, private landowners, Tribal natural-resource managers.
- Proactively restore native riparian vegetation in areas likely to be most altered by the tamarisk beetle (*Diorhabda* spp.; i.e., large tamarisk monocultures [Johnson et al. 2018b] in river systems where the hydrology has been highly altered). Protect and sustain existing

stands of native riparian vegetation that may serve as important refugia in areas currently or likely to be affected by the tamarisk beetle (Paxton et al. 2011, Sogge et al. 2013). Potential collaborators: BLM, BOR, USACE, USFS, NMED, SLO, universities, non-profit organizations, private landowners.
- Identify historic and current SGCN habitats infested with cheatgrass (*Bromus tectorum*). Work with landowners and land-management agencies to restore these areas to native vegetation. Promote land-management strategies that will inhibit the further spread of cheatgrass. Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.
- Consider the impact of honeybee apiaries on wildlands and restrict their placement in areas where native bee SGCN occur. Honeybees can pose a disease spillover risk for wild bees (Tehel et al. 2016). Potential collaborators: universities, non-profit organizations, private landowners.

POLLUTION:

- Work with appropriate agencies that enforce mining and energy development regulations, Best Management Practices, and safeguards to protect water quality and minimize SGCN mortality associated with mining and energy development. Assess impacts to SGCN and their habitats from industrial activities, including mining and energy development. These impacts may include direct mortality, pollution from transport of extracted or waste products or from acid mine drainage, light pollution from energy development, and sediment runoff from roads. Potential collaborators: BLM, USFS, EMNRD, NMED, SLO, energy and mining companies, local governments.
- Determine effects of, and implement actions to mitigate negative effects from, agro- (e.g., neonicotinoids, other pesticides) (Sanchez-Bayo 2021, EPA 2023) and petrochemicals, synthetic chemicals (e.g., per- and polyfluoroalkyl substances [PFAS]), microplastics, urban runoff, and other pollutants (e.g., sewage, nutrients, toxic chemicals, sediment) on SGCN, especially fish and pollinating insects, and their habitats. This includes solid waste that may entangle wildlife Potential collaborators: US Environmental Protection Agency (EPA), NMDA, NMED, universities, local governments, municipalities, private industry.
- Evaluate and mitigate the effects of air pollution from industrial activities, including methane released by flaring associated with oil and gas extraction and leaking from old oil and gas wells, and in urban areas on SGCN and their habitats (e.g., Duque and Dewenter 2024). Evaluate and mitigate the effects of other types of pollution, including excess generation of heat, light, and/or sound from industrial activities, urban areas, and highways on SGCN and their habitats. Potential collaborators: BLM, EMNRD, NMDOT, NMED, energy and mining companies, municipalities, utility companies.
- Where appropriate, develop green infrastructure and nature-based solutions (Warnell et al. 2023) in urban areas that catch and slow stormwater runoff to prevent pollution from entering aquatic ecosystems and promote groundwater recharge. Potential collaborators: NMDOT, local governments, municipalities, private landowners.

CLIMATE CHANGE AND SEVERE WEATHER:

- Determine how regional and global climate change will affect SGCN, vegetation patterns (e.g., Davis e al. 2019, Coop et al. 2020, Guiterman et al. 2022, Davis et al. 2023), and community (e.g., Rosenblad et al. 2023) and ecosystem processes and dynamics, including disturbance regimes. This includes identifying SGCN (e.g., Glick et al. 2011) and associated habitats that are most likely to be negatively affected by climate change, including impacts on travel corridors, habitat connectivity, and species and habitat ranges. Identification of environmental conditions or thresholds that could limit SGCN is especially important. Potential collaborators: BLM, NPS, USFS, USFWS, USGS, EMNRD, SLO, universities.
- Identify climate change (e.g., Michalak et al. 2020) or disturbance refugia (e.g., Rodman et al. 2023) for SGCN and their habitats and implement conservation actions to conserve, expand, or enhance these refugia. As appropriate, consider refugia when implementing conservation actions (e.g., focus on refugia when planting native plants to encourage reforestation following a fire) (Hennessy et al. 2024). Potential collaborators: BOR, USFS, USGS, universities.
- Identify and implement actions to mitigate the effects of climate change on SGCN and their habitats. These may include actions that assist in enhancing carbon sequestration in natural environments (e.g., appropriate forest conservation and management [Mo et al. 2023]), improving climate resilience of species and communities (e.g., Dyshko et al. 2024), or climate-smart projects that help maintain, or accommodate for or facilitate climate-related shifts in (e.g., Stanturf et al. 2024, USFWS 2024a), the distribution and natural functioning, including disturbance regimes, of these impacted species and habitats. Potential collaborators: BLM, NPS, USFS, USFWS, USGS, EMNRD, SLO, universities, Tribal natural-resource managers.
- Promote land-management practices, standards, and guidelines to conserve and/or restore structure and function of corridors that provide important habitat for SGCN and ability for animals to move as climate conditions change. This should include both mesic and xeric riparian communities that serve as important migratory corridors for birds and other wildlife while providing ecosystem services and wildlife corridors that link isolated mountain ranges (Powledge 2003) and coniferous forest patches. Potential collaborators: BLM, NPS, USFS, SLO, universities, private landowners, Tribal natural-resource managers.
- Develop new species recovery plans that consider the current status of and limiting factors for species, as well as projected future conditions for both species and their habitats. Consider full life cycles for migratory species when feasible (e.g., KFF 2021). Potential collaborators: USFWS, non-profit organizations, species working groups.
- Inform the public about potential adverse effects of continued climate change on SGCN and their habitat and encourage development of, and data collection under, citizen and community science projects focused on SGCN and their habitats. Potential collaborators: BOR, USFS, USFWS, USGS, NMSP, SLO, universities, non-profit organizations.
- Monitor SGCN to determine long-term trends that correlate to ecosystem dynamics and habitat changes (e.g., Shirk et al. 2023). If feasible, identify potential limiting factors and develop and implement strategies to mitigate them. Potential collaborators: BLM, NPS, USFS, SLO, universities, Tribal natural-resource managers.

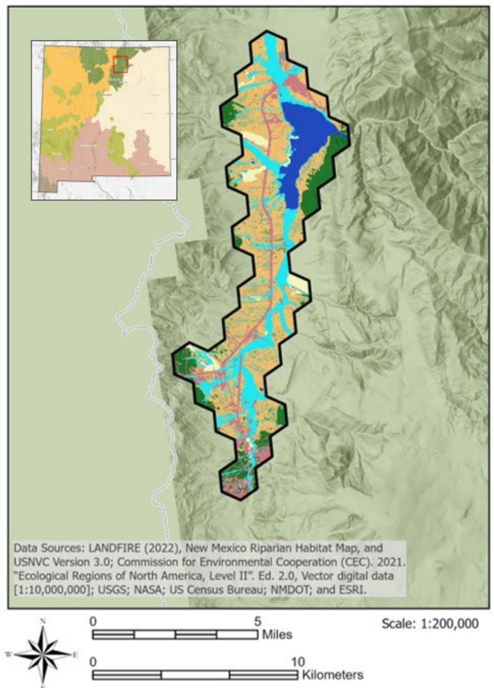
ACTIONS THAT ADDRESS MULTIPLE THREATS:

- Determine life history needs, ecology, distribution, movements, status, and trends of and threats to SGCN (especially invertebrates that are not currently monitored, riparian-obligate species, herpetofauna [Pierce et al. 2016, Olson and Pilliod 2022], and rare native fishes) and their habitats. Consider full annual cycles for migratory species when appropriate and logistically feasible (KFF 2021) and interactions with lower trophic levels that may drive SGCN status (e.g., EPA 2023). Use this information to develop and implement effective monitoring protocols and conservation actions, including actions to mitigate identified threats. Potential collaborators: BOR, BLM, NPS, USFS, SLO, universities, non-profit organizations, private industry, species working groups, Tribal natural-resource managers.
- Assess the synergistic effects between climate change and other threats to SGCN and their habitats (e.g., Friggens et al. 2019, Parks et al. 2019). Incorporate appropriate climate adaptation strategies and frameworks into projects designed to address these synergistic effects. This may include enhancing connectivity (CEQ 2023), facilitating a species' innate adaptive capacity (Thurman et al. 2022), enhancing genetic diversity (Powell 2023), considering local adaptation (Meek et al. 2023), or considering whether it is most appropriate to resist, accept, or direct ecosystem transformation (Lynch et al. 2021, Stevens et al. 2021). Projects should acknowledge ecosystem dynamism and incorporate Indigenous Knowledge (e.g., Roos et al. 2022, Eisenberg et al. 2024), nature-based solutions (Warnell et al. 2023), and experimentation (Guiterman et al. 2022) when appropriate. Potential collaborators: BLM, NPS, USFS, USGS, universities, Tribal natural-resource managers.
- Identify or develop an accessible, jointly used database to document the status and condition of, threats to, and conservation actions implemented across aquatic, riparian, and upland habitats. Identify data gaps (e.g., Ganey et al. 2017) and implement standardized methods to gather habitat data (e.g., Vollmer et al. 2018, Shirk et al. 2023) and to monitor the success of conservation actions (e.g., Davis and Pinto 2021), including impacts on local SGCN populations. Synthesize existing information (e.g., Jain et al. 2021) and apply modeling techniques (e.g., Parks et al. 2018) to aid in evaluating success when appropriate. Adjust future conservation actions as needed based on observed outcomes. Potential collaborators: BLM, BOR, NPS, USACE, USFS, USFWS, USGS, NMED, SFD, SLO, universities.
- Evaluate the effectiveness of public education and outreach efforts regarding threats to SGCN and their habitats and the ways that the public can assist in threat mitigation (KFF 2021). Modify outreach activities as needed in response to evaluation outcomes. Potential collaborators: BOR, BLM, NPS, USACE, USFS, USGS, NMED, NMSP, SFD, SLO, universities, municipalities, non-profit organizations.
- Where appropriate, incorporate native, pollinator-friendly plants (Glenny et al. 2022) or native plants adapted to projected future climatic conditions at the restoration site (e.g., Meek et al. 2023, Stanturf et al. 2024) into seed mixes and live plantings used in the restoration of lands affected by grazing, fire, resource extraction, energy development, or urban development. Consider reclamation site conditions, genetic diversity, and resilience to local threats when producing seedlings (Davis and Pinto 2021) and consider appropriate climate analogs when identifying appropriate seed sources (e.g., Richardson et al. 2024).

When focused on benefiting pollinators, prioritize plants that are attractive to pollinators, especially SGCN; support pollinators throughout the growing season (Glenny et al. 2023); provide food for caterpillars of insect SGCN (e.g., Dumroese et al. 2016); and produce pollen with high nutritional diversity (Vaudo et al. 2024). Potential collaborators: BLM, NPS, NRCS, USFS, SFD, SLO, energy and mining companies, non-profit organizations, private landowners, Tribal natural-resource managers.

CONSERVATION OPPORTUNITY AREAS

EAGLE NEST LAKE



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	303.0
Arid West Interior Freshwater Emergent Marsh	1	14.5
Barren	N/A	30.0
Cliff, Scree, and Rock Vegetation	4	1.4
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	6.5
Desert Alkali-Saline Wetland	1	0.5
Developed and Urban	N/A	835.0
Intermountain Dry Shrubland and Grassland	2	10.8
Intermountain Dwarf Sagebrush Shrubland	4	0.2
Intermountain Tall Sagebrush Shrubland	3	637.8
Introduced Riparian Vegetation	5	1.6
Montane-Subalpine Wet Shrubland and Wet Meadow	1	1456.4
Open Water	N/A	656.1
Rocky Mountain Lower Montane Forest	4	888.5
Rocky Mountain Montane Riparian Forest	1	25.4
Rocky Mountain Montane Shrubland	3	998.6
Rocky Mountain Piñon-Juniper Woodland	4	29.5
Rocky Mountain Subalpine-High Montane Conifer Forest	4	1.8
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	1874.6

Figure 26. Eagle Nest Lake Conservation Opportunity Area.

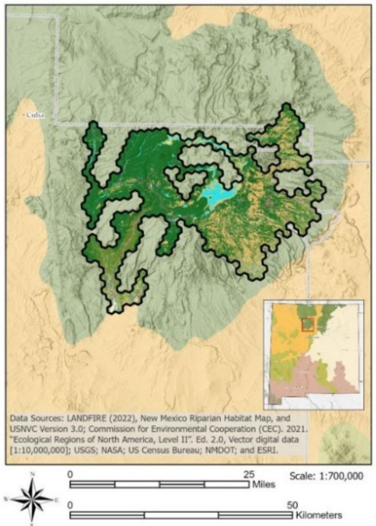
The Eagle Nest Lake COA (Figure 26) spans approximately 7,764 ha (19,185 ac) and is nestled within a basin of the Sangre de Cristo Mountains. It extends from Eagle Nest to Angel Fire and encompasses the reservoir fed by the Cimarron River.

The majority of the land (~80%) in this COA is privately owned, while the remaining area is managed by the New Mexico Department of Game and Fish (Department) (19.5%) and the USFS (0.5%). Currently, no portion of this COA is protected.

The COA supports 13 native vegetation habitats and two ruderal or introduced vegetation types, along with agricultural vegetation, barren areas, developed and urban paces, and open water. The dominant habitats include Rocky Mountain Subalpine-Montane Meadow and Grassland (24%) and Montane-Subalpine Wet Shrubland and Wet Meadow (19%). Additionally, Rocky Mountain Montane Shrubland (13%) and Rocky Mountain Lower Montane Forest (11%) are also abundant. Perennial aquatic habitats include 546 ha (1,348 ac) of cold-water reservoirs.

A total of 22 SGCN are found (either observed or with potential habitat) within the COA, including four classified as Conservation Impact Species (I) and eight as Current Focal Species (F) (Appendix G). This COA has very high potential to contain microclimate refugia for birds and cold-water fish and macroclimate refugia for terrestrial species. This COA also has high potential to contain microclimate refugia for amphibians and some potential to contain microclimate refugia for mammals and reptiles (Table 11).

JEMEZ MOUNTAINS



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	725.0
Arid West Interior Freshwater Emergent Marsh	1	10.2
Barren	N/A	67.3
Cliff, Scree, and Rock Vegetation	4	302.9
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	108.0
Colorado Plateau Piñon-Juniper Woodland	4	433.2
Desert Alkali-Saline Wetland	1	115.2
Developed and Urban	N/A	2608.7
Intermountain Arroyo Riparian Scrub	2	46.8
Intermountain Dry Shrubland and Grassland	2	2534.4
Intermountain Dwarf Sagebrush Shrubland	4	57.8
Intermountain Saltbush Shrubland	4	38.2
Intermountain Tall Sagebrush Shrubland	3	6151.3
Introduced Riparian Vegetation	5	77.3
Montane-Subalpine Wet Shrubland and Wet Meadow	1	4123.3
Open Water	N/A	143.8
Rocky Mountain Lower Montane Forest	4	54274.8
Rocky Mountain Montane Riparian Forest	1	1926.1
Rocky Mountain Montane Shrubland	3	8530.0
Rocky Mountain Piñon-Juniper Woodland	4	11934.3
Rocky Mountain Subalpine-High Montane Conifer Forest	4	1829.3
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	11948.5
Southwest Lowland Riparian Forest	1	506.6
Southwest Lowland Riparian Shrubland	1	38.0

Figure 27. Jemez Mountains Conservation Opportunity Area.

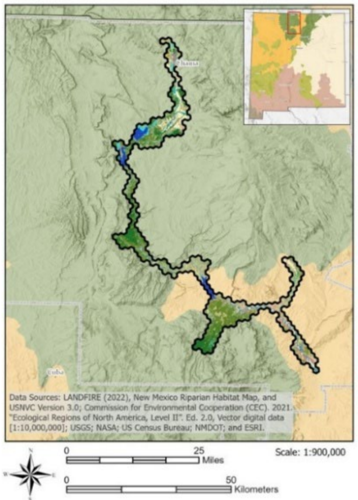
The Jemez Mountains COA (Figure 27) spans approximately 108,486 ha (268,072 ac) and is located west of Los Alamos and about 50 km (~31 mi) west of Santa Fe. It encompasses portions of the Jemez Mountains, including the headwaters of the Jemez River, and extends downstream to the Pueblo of Jemez.

Land ownership within this COA is diverse, with the USFS managing the majority (55%). The NPS manages 24.5% of the land, while the US Department of Energy and Tribal entities each manage 7%. Private ownership accounts for 6.5% and state-managed lands, including NMSP and the Department, make up less than 0.5% of the area. This COA also includes two Important Bird Areas: Bandelier National Monument and Valles Caldera/Jemez Mountains. Approximately 29% of the COA is currently protected.

The COA supports 18 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats are Rocky Mountain Lower Montane Forest (50%), Rocky Mountain Subalpine-Montane Meadow and Grassland (11%), and Rocky Mountain Piñon-Juniper Woodland (11%). Perennial aquatic habitats within the COA include 13 km (8 mi) of warm-water streams, 328 km (204 mi) of cold-water streams, and 13 ha (32 ac) of cold-water reservoirs.

A total of 73 SGCN are found (either observed or with potential habitat) within the COA, including 12 classified as I and 13 as F (Appendix G). Except for its southern- and easternmost edges, this COA may represent a climate refugia for the Grace's warbler through 2075, and areas directly north of this COA may become suitable for this species over the next 50 years. Eastern portions of this COA may represent a climate refugia for the American pika (*Ochotona princeps*) through 2075 (NHNM 2024). This COA also has very high potential to contain microclimate refugia for birds and mammals in general, high potential to contain microclimate refugia for amphibians, and some potential to contain microclimate refugia for cold-water fish (Table 11).

RIO CHAMA



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	5281.2
Arid West Interior Freshwater Emergent Marsh	1	49.3
Barren	N/A	269.6
Cliff, Scree, and Rock Vegetation	4	309.8
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	141.2
Colorado Plateau Piñon-Juniper Woodland	4	5165.0
Desert Alkali-Saline Wetland	1	633.5
Developed and Urban	N/A	3373.5
Intermountain Arroyo Riparian Scrub	2	165.3
Intermountain Dry Shrubland and Grassland	2	5293.3
Intermountain Dwarf Sagebrush Shrubland	4	358.4
Intermountain Saltbush Shrubland	4	902.3
Intermountain Tall Sagebrush Shrubland	3	12515.2
Introduced Riparian Vegetation	5	661.2
Montane-Subalpine Wet Shrubland and Wet Meadow	1	2248.6
Open Water	N/A	3353.0
Rocky Mountain Lower Montane Forest	4	9586.2
Rocky Mountain Montane Riparian Forest	1	1285.4
Rocky Mountain Montane Shrubland	3	1769.3
Rocky Mountain Piñon-Juniper Woodland	4	10536.7
Rocky Mountain Subalpine-High Montane Conifer Forest	4	61.7
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	1825.5
Southwest Lowland Riparian Forest	1	1498.6
Southwest Lowland Riparian Shrubland	1	77.7

Figure 28. Rio Chama Conservation Opportunity Area.

The Rio Chama COA (Figure 28) covers approximately 67,316 ha (166,342 ac) along the Rio Chama corridor, including the surrounding upland areas. It extends from the confluence of the Rio Grande near Española to Chama. The COA also encompasses the lower reaches of Cañones, El Rito, and Polvadera Creeks and all three major reservoirs along the Rio Chama: Abiquiu, El Vado, and Heron.

Land ownership within this COA is primarily divided between private ownership (40%) and the USFS (33%). Other land managers include NMSP (7%), Tribal lands (7%), the BLM (7%), the Department (5%), the US Department of Defense (1%), and the SLO (0.5%). This COA also includes the Chama River Gorge and Golondrina Mesa Important Bird Area. About 29% of the COA is currently protected.

The COA supports 18 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Intermountain Tall Sagebrush Shrubland (19%), Rocky Mountain Piñon-Juniper Woodland (16%), and Rocky Mountain Lower Montane Forest (14%). The vegetated riparian corridor consists mainly of Montane-Subalpine Wet Shrubland and Wet Meadow (3%), Southwest Lowland Riparian Forest (2%), and Rocky Mountain Montane Riparian Forest (2%). Perennial aquatic habitats within the COA include 59 km (37 mi) of warm-water streams, 221 km (138 mi) of cold-water streams, 560 ha (1,383 ac) of warm-water reservoirs, and 2,535 ha (6,264 ac) of cold-water reservoirs.

A total of 52 SGCN are found (either observed or with potential habitat) within the COA, including 11 classified as I and 11 as F (Appendix G). Northern and central portions of this COA may represent a climate refugia for the gray vireo through 2075, and areas within and to the north and west of this COA may become suitable for this species over the next 50 years (NHNM 2024). This COA also has high potential to contain microclimate refugia for birds in general and mammals and some potential to contain microclimate refugia for amphibians and cold-water fish and macroclimate refugia for aquatic and terrestrial species (Table 11).

Chapter 7: High Plains and Tablelands Conservation Profile

SPECIES OF GREATEST CONSERVATION NEED (SGCN) AND THEIR HABITATS

The High Plains and Tablelands ecoregion encompasses 102,890 km^2 (39,726 mi^2) of eastern New Mexico and is part of a contiguous 989,587 km^2 (382,080 mi^2) semi-arid prairie that extends across most of Kansas and Oklahoma, eastern Colorado, southern Nebraska, north and west Texas, and southeastern Wyoming (CEC 2021). In New Mexico, elevations range from 902-2,704 m (2,960-8,871 ft) (USGS 2024a), and terrain is smooth to slightly irregular with intermittent mesas and plateaus. The climate is marked by hot summers and cold winters. For the period of 1991 to 2020, precipitation averaged 41 cm (16 in) (range 30-58 cm [12-23 in]) (AdaptWest Project 2022) with over half occurring as thundershowers during July-September.

One hundred and fifty SGCN occur in the High Plains and Tablelands ecoregion. Half are birds (Table 21, Table 23). Most SGCN within the ecoregion fall within the Data Needs Species (57%), Current Focal Species (17%), or Conservation Impact Species (15%) categories.

Table 21. Number of Species of Greatest Conservation Need in the High Plains and Tablelands ecoregion.

Taxon / Category[29]	F	I	D	L	Total
Amphibians	0	3	0	1	4
Bees	0	0	3	1	4
Birds	10	7	52	7	76
Crustaceans	0	0	4	0	4
Fish	10	6	1	5	22
Mammals	5	1	10	0	16
Molluscs	0	0	7	0	7
Moths and Butterflies	0	4	4	2	10
Reptiles	1	2	6	0	9
Total	26	23	87	16	152

In the High Plains and Tablelands ecoregion, there are 20 terrestrial habitats that cover 95,607 km^2 (36,914 mi^2) or 93% of the landscape (Table 22, Figure 29). The remainder of the landscape contains miscellaneous land-cover types, primarily agricultural vegetation at 5,300 km^2 (2,046 mi^2) or 5% of the landscape. Among the natural habitats, six are characteristic of this

[29]Category abbreviations are: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.

ecoregion and collectively they comprise 70% of the area (see full descriptions in this ecoregion chapter). Great Plains Shortgrass Prairie is the major habitat in this ecoregion, encompassing 53% of the landscape, and dominates the nearly flat plains across the eastern portion of the region. Intermixed with the short shortgrass prairie are: Great Plains Mixedgrass Prairie, which is dominated by more mesic grasses that are more prevalent east of New Mexico; Great Plains Sand Grassland and Shrubland, which occurs on sand sheets and in dunelands; and Great Plains Ruderal Grassland and Shrubland, which is made up of weedy grasses and shrubs that have increased with disturbance (collectively 16% of ecoregion). Great Plains Floodplain Forest and Great Plains Wet Meadow, Marsh, and Playa occupy the riparian zones of the Canadian and upper Pecos watersheds and playas out on the plains. While they occupy less than 1% of the ecoregion, they are key habitats for wildlife in this semi-arid landscape.

Rocky Mountain Piñon-Juniper Woodland extends out of the Southern Rocky Mountains ecoregion to mesas and isolated mountains in the High Plains and Tablelands ecoregion, along with Rocky Mountain Lower Montane Forest and Rocky Mountain Montane Shrubland. Together these three habitat types from the Southern Rocky Mountains ecoregion comprise 9% of the High Plains and Tablelands ecoregion. Chihuahuan Semi-Desert Grassland and Chihuahuan Desert Scrub can be prevalent along the southern edge of the High Plains and Tablelands ecoregion (13% of the ecoregion).

Perennial water is limited (Figure 30). Most surface area of the 52 reservoirs and ponds are warm water (22 bodies; 9,276 ha [22,922 ac]). Four reservoirs (Conchas, Santa Rosa, Sumner, Ute) account for 36% of the warm-water habitat and 85% of all aquatic habitat in the ecoregion. Reservoirs and ponds that are cold water year round encompass 550 ha (1,334 ac). Warm-water, perennial streams extend 1,447 km (899 mi); cold-water streams extend 8 km (5 mi).

Table 22. Terrestrial habitat types of the High Plains and Tablelands ecoregion.

Habitat Category	USNVC Code	Habitat Name[30]	Tier[31]	Climate Vulnerability[32]	Area	
					(km^2)	(mi^2)
Alpine and Montane Vegetation	M547	Rocky Mountain Subalpine-Montane Meadow and Grassland	2	Moderate	79	30
	M049	Rocky Mountain Montane Shrubland	3	Moderate	1,210	467
	M022	Rocky Mountain Lower Montane Forest	4	Moderate	618	239
	M897	Rocky Mountain Piñon-Juniper Woodland	4	Moderate→High	6,962	2,688
Plains-Mesa Grasslands	M051	Great Plains Mixedgrass Prairie	2	High	1,446	558
	M052	Great Plains Sand Grassland and Shrubland	3	High	7,065	2,728
	M053	Great Plains Shortgrass Prairie	3	High	54,663	21,106
	M498	Great Plains Ruderal Grassland and Shrubland	5	--	7,787	3,006
Desert Grassland and Scrub	M087	Chihuahuan Semi-Desert Grassland	2	Moderate→High	13,001	5,020
	M086	Chihuahuan Desert Scrub	4	Moderate→High	639	247
	M093	Intermountain Saltbush Shrubland	4	--	477	184
Arroyo Riparian	M092	Warm-Desert Arroyo Riparian Scrub	2	--	59	23
Riparian Woodlands and Wetlands	M082	Desert Alkali-Saline Wetland	1	--	459	177
	M028	Great Plains Floodplain Forest	1	--	123	48

[30] Terrestrial habitats are based on macrogroups of the United States Natural Vegetation Classification system (USNVC Version 3.0; https://usnvc.org/) except for the four Other Land Cover types; links to USNVC macrogroup descriptions are provided in the USNVC code column. Areas for upland habitat types are based on the 2022 LandFire Existing Vegetation Map for the continental US (LANDFIRE 2022), which was quality controlled by Natural Heritage New Mexico. Ecological systems in LANDFIRE (2022) were cross-walked to USNVC macrogroups. Areas for riparian vegetation types are based on the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap), also aggregated to macrogroups and embedded in the LANDFIRE (2022) map. Habitats listed in order by Tier (see below) and then alphabetically.

[31] Tiers reflect the priority for conservation and are based on the degree of imperilment within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. Ranks: N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure. Spatial patterns: linear, small patch, large patch, and matrix. Tier 1: N1, N2, N3 small patch/linear; Tier 2: N3 large patch or N4 small patch/linear; Tier 3: N3 matrix or N4 large patch; Tier 4: N4 matrix; Tier 5: N5 ruderal vegetation linear/large patch.

[32] Climate vulnerability levels were based on a vulnerability analysis performed for Ecological Response Units (ERUs) across New Mexico and Arizona (Triepke et al. (2014). The ERU classification system represents major ecosystem types of the southwest. Vulnerability for each ERU was calculated as the relative probability of type conversion. The ERUs were then cross-walked to the habitats shown here.

Habitat Category	USNVC Code	Habitat Name[30]	Tier[31]	Climate Vulnerability[32]	Area (km^2)	(mi^2)
	M071	Great Plains Wet Meadow, Marsh, and Playa	1	--	663	256
	M893	Montane-Subalpine Wet Shrubland and Wet Meadow	1	--	36	14
	M034	Rocky Mountain Montane Riparian Forest	1	--	7	3
	M076	Southwest Lowland Riparian Shrubland	1	--	26	10
	M298	Introduced Riparian Vegetation	5	--	49	19
Cliff, Scree, and Rock Vegetation	M887	Cliff, Scree, and Rock Vegetation	4	Moderate	236	91
Other Land Cover	N/A	Agricultural Vegetation	5	--	5,300	2,046
	N/A	Barren	5	--	157	61
	N/A	Developed and Urban	5	--	1,676	647
	N/A	Open Water	5	--	170	66

Table 23. Species of Greatest Conservation Need (SGCN) in the High Plains and Tablelands ecoregion.

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Blanchard's Cricket Frog	*Acris blanchardi*	Amphibians	I	V	EC, EMCS, M071, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Boreal Chorus Frog	*Pseudacris maculata*	Amphibians	I	C, De, Di, V	EC, EMCS, M022, M028, M034, M051, M071, M076, M547, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Northern Leopard Frog	*Lithobates pipiens*	Amphibians	I	C, De, Di, V	EC, EMCS, M022, M028, M034, M049, M071, M298, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Western Narrow-mouthed Toad	*Gastrophryne olivacea*	Amphibians	L	C, De, Di, V	EC, M051, M052, M053, M071, M076, M082, M086, M087, M092, M897, PCWR, PCWS, PLCP, PWWR, PWWS
Bare Fairy Bee	*Perdita aperta*	Bees	D	C, De, V	M087, M093

33 Hyperlinks are to species booklets in the Biota Information System of New Mexico (https://bison-m.org/) for each SGCN in the High Plains and Tablelands ecoregion. Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.
34 Reason to include indicates which of five criteria for inclusion on the SGCN list a particular species met. Abbreviations are as follows: C = Climate Change Vulnerability; De = Decline; Di= Disjunct; E = Endemic; K = Keystone; V = Vulnerable.
35 Aquatic habitat abbreviations are as follows: PCWS = Perennial Cold-Water Streams; PWWS = Perennial Warm-Water Streams; PLCP = Perennial Lakes, Cirques, Ponds; PMCSS = Perennial Marshes/Cienegas/Springs/Seeps; PCWR = Perennial Cold-Water Reservoirs; PWWR = Perennial Warm-Water Reservoirs; EMCS = Ephemeral Marshes/Cienegas/Springs; EC = Ephemeral Catchments. Habitat codes refer to United States National Vegetation Classification System designations, which are identified in Table 22 above.

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Mighty Leaf-cutter Bee	*Megachile fortis*	Bees	L	V	M022
Morrison's Bumble Bee	*Bombus morrisoni*	Bees	D	C, De, V	M022, M034, M049, M051, M052, M053, M082, M086, M087, M093, M298, M498, M897
Volger’s Mining Bee	*Andrena vogleri*	Bees	D	E	M897
American Bittern	*Botaurus lentiginosus*	Birds	D	C, Di, V	EC, EMCS, M028, M071, M893, PCWS, PLCP, PMCSS, PWWS
American Kestrel	*Falco sparverius sparverius*	Birds	D	De, V	EMCS, M022, M028, M034, M049, M051, M052, M053, M071, M076, M086, M087, M092, M547, M893, M897, PMCSS
American Tree Sparrow	*Spizelloides arborea ochracea*	Birds	D	C, De, V	M028, M053, M076, M086, M897
Aplomado Falcon	*Falco femoralis septentrionalis*	Birds	L	C, V	M053, M076, M086, M087
Baird's Sparrow	*Centronyx bairdii*	Birds	F	C, De, V	M051, M053, M086, M087

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Bald Eagle	*Haliaeetus leucocephalus*	Birds	D	C, Di, V	EC, EMCS, M022, M028, M034, M049, M051, M052, M053, M071, M076, M082, M086, M087, M093, M547, M887, M893, M897, PCWR, PCWS, PLCP, PMCSS
Band-tailed Pigeon	*Patagioenas fasciata*	Birds	D	De, V	EC, M022, M028, M034, M049, M076, M087, M893, M897, PCWS, PWWS
Bank Swallow	*Riparia riparia riparia*	Birds	D	C, De, Di, V	EC, EMCS, M028, M034, M071, M076, M092, PCWR, PCWS, PMCSS, PWWR, PWWS
Bell's Vireo	*Vireo bellii*	Birds	F	C, De, Di, V	M028, M034, M053, M076, M086, M087, M092, M298, M547, M897
Bendire's Thrasher	*Toxostoma bendirei*	Birds	F	C, De, V	M022, M028, M051, M053, M076, M082, M086, M087, M092, M093, M887, M897
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	D	C, V	M022, M028, M034, M049, M076, M086, M092, M887, M893, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Black-throated Sparrow	*Amphispiza bilineata*	Birds	D	De, V	M053, M086, M087, M092, M547, M897
Brewer's Sparrow	*Spizella breweri*	Birds	D	C, V	EMCS, M028, M053, M071, M076, M086, M087, M092, M547, M897, PMCSS
Broad-tailed Hummingbird	*Selasphorus platycercus platycercus*	Birds	D	De, V	M022, M028, M034, M049, M051, M053, M076, M086, M087, M092, M547, M893, M897
Brown Pelican	*Pelecanus occidentalis carolinensis*	Birds	L	V	EC, PCWS, PLCP, PWWS
Burrowing Owl	*Athene cunicularia hypugaea*	Birds	I	C, De, K, V	M028, M051, M052, M053, M071, M076, M082, M086, M087, M092, M093, M547, M887, M897
Canyon Towhee	*Melozone fusca*	Birds	D	De, V	M028, M034, M049, M053, M076, M086, M087, M092, M547, M897
Canyon Wren	*Catherpes mexicanus conspersus*	Birds	D	De, Di, V	M887
Cassin's Sparrow	*Peucaea cassinii*	Birds	D	C, De, V	M049, M051, M052, M053, M076, M082, M086, M087, M092, M547, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	F	C, De, V	M022, M051, M052, M053, M086, M087, M547, M897
Chihuahuan Meadowlark	*Sturnella lilianae*	Birds	D	C, De, V	M051, M053, M086, M087, M897
Clark's Grebe	*Aechmophorus clarkii*	Birds	D	Di, V	EC, EMCS, M071, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Common Black Hawk	*Buteogallus anthracinus anthracinus*	Birds	D	C, V	EC, EMCS, M022, M028, M034, M071, M076, M086, M087, M092, M887, PCWS, PMCSS, PWWS
Common Nighthawk	*Chordeiles minor*	Birds	D	C, De, V	EC, EMCS, M022, M028, M034, M049, M051, M052, M053, M071, M076, M086, M087, M092, M547, M887, M893, M897, PCWS, PMCSS, PWWS
Ferruginous Hawk	*Buteo regalis*	Birds	D	C, Di, V	EMCS, M022, M028, M051, M052, M053, M071, M076, M086, M087, M092, M547, M887, M897, PMCSS

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
[Field Sparrow]()	*Spizella pusilla arenacea*	Birds	D	De, V	M051, M053, M086, M087
[Flammulated Owl]()	*Psiloscops flammeolus*	Birds	D	C, V	M022, M028, M034, M049, M053, M076, M087, M298, M547, M887, M893, M897
[Golden Eagle]()	*Aquila chrysaetos canadensis*	Birds	D	C, Di, V	EC, EMCS, M022, M028, M034, M051, M052, M053, M071, M076, M086, M087, M092, M547, M887, M893, M897, PCWS, PMCSS, PWWS
[Grace's Warbler]()	*Setophaga graciae*	Birds	I	C, De, V	M022, M028, M034, M049, M076, M887, M893, M897
[Grasshopper Sparrow]()	*Ammodramus savannarum perpallidus*	Birds	D	C, De, V	M051, M087
[Gray Vireo]()	*Vireo vicinior*	Birds	I	C, De, Di, V	M022, M028, M034, M049, M051, M082, M086, M087, M092, M093, M887, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Green-tailed Towhee	*Pipilo chlorurus*	Birds	D	C, De, V	EC, EMCS, M022, M028, M034, M049, M053, M071, M076, M086, M092, M547, M893, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Harris's Hawk	*Parabuteo unicinctus harrisi*	Birds	D	De, V	EMCS, M052, M071, M076, M086, M087, PMCSS
Horned Lark	*Eremophila alpestris*	Birds	D	C, De, V	EC, M051, M053, M086, M087, M547, M897, PCWR, PCWS, PLCP, PWWR, PWWS
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	C, De, V	M022, M028, M034, M049, M051, M052, M053, M076, M086, M087, M547, M887, M893, M897
Killdeer	*Charadrius vociferus vociferus*	Birds	D	De, Di, V	EC, EMCS, M051, M053, M071, M086, M087, M092, PCWR, PCWS, PMCSS, PWWR, PWWS
Lapland Longspur	*Calcarius lapponicus alascensis*	Birds	D	De, V	M051, M053, M087, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Lark Sparrow	*Chondestes grammacus strigatus*	Birds	D	C, De, V	EMCS, M028, M051, M053, M071, M076, M086, M087, M092, M547, M897, PMCSS
Lazuli Bunting	*Passerina amoena*	Birds	L	De, V	EC, EMCS, M028, M034, M049, M071, M076, M092, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*	Birds	F	C, De, Di, V	M022, M051, M052, M053, M086, M087, M897
Lewis's Woodpecker	*Melanerpes lewis*	Birds	D	C, De, V	M022, M028, M034, M076, M893, M897
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	C, De, V	M028, M034, M049, M051, M052, M053, M076, M082, M086, M087, M092, M093, M298, M547, M887, M897
Long-billed Curlew	*Numenius americanus americanus*	Birds	D	C, De, V	EC, EMCS, M051, M052, M053, M071, M082, M086, PMCSS, PWWS
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	C, De, Di, V	M022, M034, M049, M547, M887, M893

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
[Mountain Bluebird]()	*Sialia currucoides*	Birds	D	C, De, V	EMCS, M022, M028, M034, M049, M051, M053, M071, M076, M086, M087, M547, M887, M893, M897, PMCSS
[Mountain Chickadee]()	*Poecile gambeli gambeli*	Birds	D	C, De, V	M022, M028, M034, M076, M547, M893, M897
[Mountain Plover]()	*Charadrius montanus*	Birds	F	C, De, Di, V	EC, M051, M052, M053, M071, M082, M086, M087, M093, M547, PCWS, PWWS
[Northern Harrier]()	*Circus hudsonius*	Birds	D	Di, V	EC, EMCS, M028, M034, M051, M052, M053, M071, M076, M086, M087, M092, M547, M893, M897, PCWR, PCWS, PMCSS, PWWR, PWWS
[Olive-sided Flycatcher]()	*Contopus cooperi*	Birds	D	C, De, V	M022, M028, M034, M076, M887, M893, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Peregrine Falcon	*Falco peregrinus*	Birds	D	C, De, Di, V	EC, EMCS, M022, M028, M034, M049, M051, M053, M071, M076, M082, M086, M087, M547, M887, M893, M897, PCWS, PMCSS, PWWS
Pine Siskin	*Spinus pinus*	Birds	D	C, De, V	M022, M028, M034, M049, M076, M092, M547, M893, M897
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	F	C, De, K, V	EMCS, M022, M028, M034, M049, M051, M052, M071, M086, M087, M887, M893, M897, PMCSS
Piping Plover	*Charadrius melodus circumcinctus*	Birds	L	V	EC, PCWS, PLCP, PWWS
Plumbeous Vireo	*Vireo plumbeus*	Birds	D	C, De, V	M022, M028, M034, M049, M076, M893, M897
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	Birds	L	De, V	M028, M076
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Birds	D	C, V	M022, M028, M034, M049, M076, M092, M893, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Sage Thrasher	*Oreoscoptes montanus*	Birds	D	C, De, V	M028, M053, M076, M086, M087, M092, M547, M897
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	I	C, De, V	EC, EMCS, M028, M034, M071, M076, M082, M298, M547, M893, PCWS, PLCP, PMCSS, PWWS
Spotted Sandpiper	*Actitis macularius*	Birds	D	De, V	EC, EMCS, M028, M034, M071, M076, M893, PCWS, PLCP, PMCSS, PWWS
Spotted Towhee	*Pipilo maculatus*	Birds	D	C, De, V	M022, M028, M034, M049, M076, M086, M092, M893, M897
Sprague's Pipit	*Anthus spragueii*	Birds	F	C, De, V	M051, M053, M086, M087, M547
Steller's Jay	*Cyanocitta stelleri macrolopha*	Birds	D	De, V	EC, M022, M028, M034, M076, M092, M893, M897, PCWS
Thick-billed Longspur	*Rhynchophanes mccownii*	Birds	F	C, De, V	M051, M053, M087, M897
Varied Bunting	*Passerina versicolor*	Birds	L	C, V	M028, M076, M086, M087, M092, M887

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Vesper Sparrow	*Pooecetes gramineus*	Birds	D	C, De, V	EMCS, M028, M049, M051, M052, M053, M071, M076, M086, M087, M092, M547, M897, PMCSS
Western Bluebird	*Sialia mexicana bairdi*	Birds	D	C, V	M022, M028, M034, M049, M051, M076, M086, M087, M092, M547, M887, M893, M897
Western Grebe	*Aechmophorus occidentalis*	Birds	D	De, V	EC, EMCS, M071, PCWR, PCWS, PLCP, PMCSS
Western Kingbird	*Tyrannus verticalis*	Birds	D	C, De, V	EC, EMCS, M022, M028, M034, M049, M053, M071, M076, M086, M087, M092, M547, M893, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Western Wood Pewee	*Contopus sordidulus*	Birds	D	C, De, V	M022, M028, M049, M076, M092, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
White-throated Swift	*Aeronautes saxatalis saxatalis*	Birds	D	C, Di, V	EC, EMCS, M022, M028, M034, M053, M071, M076, M086, M087, M092, M547, M887, M893, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	Birds	D	C, K, V	M022, M028, M034, M076, M887, M893, M897
Wilson's Warbler	*Cardellina pusilla*	Birds	L	C, De, V	EC, EMCS, M022, M028, M034, M071, M076, M092, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	I	V	EMCS, M022, M028, M034, M049, M076, M086, M087, M092, M547, M893, M897, PMCSS
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	F	C, De, Di, V	EC, EMCS, M028, M034, M071, M298, PCWS, PMCSS, PWWS
Yellow-billed Cuckoo	*Coccyzus americanus americanus*	Birds	D	C, De, V	M028, M034, M298, PCWS
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Birds	D	C, De, V	EMCS, M053, M071, M092, PMCSS

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Conchas Crayfish	*Faxonius deanae*	Crustaceans	D	V	PWWR, PWWS
Diversity Clam Shrimp	*Eulimnadia diversa*	Crustaceans	D	V	EC
Scud	*Hyalella azteca*	Crustaceans	D	C, V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Southern Plains Crayfish	*Procambarus simulans simulans*	Crustaceans	D	V	PWWS
Arkansas River Shiner	*Notropis girardi*	Fish	F	C, De, Di, V	EC, PCWS, PWWS
Bigscale Logperch	*Percina macrolepida*	Fish	L	C, De, V	PWWS
Central Stoneroller	*Campostoma anomalum*	Fish	L	C, V	PCWS
Gray Redhorse	*Moxostoma congestum*	Fish	F	C, De, Di, V	PWWR, PWWS
Greenthroat Darter	*Etheostoma lepidum*	Fish	I	C, V	PMCSS, PWWS
Headwater Catfish	*Ictalurus lupus*	Fish	D	C, V	PWWS
Mexican Tetra	*Astyanax mexicanus*	Fish	I	C, Di, V	PMCSS, PWWS
Pecos Bluntnose Shiner	*Notropis simus pecosensis*	Fish	F	C, De, Di, V	PWWS
Pecos Gambusia	*Gambusia nobilis*	Fish	F	C, Di, V	PMCSS
Pecos Pupfish	*Cyprinodon pecosensis*	Fish	F	C, Di, V	PMCSS, PWWS
Peppered Chub	*Macrhybopsis tetranema*	Fish	F	C, De, Di, V	PCWS, PWWS

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Plains Minnow	*Hybognathus placitus*	Fish	L	C, De, Di, V	PWWS
Rio Grande Chub	*Gila pandora*	Fish	F	C, De, Di, V	PCWR, PCWS, PWWR, PWWS
Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	Fish	F	C, De, Di, V	PCWS
Rio Grande Shiner	*Notropis jemezanus*	Fish	I	C, Di, V	PWWS
Rio Grande Silvery Minnow	*Hybognathus amarus*	Fish	I	C, De, Di, V	PWWS
Rio Grande Sucker	*Catostomus plebeius*	Fish	F	C, De, V	PCWS, PWWS
Roundnose Minnow	*Dionda episcopa*	Fish	I	C, Di, V	PWWS
Sonora Sucker	*Catostomus insignis*	Fish	F	C, V	PWWS
Southern Redbelly Dace	*Chrosomus erythrogaster*	Fish	L	C, De, V	PCWS
Speckled Chub	*Macrhybopsis aestivalis*	Fish	I	C, Di, V	PWWS
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	L	C, V	PWWS
American Mink	*Neogale vison*	Mammals	D	C, Di, V	EC, EMCS, M028, M034, M071, M076, M893, PCWS, PMCSS, PWWS
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	D	C, De, K, V	M052, M053, M086, M087, M092

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
[Big Free-tailed Bat]()	*Nyctinomops macrotis*	Mammals	D	C, Di, V	EMCS, M022, M034, M049, M076, M086, M087, M092, M887, M893, M897, PMCSS
[Black-footed Ferret]()	*Mustela nigripes*	Mammals	F	C, De, V	M022, M049, M051, M052, M053, M086, M087, M092, M897
[Black-tailed Prairie Dog]()	*Cynomys ludovicianus*	Mammals	F	C, De, K, V	M051, M052, M053, M076, M086, M087, M547, M897
[Cave Myotis]()	*Myotis velifer*	Mammals	I	Di, K, V	EMCS, M053, M071, M076, M086, M087, M092, M887, PMCSS
[Common Porcupine]()	*Erethizon dorsatum*	Mammals	D	C, De, Di, V	M022, M028, M034, M049, M051, M052, M053, M076, M086, M087, M092, M887, M897
[Gunnison's prairie dog]()	*Cynomys gunnisoni*	Mammals	F	C, De, K, V	M022, M049, M051, M053, M086, M087, M092, M093, M547, M897
[Least Shrew]()	*Cryptotis parvus*	Mammals	F	C, V	EMCS, M028, M051, M053, M071, M076, M082, PMCSS

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Prairie Vole	*Microtus ochrogaster haydenii*	Mammals	D	C, V	EMCS, M051, M053, M071, PMCSS
Southwestern Little Brown Myotis	*Myotis occultus*	Mammals	D	C, Di, V	EMCS, M022, M028, M034, M049, M051, M052, M053, M071, M076, M086, M087, M092, M547, M887, M893, M897, PMCSS
Spotted Bat	*Euderma maculatum*	Mammals	D	Di, V	EMCS, M022, M028, M034, M049, M053, M071, M076, M086, M087, M092, M298, M547, M887, M893, M897, PMCSS
Thirteen-lined Ground Squirrel	*Ictidomys tridecemlineatus*	Mammals	D	De, V	M051, M052, M053, M087, M547
Tri-colored Bat	*Perimyotis subflavus*	Mammals	F	C, Di, V	EMCS, M071
Western Red Bat	*Lasiurus blossevillii*	Mammals	D	C, Di, V	EMCS, M022, M076, M086, PMCSS
White-tailed Jackrabbit	*Lepus townsendii campanius*	Mammals	D	C, V	M022, M547
Capitan Woodlandsnail	*Ashmunella pseudodonta*	Molluscs	D	C, Di, V	M022, M053, M087, M897
Creeping Ancylid Snail	*Ferrissia rivularis*	Molluscs	D	V	PWWR
Multirib Vallonia Snail	*Vallonia gracilicosta*	Molluscs	D	C, Di, V	M022

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
New Mexico Ramshorn Snail	*Pecosorbis kansasensis*	Molluscs	D	C, V	M086, M087, PCWS, PMCSS, PWWS
Paper Pondshell	*Utterbackia imbecillis*	Molluscs	D	C, V	PLCP, PWWR, PWWS
Sangre de Cristo Woodlandsnail	*Ashmunella thomsoniana*	Molluscs	D	C, Di, V	M022, M034, M897
Swamp Fingernailclam	*Musculium partumeium*	Molluscs	D	C, V	PWWS
Dotted Checkerspot	*Poladryas minuta*	Moths and Butterflies	D	V	M051, M053
Monarch	*Danaus plexippus*	Moths and Butterflies	L	C, De, Di, V	M022, M034, M049, M051, M052, M053, M082, M086, M087, M092, M298, M897
Organ Mountains Poling's Hairstreak	*Satyrium polingi organensis*	Moths and Butterflies	I	C, E, V	M049
Raton Mesa Silvery Blue	*Glaucopsyche lygdamus erico*	Moths and Butterflies	I	C, De, V	M022, M049, M053, M897
Rhesus Skipper	*Polites rhesus*	Moths and Butterflies	D	C, V	M022, M034, M053, M071, M087, M897
Rindge's Emerald Moth	*Nemoria rindgei*	Moths and Butterflies	I	V	M022, M082, M086, M087
Southwestern Brown Moth	*Plagiomimicus astigmatosum*	Moths and Butterflies	D	C, V	

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
West Coast Lady	*Vanessa annabella*	Moths and Butterflies	L	De, V	M022, M049, M053, M086, M897
White Sands Twirler Moth	*Chionodes bustosorum*	Moths and Butterflies	I	E, V	M087
Wiest's Sphinx Moth	*Euproserpinus wiesti*	Moths and Butterflies	D	C, De, Di, V	
Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	Reptiles	D	V	EC, EMCS, M028, M051, M052, M053, M071, M076, M086, M087, PCWS, PLCP, PMCSS, PWWS
Dunes Sagebrush Lizard	*Sceloporus arenicolus*	Reptiles	F	C, De, Di, V	M051, M052, M053, M086, M087
Midland Smooth Softshell Turtle	*Apalone mutica mutica*	Reptiles	D	V	PCWR, PCWS, PLCP, PWWR, PWWS
North American Racer	*Coluber constrictor*	Reptiles	D	C, De, Di, V	M022, M028, M051, M053, M076, M092, M547, M897
Ornate Box Turtle	*Terrapene ornata*	Reptiles	I	C, V	M028, M051, M052, M053, M076, M086, M087, M092, M897
Texas Spotted Whiptail	*Aspidoscelis gularis gularis*	Reptiles	D	De, V	M053, M076, M086, M087, M092
Trans-Pecos Rat Snake	*Bogertophis subocularis subocularis*	Reptiles	D	V	M076, M086, M092, M887, M897

Common Name[33]	Scientific Name	Taxon	Category	Reason to Include[34]	Habitats[35]
Western Massasauga	*Sistrurus tergeminus*	Reptiles	I	De, Di, V	M051, M052, M053, M086, M087, M093, M897
Western Painted Turtle	*Chrysemys picta bellii*	Reptiles	D	C, De, V	PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS

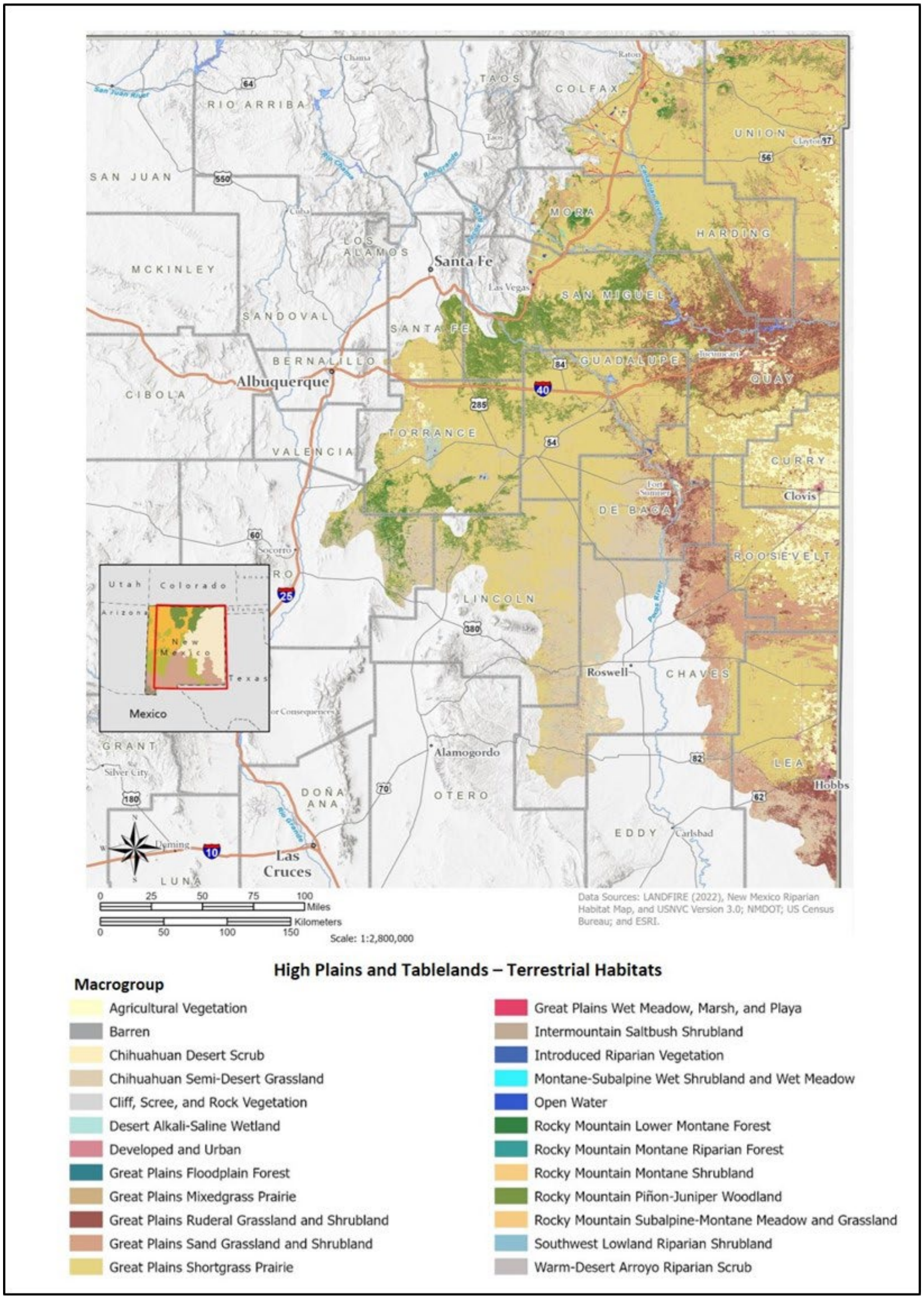


Figure 29. Terrestrial habitats in the High Plains and Tablelands ecoregion.

Map based on LandFire 2022 Existing Vegetation Map (LANDFIRE 2022) crosswalked to macrogroups from the United States National Vegetation Classification system and on vegetation types from the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap) grouped to macrogroups.

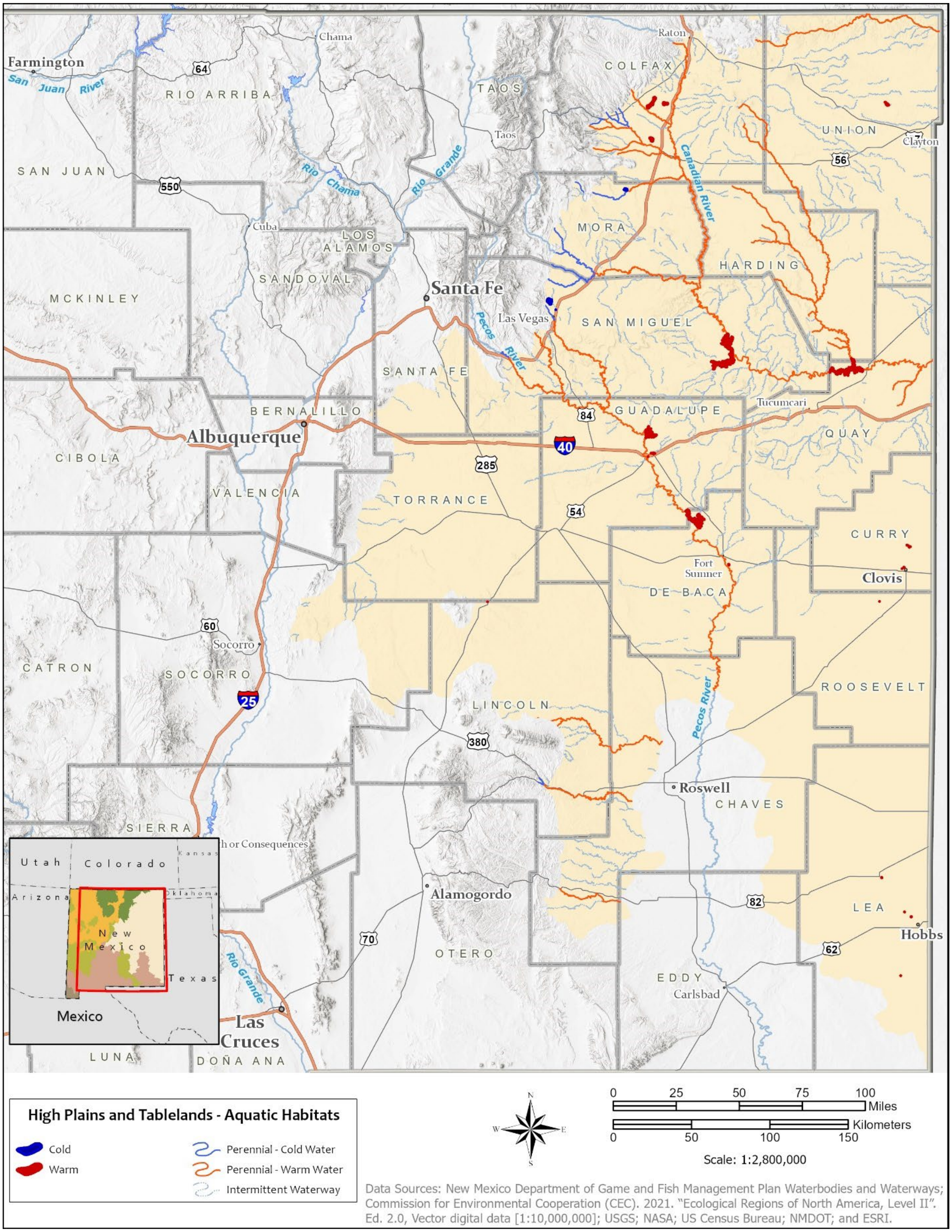


Figure 30. Aquatic habitats in the High Plains and Tablelands ecoregion.

HABITAT DESCRIPTIONS

GREAT PLAINS SHORTGRASS PRAIRIE

The Great Plains Shortgrass Prairie **[M053]**[36] is prevalent in the High Plains and Tablelands ecoregion but can also occur in isolated locations throughout New Mexico. These are expansive, nearly treeless, grasslands of the flat to rolling plains in northeastern New Mexico.

- The habitat is dominated by relatively short-statured grasses that include blue grama (*Bouteloua gracilis*), sideoats grama (*B. curtipendula*), hairy grama (*B. hirsuta*), buffalograss (*Buchloe dactyloides*), James' galleta (*Pleuraphis jamesii*), western wheatgrass (*Pascopyrum smithii*), and plains lovegrass (*Eragrostis intermedia*). New Mexico feathergrass (*Hesperostipa neomexicana*), needle and thread grass (*H. comata*), and sand dropseed (*Sporobolus cryptandrus*) commonly occur on coarser and sandier soils. Under heavy grazing pressure, purple threeawn (*Aristida purpurea*) can be a co-dominant.
- The shrub layer is mostly dominated by low-growing prairie sagewort (*Artemisia frigida*), soapweed yucca (*Yucca glauca*), tulip pricklypear (*Opuntia phaeacantha*), snakeweed (*Gutierrezia sarothrae*), and the taller tree cholla (*Cylindropuntia imbricata*), which increase with disturbance.
- Forbs can be scattered to abundant. Typical species include plains blackfoot (*Melampodium leucanthum*), tanseyleaf tansyaster (*Machaeranthera tanacetifolia*), and Hopi tea greenthread (*Thelesperma megapotamicum*).
- Stands of this habitat occur on flat to rolling plains with small swales and rises and on mesa tops. Historically, expansive fires occurred after a series of years with above-average precipitation, during which litter and fine fuels built up. Currently, fire suppression and more extensive grazing in the region may have decreased the fire frequency. Where grazing has been severe, particularly to the south, honey mesquite (*Prosopis glandulosa*) may form a sparse to moderately dense shrub cover. Soils typically are loams and clay loams with coarser sandy and gravelly pockets.

[36] Complete descriptions of habitats can be viewed by clicking on hyperlinked United States National Vegetation Classification System codes.

GREAT PLAINS MIXED-GRASS PRAIRIE

The Great Plains Mixed-Grass Prairie **[M051]** is relatively uncommon and is primarily found in the High Plains and Tablelands ecoregion with some occurrences in the Southern Rocky Mountains ecoregion. Sites tend to be more mesic where water has collected in swales or among rocks and boulders of mesa tablelands.

- It is comprised of a mixture of short and tall grass species can form dense stands. In New Mexico, the common grasses include sideoats grama, little bluestem (*Schizachyrium scoparium*), sand dropseed, western wheatgrass, and occasionally big bluestem (*Andropogon gerardii*).
- Shrubs tend to be a minor element.
- Forbs can be prevalent. Typical representatives are common yarrow (*Achillea millefolium*), white sagebrush (*Artemisia ludoviciana*), purple prairie clover (*Dalea purpurea*), and white prairie aster (*Symphyotrichum falcatum*).
- Fire can be important in constraining shrub encroachment but occurs patchily across the landscape. Poorly managed grazing constitutes the primary disturbances affecting this habitat. Soils are typically mollisols rich in organic matter and range from silt loams to silty clay loams with sandy loams possible on the western edge of the range.

GREAT PLAINS RUDERAL GRASSLAND AND SHRUBLAND

Great Plains Ruderal Grassland and Shrubland **[M498]** is a widespread habitat of the High Plains and Tablelands ecoregion and extends into the Arizona/New Mexico Mountains ecoregion. They occur in old fields, heavily grazed pastures, and other disturbed sites.

- Vegetation may be a monoculture of a single non-native graminoid species or a mix of native and adventive non-native forbs and graminoids adapted to disturbance. Among natives, purple threeawn and mat muhly (*Muhlenbergia richardsonis*) are common indicators. Non-natives include weeping lovegrass (*Eragrostis curvula*), Lehmann lovegrass (*E. lehmanniana*), and Johnsongrass (*Sorghum halepense*) (mesic sites).
- Common forbs include nodding plumeless thistle (*Carduus nutans*), knapweeds (*Centaurea* spp.), Canada thistle (*Cirsium arvense*), and field bindweed (*Convolvulus arvensis*). There are also dense stands of native ruderal species, including carelessweed (*Amaranthus palmeri*) and silverleaf nightshade (*Solanum elaeagnifolium*), resulting from anthropogenic disturbance.

- This habitat may be on mesic to dry sites where disturbances (e.g., tilling, compaction, or erosion) have altered them sufficiently to allow the establishment of ruderal, disturbance-tolerant species. The size of stands may vary from large areas (≥100 ha [250 ac]) to narrow strips adjacent to roadsides or under powerlines and in other disturbed areas. Use of artificial seeding in grassland restoration projects has led to the growth of stands of weeping lovegrass or Lehmann lovegrass. This habitat occurs on a variety of soils.

GREAT PLAINS SAND GRASSLAND AND SHRUBLAND

The Great Plains Sand Grassland and Shrubland **[M052]** habitat is found primarily in the High Plains and Tablelands ecoregion, but also occurs along the eastern edge of the Chihuahuan Desert ecoregion. This is a habitat of open grasslands on sandsheets and sand dune shrublands.

- The sand grasslands are commonly dominated by sand bluestem (*Andropogon hallii*), little bluestem, and sand dropseed and are often found in a matrix with the sand shrublands.
- Shrublands are dominated or co-dominated by sand sagebrush (*Artemisia filifolia*) and sand shinnery oak (*Quercus havardii*) that form coppice dunelands with intervening, barren deflation plains. Invasive honey mesquite can be common, particularly in the southern portion of the habitat's range.
- This habitat is particularly susceptible to wind erosion along with road disturbance. Blowouts and sand draws are some of the unique, wind-driven disturbances in the sand prairies creating a complex matrix of microhabitats across the landscape. Stands of this habitat occur on well-drained, often deep sandy to loamy sand soils on nearly flat terrain and vegetated dunelands that harbor unique animal communities.

GREAT PLAINS FLOODPLAIN FOREST

Great Plains Floodplain Forest **[M028]** is found only in the High Plains and Tablelands ecoregion. It occurs along small stream to large rivers with low gradients and wide floodplains intermixed in a patch mosaic with riparian shrublands and herbaceous wetlands (see Southwest Lowland Riparian Shrubland [**M076**] in the Chihuahuan Desert ecoregion chapter and Great Plains Wet Meadow, Marsh, and Playa [**M071**] in this chapter below).

- This habitat is dominated by plains cottonwoods (*Populus deltoides* ssp. *monilifera*) that can form pure, sometimes dense stands, but peachleaf willow (*Salix amygdaloides*), boxelder (*Acer negundo*), and netleaf hackberry (*Celtis laevigata* var. *reticulata*) can be common in the subcanopy.

- Wetland shrubs, such as coyote willow (*S. exigua*) and willow baccharis (*Baccharis salicina*), are common in the understory, particularly in younger stands.
- In older stands on drier sites of higher river bars and terraces, herbaceous cover is generally sparse and dominated by prairie grasses such as big bluestem, little bluestem, or western wheatgrass. In younger stands on more mesic sites along rivers, facultative wetland species may be present including common spikerush (*Eleocharis palustris*), rushes (*Juncus arcticus* ssp. *littoralis*, *J. longistylis, J. tenuis*), and horsetails (*Equisetum arvense*, *E. laevigatum*).
- This riparian forest habitat is found on elevated sidebars and low terraces that are situated above the active channel. Flooding frequency ranges from every two years on lower bars to once in more than 50 years on elevated terraces. Stream gradients are generally low (<1%), and riverbeds tend to be mostly sandy. Gravels and cobbles are more common as the gradient increases. Soils of young fluvial landforms are poorly developed entisols and otherwise may be loamy throughout or overlain by a sandy layer. Gravels and cobbles are generally scattered throughout the profile. Soils are dry within one meter of the ground surface but become moist upon approaching the groundwater table, particularly during seasonal flooding events.

GREAT PLAINS WET MEADOW, MARSH, AND PLAYA

The Great Plains Wet Meadow, Marsh, and Playa **[M071]** habitat is found in a matrix with Great Plains Floodplain Forest **[M028]** or surrounding playa lakes of the High Plains and Tablelands ecoregion.

- These wet meadows and marsh habitats of riparian zones are dominated by facultative and obligate wetland species such as cattails (*Typha* spp.), softstem bulrush (*Schoenoplectus tabernaemontani*), common spikerush, rushes, and horsetails.
- Playa lakes are typically surrounded by graminoids, including spikerushes (*Eleocharis* spp.), foxtail barley (*Hordeum jubatum*), western wheatgrass, vine mesquite (*Panicum obtusum*), and buffalograss, along with a wide variety of annual forbs.
- Playas present a unique environment of small, closed basins that are rarely linked to outside groundwater sources, do not have an extensive watershed, and constitute important habitat for waterfowl and other wildlife. Playas are typified by the presence of an impermeable clay layer (Randall clay) that leads to the creation of ephemeral lakes following rainfall events.

THREATS AND CONSERVATION ACTIONS

Nine threats could adversely affect SGCN in 28 habitats within the High Plains and Tablelands ecoregion (Table 24). These threats are summarized below and listed in the order presented by the IUCN (2022). The list does not reflect the order of threat severity.

- Agriculture and Aquaculture: Grazing practices that impact SGCN habitat and withdrawal of groundwater for crops.
- Energy and Mining: Wind and solar energy and oil and gas extraction.
- Transportation and Service Corridors: Transmission lines and roads, including impacts on wildlife movements associated with I-25 and other roads south of Raton, New Mexico (Cramer et al. 2022).
- Biological Resource Use: Wood harvesting and removal in piñon-juniper woodlands.
- Human Intrusion and Disturbance: Military activities and off-highway vehicles (OHVs).
- Natural System Modifications: Degradation of playas and sand shinnery oak/grass communities.
- Invasive and Other Problematic Species, Genes, and Diseases: Introduction of zebra and quagga mussels (*Dreissena polymorpha*) in aquatic habitats; invasion of riparian habitats by tamarisk (*Tamarix* spp.) or other non-native plants; and potential infection of bats by *Pseudogymnoascus destructans*, which can cause white-nose syndrome, and of amphibians by chytrid fungus (*Batrachochytrium dendrobatidis*), which can cause chytridiomycosis.
- Pollution: Air, soil, and water contamination from industrial activities; noise and light pollution from the oil and gas industry.
- Climate Change: Habitat alteration (particularly aquatic and riparian) from prolonged drought and projected increasing aridity. Though much of the ecoregion has relatively low potential to contain macro- or microclimate refugia (Table 12), much of the northeastern portion of the High Plains and Tablelands ecoregion has comparatively high potential to contain macro- or microclimate refugia for amphibians and reptiles and macroclimate refugia for birds, mammals, and cold-water fish (Figure 15; Friggens et al. 2025).

Conservation concerns include managing grasslands to provide for both cost-effective livestock grazing and SGCN habitat needs; restoring aquatic and riparian habitats, particularly playas; and addressing habitat fragmentation and pollution from industrial activities, including oil and gas development. Oil and gas well pad development can cause temporary light and noise pollution, and gas compressor stations can cause long-term noise pollution that can, in turn, impact wildlife behavior. The anticipated expansion of renewable energy development will also add to the existing habitat fragmentation from oil and gas development.

Grassland ecosystems in much of this ecoregion evolved with short-term, intensive grazing by large herbivores. These nomadic grazers left a mosaic of grazed and ungrazed patches that provided for the needs of grassland-dependent species. Conserving SGCN in this ecoregion requires the implementation or continuation of grazing practices that produce a similar result: a healthy mix of grass and shrub species that provide sufficient resources for SGCN to thrive.

The High Plains and Tablelands ecoregion supports crucial habitat for several imperiled aquatic and riparian SGCN. Withdrawal of both surface and groundwater has decreased the availability of these habitats, including along the Pecos and Canadian Rivers. An increase in invasive species, such as tamarisk, has decreased the quality of riparian habitats. Of particular concern are playas, which are seasonal wetlands that provide important habitat for wintering and migrating waterfowl and shorebirds and a diversity of other taxa. Many playas have been destroyed or degraded to the extent that they no longer function properly. This results in higher densities of birds in remaining playas, and in turn, increased potential for disease transmission. Conservation actions include monitoring changes in the quality and quantity of riparian habitats, restoring native riparian flora where possible, and working with landowners to conserve playas and groundwater resources.

Weather stations at several sites in eastern New Mexico showed a decline in mean annual precipitation between 1971-2000 and 2001-2010 (Brauer et al. 2015). A drought from 2000-2013 caused the most severe low-flow conditions documented for a site on the upper Pecos River in the High Plains and Tablelands since 1310 (Harley and Maxwell 2018). Habitats expected to have high vulnerability to climate change are Great Plains Mixedgrass Prairie, Great Plains Sand Grassland and Shrubland, and Great Plains Shortgrass Prairie (Table 22; Triepke et al. 2014).

Table 24. Potential threats to habitats and associated SGCN in the High Plains and Tablelands ecoregion.

Threat categories were derived from IUCN (2022).

Habitat / Threat	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Chihuahuan Desert Scrub	X	X	X	X	X	X	X		X
Chihuahuan Semi-Desert Grassland	X	X	X	X	X	X	X	X	X
Cliff, Scree, and Rock Vegetation		X	X		X				
Desert Alkali-Saline Wetland	X	X					X	X	X
Ephemeral Catchments						X	X		
Ephemeral Marshes/Cienegas/Springs						X	X		
Great Plains Floodplain Forest	X	X	X		X	X	X		X
Great Plains Mixedgrass Prairie	X	X	X						X
Great Plains Ruderal Grassland and Shrubland	X	X			X		X		
Great Plains Sand Grassland and Shrubland	X	X			X		X		X
Great Plains Shortgrass Prairie	X	X			X	X	X		X
Great Plains Wet Meadow, Marsh, and Playa	X	X				X	X	X	X
Intermountain Saltbush Shrubland	X				X		X	X	X
Introduced Riparian Vegetation									
Montane-Subalpine Wet Shrubland and Wet Meadow	X				X	X			X
Perennial Cold-Water Reservoirs						X	X		X
Perennial Cold-Water Streams	X	X	X	X	X	X	X	X	X
Perennial Lakes, Cirques, Ponds						X	X		
Perennial Marsh/Cienega/Spring/Seep	X	X	X	X	X	X	X	X	X
Perennial Warm-Water Reservoirs	X					X	X	X	X
Perennial Warm-Water Streams	X					X	X	X	X
Rocky Mountain Lower Montane Forest	X	X	X	X	X	X			X

Habitat \ Threat	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Rocky Mountain Montane Riparian Forest	X	X		X	X	X	X	X	X
Rocky Mountain Montane Shrubland	X	X			X	X			X
Rocky Mountain Piñon-Juniper Woodland	X	X	X	X	X	X	X	X	X
Rocky Mountain Subalpine-Montane Meadow and Grassland			X	X	X	X			X
Southwest Lowland Riparian Shrubland	X	X	X	X	X	X	X	X	X
Warm-Desert Arroyo Riparian Scrub	X	X	X			X	X	X	X

The following are proposed conservation actions for the High Plains and Tablelands ecoregion, listed in order of priority within each IUCN threat category. Threat categories are listed according to the order presented by IUCN (2022).

AGRICULTURE AND AQUACULTURE:

- Determine where habitat restoration would benefit SGCN and work with federal, state, and private landowners to restore degraded rangelands to good or excellent condition. Monitor restoration results to develop and initiate any identified improvements to restoration practices. Potential collaborators: United States (US) Bureau of Land Management (BLM), US Forest Service (USFS), New Mexico State Land Office (SLO), private landowners.
- Establish baseline composition, condition, disturbance regimes, and function of major range habitats to inform habitat-restoration actions, particularly to address shrub invasion into historic grasslands and inform activities in riparian habitats. Potential collaborators: BLM, USFS, universities, private landowners.
- Determine how timing, intensity, and duration of livestock grazing affect SGCN and their habitats, including the interactions among grazing, fire, and the spread of invasive and other problematic species and among grazing, soil erosion (e.g., Pilon et al. 2017), and native riparian vegetation growth (e.g., Lucas et al. 2004). Potential collaborators: BLM, US Natural Resources Conservation Service (NRCS), USFS, New Mexico Department of Agriculture (NMDA), SLO, universities, private landowners.
- Promote expanded use of appropriate, cost-effective grazing practices that ensure long-term ecological sustainability for SGCN and their habitats (especially riparian habitats). These include actions such as rest-rotation grazing management and conservation easements (Gripne 2005) that contribute to recovery of rangelands impacted by drought and allow restoration activities to be completed. May also include the use of virtual fencing to keep livestock in desired locations and out of sensitive areas (USFS 2024). Potential collaborators: BLM, USFS, SLO, private landowners.
- Promote grazing systems that address local needs of livestock and for SGCN habitat, including riparian areas. When particular habitat components need improvement, coordinate with ranchers and resource managers to identify and implement modifications that would provide the desired habitat outcomes. Potential collaborators: BLM, USFS, SLO, private landowners.
- Employ existing incentive programs to promote persistence of productive wildlife habitat and native vegetation on private lands, SGCN conservation, and retirement of agricultural fields and water rights where feasible. Support maintenance and growth of incentive programs. Potential collaborators: BLM, NRCS, US Fish and Wildlife Service (USFWS), NMDA, SLO, private landowners.
- Gather and assess current information on grazing practices and determine how the Department can support landowners that provide habitat for SGCN. Potential collaborators: BLM, NRCS, USFS, NMDA, SLO, private landowners.
- Balance irrigation and groundwater demands with the needs of aquatic communities, particularly those supporting native fish, amphibian, and springsnail populations. This may include promoting a transition from irrigated to dryland farming in areas where groundwater

pumping and water scarcity threaten SGCN and their habitats. Potential collaborators: US Bureau of Reclamation (BOR), NRCS, US Army Corps of Engineers (USACE), New Mexico Office of the State Engineer (NMOSE), non-profit organizations, private landowners, water-management districts.

- Work with private landowners to improve irrigation processes and infrastructure to conserve water. Includes promoting the use of devices and models that improve water conservation and irrigation efficiency (Schaible and Aillery 2012, Wang 2019) to help conserve the structure and function of aquatic and riparian habitats. Potential collaborators: NRCS, NMOSE.
- Identify human-constructed water-retention structures (e.g., stock tanks, water troughs, and drinkers) that provide habitat for aquatic SGCN and other wildlife, particularly amphibians. Remove invasive species (e.g., bullfrogs [*Rana* (*Aquarana*) *catesbeiana*]) from these structures that may threaten native aquatic wildlife. Potential collaborators: BLM, USFS, universities, private landowners.
- Promote grazing systems that incorporate rested pastures and help improve overall range condition and enhance wildlife habitat health and function. In upland areas, these systems may include rest-rotation and/or deferred-rotation. In riparian areas, beneficial grazing practices may also include grazing in early spring and restricting summer grazing and redistribution practices such as herding and developing drinking water sources in upland areas. Especially during times of drought, rested pastures can provide forage reserves and relieve pressure on grazed pastures or allotments. Potential collaborators: BLM, NRCS, USFS, SLO, private landowners.
- Promote use of ecoregion-appropriate agricultural practices that provide habitat or resources or protect habitat quality (e.g., reduce erosion) for SGCN, including planting rows of trees between crops (McCarthy 2024) and pollinator-friendly practices such as planting pollinator habitat along field margins and underutilized areas, revegetating retired farmland with wildflowers, including pollinator-friendly forbs in cover-crop seed mixes (O'Brien and Arathi 2021), and conserving semi-natural habitat near agricultural fields (Shi et al. 2024). Potential collaborators: NRCS, USFWS, NMDA, private landowners.
- Implement practices that would increase populations and nesting success of grassland birds, such as maintaining a network of grassland reserves that can serve as refugia for species dependent on high quality, natural grassland habitats. This may include promoting aggregation of fields in the Conservation Reserve Program and minimizing haying activities during the nesting and brood-rearing seasons. Potential collaborators: NRCS, private landowners.

ENERGY AND MINING:

- Determine where energy development and mineral extraction currently, and in the future, may affect SGCN. Work with regulatory agencies to develop permitting guidelines and policies that result in siting new development in areas that minimize impacts to SGCN. Potential collaborators: BLM, USFS, New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), New Mexico Bureau of Geology and Mineral Resources (NMBGMR), SLO, energy and mining companies.

- Identify and promote best management practices that minimize the impacts (especially habitat fragmentation and direct SGCN mortality) of energy development (including of renewable energy sources [Lovich and Ennen 2011, Copping et al. 2020, Levin et al. 2023]) and mining on SGCN and their aquatic and terrestrial habitats. This includes informing and supporting resource managers in the implementation of measures to prevent direct take of SGCN associated with energy extraction and mining (e.g., use of appropriate exclusionary netting and/or fencing, bird balls, and closed containment systems at toxic sites). May also include increased use of small, localized installations (e.g., community solar development) rather than utility-scale developments (Bowlin et al. 2024). Potential collaborators: BLM, EMNRD, SLO, universities, energy and mining companies, municipalities.
- Reclaim disturbed habitats impacted by resource extraction as close as possible to pre-development conditions. Rehabilitate abandoned well pads, mining sites, and associated access roads. Remove unneeded roads, transmission lines, and any other abandoned infrastructure and equipment (e.g., pits, pipelines, unused machinery). Restore native vegetation. Where feasible, maintain abandoned mines as habitat for bats and snakes by constructing appropriate bat gates on mine shafts and adits (Spanjer and Fenton 2005). Potential collaborators: BLM, USFS, USFWS, EMNRD, SLO, energy and mining companies, private landowners.
- Maintain and expand open communication with mining and energy companies and land-management agencies to minimize adverse impacts of development to SGCN. Potential collaborators: BLM, USFS, EMNRD, SLO, energy and mining companies.

TRANSPORTATION AND SERVICE CORRIDORS:

- Site, consolidate, and maintain utility corridors to minimize adverse effects to SGCN and their habitats. Reduce avian powerline collisions by using line markers and illumination with ultraviolet lights and by burying powerlines (Bateman et al. 2023). Avoid mowing rights-of-way during peak SGCN pollinator larvae abundance and avoid mowing patches of nectar resources important for pollinator SGCN (e.g., Xerces Society 2018). Potential collaborators: BLM, USFS, SLO, interested and affected members of the public, local governments, utility companies.
- Determine where roads, vehicle traffic, and utility lines are inhibiting or preventing movement of SGCN, including during migration. Identify and conserve natural habitat corridors, especially those at risk from future fragmentation by roads or utility lines. This may include reconnecting stream and wetland habitats that have been fragmented by roads, culverts, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Does not include structures that serve a beneficial role for wildlife (e.g., native fish barriers). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, USFS, New Mexico Department of Transportation (NMDOT), universities, non-profit organizations, private landowners, utility companies.
- Work with collaborators to complete mitigation measures that will increase the probability of safe passage across roads and near utility lines for affected SGCN. These include modifying barrier fences along roadways, constructing road crossings, placing warning signs for motorists, marking utility lines so they can be readily seen by birds, and placing safeguards

that will reduce the probability of electrocution. Integrate benefits to SGCN in projects primarily designed and implemented to enhance safe passage for large mammals (e.g., projects implemented under the Wildlife corridors Action Plan) (Cramer et al. 2022). Monitor the efficacy of mitigation measures and initiate any identified maintenance and improvements. Potential collaborators: BLM, USFS, NMDOT, SLO, private landowners, utility companies.
- Identify and conserve natural habitat corridors, especially those at risk from future fragmentation. Potential approaches include conservation easements. Potential collaborators: BLM, USFS, universities, non-profit organizations.
- Work with appropriate agencies to develop and enforce road-management plans (Crist et al. 2005). Potential collaborators: BLM, USFS.

BIOLOGICAL RESOURCE USE:

- Work with landowners and land-management agencies to use piñon-juniper woodlands in a manner that maintains healthy, and returns degraded, stands to an improved composition and function for SGCN, while protecting surrounding grassland communities from woody plant invasion. Potential collaborators: BLM, USFS, New Mexico State Forestry Division (SFD), SLO, private landowners.
- Inform natural-resource law enforcement staff of the distribution, life history, and habitat needs of SGCN. Partner with them to enforce laws to protect SGCN populations and habitats. Potential collaborators: BLM, USFS, USFWS.

HUMAN INTRUSIONS AND DISTURBANCE:

- Identify and characterize areas and routes frequented by OHVs and used by other recreationists, and use that information to assess the potential impacts to SGCN, other wildlife, and their habitats (e.g., Larson et al. 2016, Zeller et al. 2024). This includes identifying and characterizing areas used for and impacts from unauthorized dispersed camping (Marion et al. 2018). Potential collaborators: BLM, USFS, SLO, universities.
- Identify, designate, and promote areas for OHV and other recreational use, including dispersed camping, that avoid disturbance to, or modification of, SGCN habitats. Potential collaborators: BLM, USFS, SLO.
- Initiate a public-information campaign to inform and educate OHV users and other recreationists of both permitted and prohibited activities that can impact SGCN and other wildlife. This may include public-service announcements, print advertising, public meetings, and signs in areas frequented by OHV users and other recreationists. Ensure that the campaign presents information in ways, and using languages, accessible to a diverse public (LCJF 2022). Potential collaborators: BLM, USFS, SLO, local governments, non-profit organizations.
- Work with public land-management agencies to regularly review and update OHV travel routes and recreational trails open to the public and appropriate restrictions on recreation necessary to protect SGCN and other wildlife. Potential collaborators: BLM, USFS, SLO.
- Work with land-management agencies to improve OHV and other recreational law enforcement with passive measures (e.g., strategically located barricades) and active

measures (e.g., monitoring and enforcement patrols) to reduce negative impacts of OHVs and other recreational activities on SGCN and other wildlife. Potential collaborators: BLM, USFS, SLO.

- Work with the public to educate residents and recreationists about restrictions on and potential negative impacts of free-ranging, domestic pets, especially both domestic and feral cats (Loss et al. 2013b), on SGCN and other wildlife. Potential collaborators: universities, municipalities, non-profit organizations.
- Work with the US Department of Defense (DOD) to minimize impacts of military training exercises on SGCN in areas on or adjacent to military reservations. Potential collaborators: DOD.

NATURAL SYSTEM MODIFICATIONS:

- Design and implement riparian and aquatic habitat-restoration projects to benefit SGCN. This may include establishing priorities for habitat restoration and developing reach-specific plans. May also include reintroducing keystone species including American beavers (*Castor canadensis*) (Baker and Cade 1995, McKinstry et al. 2001, Grudzinski et al. 2022) and native fishes. Monitor restoration projects to determine effectiveness (Block et al. 2001, Holste et al. 2022) and inform adaptive management. Potential collaborators: BLM, BOR, USACE, USFS, USFWS, New Mexico Environment Department (NMED), SFD, SLO, universities, private landowners.
- Restore and protect aquatic, riparian, wetland, and wet meadow habitats, particularly springs and cienegas, and the surface and groundwater that supports them. Minimize activities that lead to gully formation, soil erosion, or a loss of soil health (e.g., soil fungal diversity) (Wagner 2023). Potential collaborators: BLM, BOR, NRCS, USACE, USFS, USFWS, NMED, SLO, private landowners.
- Assess the impacts of stream-flow magnitude, frequency, timing, duration, and rate of change on riparian ecosystems and the effects of hydrologic alterations on these ecosystems. Determine flows needed to sustain SGCN and their habitats and the effects of flow modification by upstream dams and of upland disturbances in local watersheds (Goeking and Tarboton 2022). Work with agencies that manage dams and reservoirs to ensure released environmental flows match amounts and timing of flows needed for persistence of native riparian communities and associated SGCN, including allowing for overbank flows to coincide with seed dispersal from native vegetation (e.g., Greco 2013) and when saturated soil can best benefit SGCN prey. Potential collaborators: BOR, USACE, USFWS, US Geological Survey (USGS), NMED, NMOSE, universities, private industry.
- Encourage sustainable groundwater use to protect aquatic and riparian habitats from lowered groundwater tables. Promote water conservation, such as use of devices and models that facilitate optimal irrigation (Schaible and Aillery 2012, Storm et al. 2024) and estimate water consumption and withdrawal (Zhou et al. 2021) or temporary field fallowing (DBSA 2022) and dryland farming, especially of drought-adapted crops (McCarthy 2024), to conserve the structure and function of aquatic and riparian habitats. Promote the use of water data from groundwater monitoring networks (Pine et al. 2023) to inform water

conservation and management strategies. Potential collaborators: DOD, NRCS, NMBGMR, NMDA, SLO, municipalities, private landowners, water-management districts.

- Reduce shrub encroachment in grassland habitats important to SGCN. This may be achieved through reduction of processes that promote shrub encroachment, implementation of a natural fire regime (Ravi et al. 2009), reseeding with native grasses, and shrub removal (Bestelmeyer et al. 2003). Potential collaborators: BLM, DOD, USFS, USFWS, SLO, private landowners.
- Determine responses of upland, and associated riparian/aquatic, communities that include SGCN to prescribed burns and wildfires (e.g., Saab et al. 2022). Where appropriate, integrate low-intensity fire and fuels reduction management into riparian ecosystem conservation. Design and implement projects that reduce unnaturally high fire risk associated with increased fuel loads or lack of moist soils in riparian areas. Methods may include flooding and/or implementing environmental flows, mechanical removal of non-native woody plants (e.g., tamarisk) and woody debris (Ellis 2001, Webb et al. 2019), and replanting native riparian vegetation (Queheillalt and Morrison 2006, Mosher and Bateman 2016). Potential collaborators: BLM, BOR, USACE, USFS, USFWS, SFD, SLO, universities, private landowners, water-management districts.
- Restore, protect, and monitor important disjunct wildlife habitats, such as caves, playas, and saline lakes. Potential collaborators: BLM, DOD, NRCS, USFS, USFWS, EMNRD, SLO, non-profit organizations, private landowners.
- Ensure the ecological sustainability and integrity of the Great Plains Shortgrass Prairie and associated SGCN by establishing conservation agreements or memoranda of understanding or acquiring lands from willing sellers. Potential collaborators: NRCS, USFWS, SFD, SLO, non-profit organizations, private landowners.
- Encourage aquatic habitat-improvement projects, such as creating ponds and oxbows near stream systems and stock tank improvements, to benefit aquatic SGCN (Stuart and Ward 2009, Stone et al. 2022). Potential collaborators: BLM, BOR, NRCS, USACE, USFS, USFWS, NMED, SLO, private landowners.
- Survey and monitor perennial marshes/cienegas/springs/seeps habitats and the SGCN that inhabit them to determine changes in habitat quantity and quality and the status and trend of SGCN populations. Promote conservation efforts, such as protecting groundwater resources, that enhance the persistence and quality of these perennial aquatic habitats. Potential collaborators: BLM, USFS, USFWS, NMED, SLO, universities.
- Determine beneficial fire frequencies and intensities and work with land-management agencies, sovereign Tribal entities, and private landowners to develop fire management plans and implement prescribed burns or cultural burns (Roos et al. 2021, Parks et al. 2023b, Eisenberg et al. 2024) that avoid disturbing SGCN during sensitive periods (e.g., nesting); maintain condition of sensitive habitats (e.g., riparian habitat), ecosystem components (e.g., soil microbial community) (Dove and Hart 2017, Brady et al. 2022), and ecosystem function (e.g., soil carbon storage) (Brady et al. 2022); enhance local diversity (Bowman et al. 2016, Eisenberg et al. 2024) and gene flow (Jones et al. 2023), including of SGCN such as pollinating insects; and protect people and property (Roos et al. 2021). Potential collaborators: BLM, USFS, USFWS, SFD, SLO, universities, private landowners, Tribal natural-resource managers.

- Promote post-fire management activities that are beneficial to SGCN. Includes minimizing ash flow into streams and other post-fire impacts to water quality (Rhoades et al. 2019a, Rhoades et al. 2019b) and augmenting natural plant regeneration including by re-seeding burned areas with native species (Herron et al. 2013). Potential collaborators: NRCS, USFS, NMED, SFD, SLO, non-profit organizations, private landowners.
- As appropriate to local site conditions (e.g., topography, prevailing winds, disturbance history, infrastructure) (Urza et al. 2023) and not in persistent piñon-juniper woodlands (Romme et al. 2009, Darr et al. 2022), thin stands of trees in woodlands to natural or historic densities that reduce the probability of insect and disease outbreaks and stand-replacing wildfires, and promote the growth of native understory cover (Redmond et al. 2023). Avoid unnecessary removal of large old-growth trees and snags, which serve as important wildlife habitat (Kalies and Rosenstock 2013); leave some juvenile trees or plant seedlings to promote establishment of new trees (Redmond et al. 2023); use best practices to maintain soil health (e.g., limit pile burning and mastication where possible) (Ross et al. 2012); and evaluate treatment effectiveness (e.g., McKinney et al. 2022), including monitoring local SGCN populations. Potential collaborators: BLM, USFS, SFD, SLO, non-profit organizations.
- Implement protections to conserve aquatic habitats within closed basins or hydrologic units not currently designated as Waters of the United States. Potential collaborators: BLM, NMED, NMOSE, water users.
- Determine amount, status, and trend of upland, aquatic, and riparian habitats, levels of fragmentation, and how SGCN might be affected. Identify appropriate locations and implement projects to enhance habitat quality and connectivity or prevent further fragmentation. This may include re-connecting streams and aquatic habitats that have been fragmented by dams, diversions, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Remove structures when feasible; otherwise, improve existing infrastructure by incorporating passage features for aquatic organisms (e.g., fish ladders). May also include protecting and promoting the natural establishment, development, and succession of native riparian vegetation by addressing any locally limiting hydrological conditions (e.g., ensuring overbank flooding occurs at optimal times and establishment of early successional vegetation) (Hatten et al. 2010, Greco 2013, Stanek et al. 2021, Wohner et al. 2021). May further include emphasizing restoration in areas that will enhance connectivity between native riparian habitat patches (e.g., migratory stopover sites) (McNeil et al. 2013). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, BOR, USACE, USFS, USFWS, NMDOT, NMED, SFD, SLO, Soil and Water Conservation Districts (SWCDs), universities, non-profit organizations, private landowners, water-management districts.
- Promote public participation in restoration and conservation of watersheds. Potential collaborators: BOR, USACE, USFS, USFWS, NMED, SFD, universities, private land managers, non-profit organizations.
- Inform interested and affected members of the public about the value of aquatic and riparian systems and maintaining in-stream flows to build support for the conservation of aquatic and riparian species and habitat-restoration efforts. Potential collaborators: BOR, NRCS, USACE, USFS, USFWS, NMED, universities, non-profit organizations, private landowners.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES:

- Work with appropriate agencies to enforce regulations to prevent the introduction and spread of non-native species. Potential collaborators: USFWS, NMDA.
- Design and implement protocols for early detection of invasive and other problematic species and diseases. Quickly respond to detection. Potential collaborators: BLM, NRCS, USFS, USFWS, NMDA, NMED, SLO, universities, private landowners.
- Where feasible, reestablish native aquatic communities in perennial streams and restored aquatic habitats. Potential collaborators: BLM, BOR, USACE, USFWS, USFS, NMED, SLO, non-profit organizations, private landowners.
- Continue current efforts to prevent the infestation of aquatic habitats in New Mexico by zebra and quagga mussels and other aquatic invasive species. This includes informing anglers and boaters of the importance of not introducing invasive and other problematic species and providing them with information on how to prevent the spread of aquatic invasive species. Potential collaborators: BLM, BOR, USACE, USFS, NMED, New Mexico State Parks (NMSP), universities, non-profit organizations.
- Determine the distribution of all invasive and other problematic species and diseases found in New Mexico, assess related threats to SGCN, and develop and implement strategies to address these threats, including eradicating existing populations of non-native and invasive species when appropriate. When removing non-native vegetation, ensure that any SGCN that use this vegetation have suitable alternate habitat present (e.g., Sogge et al. 2013) and that site conditions support the restoration of native plants. If herbicide application cannot be avoided, limit impacts to pollinating insect SGCN by applying to smaller patches within the treatment area (e.g., Black et al. 2011) and spraying before target plants bloom (Hopwood et al. 2015). Potential collaborators: BLM, BOR, NRCS, USACE, USFS, USFWS, NMDA, NMED, SLO, universities, non-profit organizations, private landowners.
- Investigate and monitor black-tailed prairie dog population distribution, density, and abundance (Facka et al. 2008). Evaluate factors influencing the spread of plague (George et al. 2013), the ecological consequences of control efforts (Miller et al. 2007), and the potential for emerging plague vaccine application. Potential collaborators: BLM, DOD, USFWS, SLO, non-profit organizations, private landowners.
- Develop strategies to prevent emerging diseases from getting into New Mexico and develop and implement strategies that will inhibit the spread of ones already present (e.g., Clemons et al. 2024). This includes working with land-management agencies to control human access for recreation or other purposes as needed (Reynolds and Barton 2013), educating the public about what they can do to mitigate disease spread (e.g., Olson and Pilliod 2022), implementing appropriate hygiene guidelines for field researchers (e.g., Shapiro et al. 2024), and incorporating principles related to the interconnectedness of humans with local flora, fauna, and the natural environment (i.e., One Health) (AFWA 2023). Potential collaborators: BLM, USFS, NMED, SLO, universities.
- As needed, gather additional information regarding the distribution of tamarisk and other exotic plants in riparian habitats (e.g., NHNM 2023). Determine the impact of exotic plants, and their removal and reduction, on SGCN and their habitats. Create and implement site-specific plans, with measurable goals and objectives, to restore the historic structure and

composition of riparian habitats while minimizing negative impacts on SGCN and soil health (Wagner 2023). Prioritize removal of monoculture stands of non-native plants (e.g., Johnson et al. 2018b) and ensure that sufficient native riparian vegetation is locally available to SGCN and that local hydrological conditions support native vegetation regrowth. Since pollinating insects may use exotic riparian plants (e.g., Pendleton et al. 2011), minimize impacts of removing these plants on pollinating insect SGCN, including by avoiding herbicide application when plants are in bloom and treating the focal area in stages. Include post-implementation monitoring and maintenance for all riparian restoration projects. Document and report restoration approaches used, including successes and failures (Shafroth et al. 2008, Sogge et al. 2013). Potential collaborators: BLM, BOR, NRCS, USACE, USFS, USFWS, NMDA, SFD, SLO, SWCDs, universities, non-profit organizations, private landowners.

- Restore native riparian plants (e.g., cottonwood [*Populus* spp.] and willow [*Salix* spp.]) and natural riparian ecosystem processes and functions following the removal or biocontrol of tamarisk and other non-native plants. Ensure maintenance of adequate water supply for native plants. At sites with low water availability, restoration of native xeric plants may be more appropriate than hydroriparian and wetland plants. Stage and balance non-native plant removal and native habitat restoration over time, to avoid rapid loss of exotic woody riparian habitats for wildlife until native habitats can be developed (Sogge et al. 2013), and minimize herbicide use. Potential collaborators: BLM, BOR, USACE, USFS, USFWS, NMED, SLO, universities, non-profit organizations, private landowners.
- Proactively restore native riparian vegetation in areas likely to be most altered by the tamarisk beetle (*Diorhabda* spp.; i.e., large tamarisk monocultures [Johnson et al. 2018b] in river systems where the hydrology has been highly altered). Protect and sustain existing stands of native riparian vegetation that may serve as important refugia in areas currently or likely to be affected by the tamarisk beetle (Paxton et al. 2011, Sogge et al. 2013). Potential collaborators: BLM, BOR, USACE, NMED, SLO, universities, non-profit organizations, private landowners.
- Consider the impact of honeybee apiaries on wildlands and restrict their placement in areas where native bee SGCN occur. Honeybees can pose a disease spillover risk for wild bees (Tehel et al. 2016). Potential collaborators: universities, non-profit organizations, private landowners.

POLLUTION:

- Work with appropriate agencies that enforce mining and energy development regulations, Best Management Practices, and safeguards to protect water quality and minimize SGCN mortality associated with mining and energy development. Assess impacts to SGCN and their habitats from industrial activities, including mining and energy development. These impacts may include direct mortality, pollution from produced wastewater (including brine and hydraulic injection fluids) for from transport of extracted products, noise and light pollution from energy development activities, and sediment runoff from roads. Potential collaborators: BLM, USFS, EMNRD, NMED, SLO, energy and mining companies, local governments.

- Evaluate and mitigate the effects of air pollution from industrial activities, including methane released by flaring associated with oil and gas extraction and leaking from old oil and gas wells, and in urban areas on SGCN and their habitats (e.g., Duque and Dewenter 2024). Evaluate and mitigate the effects of other types of pollution, including excess generation of heat, light, and/or sound from industrial activities, urban areas, and highways on SGCN and their habitats. Potential collaborators: BLM, EMNRD, NMDOT, NMED, energy and mining companies, municipalities, utility companies.
- Determine effects of, and implement actions to mitigate negative effects from, agro- (e.g., neonicotinoids, other pesticides) (Sanchez-Bayo 2021, EPA 2023) and petrochemicals, synthetic chemicals (e.g., per- and polyfluoroalkyl substances [PFAS]), microplastics, urban runoff, and other pollutants (e.g., sewage, nutrients, toxic chemicals, sediment) on SGCN, especially fish and pollinating insects, and their habitats. This includes solid waste that may entangle wildlife. Potential collaborators: US Environmental Protection Agency (EPA), NMDA, NMED, universities, local governments, municipalities, private industry.
- Where appropriate, develop green infrastructure and nature-based solutions (Warnell et al. 2023) in urban areas that catch and slow stormwater runoff to prevent pollution from entering aquatic ecosystems and promote groundwater recharge. Potential collaborators: NMDOT, local governments, municipalities, private landowners.

CLIMATE CHANGE AND SEVERE WEATHER:

- Determine how regional and global climate change will affect SGCN, vegetation patterns (e.g., Davis et al. 2019, Coop et al. 2020, Guiterman et al. 2022, Davis et al. 2023), and community (e.g., Rosenblad et al. 2023) and ecosystem processes and dynamics, including disturbance regimes. This includes identifying SGCN (e.g., Glick et al. 2011) and associated habitats that are most likely to be negatively affected by climate change, including impacts on travel corridors, habitat connectivity, and species and habitat ranges. Identification of environmental conditions or thresholds that could limit SGCN is especially important. Potential collaborators: BLM, USFS, USFWS, USGS, EMNRD, SLO, universities.
- Identify climate change (e.g., Michalak et al. 2020) or disturbance refugia (e.g., Rodman et al. 2023) for SGCN and their habitats and implement conservation actions to conserve, expand, or enhance these refugia. As appropriate, consider refugia when implementing conservation actions (e.g., focus on refugia when planting native plants to encourage reforestation following a fire) (Hennessy et al. 2024). Potential collaborators: BOR, USFS, USGS, universities.
- Identify and implement actions to mitigate the effects of climate change on SGCN and their habitats. These may include actions that assist in enhancing carbon sequestration in natural environments (e.g., appropriate forest [Moe et al. 2023] and grassland [Bai and Cotrujo 2022] conservation and management), improving climate resilience of species and communities (e.g., Dyshko et al. 2024), or climate-smart projects that help maintain, or accommodate for or facilitate climate-related shifts in (e.g., Stanturf et al. 2024, USFWS 2024a), the distribution and natural functioning, including disturbance regimes, of these impacted species and habitats. Potential collaborators: BLM, USFS, USFWS, USGS, EMNRD, SLO, universities.

- Promote land-management practices, standards, and guidelines to conserve and/or restore structure and function of corridors that provide important habitat for SGCN and ability for animals to move as climate conditions change. This should include both mesic and xeric riparian communities that serve as important migratory corridors for birds and other wildlife while providing ecosystem services and wildlife corridors that link isolated mountain ranges (Powledge 2003) and coniferous forest patches. Potential collaborators: BLM, USFS, USFWS, SLO, universities, private landowners.
- Develop new species recovery plans that consider the current status of and limiting factors for species, as well as projected future conditions for both species and their habitats. Consider full life cycles for migratory species when feasible (e.g., KFF 2021). Potential collaborators: USFWS, non-profit organizations, species working groups.
- Inform the public about potential adverse effects of continued climate change on SGCN and their habitats and encourage development of, and data collection under, citizen and community science projects focused on SGCN and their habitats. Potential collaborators: BOR, USFS, USFWS, USGS, NMSP, SLO, universities, non-profit organizations.
- Monitor SGCN to determine long-term trends that correlate to ecosystem dynamics and habitat changes (e.g., Shirk et al. 2023). If feasible, identify potential limiting factors and develop and implement strategies to mitigate them. Potential collaborators: BLM, DOD, USFS, USFWS, SLO, universities.

ACTIONS THAT ADDRESS MULTIPLE THREATS:

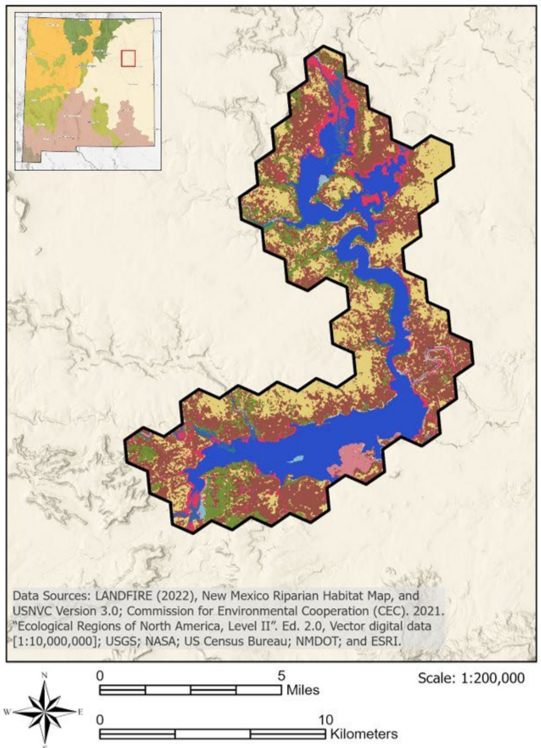
- Determine life history needs, ecology, distribution, movements, status, and trends of and threats to SGCN (especially invertebrates that are not currently monitored, riparian-obligate species, herpetofauna [Pierce et al. 2016, Olson and Pilliod 2022], and rare native fish) and their habitats. Consider full annual cycles for migratory species when appropriate and logistically feasible (KFF 2021) and interactions with lower trophic levels that may drive SGCN status (e.g., EPA 2023). Use this information to develop and implement effective monitoring protocols and conservation actions, including actions to mitigate identified threats. Potential collaborators: BOR, BLM, USFS, USFWS, SLO, universities, non-profit organizations, private industry, species working groups.
- Assess the synergistic effects between climate change and other threats to SGCN and their habitats (e.g., Friggens et al. 2019, Parks et al. 2019). Incorporate appropriate climate adaptation strategies and frameworks into projects designed to address these synergistic effects. This may include enhancing connectivity (CEQ 2023), facilitating a species' innate adaptive capacity (Thurman et al. 2022), enhancing genetic diversity (Powell 2023), considering local adaptation (Meek et al. 2023), or considering whether it is most appropriate to resist, accept, or direct ecosystem transformation (Lynch et al. 2021, Stevens et al. 2021). Projects should acknowledge ecosystem dynamism and incorporate Indigenous Knowledge (e.g., Roos et al. 2022, Eisenberg et al. 2024), nature-based solutions (Warnell et al. 2023), and experimentation (Guiterman et al. 2022) when appropriate. Potential collaborators: BLM, USFS, USFWS, USGS, universities.
- Identify or develop an accessible, jointly used database to document the status and condition of, threats to, and conservation actions implemented across aquatic, riparian, and

upland habitats. Identify data gaps (e.g., Ganey et al. 2017) and implement standardized methods to gather habitat data (e.g., Vollmer et al. 2018, Shirk et al. 2023) and to monitor the success of conservation actions (e.g., Davis and Pinto 2021), including impacts on local SGCN populations. Synthesize existing information (e.g., Jain et al. 2021) and apply modeling techniques to aid in evaluating success when appropriate (e.g., Parks et al. 2018). Adjust future conservation actions as needed based on observed outcomes. Potential collaborators: BLM, BOR, NPS, USACE, USFS, USFWS, USGS, NMED, SFD, SLO, universities.

- Evaluate the effectiveness of public education and outreach efforts regarding threats to SGCN and their habitats and the ways that the public can assist in threat mitigation (KFF 2021). Modify outreach activities as needed in response to evaluation outcomes. Potential collaborators: BOR, BLM, USACE, USFS, USFWS, USGS, NMED, NMSP, SFD, SLO, universities, municipalities, non-profit organizations.
- Where appropriate, incorporate native, pollinator-friendly plants (Glenny et al. 2022) or native plants adapted to projected future climatic conditions at the restoration site (e.g., Meek et al. 2023, Stanturf et al. 2024) into seed mixes and live plantings used in the restoration of lands affected by grazing, fire, resource extraction, energy development, or urban development. Consider reclamation site conditions, genetic diversity, and resilience to local threats when producing seedlings (Davis and Pinto 2021) and consider appropriate climate analogs when identifying appropriate seed sources (e.g., Richardson et al. 2024). When focused on benefiting pollinators, prioritize plants that are attractive to pollinators, especially SGCN; support pollinators throughout the growing season (Glenny et al. 2023); provide food for caterpillars of insect SGCN (e.g., Dumroese et al. 2016); and produce pollen with high nutritional diversity (Vaudo et al. 2024). Potential collaborators: BLM, NRCS, USFS, SFD, SLO, energy and mining companies, non-profit organizations, private landowners.

CONSERVATION OPPORTUNITY AREAS

CONCHAS RESERVOIR



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*2.2*
Barren	*N/A*	*3.0*
Cliff, Scree, and Rock Vegetation	*4*	*3.9*
Developed and Urban	*N/A*	*235.1*
Great Plains Floodplain Forest	*1*	*226.6*
Great Plains Mixedgrass Prairie	*2*	*7.2*
Great Plains Ruderal Grassland and Shrubland	*5*	*5245.0*
Great Plains Sand Grassland and Shrubland	*3*	*52.3*
Great Plains Shortgrass Prairie	*3*	*3171.1*
Great Plains Wet Meadow, Marsh, and Playa	*1*	*761.9*
Introduced Riparian Vegetation	*5*	*210.8*
Open Water	*N/A*	*3197.6*
Rocky Mountain Lower Montane Forest	*4*	*1.6*
Rocky Mountain Piñon-Juniper Woodland	*4*	*1212.9*
Southwest Lowland Riparian Shrubland	*1*	*71.1*
Warm-Desert Arroyo Riparian Scrub	*2*	*97.8*

Figure 31. Conchas Reservoir Conservation Opportunity Area.

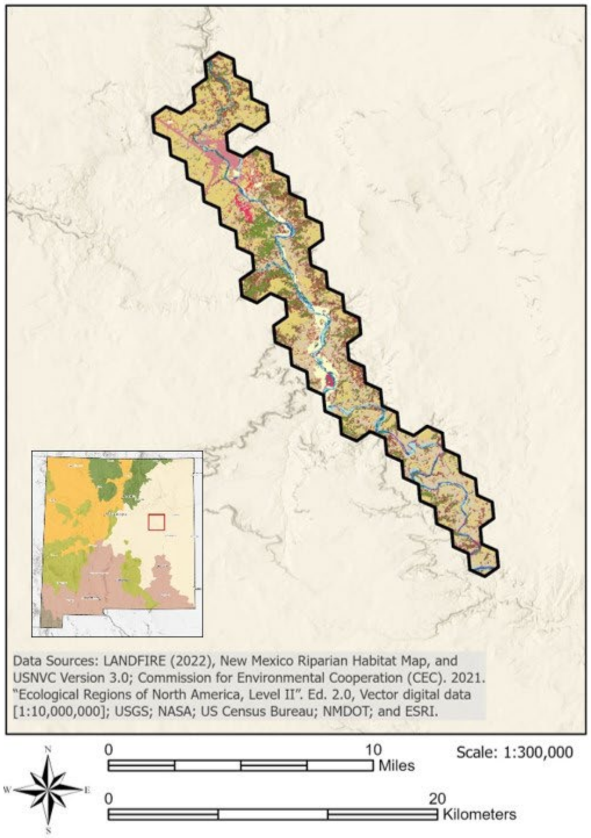
The Conchas Reservoir Conservation Opportunity Area (COA) (Figure 31) spans approximately 14,494 ha (35,816 ac) in northeastern New Mexico. It includes Conchas Lake, portions of the Canadian River that flow into the reservoir, and the surrounding lands. The COA is located about 50 km (30 mi) northwest of Tucumcari.

The majority of this COA (~94%) is privately owned, while the remaining 6% is managed by the SLO (3%), the BOR (2%), and NMSP (1%). Approximately 24% of this COA is currently protected.

The COA supports 10 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant terrestrial habitats are Great Plains Ruderal Grassland and Shrubland (36%) and Great Plains Shortgrass Prairie (22%). Notably, open water accounts for approximately 22% of the total area. Perennial aquatic habitats include 9 km (5 mi) of warm-water streams and 3,588 ha (8,867 ac) of warm-water reservoirs.

A total of 24 SGCN are found (either observed or with potential habitat within the COA, including five classified as Conservation Impact Species (I) and seven as Current Focal Species (F) (Appendix G). This COA also has high potential to contain microclimate refugia for amphibians and reptiles (Table 11).

PECOS RIVER HEADWATERS



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*497.0*
Barren	*N/A*	*6.6*
Chihuahuan Semi-Desert Grassland	*2*	*3307.8*
Cliff, Scree, and Rock Vegetation	*4*	*16.0*
Desert Alkali-Saline Wetland	*1*	*402.3*
Developed and Urban	*N/A*	*522.0*
Great Plains Floodplain Forest	*1*	*254.2*
Great Plains Mixedgrass Prairie	*2*	*70.2*
Great Plains Ruderal Grassland and Shrubland	*5*	*1942.0*
Great Plains Sand Grassland and Shrubland	*3*	*37.5*
Great Plains Shortgrass Prairie	*3*	*3847.1*
Great Plains Wet Meadow, Marsh, and Playa	*1*	*202.1*
Introduced Riparian Vegetation	*5*	*50.0*
Open Water	*N/A*	*126.8*
Rocky Mountain Lower Montane Forest	*4*	*3.0*
Rocky Mountain Piñon-Juniper Woodland	*4*	*1337.3*
Southwest Lowland Riparian Shrubland	*1*	*44.5*
Warm-Desert Arroyo Riparian Scrub	*2*	*26.4*

Figure 32. Pecos River Headwaters Conservation Opportunity Area.

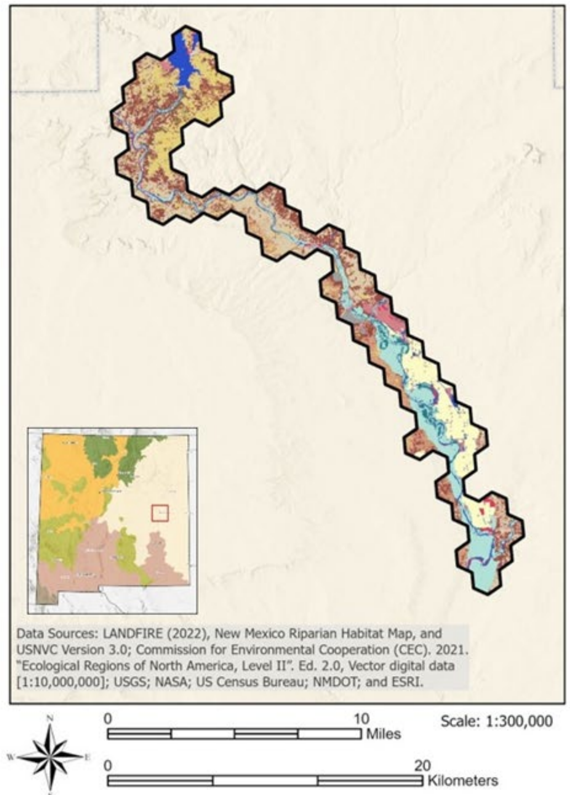
The Pecos River Headwaters COA (Figure 32) covers approximately 12,681 ha (31,336 ac) along the Pecos River near Santa Rosa and extends about 4 km (2.5 mi) downstream. It encompasses portions of the Pecos River riparian corridor and the surrounding upland areas.

The majority of this COA is privately owned (86%), with 10% managed by the SLO and the remaining 4% managed by the BLM (~3.5%) and the New Mexico Department of Game and Fish (<0.5%). Currently, no portion of this COA is protected.

The COA supports 12 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats are Great Plains Shortgrass Prairie (30%) and Chihuahuan Semi-Desert Grassland (26%). Additionally, Great Plains Ruderal Grassland and Shrubland (15%) and Rocky Mountain Piñon-Juniper Woodland (11%) are well represented within the COA. Desert Alkali-Saline Wetland (3%) and Great Plains Floodplain Forest (2%) are common habitats of the vegetated riparian corridor. Perennial aquatic habitats include 59 km (37 mi) of warm-water streams.

A total of 33 SGCN are found (either observed or with potential habitat) within the COA, including 10 classified as I and seven as F (Appendix G).

PECOS RIVER – LAKE SUMNER



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*1536.3*
Barren	*N/A*	*139.1*
Chihuahuan Semi-Desert Grassland	*2*	*2941.3*
Cliff, Scree, and Rock Vegetation	*4*	*46.3*
Desert Alkali-Saline Wetland	*1*	*1970.1*
Developed and Urban	*N/A*	*487.7*
Great Plains Floodplain Forest	*1*	*306.5*
Great Plains Ruderal Grassland and Shrubland	*5*	*2870.0*
Great Plains Sand Grassland and Shrubland	*3*	*1047.5*
Great Plains Shortgrass Prairie	*3*	*1666.4*
Great Plains Wet Meadow, Marsh, and Playa	*1*	*161.3*
Introduced Riparian Vegetation	*5*	*224.7*
Open Water	*N/A*	*534.0*
Rocky Mountain Piñon-Juniper Woodland	*4*	*55.9*
Southwest Lowland Riparian Shrubland	*1*	*77.2*
Warm-Desert Arroyo Riparian Scrub	*2*	*176.1*

Figure 33. Pecos River – Lake Sumner Conservation Opportunity Area.

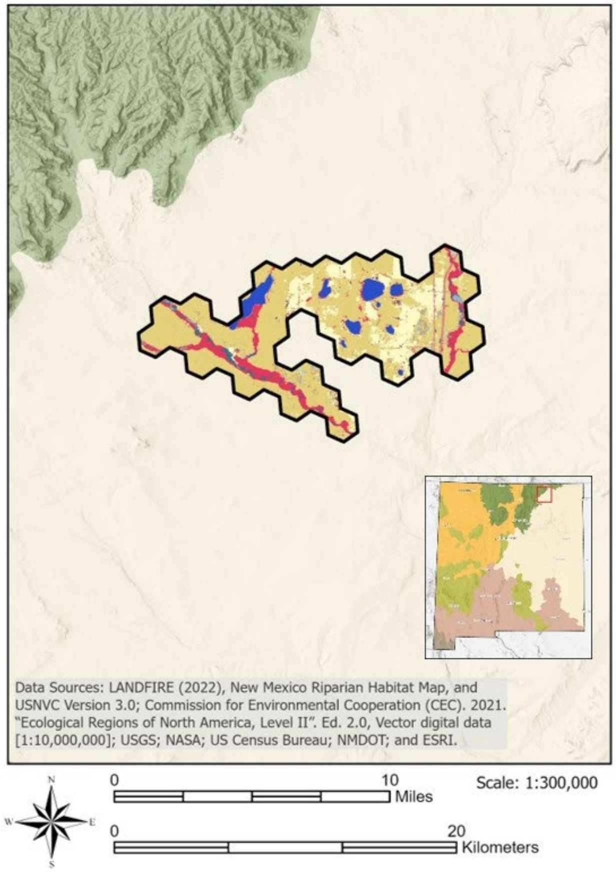
The Pecos River – Lake Sumner COA (Figure 33) covers approximately 14,235 ha (35,176 ac) and extends from the southern edge of Lake Sumner downstream and southeast of Fort Sumner for about 18 km (11 mi). It includes portions of the Pecos River riparian corridor and the surrounding upland areas.

The majority of this COA is privately owned (85%), with 7% managed by the SLO, 5% by the BOR, and the remaining 3% managed by NMSP (2.5%) and the BLM (0.5%). The Bosque Redondo Important Bird Area is located within this COA. Currently, no portion of the COA is protected.

The COA supports 10 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Chihuahuan Semi-Desert Grassland (21%), Great Plains Ruderal Grassland and Shrubland (20%), and Great Plains Shortgrass Prairie (12%). The vegetated riparian corridor is primarily composed of Desert Alkali-Saline Wetland (14% of total COA). Perennial aquatic habitats within the COA include 58 km (36 mi) of warm-water streams and 503 ha (1,243 ac) of warm-water reservoirs.

A total of 41 SGCN are found (either observed or with potential habitat) within the COA, including 10 classified as I and 12 as F (Appendix G).

VERMEJO RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*1859.0*
Barren	*N/A*	*41.9*
Cliff, Scree, and Rock Vegetation	*4*	*2.2*
Desert Alkali-Saline Wetland	*1*	*48.9*
Developed and Urban	*N/A*	*146.1*
Great Plains Floodplain Forest	*1*	*97.9*
Great Plains Mixedgrass Prairie	*2*	*203.5*
Great Plains Ruderal Grassland and Shrubland	*5*	*64.6*
Great Plains Sand Grassland and Shrubland	*3*	*3.1*
Great Plains Shortgrass Prairie	*3*	*6616.4*
Great Plains Wet Meadow, Marsh, and Playa	*1*	*1035.8*
Intermountain Saltbush Shrubland	*4*	*108.2*
Introduced Riparian Vegetation	*5*	*33.3*
Open Water	*N/A*	*537.2*
Rocky Mountain Montane Shrubland	*3*	*29.4*
Rocky Mountain Piñon-Juniper Woodland	*4*	*3.3*
Southwest Lowland Riparian Shrubland	*1*	*44.3*

Figure 34. Vermejo River Conservation Opportunity Area.

The Vermejo River COA (Figure 34) covers approximately 10,870 ha (26,859 ac) just west of Maxwell. It includes the lower reach of the Vermejo River, along with numerous wetlands and lakes managed for wildlife north of the river.

The majority of this COA consists of privately owned land (82%), with approximately 13% managed by the USFWS and 5% by the BOR. The Maxwell National Wildlife Refuge, an Important Bird Area, is also included within the COA. Only 2% of the COA is currently protected.

The COA supports 11 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitat is Great Plains Shortgrass Prairie (61%), with Great Plains Wet Meadow, Marsh, and Playa (10%) also prevalent. Agricultural vegetation (17%), likely some of which is managed for wildlife, is also common. Perennial aquatic habitats within the COA include 28 km (17 mi) of warm-water streams and 421 ha (1,061 ac) of warm-water reservoirs.

A total of 25 SGCN are found (either observed or with potential habitat) within the COA, including five classified as I and six as F (Appendix G). This COA has high potential to contain microclimate refugia for amphibians and reptiles (Table 11).

Chapter 8: Chihuahuan Desert Conservation Profile

SPECIES OF GREATEST CONSERVATION NEED (SGCN) AND THEIR HABITATS

The Chihuahuan Desert ecoregion encompasses 69,905 km^2 (26,990 mi^2) of the southern third of New Mexico and represents the northern boundary of 966,135 km^2 (373,025 mi^2) of contiguous warm desert that extends southward into central Mexico and westward across southern Arizona, California, and Nevada (CEC 2021). In New Mexico, elevations range from 866-2,715 m (2,841-8,908 ft) (USGS 2024a). Terrain consists of broad basins bordered by isolated, rugged mountains. The ecoregion is arid, marked by hot summers and mild winters. For the period from 1991 to 2020, mean annual temperatures were 6-28.6 °C (43-78.6 °F) and annual precipitation averaged 33 cm (10 in) (range: 24-72 cm [10-28 in]) (AdaptWest Project 2022), most of which fell in summer.

This ecoregion supports the highest number of SGCN (288) (Table 25, Table 27). Birds are the dominant taxa, making up 38% of the species in the ecoregion. The categories Data Needs Species (57%) and Current Focal Species (16%) are the most numerous within the ecoregion.

Table 25. Number of Species of Greatest Conservation Need in the Chihuahuan Desert ecoregion.

Taxon \ Category[37]	F	I	D	L	Total
Amphibians	1	2	1	3	7
Bees	0	3	18	1	22
Beetles	0	1	0	0	1
Birds	11	7	70	22	110
Crustaceans	2	0	14	0	16
Fish	16	7	1	4	28
Flies	0	1	4	0	5
Mammals	7	6	16	1	30
Molluscs	6	1	23	0	30
Moths and Butterflies	0	9	3	1	13
Reptiles	3	3	16	4	26
Total	46	40	166	36	288

In the Chihuahuan Desert ecoregion, there are 16 terrestrial habitats that cover 65,865 km^2 (25,431 mi^2) or 94% of the landscape (Table 26, Figure 35). The remainder of the landscape

[37]Category abbreviations are: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.

contains miscellaneous land-cover types, primarily agricultural vegetation at 1,972 km^2 (762 mi^2) or 3% of the landscape. Among the natural habitats, eight are characteristic of this ecoregion and collectively they comprise 88% of the area (see full descriptions of all but the Chihuahuan Semi-Desert Grassland in this ecoregion chapter; this habitat appears in the Madrean Archipelago ecoregion chapter). The majority of the ecoregion is dominated by two habitats: Chihuahuan Semi-Desert Grassland (18,246 km^2 [7,045 mi^2) and Chihuahuan Desert Scrub (38,697 km^2 [14,941 mi^2), which together comprise 81% of the landscape. They occur across broad expanses of alluvial piedmonts (bajadas), foothills, and basin bottoms generally below 2,000 m (6,560 ft) in elevation. Intermixed among the grasslands and shrublands are Chihuahuan Ruderal Grasslands dominated by non-native species that occupy about 5% of the landscape. In addition, there are five riparian and wetland habitats that occur along the rivers and ephemeral desert washes that, while they only occupy 3% of the ecoregion's landscape, play an outsized role as wildlife habitat and sustain many SGCN.

Perennial water sources are limited to 24 warm-water reservoirs (5,847 ha [14,449 ac]); 14 warm-water, perennial streams (1,676 km [1,041 mi]); and two cold-water, perennial streams (131 km [82 mi]) (Figure 36). Eighty-one percent of the surface area of reservoirs in the ecoregion is encompassed by Elephant Butte and Caballo Lakes.

Table 26. Terrestrial habitat types of the Chihuahuan Desert ecoregion.

Habitat Category	USNVC Code	Habitat Name[38]	Tier[39]	Climate Vulnerability[40]	Area (km^2)	(mi^2)
Alpine and Montane Vegetation	M049	Rocky Mountain Montane Shrubland	3	High	1	0.5
	M010	Madrean Lowland Evergreen Woodland	4	Moderate→Very High	496	191
	M022	Rocky Mountain Lower Montane Forest	4	High	5	2
	M091	Warm Interior Chaparral	4	Moderate→Very High	535	207
Plains-Mesa Grassland	M052	Great Plains Sand Grassland and Shrubland	3	Very High	918	355
Desert Grassland and Scrub	M087	Chihuahuan Semi-Desert Grassland	2	Moderate→Very High	18,246	7,045
	M171	Intermountain Dry Shrubland and Grassland	2	Moderate→Very High	11	4
	M086	Chihuahuan Desert Scrub	4	High	38,697	14,941
	M512	Chihuahuan Ruderal Grassland	5	--	3,802	1,468
Arroyo Riparian	M092	Warm-Desert Arroyo Riparian Scrub	2	--	155	60
Riparian Woodland and Wetland	M888	Arid West Interior Freshwater Emergent Marsh	1	--	86	33
	M082	Desert Alkali-Saline Wetland	1	--	1,783	689
	M036	Southwest Lowland Riparian Forest	1	--	108	42

[38] Terrestrial habitats are based on macrogroups of the United States Natural Vegetation Classification system (USNVC Version 3.0; https://usnvc.org/) except for the four Other Land Cover types; links to USNVC macrogroup descriptions are provided in the USNVC code column. Areas for upland habitat types are based on the 2022 LandFire Existing Vegetation Map for the continental US (LANDFIRE 2022), which was quality controlled by Natural Heritage New Mexico. Ecological systems in LANDFIRE (2022) were cross-walked to USNVC macrogroups. Areas for riparian vegetation types are based on the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap), also aggregated to macrogroups and embedded in the LANDFIRE (2022) map. Habitats listed in order by Tier (see below) and then alphabetically.

[39] Tiers reflect the priority for conservation and are based on the degree of imperilment within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. Ranks: N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure. Spatial patterns: linear, small patch, large patch, and matrix. Tier 1: N1, N2, N3 small patch/linear; Tier 2: N3 large patch or N4 small patch/linear; Tier 3: N3 matrix or N4 large patch; Tier 4: N4 matrix; Tier 5: N5 ruderal vegetation linear/large patch.

[40] Climate vulnerability levels were based on a vulnerability analysis performed for Ecological Response Units (ERUs) across New Mexico and Arizona (Triepke et al. (2014). The ERU classification system represents major ecosystem types of the southwest. Vulnerability for each ERU was calculated as the relative probability of type conversion. The ERUs were then cross-walked to the habitats shown here.

Habitat Category	USNVC Code	Habitat Name[38]	Tier[39]	Climate Vulnerability[40]	Area (km^2)	(mi^2)
	M076	Southwest Lowland Riparian Shrubland	1	--	103	40
	M298	Introduced Riparian Vegetation	5	--	160	62
Cliff, Scree, and Rock Vegetation	M887	Cliff, Scree, and Rock Vegetation	4	High	758	293
Other Land Cover	N/A	Agricultural Vegetation	5	--	1,972	762
	N/A	Barren	5	--	250	97
	N/A	Developed and Urban	5	--	1,463	565
	N/A	Open Water	5	--	169	65

Table 27. Species of Greatest Conservation Need (SGCN) in the Chihuahuan Desert ecoregion.

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Arizona Toad	*Anaxyrus microscaphus microscaphus*	Amphibians	I	C, De, V	EC, M010, M022, M036, M076, M086, M087, M298, PCWS, PWWS
Barking Frog	*Craugastor augusti latrans*	Amphibians	L	C, De, Di, V	M086, M092, M887
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	Amphibians	F	C, De, Di, V	EC, EMCS, M010, M022, M036, M076, M298, M888, PCWS, PLCP, PMCSS, PWWS
Lowland Leopard Frog	*Lithobates yavapaiensis*	Amphibians	L	C, De, Di, V	EC, EMCS, M010, M036, M076, M888, PCWS, PLCP, PMCSS, PWWS
Rio Grande Leopard Frog	*Lithobates berlandieri*	Amphibians	I	C, V	EC, EMCS, M036, M076, M092, M888, PCWS, PMCSS, PWWS
Sonoran Desert Toad	*Incilius alvarius*	Amphibians	D	Di, V	EC, EMCS, M036, M076, M082, M086, M087, M092, PCWS, PLCP, PMCSS, PWWR, PWWS
Western Narrow-mouthed Toad	*Gastrophryne olivacea*	Amphibians	L	C, De, Di, V	EC, M052, M076, M082, M086, M087, M092, PCWS, PLCP, PWWR, PWWS
Andrenid Bee	*Perdita biparticeps*	Bees	D	E	M086
Andrenid Bee	*Perdita claripennis*	Bees	D	E	M086

[41] Hyperlinks are to species booklets in the Biota Information System of New Mexico (https://bison-m.org/) for each SGCN in the Chihuahuan Desert ecoregion. Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.
[42] Reason to include indicates which of five criteria for inclusion on the SGCN list a particular species met. Abbreviations are as follows: C = Climate Change Vulnerability; De = Decline; Di= Disjunct; E = Endemic; K = Keystone; V = Vulnerable.
[43] Aquatic habitat abbreviations are as follows: PCWS = Perennial Cold-Water Streams; PWWS = Perennial Warm-Water Streams; PLCP = Perennial Lakes, Cirques, Ponds; PMCSS = Perennial Marshes/Cienegas/Springs/Seeps; PWWR = Perennial Warm-Water Reservoirs; EMCS = Ephemeral Marshes/Cienegas/Springs; EC = Ephemeral Catchments. Habitat codes refer to United States National Vegetation Classification System designations, which are identified in Table 26 above.

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Andrenid Bee	*Perdita geminata*	Bees	D	V	M086
Andrenid Bee	*Perdita grandiceps*	Bees	D	E	M086
Andrenid Bee	*Perdita maculipes*	Bees	D	E	M086
Andrenid Bee	*Perdita senecionis*	Bees	D	E	M086
Andrenid Bee	*Perdita tarda*	Bees	D	E	M086
Austin's Fairy Bee	*Perdita austini*	Bees	D	C, De	M086
Bare Fairy Bee	*Perdita aperta*	Bees	D	C, De, V	M087, M171
Beloved Fairy Bee	*Perdita cara*	Bees	D	C, De, V	
Brave Digger Bee	*Anthophora vallorum*	Bees	D	C, De, V	M086
Chihuahuan Desert Digger Bee	*Anthophora chihuahua*	Bees	D	C, De, V	
Dakota Leaf-cutter Bee	*Megachile dakotensis*	Bees	L	De, V	
Half-scarlet Fairy Bee	*Perdita semicrocea*	Bees	I	C, De, V	M086, M087
Morrison's Bumble Bee	*Bombus morrisoni*	Bees	D	C, De, V	M010, M022, M049, M052, M082, M086, M087, M091, M171, M298, M512, M888
Southern Plains Bumble Bee	*Bombus fraternus*	Bees	D	C, De, V	M022, M052, M087, M171
Southwest Leaf-cutter Bee	*Megachile melanderi*	Bees	D	De, V	M082
Thirsty Plasterer Bee	*Colletes aridus*	Bees	D	C, De, V	
Triton Fairy Bee	*Perdita trinotata*	Bees	I	C, De, V	
Volger's Mining Bee	*Andrena vogleri*	Bees	D	E	
Watson's Mason Bee	*Osmia watsoni*	Bees	D	C, De, V	
White Sands Sweat Bee	*Lasioglossum argammon*	Bees	I	De, V	M086
Anthony Blister Beetle	*Lytta mirifica*	Beetles	I	C, V	M086
Abert's Towhee	*Melozone aberti aberti*	Birds	L	C, De, V	EMCS, M036, M076, M086, M087, M091, M092, M298, M888, PMCSS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
American Kestrel	*Falco sparverius sparverius*	Birds	D	De, V	EMCS, M010, M022, M036, M049, M052, M076, M086, M087, M091, M092, M171, M888, PMCSS
American Pipit	*Anthus rubescens*	Birds	D	V	EC, M036, M076, PCWS, PWWS
Aplomado Falcon	*Falco femoralis septentrionalis*	Birds	L	C, V	M076, M086, M087, M171
Baird's Sparrow	*Centronyx bairdii*	Birds	F	C, De, V	M086, M087, M171
Bald Eagle	*Haliaeetus leucocephalus*	Birds	D	C, Di, V	EC, EMCS, M010, M022, M036, M049, M052, M076, M082, M086, M087, M091, M171, M887, M888, PCWS, PLCP, PMCSS
Band-tailed Pigeon	*Patagioenas fasciata*	Birds	D	De, V	EC, M010, M022, M036, M049, M076, M087, M091, PCWS, PWWS
Bank Swallow	*Riparia riparia riparia*	Birds	D	C, De, Di, V	EC, EMCS, M036, M076, M092, M888, PCWS, PMCSS, PWWR, PWWS
Bell's Vireo	*Vireo bellii*	Birds	F	C, De, Di, V	M010, M036, M076, M086, M087, M092, M298
Bendire's Thrasher	*Toxostoma bendirei*	Birds	F	C, De, V	M010, M022, M076, M082, M086, M087, M092, M171, M887
Bewick's Wren	*Thryomanes bewickii*	Birds	D	C, De, V	M010, M022, M036, M049, M076, M086, M087, M091, M092
Black-chinned Sparrow	*Spizella atrogularis evura*	Birds	D	C, De, V	M010, M036, M076, M086, M091, M092, M887

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Black-headed Grosbeak	*Pheucticus melanocephalus*	Birds	D	C, De, V	EC, EMCS, M010, M022, M036, M049, M076, M086, M091, M092, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	D	C, V	M010, M022, M036, M049, M076, M086, M091, M092, M171, M887
Black-throated Sparrow	*Amphispiza bilineata*	Birds	D	De, V	M086, M087, M092
Brewer's Sparrow	*Spizella breweri*	Birds	D	C, V	EMCS, M036, M076, M086, M087, M092, M171, M888, PMCSS
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	Birds	L	C, Di, V	M036, M087
Broad-tailed Hummingbird	*Selasphorus platycercus platycercus*	Birds	D	De, V	M022, M036, M049, M076, M086, M087, M091, M092
Brown Pelican	*Pelecanus occidentalis carolinensis*	Birds	L	V	EC, PCWS, PLCP, PWWS
Buff-breasted Flycatcher	*Empidonax fulvifrons pygmaeus*	Birds	L	De, V	M022
Bullock's Oriole	*Icterus bullockii*	Birds	D	C, De, V	EC, EMCS, M036, M076, M086, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Burrowing Owl	*Athene cunicularia hypugaea*	Birds	I	C, De, K, V	M036, M052, M076, M082, M086, M087, M092, M171, M887
Cactus Wren	*Campylorhynchus brunneicapillus couesi*	Birds	D	De, Di, V	M036, M076, M086, M087, M171
Canyon Towhee	*Melozone fusca*	Birds	D	De, V	M036, M049, M076, M086, M087, M091, M092
Canyon Wren	*Catherpes mexicanus conspersus*	Birds	D	De, Di, V	M887
Cassin's Finch	*Haemorhous cassinii*	Birds	D	C, De, K, V	M010, M022, M036, M076, M887

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Cassin's Kingbird	*Tyrannus vociferans vociferans*	Birds	D	De, V	M010, M022, M036, M049, M076, M086, M091, M092
Cassin's Sparrow	*Peucaea cassinii*	Birds	D	C, De, V	M010, M049, M052, M076, M082, M086, M087, M091, M092, M171
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	F	C, De, V	M010, M022, M052, M086, M087, M171
Chihuahuan Meadowlark	*Sturnella lilianae*	Birds	D	C, De, V	M086, M087, M171
Chihuahuan Raven	*Corvus cryptoleucus*	Birds	D	De, V	M036, M076, M086, M087
Clark's Grebe	*Aechmophorus clarkii*	Birds	D	Di, V	EC, EMCS, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Clark's Nutcracker	*Nucifraga columbiana*	Birds	D	C, De, V	EC, M010, M022, M087, PCWS, PWWS
Cliff Swallow	*Petrochelidon pyrrhonota*	Birds	D	C, De, Di, V	EC, EMCS, M036, M076, M887, M888, PCWS, PMCSS, PWWR, PWWS
Common Black Hawk	*Buteogallus anthracinus anthracinus*	Birds	D	C, V	EC, EMCS, M010, M022, M036, M076, M086, M087, M091, M092, M887, M888, PCWS, PMCSS, PWWS
Common Ground Dove	*Columbina passerina pallescens*	Birds	L	C, V	EMCS, M010, M036, M076, M082, M086, M087, M171, M887, M888, PMCSS
Common Nighthawk	*Chordeiles minor*	Birds	D	C, De, V	EC, EMCS, M010, M022, M036, M049, M052, M076, M086, M087, M091, M092, M171, M887, M888, PCWS, PMCSS, PWWS
Costa's Hummingbird	*Calypte costae*	Birds	L	C, De, Di, V	M010, M022, M036, M076, M086, M087, M092
Eastern Bluebird	*Sialia sialis*	Birds	D	De, V	M036, M076, M086

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Elegant Trogon	*Trogon elegans canescens*	Birds	L	C, De, V	EC, M010, M022, M036, M076, PCWS, PWWS
Elf Owl	*Micrathene whitneyi whitneyi*	Birds	D	C, V	M010, M036, M076, M086, M087, M091
Ferruginous Hawk	*Buteo regalis*	Birds	D	C, Di, V	EMCS, M010, M022, M036, M052, M076, M086, M087, M092, M171, M887, M888, PMCSS
Flammulated Owl	*Psiloscops flammeolus*	Birds	D	C, V	M010, M022, M036, M049, M076, M087, M298, M887
Gila Woodpecker	*Melanerpes uropygialis uropygialis*	Birds	L	C, De, Di, V	EMCS, M010, M036, M076, M086, M087, M298, M888, PMCSS
Golden Eagle	*Aquila chrysaetos canadensis*	Birds	D	C, Di, V	EC, EMCS, M010, M022, M036, M052, M076, M086, M087, M092, M171, M887, M888, PCWS, PMCSS, PWWS
Grace's Warbler	*Setophaga graciae*	Birds	I	C, De, V	M022, M036, M049, M076, M887
Grasshopper Sparrow	*Ammodramus savannarum perpallidus*	Birds	D	C, De, V	M087
Gray Vireo	*Vireo vicinior*	Birds	I	C, De, Di, V	M010, M022, M036, M049, M082, M086, M087, M091, M092, M171, M887
Greater Pewee	*Contopus pertinax pallidiventris*	Birds	L	C, De, V	M010, M022
Greater Yellowlegs	*Tringa melanoleuca*	Birds	D	De, V	EC, EMCS, M076, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Green-tailed Towhee	*Pipilo chlorurus*	Birds	D	C, De, V	EC, EMCS, M010, M022, M036, M049, M076, M086, M091, M092, M171, M888, PCWS, PLCP, PMCSS, PWWR, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Harris's Hawk	*Parabuteo unicinctus harrisi*	Birds	D	De, V	EMCS, M036, M052, M076, M086, M087, M888, PMCSS
Horned Lark	*Eremophila alpestris*	Birds	D	C, De, V	EC, M086, M087, M171, PCWS, PLCP, PWWR, PWWS
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	C, De, V	M010, M022, M036, M049, M052, M076, M086, M087, M091, M887
Killdeer	*Charadrius vociferus vociferus*	Birds	D	De, Di, V	EC, EMCS, M086, M087, M092, M171, M888, PCWS, PMCSS, PWWR, PWWS
Lark Bunting	*Calamospiza melanocorys*	Birds	D	C, De, V	M086, M087, M092, M171
Lark Sparrow	*Chondestes grammacus strigatus*	Birds	D	C, De, V	EMCS, M010, M036, M076, M086, M087, M091, M092, M171, M888, PMCSS
Lazuli Bunting	*Passerina amoena*	Birds	L	De, V	EC, EMCS, M036, M049, M076, M091, M092, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Least Tern	*Sternula antillarum athalassos*	Birds	L	C, V	EC, EMCS, M082, M086, M087, M888, PCWS, PMCSS, PWWR, PWWS
Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*	Birds	F	C, De, Di, V	M010, M022, M052, M086, M087, M171
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	C, De, V	M010, M036, M049, M052, M076, M082, M086, M087, M091, M092, M171, M298, M887
Long-billed Curlew	*Numenius americanus americanus*	Birds	D	C, De, V	EC, EMCS, M052, M082, M086, M171, M888, PMCSS, PWWS
Long-billed Dowitcher	*Limnodromus scolopaceus*	Birds	D	De, V	EC, EMCS, M092, M888, PCWS, PLCP, PMCSS, PWWR, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Long-eared Owl	*Asio otus*	Birds	D	De, V	EMCS, M022, M036, M076, M086, M087, M091, M092, M171, M888, PMCSS
Lucifer Hummingbird	*Calothorax lucifer*	Birds	L	C, De, Di, V	M010, M036, M076, M086, M087, M091, M171, M887
Lucy's Warbler	*Leiothlypis luciae*	Birds	D	C, De, V	EMCS, M010, M022, M036, M076, M086, M087, M092, M298, M512, M888, PMCSS
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	C, De, Di, V	M010, M022, M036, M049, M091, M887, M888
Mountain Bluebird	*Sialia currucoides*	Birds	D	C, De, V	EMCS, M010, M022, M036, M049, M076, M086, M087, M091, M171, M887, M888, PMCSS
Mountain Plover	*Charadrius montanus*	Birds	F	C, De, Di, V	EC, M052, M082, M086, M087, M171, PCWS, PWWS
Neotropic Cormorant	*Phalacrocorax brasilianus*	Birds	L	C, V	EC, EMCS, M036, M076, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Northern Harrier	*Circus hudsonius*	Birds	D	Di, V	EC, EMCS, M036, M052, M076, M086, M087, M092, M171, M888, PCWS, PMCSS, PWWR, PWWS
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Birds	D	De, V	EC, EMCS, M036, M076, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Olive-sided Flycatcher	*Contopus cooperi*	Birds	D	C, De, V	M010, M022, M036, M076, M887
Peregrine Falcon	*Falco peregrinus*	Birds	D	C, De, Di, V	EC, EMCS, M010, M022, M036, M049, M076, M082, M086, M087, M091, M887, M888, PCWS, PMCSS, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Phainopepla	*Phainopepla nitens lepida*	Birds	D	C, De, V	EMCS, M036, M049, M076, M086, M091, M092, M888, PMCSS
Pine Siskin	*Spinus pinus*	Birds	D	C, De, V	M022, M036, M049, M076, M091, M092
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	F	C, De, K, V	EMCS, M010, M022, M049, M052, M086, M087, M091, M171, M887, PMCSS
Piping Plover	*Charadrius melodus circumcinctus*	Birds	L	V	EC, PCWS, PLCP, PWWS
Plumbeous Vireo	*Vireo plumbeus*	Birds	D	C, De, V	M010, M022, M036, M049, M076, M091
Purple Martin	*Progne subis*	Birds	D	C, De, V	M022, M036, M076
Pyrrhuloxia	*Cardinalis sinuatus sinuatus*	Birds	D	De, V	EMCS, M036, M076, M086, M087, M092, M888, PMCSS
Red-faced Warbler	*Cardellina rubrifrons*	Birds	D	C, De, V	M010, M022, M036, M076, M887
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	Birds	L	De, V	M036, M076
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Birds	D	C, V	M022, M036, M049, M076, M091, M092
Rock Wren	*Salpinctes obsoletus obsoletus*	Birds	D	C, De, Di, V	M036, M076, M086, M087, M091, M171, M887
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Birds	D	C, De, V	M049, M052, M082, M086, M087, M091, M092, M171, M887
Scott's Oriole	*Icterus parisorum*	Birds	D	De, V	M010, M022, M036, M076, M086, M091, M092
Snowy Plover	*Charadrius nivosus*	Birds	L	C, De, V	EC, EMCS, M082, M086, M087, M092, M887, M888, PCWS, PMCSS, PWWR, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	I	C, De, V	EC, EMCS, M036, M076, M082, M298, M888, PCWS, PLCP, PMCSS, PWWS
Spotted Sandpiper	*Actitis macularius*	Birds	D	De, V	EC, EMCS, M036, M076, M888, PCWS, PLCP, PMCSS, PWWS
Spotted Towhee	*Pipilo maculatus*	Birds	D	C, De, V	M010, M022, M036, M049, M076, M086, M091, M092
Sprague's Pipit	*Anthus spragueii*	Birds	F	C, De, V	M086, M087, M171
Thick-billed Kingbird	*Tyrannus crassirostris*	Birds	L	C, V	M010, M036, M076, M091
Thick-billed Longspur	*Rhynchophanes mccownii*	Birds	F	C, De, V	M087, M171
Varied Bunting	*Passerina versicolor*	Birds	L	C, V	M010, M036, M076, M086, M087, M091, M092, M887
Verdin	*Auriparus flaviceps ornatus*	Birds	D	De, V	M036, M076, M086, M087, M092
Vesper Sparrow	*Pooecetes gramineus*	Birds	D	C, De, V	EMCS, M010, M036, M049, M052, M076, M086, M087, M092, M171, M512, M888, PMCSS
Violet-crowned Hummingbird	*Leucolia violiceps ellioti*	Birds	L	C, Di, V	M010, M036, M086, M087
Western Bluebird	*Sialia mexicana bairdi*	Birds	D	C, V	M010, M022, M036, M049, M076, M086, M087, M091, M092, M171, M887
Western Grebe	*Aechmophorus occidentalis*	Birds	D	De, V	EC, EMCS, M888, PCWS, PLCP, PMCSS
Western Kingbird	*Tyrannus verticalis*	Birds	D	C, De, V	EC, EMCS, M022, M036, M049, M076, M086, M087, M091, M092, M171, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Western Sandpiper	*Calidris mauri*	Birds	L	De, V	EC, EMCS, M092, M888, PCWS, PMCSS, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Western Wood Pewee	*Contopus sordidulus*	Birds	D	C, De, V	M022, M036, M049, M076, M091, M092
Whiskered Screech-Owl	*Megascops trichopsis asperus*	Birds	F	C, De, V	M010, M022, M036, M076, M091
White-throated Swift	*Aeronautes saxatalis saxatalis*	Birds	D	C, Di, V	EC, EMCS, M022, M036, M076, M086, M087, M092, M887, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Wilson's Warbler	*Cardellina pusilla*	Birds	L	C, De, V	EC, EMCS, M022, M036, M076, M092, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	I	V	EMCS, M010, M022, M036, M049, M076, M086, M087, M091, M092, M888, PMCSS
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	F	C, De, Di, V	EC, EMCS, M010, M036, M298, PCWS, PMCSS, PWWS
Yellow-billed Cuckoo	*Coccyzus americanus americanus*	Birds	D	C, De, V	M010, M036, M298, PCWS
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Birds	D	C, De, V	EMCS, M092, M888, PMCSS
Alkali Fairy Shrimp	*Branchinecta mackini*	Crustaceans	D	V	EC, PCWS, PLCP, PWWR, PWWS
BLNWR cryptic species Amphipod	*Gammarus sp.*	Crustaceans	D	Di, V	EC, PCWS, PLCP, PMCSS, PWWR, PWWS
Brine Shrimp	*Artemia franciscana*	Crustaceans	D	V	EC, PCWS, PLCP, PWWR, PWWS
Cylindrical Cyst Clam Shrimp	*Eulimnadia cylindrova*	Crustaceans	D	V	EC
Desert Fairy Shrimp	*Streptocephalus dorothae*	Crustaceans	D	De, Di	EC, PCWS, PLCP, PWWR, PWWS
Desert Tadpole Shrimp	*Triops newberryi*	Crustaceans	D	De, Di	EC, PCWS, PLCP, PWWR, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Lynch Tadpole Shrimp	*Lepidurus lemmoni*	Crustaceans	D	De, Di, V	EC, PCWS, PLCP, PWWR, PWWS
Mackin Fairy Shrimp	*Streptocephalus mackini*	Crustaceans	D	De, Di	EC, PCWS, PLCP, PWWR, PWWS
Mexican Beavertail Fairy Shrimp	*Thamnocephalus mexicanus*	Crustaceans	D	V	EC, PCWS, PLCP, PWWR, PWWS
Moore's Fairy Shrimp	*Streptocephalus moorei*	Crustaceans	D	C, Di, E, V	M082, M086
Noel's Amphipod	*Gammarus desperatus*	Crustaceans	F	C, De, Di, E, V	EC, M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Playa Clam Shrimp	*Leptestheria compleximanus*	Crustaceans	D	De, Di	EC, PCWS, PLCP, PWWR, PWWS
Sitting Bull Spring cryptic species Amphipod	*Gammarus* sp.	Crustaceans	D	C, V	EC, PCWS, PLCP, PWWR, PWWS
Socorro Isopod	*Thermosphaeroma thermophilum*	Crustaceans	F	C, De, Di, E, V	PMCSS
Sublette's Fairy Shrimp	*Phallocryptis sublettei*	Crustaceans	D	V	EC, M082, PCWS, PLCP, PWWR, PWWS
Texan Clam Shrimp	*Eulimnadia texana*	Crustaceans	D	V	EC
Bigscale Logperch	*Percina macrolepida*	Fish	L	C, De, V	PWWS
Blue Sucker	*Cycleptus elongatus*	Fish	F	C, De, V	PWWR, PWWS
Chihuahua Chub	*Gila nigrescens*	Fish	F	C, De, Di, V	PCWS, PMCSS, PWWS
Desert Sucker	*Catostomus clarkii*	Fish	F	C, V	PWWS
Gila Chub	*Gila intermedia*	Fish	F	C, De, Di, V	PWWS
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	Fish	L	C, De, V	PMCSS
Gila Trout	*Oncorhynchus gilae*	Fish	F	C, De, Di, V	PCWS
Gray Redhorse	*Moxostoma congestum*	Fish	F	C, De, Di, V	PWWR, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Greenthroat Darter	*Etheostoma lepidum*	Fish	I	C, V	PMCSS, PWWS
Headwater Catfish	*Ictalurus lupus*	Fish	D	C, V	PWWS
Loach Minnow	*Rhinichthys cobitis*	Fish	F	C, De, Di, V	PWWS
Longnose Gar	*Lepisosteus osseus*	Fish	L	V	PWWS
Mexican Tetra	*Astyanax mexicanus*	Fish	I	C, Di, V	PMCSS, PWWS
Pecos Bluntnose Shiner	*Notropis simus pecosensis*	Fish	F	C, De, Di, V	PWWS
Pecos Gambusia	*Gambusia nobilis*	Fish	F	C, Di, V	PMCSS
Pecos Pupfish	*Cyprinodon pecosensis*	Fish	F	C, Di, V	PMCSS, PWWS
Rio Grande Chub	*Gila pandora*	Fish	F	C, De, Di, V	PCWS, PWWR, PWWS
Rio Grande Shiner	*Notropis jemezanus*	Fish	I	C, Di, V	PWWS
Rio Grande Silvery Minnow	*Hybognathus amarus*	Fish	I	C, De, Di, V	PWWS
Rio Grande Sucker	*Catostomus plebeius*	Fish	F	C, De, V	PCWS, PWWS
Roundnose Minnow	*Dionda episcopa*	Fish	I	C, Di, V	PWWS
Roundtail Chub	*Gila robusta*	Fish	F	C, De, Di, V	PCWS, PWWS
Smallmouth Buffalo	*Ictiobus bubalus*	Fish	I	C, V	PWWS
Sonora Sucker	*Catostomus insignis*	Fish	F	C, V	PWWS
Speckled Chub	*Macrhybopsis aestivalis*	Fish	I	C, Di, V	PWWS
Spikedace	*Meda fulgida*	Fish	F	C, De, Di, V	PWWS
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	L	C, V	PWWS
White Sands Pupfish	*Cyprinodon tularosa*	Fish	F	C, Di, E, V	PMCSS, PWWS
Alamogordo Window Fly	*Caenotus inornatus*	Flies	D	E	M086
Dune Flower-loving Fly	*Apiocera bilineata*	Flies	D	Di, V	M022, M086
Painter's Mydas Fly	*Rhaphiomidas painteri*	Flies	I	V	

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Rio Grande Flower-loving Fly	*Apiocera hamata*	Flies	D	Di, V	
Small Window Fly	*Caenotus minutus*	Flies	D	E, V	M086
Allen's Big-eared Bat	*Idionycteris phyllotis*	Mammals	D	Di, V	EMCS, M010, M022, M036, M049, M086, M887, M888, PMCSS
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	D	C, De, K, V	M052, M086, M087, M092, M171
Big Free-tailed Bat	*Nyctinomops macrotis*	Mammals	D	C, Di, V	EMCS, M010, M022, M036, M049, M076, M086, M087, M091, M092, M171, M887, M888, PMCSS
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	F	C, De, K, V	M010, M036, M052, M076, M086, M087
Cave Myotis	*Myotis velifer*	Mammals	I	Di, K, V	EMCS, M010, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Common Porcupine	*Erethizon dorsatum*	Mammals	D	C, De, Di, V	M010, M022, M036, M049, M052, M076, M086, M087, M091, M092, M171, M887
Desert Pocket Gopher	*Geomys arenarius*	Mammals	D	C, De, E, V	M036, M076, M086, M087, M092
Eastern Red Bat	*Lasiurus borealis*	Mammals	D	Di, V	M010, M036, M076, M086, M087, M092
Fringed Myotis	*Myotis thysanodes thysanodes*	Mammals	I	C, Di, K, V	EMCS, M010, M022, M036, M049, M052, M076, M086, M087, M091, M092, M171, M887, M888, PMCSS
Gunnison's prairie dog	*Cynomys gunnisoni*	Mammals	F	C, De, K, V	M022, M049, M086, M087, M092, M171
Hooded Skunk	*Mephitis macroura milleri*	Mammals	D	C, V	M010, M022, M036, M049, M076, M086, M087, M091, M092

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Jaguar	*Panthera onca arizonensis*	Mammals	L	C, De, Di, V	EMCS, M010, M022, M036, M049, M076, M086, M087, M091, M092, M887, M888, PMCSS
Least Shrew	*Cryptotis parvus*	Mammals	F	C, V	EMCS, M036, M076, M082, M171, M888, PMCSS
Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	Mammals	F	C, Di, V	EMCS, M010, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Mexican Gray Wolf	*Canis lupus baileyi*	Mammals	I	C, De, V	EMCS, M010, M022, M036, M049, M076, M086, M087, M091, M092, M171, M887, M888, PMCSS
Mexican Long-nosed Bat	*Leptonycteris nivalis*	Mammals	F	C, De, Di, V	EMCS, M010, M022, M049, M076, M086, M087, M091, M092, M887, M888, PMCSS
Mexican Long-tongued Bat	*Choeronycteris mexicana*	Mammals	F	C, Di, V	EMCS, M010, M022, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
New Mexico Jumping Mouse	*Zapus hudsonius luteus (= Zapus luteus luteus)*	Mammals	I	C, De, Di, V	EMCS, M022, M036, M076, M888, PCWS, PMCSS, PWWS
Northern Pygmy Mouse	*Baiomys taylori ater*	Mammals	D	C, V	EMCS, M010, M076, M087, M092, PMCSS
Organ Mountains Colorado Chipmunk	*Neotamias quadrivittatus australis*	Mammals	I	C, De, Di, E, V	M010, M022, M049, M091, M092, M887
Oscura Mountains Colorado Chipmunk	*Neotamias quadrivittatus oscuraensis*	Mammals	I	C, De, E, V	M010, M049, M091, M887
Pocketed Free-tailed Bat	*Nyctinomops femorosaccus*	Mammals	D	C, Di, V	M010, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Southwestern Little Brown Myotis	*Myotis occultus*	Mammals	D	C, Di, V	EMCS, M010, M022, M036, M049, M052, M076, M086, M087, M091, M092, M171, M887, M888, PMCSS
Spotted Bat	*Euderma maculatum*	Mammals	D	Di, V	EMCS, M022, M036, M049, M076, M086, M087, M091, M092, M171, M298, M887, M888, PMCSS
Tri-colored Bat	*Perimyotis subflavus*	Mammals	F	C, Di, V	EMCS, M036
Western Red Bat	*Lasiurus blossevillii*	Mammals	D	C, Di, V	EMCS, M010, M022, M036, M076, M086, M888, PMCSS
Western Yellow Bat	*Dasypterus xanthinus*	Mammals	D	V	EMCS, M010, M036, M076, M086, M087, M092, M888, PMCSS
White-nosed Coati	*Nasua narica*	Mammals	D	V	M010, M022, M036, M076, M086, M091, M092, M887
Yellow-nosed Cotton Rat	*Sigmodon ochrognathus*	Mammals	D	V	M010, M022, M036, M076, M087
Yuma Myotis	*Myotis yumanensis yumanensis*	Mammals	D	C, De, Di, V	EMCS, M022, M036, M049, M076, M086, M087, M091, M092, M171, M887, M888, PMCSS
Big Hatchet Woodlandsnail	*Ashmunella mearnsii*	Molluscs	D	C, Di, V	M010, M091, M887
Bishop Tubeshell Snail	*Coelostemma pyrgonasta*	Molluscs	D	C, Di, V	M086
Chupadera Springsnail	*Pyrgulopsis chupaderae*	Molluscs	F	C, De, Di, E, V	PMCSS
Doña Ana Talussnail	*Sonorella todseni*	Molluscs	D	C, Di, E, V	M010, M036, M087, M091, M887
Florida Mountain Woodlandsnail	*Ashmunella walkeri*	Molluscs	D	C, Di, E, V	M010
Franklin Mountain Talussnail	*Sonorella metcalfi*	Molluscs	D	C, Di, V	

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Franklin Mountain Woodlandsnail	*Ashmunella pasonis pasonis*	Molluscs	D	C, Di, V	
Goat Mountain Woodlandsnail	*Ashmunella harrisi*	Molluscs	D	C, Di, E, V	M010, M087
Hacheta Mountainsnail	*Radiocentrum hachetanum*	Molluscs	D	C, Di, V	M010, M887
Koster's Springsnail	*Juturnia kosteri*	Molluscs	F	C, De, Di, E, V	PMCSS
Maple Canyon Woodlandsnail	*Ashmunella todseni*	Molluscs	D	C, Di, E, V	M010
Metcalf Holospira Snail	*Holospira metcalfi*	Molluscs	D	C, Di, E, V	M010, M087, M887
Mount Riley Woodlandsnail	*Ashmunella rileyensis*	Molluscs	D	C, Di, E, V	M086, M087
Multirib Vallonia Snail	*Vallonia gracilicosta*	Molluscs	D	C, Di, V	M022
New Mexico Ramshorn Snail	*Pecosorbis kansasensis*	Molluscs	D	C, V	M086, M087, PCWS, PMCSS, PWWS
Organ Mountain Woodlandsnail	*Ashmunella organensis*	Molluscs	D	C, Di, V	M022
Ovate Vertigo Snail	*Vertigo ovata*	Molluscs	D	C, Di, V	EMCS, M036, M076, M086, M888, PMCSS
Pecos Assiminea	*Assiminea pecos*	Molluscs	F	C, De, Di, V	EMCS, M036, M076, M888, PMCSS
Pecos Springsnail	*Pyrgulopsis pecosensis*	Molluscs	F	C, De, E, V	PMCSS
Pinos Altos Mountainsnail	*Oreohelix confragosa*	Molluscs	D	C, Di, E, V	
Roswell Springsnail	*Pyrgulopsis roswellensis*	Molluscs	F	C, De, Di, E, V	PMCSS
Salinas Peak Woodlandsnail	*Ashmunella salinasensis*	Molluscs	D	C, Di, V	M010
Socorro Mountainsnail	*Oreohelix neomexicana*	Molluscs	D	C, Di, V	M022, M887
Socorro Springsnail	*Pyrgulopsis neomexicana*	Molluscs	I	C, De, Di, E, V	PMCSS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
Texas Hornshell	*Popenaias popeii*	Molluscs	F	C, De, Di, V	PWWS
Tularosa Springsnail	*Juturnia tularosae*	Molluscs	D	V	EC, PCWS, PLCP, PMCSS, PWWR, PWWS
Woodlandsnail	*Ashmunella amblya cornudasensis*	Molluscs	D	C, Di, V	M010, M087, M887
Woodlandsnail	*Ashmunella auriculata*	Molluscs	D	C, Di, V	M010
Woodlandsnail	*Ashmunella kochii*	Molluscs	D	C, Di, V	M010, M086, M087, M091
Wrinkled Marshsnail	*Stagnicola caperata*	Molluscs	D	C, V	EMCS, M888, PCWS, PMCSS, PWWS
Blanchard's Pelochrista Moth	*Pelochrista blanchardi*	Moths and Butterflies	D	C, V	M082, M086, M298
Lafontaine's Cutworm Moth	*Euxoa lafontainei*	Moths and Butterflies	I	E, V	M087
Landry's Flower Moth	*Arotrura landryorum*	Moths and Butterflies	I	E, V	M087
Orange Giant Skipper	*Agathymus neumoegeni neumoegeni*	Moths and Butterflies	D	C, V	M022, M087
Organ Mountains Poling's Hairstreak	*Satyrium polingi organensis*	Moths and Butterflies	I	C, E, V	M049, M091
Rindge's Emerald Moth	*Nemoria rindgei*	Moths and Butterflies	I	V	M022, M082, M086, M087, M091, M512
Southwestern Brown Moth	*Plagiomimicus astigmatosum*	Moths and Butterflies	D	C, V	
West Coast Lady	*Vanessa annabella*	Moths and Butterflies	L	De, V	M022, M049, M086, M171
White Sands Cutworm Moth	*Protogygia whitesandsensis*	Moths and Butterflies	I	E, V	M087
White Sands Dune Moth	*Areniscythris whitesands*	Moths and Butterflies	I	E, V	
White Sands Owlet Moth	*Aleptina arenaria*	Moths and Butterflies	I	E, V	M086

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
White Sands Twirler Moth	*Chionodes bustosorum*	Moths and Butterflies	I	E, V	M087
White Sands Yinyang Moth	*Cochylis yinyangana*	Moths and Butterflies	I	E, V	M086
Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	Reptiles	D	V	EC, EMCS, M036, M052, M076, M086, M087, M091, M888, PCWS, PLCP, PMCSS, PWWS
Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	Reptiles	I	C, De, Di, V	M010, M022, M049, M087, M091, M887
Big Bend Slider	*Trachemys gaigeae*	Reptiles	F	C, De, V	EC, EMCS, M036, M086, M087, M888, PLCP, PMCSS
Bleached Earless Lizard	*Holbrookia maculata ruthveni*	Reptiles	D	C, E, V	M086, M087
Bolson's Tortoise	*Gopherus flavomarginatus*	Reptiles	L	C, V	M086, M087, M092
Dunes Sagebrush Lizard	*Sceloporus arenicolus*	Reptiles	F	C, De, Di, V	M052, M086, M087
Gila Monster	*Heloderma suspectum*	Reptiles	D	C, De, Di, V	M010, M036, M076, M086, M087, M091, M887
Gray-banded Kingsnake	*Lampropeltis alterna*	Reptiles	D	De, V	M076, M086, M087, M092, M887
Gray-checkered Whiptail	*Aspidoscelis dixoni*	Reptiles	D	C, De, V	M010, M086, M087, M092
Green Rat Snake	*Senticolis triaspis intermedia*	Reptiles	D	V	M010, M022, M036, M076, M086, M087, M092
Madrean Mountain Spiny Lizard	*Sceloporus jarrovii jarrovii*	Reptiles	L	C, De, V	M010, M036, M049, M091, M887
Mojave Rattlesnake	*Crotalus scutulatus scutulatus*	Reptiles	D	V	M086, M087
Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	Reptiles	D	C, De, V	M086, M887
Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	Reptiles	L	C, De, Di, V	EC, EMCS, M010, M022, M036, M076, M888, PCWS, PMCSS, PWWS

Common Name[41]	Scientific Name	Taxon	Category	Reason to Include[42]	Habitats[43]
North American Racer	*Coluber constrictor*	Reptiles	D	C, De, Di, V	M022, M036, M076, M092
Northern Mexican Gartersnake	*Thamnophis eques megalops*	Reptiles	L	C, De, Di, V	EC, EMCS, M022, M036, M076, M888, PCWS, PMCSS, PWWS
Ornate Box Turtle	*Terrapene ornata*	Reptiles	I	C, V	M010, M036, M052, M076, M086, M087, M092
Sonoran Lyresnake	*Trimorphodon lambda*	Reptiles	D	V	M010, M036, M076, M086, M091, M887
Texas Lyresnake	*Trimorphodon vilkinsonii*	Reptiles	D	V	M010, M036, M076, M086, M091, M887
Texas Spotted Whiptail	*Aspidoscelis gularis gularis*	Reptiles	D	De, V	M036, M076, M086, M087, M092
Trans-Pecos Rat Snake	*Bogertophis subocularis subocularis*	Reptiles	D	V	M010, M036, M076, M086, M092, M887
Western Blind Snake	*Rena humilis segregus*	Reptiles	D	C, V	M010, M052, M086, M087
Western Massasauga	*Sistrurus tergeminus*	Reptiles	I	De, Di, V	M052, M086, M087
Western Painted Turtle	*Chrysemys picta bellii*	Reptiles	D	C, De, V	M888, PCWS, PLCP, PMCSS, PWWR, PWWS
Western River Cooter	*Pseudemys gorzugi*	Reptiles	F	C, De, Di, V	EC, EMCS, M036, M086, M888, PCWS, PLCP, PMCSS, PWWS
Yellow-bellied Water Snake	*Nerodia erythrogaster transversa*	Reptiles	D	C, De, V	EC, EMCS, M036, M086, M888, PLCP, PMCSS, PWWS

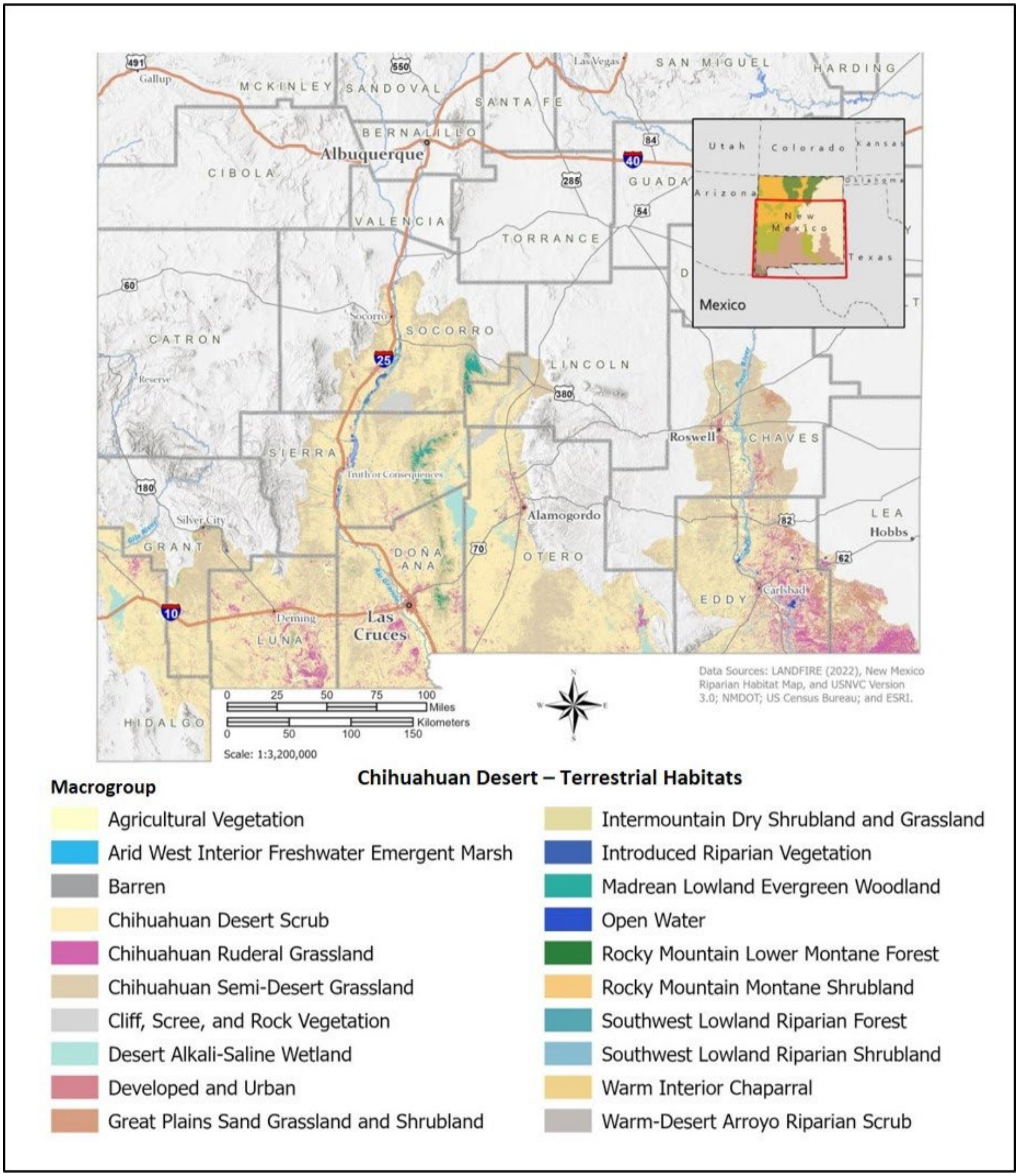


Figure 35. Terrestrial habitats in the Chihuahuan Desert ecoregion.

Map based on LandFire 2022 Existing Vegetation Map (LANDFIRE 2022) crosswalked to macrogroups from the United States National Vegetation Classification system and on vegetation types from the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap) grouped to macrogroups.

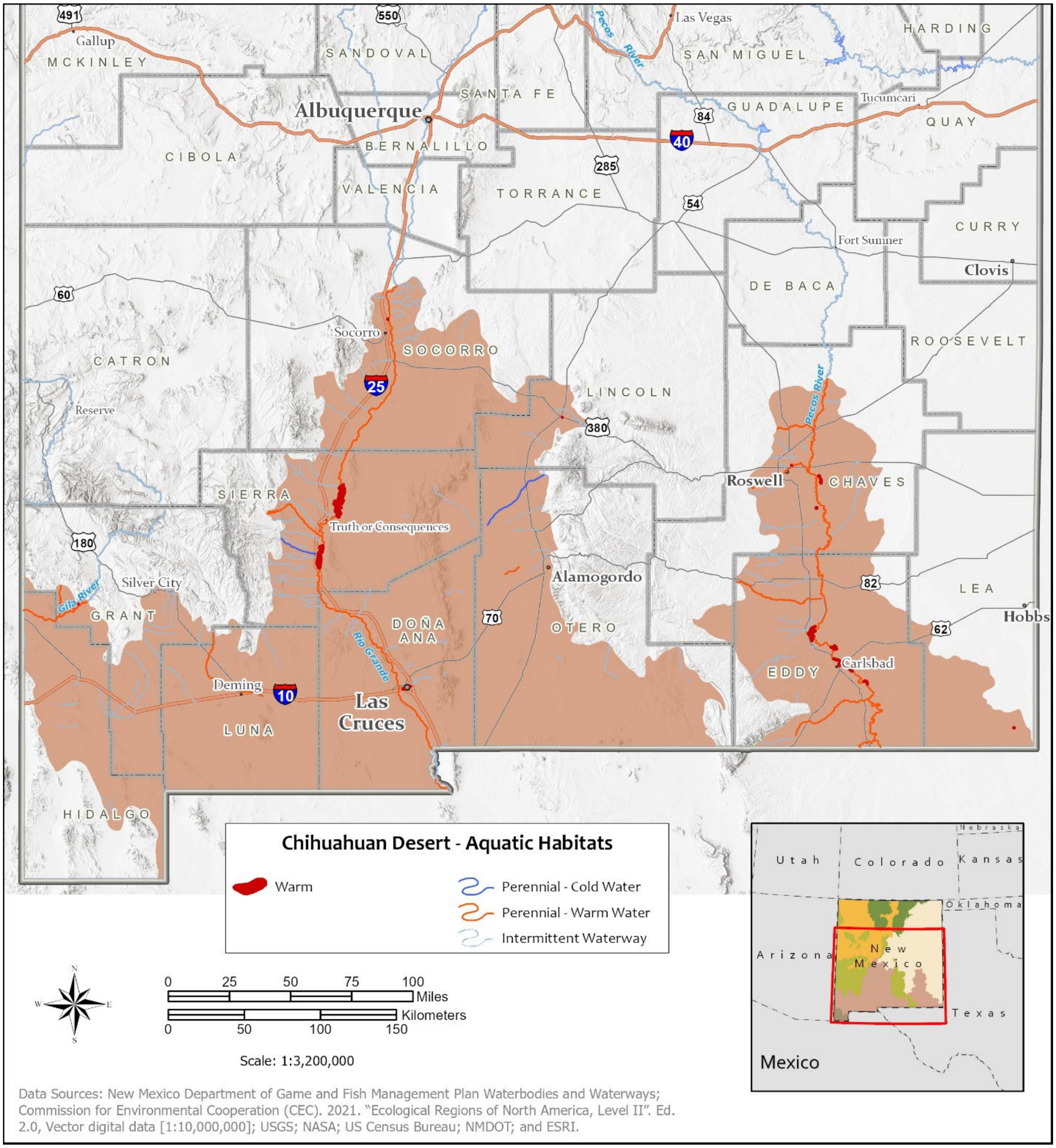


Figure 36. Aquatic habitats in the Chihuahuan Desert ecoregion.

HABITAT DESCRIPTIONS

CHIHUAHUAN DESERT SCRUB

Chihuahuan Desert Scrub **[M086]**[44] is the most abundant habitat in this ecoregion with scattered occurrences in adjacent ecoregions. It occurs at 1,000-2,000 m (3,280-6,560 ft) in elevation primarily along piedmont slopes of basins but also extending up into adjacent foothills and down to basin bottoms. It can be interspersed with Chihuahuan Semi-Desert Grasslands **[M087]** (see Madrean Archipelago ecoregion chapter for this description).

- This habitat is dominated by xeromorphic shrubs that form sparse to dense canopies. The most common indicator species is creosote bush (*Larrea tridentata*), but stands can also be dominated or co-dominated by whitethorn acacia (*Vachellia constricta*), viscid acacia (*V. vernicosa*), tarbush (*Flourensia cernua*), and honey mesquite (*Prosopis glandulosa*). Other common shrub associates are catclaw acacia (*Senegalia greggii*), fourwing saltbush (*Atriplex canescens*), Torrey's jointfir (*Ephedra torreyana*), longleaf jointfir (*E. trifurca*), ocotillo (*Fouquieria splendens*), mariola (*Parthenium incanum*), and at the southern edge of range, lechuguilla (*Agave lechuguilla*).

- Many stands of this habitat type lack an herbaceous understory layer and develop a pebbly desert pavement on the soil surface, but some stands have scattered grasses and forbs. If present, the understory is a sparse to moderately dense herbaceous layer dominated by grasses including black grama (*Bouteloua eriopoda*), bush muhly (*Muhlenbergia porteri*), tobosagrass (*Pleuraphis mutica*), fluffgrass (*Dasyochloa pulchella*), burrograss (*Scleropogon brevifolius*), and mesa dropseed (*Sporobolus flexuosus*). Forb species are often present but have low cover.
- Most species are drought tolerant, but extreme droughts can impact species, particularly grasses. Much of this desert scrubland is thought to be the result of an expansion in the last 150 years of creosote bush, sometimes with honey mesquite, into former desert grasslands and steppe driven by a combination of drought, overgrazing by livestock, wind and water erosion, and/or decreases in fire. Substrates are variable, dependent on position in the

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[44] Complete descriptions of habitats can be viewed by clicking on hyperlinked United States National Vegetation Classification System codes.

landscape, and can include coarse-textured loams on well-drained, gravelly plains; slopes with soils that are typically non-saline and calcareous; sandy plains and coppice dunes; or rocky foothill slopes.

CHIHUAHUAN RUDERAL GRASSLAND

Chihuahuan Ruderal Grassland [**M512**] is the third most common habitat in this ecoregion occupying at least 5% of the area. It includes both grasslands dominated by non-native grasses and thorn scrub dominated by native, invasive shrubs. It typically occurs in historically heavily impacted pastures, old fields, and other disturbed sites.

- The grasslands are commonly dominated by Lehmann lovegrass (*Eragrostis lehmanniana*) and buffelgrass (*Pennisetum ciliare*), but weedy natives such as purple threeawn (*Aristida purpurea*) and burrograss may be prevalent.
- Honey mesquite dominates where it has invaded the upland grasslands or developed into coppice dunes following disturbance of sandy sites.
- Forbs can also be common and dominated by weedy species (e.g., carelessweed [*Amaranthus palmeri*] and silverleaf nightshade [*Solanum elaeagnifolium*]).
- During the last century, the area occupied by this ruderal desert thornscrub habitat has increased as a result of the conversion of desert grasslands driven by drought, overgrazing, honey mesquite seed dispersion by livestock, and/or decreases in fire frequency.

WARM-DESERT ARROYO RIPARIAN SCRUB

Warm-Desert Arroyo Riparian Scrub [**M092**] in the Chihuahuan Desert ecoregion but can extend into adjacent ecoregions. It is primarily an open shrubland habitat with patches of vegetation occurring within, and along the edges of, ephemerally wetted desert washes.

- Desert willow (*Chilopsis linearis*), Apache plume (*Fallugia paradoxa*), and littleleaf sumac (*Rhus microphylla*) are the typical dominants of this primarily open shrubland. Singlewhorl burrobrush (*Hymenoclea monogyra*), little walnut (*Juglans microcarpa*), and splitleaf brickellbush (*Brickellia laciniata*) are commonly found in this habitat.
- The herbaceous layer is usually sparse with widely scattered grasses and forbs.
- This habitat is associated with flash flooding and rapid sheet and gully flows that scour channel bottoms. The vegetation is sparse due to the high impact of flooding and the lack of moisture following flooding events.

SOUTHWEST LOWLAND RIPARIAN FOREST

Southwest Lowland Riparian Forest **[M036]** is a lowland riverine riparian habitat found mostly in the Chihuahuan Desert, Arizona/New Mexico Mountains, and Colorado Plateaus ecoregions. It is found along perennial streams and rivers of lowland valleys and extends into canyons of mountain foothills at elevations ranging from 1,160 to 1,770 m (3,800 to 5,800 ft).

- Broad-leaved deciduous trees dominate this habitat and include Fremont cottonwood (*Populus fremontii*) and Rio Grande cottonwood (*P. deltoides* var. *wislizenii*) along with Arizona sycamore (*Platanus wrightii*), netleaf hackberry (*Celtis laevigata*), velvet ash (*Fraxinus velutina*), Arizona walnut (*Juglans major*), and Goodding's willow (*Salix gooddingii*).
- Shrubs can include New Mexico olive (*Forestiera pubescens* var. *pubescens*) and silver buffaloberry (*Shepherdia argentea*) in the understory of drier, mature stands, or coyote willow (*S. exigua*) and baccharis (*Baccharis salicifolia, B. emoryi*) in younger early- to mid-successional communities.
- Grasses and forbs tend to be scattered and can include Torrey's rush (*Juncus torreyi*), knotgrass (*Paspalum distichum*), alkali muhly (*Muhlenbergia asperifolia*), and alkali sacaton (*Sporobolus airoides*).
- Most of the dominant woody species are phreatophytes and require the presence of a seasonally shallow water table. Typically, this habitat occurs on bars and terraces along channels that are flooded every 1 to 25 years. This habitat is declining in most areas due to regulation of rivers that reduces annual flow volumes, changes seasonal peak flows from spring to summer, and disrupts the annual fluctuation in flow volume as a result of water diversions during dry years; exotic shrub invasions; increased fire frequency; and excessive herbivory by livestock and native animals. Stream gradients are low to moderate (0.3% on average), and channel substrates tend to be sands and gravels. Soils are moist and well-drained but weakly developed entisols that are either sandy throughout or sandy underlain by a gravelly matrix. They tend to be dry on the surface most of the year but are moist within the rooting zone of most species, particularly during spring runoff.

SOUTHWEST LOWLAND RIPARIAN SHRUBLAND

Southwest Lowland Riparian Shrubland **[M076]** occurs primarily in the Chihuahuan Desert and Madrean Archipelago ecoregions. This habitat occurs along perennial and intermittent streams and lake or playa edges and at alkaline seeps and springs in lowland floodplains of wide valleys but may extend into montane reaches up to 2,140 m (7,020 ft) in elevation.

- This habitat is characterized by a mix of phreatophyte shrub species that tap into groundwater below the streambed. Emory's baccharis (*Baccharis emoryi*), mule-fat (*B. salicifolia*), silver buffaloberry, and coyote willow typically dominate this habitat, though honey mesquite may dominate on drier sites.
- A dense understory layer of graminoids and forbs can be present on moist-mesic sites and can include Emory's sedge (*Carex emoryi*), Torrey's rush, Dudley's rush (*Juncus dudleyi*), hairy willowherb (*Epilobium ciliatum*), smooth horsetail (*Equisetum laevigatum*), common threesquare (*Schoenoplectus pungens*), and field horsetail (*E. arvense*).
- Stands are generally found on depositional side or island bars that are frequently flooded, and soils are typically poorly developed with recent sediments. As stands mature and bars accumulate additional sediments, bars are flooded less often, even as little as every 25 years. Occasionally, stands develop in backwater channels and around ponds. Vegetation depends on an annual rise in the water table or annual/periodic flooding and associated sediment scour for growth and reproduction. It is often an early successional stage that develops prior to Southwest Lowland Riparian Forest **[M036]** and Great Plains Floodplain Forest **[M028]** (see High Plains and tablelands ecoregion chapter for this description).

ARID WEST INTERIOR FRESHWATER EMERGENT MARSH

Arid West Interior Freshwater Emergent Marsh **[M888]** occurs primarily in the Chihuahuan Desert, Colorado Plateaus, and Arizona/New Mexico Mountains ecoregions. This wetland is associated with river bars, backwater channels, and springs where ground water is at or near the surface.

- This habitat is characterized by a lush herbaceous layer that can be diverse or approach a single-species monoculture. Structure varies from emergent forbs, which barely reach the water surface, to tall graminoids that reach as tall as 4 m (13 ft). Dominant species typically include wetland-obligate species such as common threesquare, chairmaker's bulrush (*Schoenoplectus americanus*), broadleaf cattail (*Typha latifolia*), southern cattail (*T. domingensis*), common spikerush

(*Eleocharis palustris*), mountain rush (*Juncus arcticus* ssp. *littoralis*), knotgrass, clustered field sedge (*Carex praegracilis*), woolly sedge (*C. pellita*), flatsedges (*Cyperus* spp.), beggarticks (*Bidens* spp.), water hemlocks (*Cicuta* spp.), monkeyflowers (*Mimulus* spp.), and canarygrasses (*Phalaris* spp.).
- Encompassed within this habitat is wetland vegetation growing in shallow freshwater to brackish waterbodies found below seeps and in bottomlands along drainages, river floodplain depressions, cienegas, oxbow lakes, frequently flooded gravel bars, low-lying sidebars, in-fill side channels, small ponds, stock ponds, ditches, and slow-moving perennial streams in valleys and mountain foothills. They are also found along the borders of ponds, lakes, or reservoirs that have more open water. Some occurrences of this habitat are interdunal wetlands in wind deflation areas where sands are scoured down to the water table. Marshes may be semi-permanently flooded, but some marshes only receive seasonal flooding. Soils typically show indications of high water tables and anoxic conditions (gleying).

INTRODUCED RIPARIAN VEGETATION

Introduced Riparian Vegetation **[M298]** is a habitat dominated by invasive, non-native shrubs and trees that occurs along lowland streams and rivers below approximately 1,980 m (6,000 ft) throughout New Mexico.

- Russian olive (*Elaeagnus angustifolia*) and tamarisk (also known as salt cedar; *Tamarix* spp.) dominate the habitat as shrubs and small trees. They can form large stands that effectively displace the native cottonwoods (*Populus* spp.) and willows (*Salix* spp.). Remnant native shrubs may still be present (e.g., coyote willow, New Mexico olive [*Forestiera pubescens* var. *pubescens*]).
- The understory can be grassy with salt-tolerant species (e.g., saltgrass [*Distichlis spicata*], alkali muhly, and alkali sacaton), but, more commonly, stands are sparse and low in diversity.
- Regulated stream flows appear to have led to an explosion of Russian olive and tamarisk within a relatively short period (<100 years). Stands typically line streambanks and benches, floodplains, and canyons with permanent, intermittent, or temporary water flow. Sites are mesic to dry but are at least temporarily flooded during most years. Hydric conditions typically occur within the top 1 m (3 ft) below the soil surface.

THREATS AND CONSERVATION ACTIONS

Ten threats could potentially impact SGCN in 23 habitats within the Chihuahuan Desert ecoregion (Table 28). These threats are summarized below and listed in the order presented by the IUCN (2022). The list does not reflect the order of threat severity.

- Agriculture and Aquaculture: Grazing practices that impact SGCN habitat and groundwater withdrawal for crops.
- Energy and Mining: Solar- and wind-energy development and oil and gas extraction.
- Transportation and Service Corridors: Transmission lines and roads.
- Biological Resource Use: Collection of reptiles and amphibians.
- Human Intrusion and Disturbance: Military activities, off-highway vehicles (OHVs), and unauthorized dispersed camping.
- Natural System Modifications: Degradation of riparian and aquatic habitats and shrub encroachment.
- Invasive and Other Problematic Species, Genes, and Diseases: Introduction of quagga (*Dreissena bugensis*) and zebra mussels (*Dreissena polymorpha*) in aquatic habitats; and tamarisk (*Tamarix* spp.) intrusion in riparian habitat; and potential infection of bats by *Pseudogymnoascus destructans*, which can cause white-nose syndrome, and of amphibians by chytrid fungus (*Batrachochytrium dendrobatidis*), which can cause chytridiomycosis.
- Pollution: Air, soil, and water contamination from industrial activities; noise and light pollution from the oil and gas industry.
- Climate Change: Habitat alteration due to prolonged drought and projected increasing aridity. Approximately 6% (Table 12) of the Chihuahuan Desert ecoregion, especially along the lower Pecos River and Rio Grande, has higher potential to contain microclimate refugia for amphibians and reptiles; the lower Rio Grande has pockets of potential microclimate refugia for birds (Figure 15; Friggens et al. 2025).

Conservation concerns include poorly managed grazing, unregulated energy development, and degradation of riparian habitats, particularly from intrusion by tamarisk. Unlike grasslands in the High Plains and Tablelands ecoregion, Chihuahuan Desert grasslands did not evolve with periodic grazing by large herbivores. Additionally, due to variable and limited precipitation, forage availability is not predictable or abundant. Thus, cost-effective grazing is difficult to achieve. Withdrawal of groundwater for crop production can lead to sharp drops in groundwater levels, which has deleterious impacts on local aquatic and riparian habitats. Conservation actions to address these challenges include working with ranchers and farmers to determine current practices, needs, and environmental impacts and implementing new practices where they will lead to a better balance between agricultural and SGCN conservation needs.

Energy-related activities in this ecoregion includes oil and gas extraction and, increasingly, solar and wind development. Over time, local habitats have become highly fragmented where energy development has occurred. Evolving best management practices and technologies have provided opportunities to reduce the amount of surface disturbance associated with oil and gas well development. Solar and wind development is increasing and related impacts on wildlife are not yet fully known. However, these installations could have a substantial adverse impact if placed in habitats crucial to SGCN or if cumulative disturbance reaches an as yet unidentified threshold. Evaluation of all energy-related threats requires knowledge of SGCN distribution and habitat requirements. Early and continued participation in planning and development of energy resources is essential so that appropriate, site-specific mitigation measures, to reduce impacts to SGCN and their habitats, can be incorporated into project designs.

Riparian and aquatic habitats, including along the lower Pecos River, and the SGCN that depend on them, in this ecoregion are threatened by anthropogenic water demands, altered hydrological regimes, unpredictable and limited precipitation, and projections of increasing drought associated with changing climatic conditions. The presence and spread of invasive species make SGCN conservation more complex and difficult. This is particularly true when SGCN have adapted to their presence (e.g., southwestern willow flycatchers [*Empidonax traillii extimus*] nesting in tamarisk). Conservation actions include early detection and eradication of invasive species and determining and implementing strategies to rapidly restore native species to densities suitable for riparian-obligate SGCN.

The Chihuahuan Desert ecoregion experienced warmer temperatures (with an increase of 0.8 °C [1.4 °F]) and drier conditions (with 4 cm [2 in] less precipitation) during the period from 1991 to 2020 when compared to the prior period from 1961 to 1990 (AdaptWest Project 2022). Average maximum and minimum temperatures recorded by weather stations at the following sites increased significantly from 1970-2005: Bottomless Lakes, Lost River, Pecos River, Bitter Lake, Rio Felix, and Lower Hondo (Enquist and Gori 2008). A drought from 2000-2013 caused the most severe low-flow conditions documented for the Pecos River since 1310; since the river dries from north to south, conditions were likely more extreme in the Chihuahuan Desert than the location in the High Plains and Tablelands where the flow data were gathered (Harley and Maxwell 2018).

Under continued climate change, Chihuahuan Desert Scrub habitat is expected to expand and Chihuahuan Semi-Desert Grasslands are expected to decrease in area (Rehfeldt et al. 2006). Multiple species of forbs and grasses and even some shrubs have been observed to decline in the Chihuahuan Desert ecoregion as maximum summer temperatures increased (Munson et al. 2013). Woodlands may disappear completely by mid-century (Rehfeldt et al. 2006). Agaves (*Agave* spp.) are expected to decline throughout much of the Chihuahuan Desert ecoregion by 2050 and 2070, with implications for nectar-feeding bats (Gomez-Ruiz and Lacher 2019). The habitat with very high vulnerability to climate change is Great Plains Sand Grassland and Shrubland (Table 26; Triepke et al. 2014).

Table 28. Potential threats to habitat and associated SGCN in the Chihuahuan Desert ecoregion.

Threat categories were derived from IUCN (2022).

Habitat \ Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Arid West Interior Freshwater Emergent Marsh		X					X	X	X	X
Chihuahuan Desert Scrub		X	X	X	X	X	X	X		X
Chihuahuan Ruderal Grassland		X	X	X		X		X		
Chihuahuan Semi-Desert Grassland		X	X	X	X	X	X	X	X	X
Cliff, Scree, and Rock Vegetation			X	X		X				
Desert Alkali-Saline Wetland		X	X					X	X	X
Ephemeral Catchments							X	X		
Ephemeral Marshes/Cienegas/Springs							X	X		
Great Plains Sand Grassland and Shrubland		X	X			X		X		X
Intermountain Dry Shrubland and Grassland		X	X			X		X	X	X
Introduced Riparian Vegetation										
Madrean Lowland Evergreen Woodland	X	X	X	X	X	X	X		X	X
Perennial Cold-Water Streams	X	X	X	X	X	X	X	X	X	X
Perennial Lakes, Cirques, Ponds							X	X		
Perennial Marsh/Cienega/Spring/Seep		X	X	X	X	X	X	X	X	X
Perennial Warm-Water Reservoirs		X					X	X	X	X
Perennial Warm-Water Streams		X					X	X	X	X
Rocky Mountain Lower Montane Forest	X	X	X	X	X	X	X			X
Rocky Mountain Montane Shrubland	X	X	X			X	X			X
Southwest Lowland Riparian Forest		X	X	X	X	X	X	X	X	X

Habitat \ Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Southwest Lowland Riparian Shrubland		X	X	X	X	X	X	X	X	X
Warm Interior Chaparral	X		X			X	X			X
Warm-Desert Arroyo Riparian Scrub		X	X	X			X	X	X	X

The following are proposed conservation actions for the Chihuahuan Desert ecoregion, listed in order of priority within each threat category. Threat categories are listed according to the order presented by IUCN (2022).

DEVELOPMENT:

- Determine distribution and habitat needs of SGCN that reside in (e.g., Boakes et al. 2024) or near urban areas. This includes initiation and promotion of citizen or community science activities that document SGCN and other wildlife in and around urban areas. Inform municipal staff of nearby SGCN and how to minimize development-related impacts to SGCN and their habitats. Encourage community enrollment in programs designed to benefit particular SGCN or taxa (e.g., Monarch City USA; https://www.monarchcityusa.com/) and in wildlife habitat certification programs (e.g., National Wildlife Federation; https://certifiedwildlifehabitat.nwf.org/; Albuquerque Backyard Refuge Program; https://friendsofvalledeoro.org/abq-backyard-refuge/). Potential collaborators: universities, municipalities, non-profit organizations, private landowners.
- Investigate the potential impacts of current and future development on SGCN and their habitats and identify ways to mitigate those impacts. This includes working with municipalities to stay informed about new developments and initiate policies that will minimize negative impacts of future developments on SGCN. This also includes promoting the development of green spaces and green infrastructure in urban areas that, where appropriate, provide habitat and resources to SGCN (Gallo et al. 2017; Threlfall et al. 2017), including pollinators (Fukase and Simons 2016; Majewska and Altizer 2020). Potential collaborators: New Mexico Department of Transportation (NMDOT), universities, local governments, municipalities, non-profit organizations, private landowners.
- Participate in public-involvement opportunities when proposed developments might threaten the persistence of SGCN and their habitats. Potential collaborators: non-profit organizations, private landowners.

AGRICULTURE AND AQUACULTURE:

- Determine where habitat restoration would benefit SGCN and work with federal, state, and private landowners to restore degraded rangelands to good or excellent condition. Monitor restoration results to develop and initiate any identified improvements to restoration practices. Potential collaborators: United States (US) Bureau of Land Management (BLM), New Mexico State Land Office (SLO), private landowners.
- Establish baseline composition, condition, disturbance regimes, and function of major range habitats to inform habitat-restoration actions, with an emphasis on shrub invasion into historic grasslands and inform activities in riparian habitats. Potential collaborators: BLM, universities.
- Determine how timing, intensity, and duration of livestock grazing affect SGCN and their habitats, including the interactions among grazing, fire, and the spread of invasive and other problematic species and among grazing, soil erosion (e.g., Pilon et al. 2017), and native riparian vegetation growth (e.g., Lucas et al. 2004). Potential collaborators: BLM, US Natural

Resources Conservation Service (NRCS), New Mexico Department of Agriculture (NMDA), SLO, universities, private landowners.

- Balance irrigation and groundwater demands with the needs of aquatic communities, particularly those supporting native fish, amphibian, and springsnail populations. This may include promoting a transition from irrigated to dryland farming in areas where groundwater pumping and water scarcity threaten SGCN and their habitats. Potential collaborators: US Bureau of Reclamation (BOR), NRCS, US Army Corps of Engineers (USACE), New Mexico Office of the State Engineer (NMOSE), non-profit organizations, private landowners, water-management districts.
- Promote expanded use of appropriate, cost-effective grazing practices that ensure long-term ecological sustainability for SGCN and their habitats (especially riparian habitats). These include actions such as rest-rotation grazing management and conservation easements (Gripne 2005) that contribute to recovery of rangelands impacted by drought and allow restoration activities to be completed. May also include the use of virtual fencing to keep livestock in desired locations and out of sensitive areas (USFS 2024). Potential collaborators: BLM, SLO, private landowners.
- Promote grazing systems that address local needs of livestock and for SGCN habitat, including riparian areas. When particular habitat components need improvement, coordinate with ranchers and resource managers to identify and implement modifications that would provide the desired habitat outcomes. Potential collaborators: BLM, SLO, private landowners.
- Work with private landowners to improve irrigation processes and infrastructure to conserve water. Includes promoting the use of devices and models that improve water conservation and irrigation efficiency (Schaible and Aillery 2012, Wang 2019) to help conserve the structure and function of aquatic and riparian habitats. Potential collaborators: NRCS, NMOSE.
- Employ existing incentive programs to promote persistence of productive wildlife habitat and native vegetation on private lands, SGCN conservation, and retirement of agricultural fields and water rights where feasible. Support maintenance and growth of incentive programs. Potential collaborators: BLM, NRCS, US Fish and Wildlife Service (USFWS), NMDA, SLO, private landowners.
- Gather and assess current information on grazing practices and determine how the Department can support landowners that provide habitat for SGCN. Potential collaborators: BLM, NRCS, NMDA, SLO, private landowners.
- Identify human-constructed water-retention structures (e.g., stock tanks, water troughs, and drinkers) that provide habitat for aquatic SGCN and other wildlife, particularly amphibians. Remove invasive species (e.g., bullfrogs [*Rana* (*Aquarana*) *catesbeiana*]) from these structures that may threaten native aquatic wildlife. Potential collaborators: BLM, universities, private landowners.
- Promote grazing systems that incorporate rested pastures and help improve overall range condition and enhance wildlife habitat health and function. In upland areas, these systems may include rest-rotation and/or deferred-rotation. In riparian areas, beneficial grazing practices may also include grazing in early spring and restricting summer grazing and redistribution practices such as herding and developing drinking water sources in upland

areas. Especially during times of drought, rested pastures can provide forage reserves and relieve pressure on grazed pastures or allotments. Potential collaborators: BLM, NRCS, USFWS, SLO, private landowners.

- Promote use of ecoregion-appropriate agricultural practices that provide habitat or resources or protect habitat quality (e.g., reduce erosion) for SGCN, including planting rows of trees between crops (McCarthy 2024) and pollinator-friendly practices such as planting pollinator habitat along field margins and underutilized areas, revegetating retired farmland with wildflowers, including pollinator-friendly forbs in cover-crop seed mixes (O'Brien and Arathi 2021), and conserving semi-natural habitat near agricultural fields (Shi et al. 2024). Potential collaborators: NRCS, USFWS, NMDA, private landowners.

ENERGY AND MINING:

- Determine where energy development and mineral extraction currently, and in the future, may affect SGCN. Work with regulatory agencies to develop permitting guidelines and policies that result in siting new development in areas that minimize impacts to SGCN. Potential collaborators: BLM, New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), New Mexico Bureau of Geology and Mineral Resources (NMBGMR), SLO, energy and mining companies.
- Identify and promote best management practices that minimize the impacts (especially habitat fragmentation and direct SGCN mortality) of energy development (including of renewable energy sources [Lovich and Ennen 2011, Copping et al. 2020, Levin et al. 2023]) and mining on SGCN and their aquatic and terrestrial habitats. This includes informing and supporting resource managers in the implementation of measures to prevent direct take of SGCN associated with energy extraction and mining (e.g., use of appropriate exclusionary netting and/or fencing, bird balls, and closed containment systems at toxic sites). May also include increased use of small, localized installations (e.g., community solar development) rather than utility-scale developments (Bowlin et al. 2024). Potential collaborators: BLM, EMNRD, SLO, universities, energy and mining companies, municipalities.
- Reclaim disturbed habitats impacted by resource extraction as close as possible to pre-development conditions. Rehabilitate abandoned well pads, mining sites, and associated access roads. Remove unneeded roads, transmission lines, and any other abandoned infrastructure and equipment (e.g., pits, pipelines, unused machinery). Restore native vegetation. Where feasible, maintain abandoned mines as habitat for bats and snakes by constructing appropriate bat gates on mine shafts and adits (Spanjer and Fenton 2005). Potential collaborators: BLM, USFWS, EMNRD, SLO, energy and mining companies, private landowners.
- Maintain and expand open communication with mining and energy companies and land-management agencies to minimize adverse impacts of development to SGCN. Potential collaborators: BLM, EMNRD, SLO, energy and mining companies.

TRANSPORTATION AND SERVICE CORRIDORS:

- Site, consolidate, and maintain utility corridors to minimize adverse effects to SGCN and their habitats. Reduce avian powerline collisions by using line markers and illumination with ultraviolet lights and by burying powerlines (Bateman et al. 2023). Avoid mowing rights-of-way during peak SGCN pollinator larvae abundance and avoid mowing patches of nectar resources important for pollinator SGCN (e.g., Xerces Society 2018). Potential collaborators: BLM, US Department of Defense (DOD), SLO, interested and affected members of the public, local governments, utility companies.

- Determine where roads, vehicle traffic, and utility lines are inhibiting or preventing movement of SGCN, including during migration. Identify and conserve natural habitat corridors, especially those at risk from future fragmentation by roads or utility lines. This may include reconnecting stream and wetland habitats that have been fragmented by roads, culverts, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Does not include structures that serve a beneficial role for wildlife (e.g., native fish barriers). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, New Mexico Department of Transportation (NMDOT), universities, non-profit organizations, private landowners, utility companies.
- Work with collaborators to complete mitigation measures that will increase the probability of safe passage across roads and near utility lines for affected SGCN. These include modifying barrier fences along roadways, constructing road crossings, placing warning signs for motorists, marking utility lines so they can be readily seen by birds, and placing safeguards that will reduce the probability of electrocution. Integrate benefits to SGCN in projects primarily designed and implemented to enhance safe passage for large mammals (e.g., projects implemented under the Wildlife Corridors Action Plan) (Cramer et al. 2022). Monitor the efficacy of mitigation measures and initiate any identified maintenance and improvements. Potential collaborators: BLM, DOD, NMDOT, SLO, private landowners, utility companies.
- Work with appropriate agencies to develop and enforce road-management plans (Crist et al. 2005). Potential collaborators: BLM.

BIOLOGICAL RESOURCE USE

- Enforce laws that protect SGCN populations that are often collected illegally, especially reptiles and amphibians. Longer-lived species, such as turtles, may be especially threatened by over-collection (Fitzgerald et al. 2004). Potential collaborators: BLM, DOD, US National Park Service (NPS), USFWS, SLO.
- Support programs that educate the public about the importance of not illegally collecting or harassing SGCN, especially reptiles and amphibians (Pierce et al 2016). Potential collaborators: BLM, DOD, NPS, USFWS, SLO.
- Work with landowners and land-management agencies to use piñon-juniper woodlands in a manner that maintains healthy, and returns degraded, stands to an improved composition and function for SGCN, while protecting surrounding grassland communities from woody plant invasion. Potential collaborators: BLM, DOD, SLO, private landowners.
- Inform natural-resource law enforcement staff of the distribution, life history, and habitat needs of SGCN. Partner with them to enforce laws to protect SGCN populations and habitats. Potential collaborators: BLM, NPS, USFWS.

HUMAN INTRUSIONS AND DISTURBANCE:

- Identify and characterize areas and routes frequented by OHVs and used by other recreationists, and use that information to assess the potential impacts to SGCN, other wildlife, and their habitats (e.g., Larson et al. 2016, Zeller et al. 2024). This includes identifying and characterizing areas used for and impacts from unauthorized dispersed camping (Marion et al. 2018). Potential collaborators: BLM, NPS, SLO, universities.
- Identify, designate, and promote areas for OHV and other recreational use, including dispersed camping, that avoid disturbance to, or modification of, SGCN habitats. Potential collaborators: BLM, NPS, SLO.
- Initiate a public-information campaign to inform and educate OHV users and other recreationists of both permitted and prohibited activities that can impact SGCN and other wildlife. This may include public-service announcements, print advertising, public meetings, and signs in areas frequented by OHV users and other recreationists. Ensure that the campaign presents information in ways, and using languages, accessible to a diverse public (LCJF 2022). Potential collaborators: BLM, NPS, SLO, local governments, non-profit organizations.
- Work with public land-management agencies to regularly review and update OHV travel routes and recreational trails open to the public and appropriate restrictions on recreation necessary to protect SGCN and other wildlife. Potential collaborators: BLM, NPS, SLO.
- Work with land-management agencies to improve OHV and other recreational law enforcement with passive measures (e.g., strategically located barricades) and active measures (e.g., monitoring and enforcement patrols) to reduce negative impacts of OHVs and other recreational activities on SGCN and other wildlife. Potential collaborators: BLM, NPS, SLO.
- Work with the public to educate residents and recreationists about restrictions on and potential negative impacts of free-ranging, domestic pets, especially both domestic and feral cats (Loss et al. 2013b), on SGCN and other wildlife. Potential collaborators: universities, municipalities, non-profit organizations.
- Reduce adverse effects of border enforcement activities on SGCN and sensitive habitats. Potential collaborators: BLM, US Customs and Border Protection (CBP), SLO.
- Work with the DOD to minimize impacts of military training exercises on SGCN in areas on or adjacent to military reservations. Potential collaborators: DOD.

NATURAL SYSTEM MODIFICATIONS:

- Design and implement riparian and aquatic habitat-restoration projects to benefit SGCN. This may include establishing priorities for habitat restoration and developing reach-specific plans. May also include reintroducing keystone species including American beavers (*Castor canadensis*) (Baker and Cade 1995, McKinstry et al. 2001, Grudzinski et al. 2022) and native fishes. Monitor restoration projects to determine effectiveness (Block et al. 2001, Holste et al. 2022) and inform adaptive management. Potential collaborators: BLM, BOR, USACE, USFWS, New Mexico Environment Department (NMED), New Mexico State Forestry Division (SFD), SLO, universities, private landowners.

- Restore and protect aquatic, riparian, wetland, and wet meadow habitats, particularly springs and cienegas, and the surface and groundwater that supports them. Minimize activities that lead to gully formation, soil erosion, or a loss of soil health (e.g., soil fungal diversity) (Wagner 2023). Potential collaborators: BLM, BOR, NRCS, USACE, USFWS, NMED, SLO, private landowners.
- Encourage sustainable groundwater use to protect aquatic and riparian habitats from lowered groundwater tables. Promote water conservation, such as use of devices and models that facilitate optimal irrigation (Schaible and Aillery 2012, Storm et al. 2024) and estimate water consumption and withdrawal (Zhou et al. 2021) or temporary field fallowing (DBSA 2022) and dryland farming, especially of drought-adapted crops (McCarthy 2024), to conserve the structure and function of aquatic and riparian habitats. Promote the use of water data from groundwater monitoring networks (Pine et al. 2023) to inform water conservation and management strategies. Potential collaborators: NRCS, NMBGMR, NMDA, SLO, municipalities, private landowners, water-management districts.
- Assess the impacts of stream-flow magnitude, frequency, timing, duration, and rate of change on riparian ecosystems and the effects of hydrologic alterations on these ecosystems. Determine flows needed to sustain SGCN and their habitats and the effects of flow modification by upstream dams and of upland disturbances in local watersheds (Goeking and Tarboton 2022). Work with agencies that manage dams and reservoirs to ensure released environmental flows match amounts and timing of flow needed for persistence of native riparian communities and associated SGCN, including allowing for overbank flows to coincide with seed dispersal from native vegetation (e.g., Greco 2013) and when saturated soil can best benefit SGCN prey. Potential collaborators: BOR, USACE, USFWS, US Geological Survey (USGS), NMED, NMOSE, universities, private industry.
- Determine responses of upland, and associated riparian/aquatic, communities that include SGCN to prescribed burns and wildfires (e.g., Saab et al. 2022). Where appropriate, integrate low-intensity fire and fuels reduction management into riparian ecosystem conservation. Design and implement projects that reduce unnaturally high fire risk associated with increased fuel loads or lack of moist soils in riparian areas. Methods may include flooding and/or implementing environmental flows, mechanical removal of non-native woody plants (e.g., tamarisk) and woody debris (Ellis 2001, Webb et al. 2019), and replanting native riparian vegetation (Queheillalt and Morrison 2006, Mosher and Bateman 2016). Potential collaborators: BLM, BOR, USACE, USFWS, SFD, SLO, universities, private landowners, water-management districts.
- Reduce shrub encroachment in grassland habitats important to SGCN. This may be achieved through reduction of processes that promote shrub encroachment, implementation of a natural fire regime (Ravi et al. 2009), reseeding with native grasses, and shrub removal (Bestelmeyer et al. 2003). Potential collaborators: BLM, DOD, USFWS, SLO, private landowners.
- Restore, protect and monitor important disjunct wildlife habitats, such as caves, playas, saline lakes, and talus slopes. Potential collaborators: BLM, DOD, NRCS, USFWS, EMNRD, SLO, non-profit organizations, private landowners.
- Determine beneficial fire frequencies and intensities and work with land-management agencies, sovereign Tribal entities, and private landowners to develop fire management

plans and implement prescribed burns or cultural burns (Roos et al. 2021, Parks et al. 2023b, Eisenberg et al. 2024) that avoid disturbing SGCN during sensitive periods (e.g., nesting); maintain condition of sensitive habitats (e.g., riparian habitat), ecosystem components (e.g., soil microbial community) (Dove and Hart, Brady et al. 2022), and ecosystem function (e.g., soil carbon storage) (Brady et al. 2022); avoid fire use in unsuitable habitats (e.g., Chihuahuan Desert grasslands) (Bestelmeyer et al. 2021); enhance local diversity (Bowman et al. 2016, Eisenberg et al. 2024) and gene flow (Jones et al. 2023), including of SGCN such as pollinating insects; and protect people and property (Roos et. al. 2021). Potential collaborators: BLM, USFWS, SFD, SLO, universities, private landowners, Tribal natural-resource managers.

- As appropriate to local site conditions (e.g., topography, prevailing winds, disturbance history, infrastructure) (Urza et al. 2023) and not in persistent piñon-juniper woodlands (Romme et al. 2009, Darr et al. 2022), thin stands of trees in woodlands to natural or historic densities that reduce the probability of insect and disease outbreaks and stand-replacing wildfires, and promote the growth of native understory cover (Redmond et al. 2023). Avoid unnecessary removal of large old-growth trees and snags, which serve as important wildlife habitat (Kalies and Rosenstock 2013); leave some juvenile trees or seedlings to promote establishment of new trees (Redmond et al. 2023); use best practices to maintain soil health (e.g., limit pile burning and mastication where possible) (Ross et al. 2012); and evaluate treatment effectiveness (e.g., McKinney et al. 2022), including monitoring local SGCN populations. Potential collaborators: BLM, SFD, SLO, non-profit organizations.
- Promote post-fire management activities that are beneficial to SGCN. Includes minimizing ash flow into streams and other post-fire impacts to water quality (Rhoades et al. 2019a, Rhoades et al. 2019b) and augmenting natural plant regeneration including by re-seeding burned areas with native species (Herron et al. 2013) and when there are appropriate climatic conditions (Copeland et al. 2018). Potential collaborators: NRCS, NMED, SFD, SLO, non-profit organizations, private landowners.
- Determine amount, status, and trend of upland, aquatic, and riparian habitats; levels of fragmentation; and how SGCN might be affected. Identify appropriate locations and implement projects to enhance habitat quality and connectivity or prevent further fragmentation. This may include re-connecting streams and aquatic habitats that have been fragmented by dams, diversions, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Remove structures when feasible; otherwise, improve existing infrastructure by incorporating passage features for aquatic organisms (e.g., fish ladders). May also include protecting and promoting the natural establishment, development, and succession of native riparian vegetation by addressing any locally limiting hydrological conditions (e.g., ensuring overbank flooding occurs at optimal times and establishment of early successional vegetation) (Hatten et al. 2010, Greco 2013, Stanek et al. 2021, Wohner et al. 2021). May further include emphasizing restoration in areas that will enhance connectivity between native riparian habitat patches (e.g., migratory stopover sites) (McNeil et al. 2013). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, BOR, USACE, USFWS, NMDOT, NMED, SFD, SLO, Soil and Water Conservation Districts (SWCDs), universities, non-profit organizations, private landowners, water-management districts.

- Encourage aquatic habitat-improvement projects, such as creating ponds and oxbows near stream systems and stock tank improvements, to benefit aquatic SGCN (Stuart and Ward 2009, Stone et al. 2022). Potential collaborators: BLM, BOR, DOD, NRCS, USACE, USFWS, NMED, SLO, private landowners.
- Survey and monitor perennial marshes/cienegas/springs/seeps habitats and the SGCN that inhabit them to determine changes in habitat quantity and quality and the status and trend of SGCN populations. Promote conservation efforts, such as protecting groundwater resources, that enhance the persistence and quality of these perennial aquatic habitats. Potential collaborators: BLM, USFWS, NMED, SLO, universities.
- Implement protections to conserve aquatic habitats within closed basins or hydrologic units not currently designated as Waters of the United States. Potential collaborators: BLM, NMED, NMOSE, private landowners.
- Promote public participation in restoration and conservation of watersheds. Potential collaborators: BOR, USACE, USFWS, NMED, SFD, universities, private landowners, non-profit organizations.
- Inform interested and affected members of the public about the value of riparian systems and maintaining in-stream flows to build support for the conservation of aquatic and riparian species and habitat-restoration efforts. Potential collaborators: BOR, NRCS, USACE, NMED, universities, non-profit organizations, private landowners.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES:

- Work with appropriate agencies to enforce regulations to prevent the introduction and spread of non-native species. Potential collaborators: USFWS, NMDA.
- Design and implement protocols for early detection of invasive and other problematic species, including feral ungulates, and diseases. Quickly respond to detection. Potential collaborators: BLM, NPS, NRCS, USFWS, NMDA, NMED, SLO, universities, private landowners.
- Continue current efforts to prevent the infestation of aquatic habitats in New Mexico by zebra and quagga mussels and other aquatic invasive species. This includes informing anglers and boaters of the importance of not introducing invasive and other problematic species and providing them with information on how to prevent the spread of aquatic invasive species. Potential collaborators: BLM, BOR, USACE, NMED, New Mexico State Parks (NMSP), universities, non-profit organizations
- Determine the distribution of all invasive and other problematic species, including feral ungulates (Beever 2003, Beschta et al. 2013, Sedinger et al. 2025), and diseases found in New Mexico, assess related threats to SGCN, and develop and implement strategies to address these threats, including eradicating or controlling existing populations of non-native and invasive and other problematic species when appropriate. When removing non-native vegetation, ensure that any SGCN that use this vegetation have suitable alternate habitat present (e.g., Sogge et al. 2013) and that site conditions support the restoration of native plants. If herbicide application cannot be avoided, limit impacts to pollinating insect SGCN by applying to smaller patches within the treatment area (e.g., Black et al. 2011) and spraying before target plants bloom (Hopwood et al. 2015). Potential collaborators: BLM,

BOR, DOD, NPS, NRCS, USACE, USFWS, NMDA, NMED, SLO, universities, non-profit organizations, private landowners.

- Develop strategies to prevent emerging diseases from getting into New Mexico and develop and implement strategies that will inhibit the spread of ones already present (e.g., Clemons et al. 2024). This includes working with land-management agencies to control human access for recreation or other purposes as needed (Reynolds and Barton 2013), educating the public about what they can do to mitigate disease spread (e.g., Olson and Pilliod 2022), implementing appropriate hygiene guidelines for field researchers (e.g., Shapiro et al. 2024), and incorporating principles related to the interconnectedness of humans with local flora, fauna, and the natural environment (i.e., One Health) (AFWA 2023). Potential collaborators: BLM, NPS, NMED, SLO, universities.
- Investigate and monitor black-tailed prairie dog population distribution, density, and abundance (Facka et al. 2008). Evaluate factors influencing the spread of plague (George et al. 2013), the ecological consequences of control efforts (Miller et al. 2007), and the potential for emerging plague vaccine application. Potential collaborators: BLM, DOD, SLO, non-profit organizations, private landowners.
- As needed, gather additional information regarding the distribution of tamarisk and other exotic plants in riparian habitats (e.g., NHNM 2023). Determine the impact of exotic plants, and their removal and reduction, on SGCN and their habitats. Create and implement site-specific plans, with measurable goals and objectives, to restore the historic structure and composition of riparian habitats while minimizing negative impacts on SGCN and soil health (Wagner 2023) Prioritize removal of monoculture stands of non-native plants (e.g., Johnson et al. 2018b) and ensure that sufficient native riparian vegetation is locally available to SGCN and that local hydrological conditions support native vegetation regrowth. Since pollinating insects may use exotic riparian plants (e.g., Pendleton et al. 2011), minimize impacts of removing these plants on pollinating insect SGCN, including by avoiding herbicide application when plants are in bloom and treating the focal area in stages. Include post-implementation monitoring and maintenance for all riparian restoration projects. Document and report restoration approaches used, including successes and failures (Shafroth et al. 2008, Sogge et al. 2013). Potential collaborators: BLM, BOR, NRCS, USACE, USFWS, NMDA, SFD, SLO, SWCDs, universities, non-profit organizations, private landowners.
- Restore native riparian plants (e.g., cottonwood and willow) and natural riparian ecosystem processes and functions following the removal or biocontrol of tamarisk and other non-native plants. Ensure maintenance of adequate water supply for native plants. At sites with low water availability, restoration of native xeric plants may be more appropriate than hydroriparian and wetland plants. Stage and balance non-native plant removal and native habitat restoration over time, to avoid rapid loss of exotic woody riparian habitats for wildlife until native habitats can be developed (Sogge et al. 2013), and minimize herbicide use. Potential collaborators: BLM, BOR, USACE, USFWS, NMED, SLO, universities, non-profit organizations, private landowners.
- Proactively restore native riparian vegetation in areas likely to be most altered by the tamarisk beetle (*Diorhabda* spp.; i.e., large tamarisk monocultures [Johnson et al. 2018b] in river systems where the hydrology has been highly altered). Protect and sustain existing

stands of native riparian vegetation that may serve as important refugia in areas currently or likely to be affected by the tamarisk beetle (Paxton et al. 2011, Sogge et al. 2013). Potential collaborators: BLM, BOR, USACE, NMED, SLO, universities, non-profit organizations, private landowners.
- Where feasible, reestablish native aquatic communities in perennial streams and restored aquatic habitats. Potential collaborators: BLM, BOR, USACE, USFWS, NMED, SLO, non-profit organizations, private landowners.
- Identify historic and current SGCN habitats infested with cheatgrass (*Bromus tectorum*). Work with landowners and land-management agencies to restore these areas to native vegetation. Promote land-management strategies that will inhibit the further spread of cheatgrass. Potential collaborators: BLM, SLO, private landowners.
- Consider the impact of honeybee apiaries on wildlands and restrict their placement in areas where native bee SGCN occur. Honeybees can pose a disease spillover risk for wild bees (Tehel et al. 2016). Potential collaborators: universities, non-profit organizations, private landowners.

POLLUTION:

- Work with appropriate agencies that enforce mining and energy development regulations, Best Management Practices, and safeguards to protect water quality and minimize SGCN mortality associated with mining and energy development. Assess impacts to SGCN and their habitats from industrial activities, including mining and energy development. These impacts may include direct mortality, pollution from produced wastewater (including brine and hydraulic injection fluids) or from transport of extracted products, noise and light pollution from energy development activities, and sediment runoff from roads. Potential collaborators: BLM, EMRND, NMED, SLO, energy and mining companies, local governments.
- Determine effects of, and implement actions to mitigate negative effects from, agro- (e.g., neonicotinoids, other pesticides) (Sanchez-Bayo 2021, EPA 2023) and petrochemicals, synthetic chemicals (e.g., per- and polyfluoroalkyl substances [PFAS]), microplastics, urban runoff, and other pollutants (e.g., sewage, nutrients, toxic chemicals, sediment) on SGCN, especially fish and pollinating insects, and their habitats. This includes solid waste that may entangle wildlife. Potential collaborators: US Environmental Protection Agency (EPA), NMDA, NMED, universities, local governments, municipalities, private industry.
- Evaluate and mitigate the effects of air pollution from industrial activities, including methane released by flaring associated with oil and gas extraction and leaking from old oil and gas wells, and in urban areas on SGCN and their habitats (e.g., Duque and Dewenter 2024). Evaluate and mitigate the effects of other types of pollution, including excess generation of heat, light, and/or sound from industrial activities, urban areas, and highways on SGCN and their habitats. Potential collaborators: BLM, EMNRD, NMDOT, NMED, energy and mining companies, municipalities, utility companies.
- Where appropriate, develop green infrastructure and nature-based solutions (Warnell et al. 2023) in urban areas that catch and slow stormwater runoff to prevent pollution from

entering aquatic ecosystems and promote groundwater recharge. Potential collaborators: NMDOT, local governments, municipalities, private landowners.

CLIMATE CHANGE AND SEVERE WEATHER:

- Determine how regional and global climate change will affect SGCN, vegetation patterns (e.g., Davis et al. 2019, Coop et al. 2020, Guiterman et al. 2022, Davis et al. 2023), and community (e.g., Rosenblad et al. 2023) and ecosystem processes and dynamics, including disturbance regimes. This includes identifying SGCN (e.g., Glick et al. 2011) and associated habitats that are most likely to be negatively affected by climate change, including impacts on travel corridors, habitat connectivity, and species and habitat ranges. Identification of environmental conditions or thresholds that could limit SGCN is especially important. Potential collaborators: BLM, NPS, USFWS, USGS, EMNRD, SLO, universities.
- Identify climate change (e.g., Michalak et al. 2020) or disturbance refugia (e.g., Rodman et al. 2023) for SGCN and their habitats and implement conservation actions to conserve, expand, or enhance these refugia. As appropriate, consider refugia when implementing conservation actions (e.g., focus on refugia when planting native plants to encourage reforestation following a fire) (Hennessy et al. 2024). Potential collaborators: BOR, US Forest Service (USFS), USGS, universities.
- Identify and implement actions to mitigate the effects of climate change on SGCN and their habitats. These may include actions that assist in enhancing carbon sequestration in natural environments (e.g., appropriate forest [Mo et al. 2023] and grassland [Bai and Cotrufo 2022] conservation and management), improving climate resilience of species and communities (e.g., Dyshko et al. 2024), or climate-smart projects that help maintain, or accommodate for or facilitate climate-related shifts in (e.g., Stanturf et al. 2024, USFWS 2024a), the distribution and natural functioning, including disturbance regimes, of these impacted species and habitats. Potential collaborators: BLM, DOD, NPS, USFWS, USGS, EMNRD, SLO, universities.
- Promote land-management practices, standards, and guidelines to conserve and/or restore structure and function of corridors that provide important habitat for SGCN and ability for animals to move as climate conditions change. This should include both mesic and xeric riparian communities that serve as important migratory corridors for birds and other wildlife while providing ecosystem services and wildlife corridors that link isolated mountain ranges (Powledge 2003) and coniferous forest patches. Potential collaborators: BLM, NPS, USFWS, SLO, universities, private landowners.
- Develop new species recovery plans that consider the current status of and limiting factors for species, as well as projected future conditions for both species and their habitats. Consider full life cycles for migratory species when feasible (e.g., KFF 2021). Potential collaborators: USFWS, non-profit organizations, species working groups.
- Inform the public about the potential adverse effects of continued climate change on SGCN and their habitats and encourage development of, and data collection under, citizen and community science projects focused on SGCN and their habitats. Potential collaborators: BOR, USFWS, USGS, NMSP, SLO, universities, non-profit organizations.

- Monitor SGCN to determine long-term trends that correlate to ecosystem dynamics and habitat changes (e.g., Shirk et al. 2023). If feasible, identify potential limiting factors and develop and implement strategies to mitigate them. Potential collaborators: BLM, BOR, DOD, NPS, USFWS, SLO, universities.

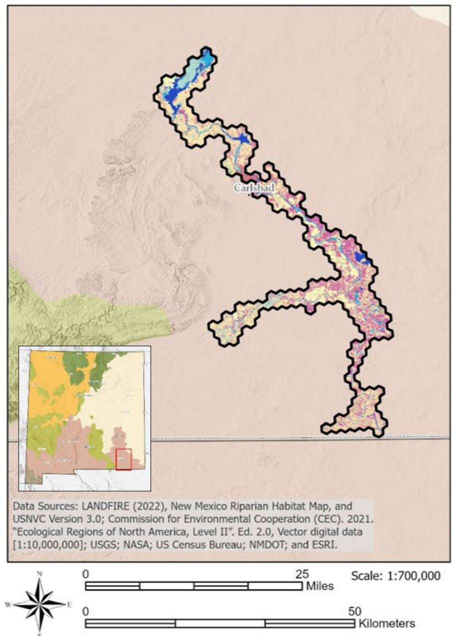
ACTIONS THAT ADDRESS MULTIPLE THREATS:

- Determine life history needs, ecology, distribution, movements, status, and trends of and threats to SGCN (especially invertebrates that are not currently monitored, riparian-obligate species, herpetofauna [Pierce et al. 2016, Olson and Pilliod 2022], and rare native fishes) and their habitats. Consider full annual cycles for migratory species when appropriate and logistically feasible (KFF 2021) and interactions with lower trophic levels that may drive SGCN status (e.g., EPA 2023). Use this information to develop and implement effective monitoring protocols and conservation actions, including actions to mitigate identified threats. Potential collaborators: BOR, BLM, NPS, USFWS, SLO, universities, non-profit organizations, private industry, species working groups.
- Assess the synergistic effects between climate change and other threats to SGCN and their habitats (e.g., Friggens et al. 2019, Parks et al. 2019). Incorporate appropriate climate adaptation strategies and frameworks into projects designed to address these synergistic effects. This may include enhancing connectivity (CEQ 2023), facilitating a species' innate adaptive capacity (Thurman et al. 2022), enhancing genetic diversity (Powell 2023), considering local adaptation (Meek et al. 2023), or considering whether it is most appropriate to resist, accept, or direct ecosystem transformation (Lynch et al. 2021, Stevens et al. 2021). Projects should acknowledge ecosystem dynamism and incorporate Indigenous Knowledge (e.g., Roos et al. 2022, Eisenberg et al. 2024), nature-based solutions (Warnell et al. 2023), and experimentation (Guiterman et al. 2022) when appropriate. Potential collaborators: BLM, NPS, USFWS, USGS, universities.
- Identify or develop an accessible, jointly used database to document the status and condition of, threats to, and conservation actions implemented across aquatic, riparian, and upland habitats. Identify data gaps (e.g., Ganey et al. 2017) and implement standardized methods to gather habitat data (e.g., Vollmer et al. 2018, Shirk et al. 2023) and to monitor the success of conservation actions (e.g., Davis and Pinto 2021), including impacts on local SGCN populations. Synthesize existing information (e.g., Jain et al. 2021) and apply modeling techniques to aid in evaluating success when appropriate (e.g., Parks et al. 2018). Adjust future conservation actions as needed based on observed outcomes. Potential collaborators: BLM, BOR, NPS, USACE, USFS, USFWS, USGS, NMED, SFD, SLO, universities.
- Evaluate the effectiveness of public education and outreach efforts regarding threats to SGCN and their habitats and the ways that the public can assist in threat mitigation (KFF 2021). Modify outreach activities as needed in response to evaluation outcomes. Potential collaborators: BOR, BLM, NPS, USACE, USFWS, USGS, NMED, NMSP, SFD, SLO, universities, municipalities, non-profit organizations.
- Where appropriate, incorporate native, pollinator-friendly plants (Glenny et al. 2022) or native plants adapted to projected future climatic conditions at the restoration site (e.g.,

Meek et al. 2023, Stanturf et al. 2024) into seed mixes and live plantings used in the restoration of lands affected by grazing, fire, resource extraction, energy development, or urban development. Consider reclamation site conditions, genetic diversity, and resilience to local threats when producing seedlings (Davis and Pinto 2021) and consider appropriate climate analogs when identifying appropriate seed sources (e.g., Richardson et al. 2024). When focused on benefiting pollinators, prioritize plants that are attractive to pollinators, especially SGCN; support pollinators throughout the growing season (Glenny et al. 2023); provide food for caterpillars of insect SGCN (e.g., Dumroese et al. 2016); and produce pollen with high nutritional diversity (Vaudo et al. 2024). Potential collaborators: BLM, NRCS, SFD, SLO, energy and mining companies, non-profit organizations, private landowners.

CONSERVATION OPPORTUNITY AREAS

LOWER PECOS AND BLACK RIVERS



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	5542.3
Arid West Interior Freshwater Emergent Marsh	1	961.5
Barren	N/A	912.8
Chihuahuan Desert Scrub	4	19245.8
Chihuahuan Ruderal Grassland	5	9928.7
Chihuahuan Semi-Desert Grassland	2	4415.9
Cliff, Scree, and Rock Vegetation	4	263.2
Desert Alkali-Saline Wetland	1	4099.0
Developed and Urban	N/A	2922.6
Great Plains Sand Grassland and Shrubland	3	2.1
Introduced Riparian Vegetation	5	770.9
Madrean Lowland Evergreen Woodland	4	62.4
Open Water	N/A	2213.7
Southwest Lowland Riparian Forest	1	47.3
Southwest Lowland Riparian Shrubland	1	430.8
Warm Interior Chaparral	4	6.2
Warm-Desert Arroyo Riparian Scrub	2	662.0

Figure 37. Lower Pecos and Black Rivers Conservation Opportunity Area.

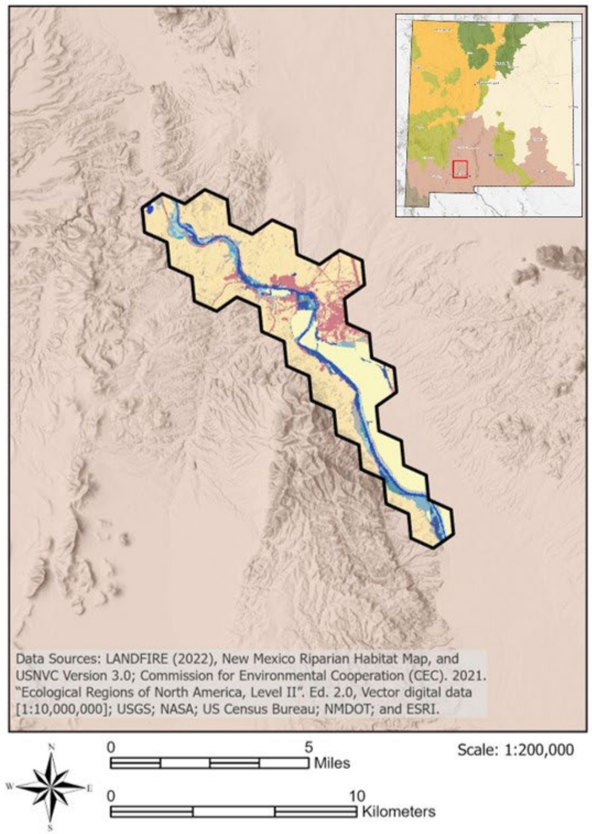
The Lower Pecos and Black Rivers Reservoir Conservation Opportunity Area (COA) (Figure 37) spans approximately 52,543 ha (129,837 ac), extends from Lake McMillan to about 25 km (16 mi) northwest of Carlsbad, and follows the Pecos River valley downstream to the Texas state line. It also includes the lower portion of the Black River.

The highest percentage of the land (~43%) in this COA is privately owned, while 28% is managed by the (USFS) and 19% by the BOR. The remaining 10% is managed by the SLO (6.5%) and NMSP (3.5%). Four Important Bird Areas intersect this COA: Brantley Lake State Park, Delaware River, Six-Mile Dam, and the Laguna Grande Complex. Only about 2% of this COA is currently protected.

The COA supports 11 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats are Chihuahuan Desert Scrub (37%) and Chihuahuan Ruderal Grassland (19%). Additionally, Chihuahuan Semi-Desert Grassland (8%) and Desert Alkali-Saline Wetland (8%) are well represented within the COA. Perennial aquatic habitats include 166 km (103 mi) of warm-water streams and 1,024 ha (2,530 ac) of warm-water reservoirs.

A total of 56 SGCN are found (either observed or with potential habitat) within the COA, including 14 classified as Conservation Impact Species (I) and 14 as Current Focal Species (F) (Appendix G). This COA has very high potential to contain microclimate refugia for amphibians and reptiles (Table 11).

LOWER RIO GRANDE



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*876.2*
Arid West Interior Freshwater Emergent Marsh	*1*	*13.1*
Barren	*N/A*	*0.2*
Chihuahuan Desert Scrub	*4*	*2428.7*
Chihuahuan Ruderal Grassland	*5*	*43.7*
Chihuahuan Semi-Desert Grassland	*2*	*373.9*
Cliff, Scree, and Rock Vegetation	*4*	*3.9*
Desert Alkali-Saline Wetland	*1*	*119.5*
Developed and Urban	*N/A*	*385.1*
Introduced Riparian Vegetation	*5*	*190.9*
Madrean Lowland Evergreen Woodland	*4*	*1.6*
Open Water	*N/A*	*151.0*
Southwest Lowland Riparian Forest	*1*	*55.4*
Southwest Lowland Riparian Shrubland	*1*	*152.4*
Warm-Desert Arroyo Riparian Scrub	*2*	*124.3*

Figure 38. Lower Rio Grande Conservation Opportunity Area.

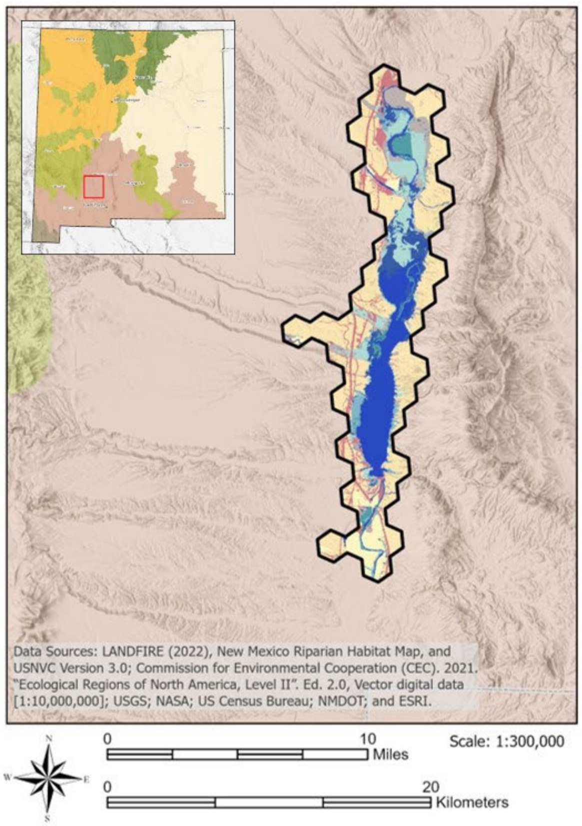
The Lower Rio Grande COA (Figure 38) covers approximately 4,921 ha (12,160 ac) and is situated near Radium Springs. It encompasses a portion of the lower Rio Grande valley and the adjacent upland areas.

The majority of this COA (~61%) is privately owned, while ~30% is managed by the BLM. The remaining 9% is managed by the SLO (7%) and NMSP (2%). About 21% of this COA is currently protected.

The COA supports nine native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats are Chihuahuan Desert Scrub (49%) and Chihuahuan Semi-Desert Grassland (8%). Agricultural vegetation (18%) and developed and urban spaces (8%) are also relatively common. Introduced Riparian Vegetation (4%) and Southwest Lowland Riparian Shrubland (3%) are the most prevalent riparian vegetation types. Perennial aquatic habitats include 22 km (14 mi) of warm-water streams.

A total of 39 SGCN are found (either observed or with potential habitat) within the COA, including 12 classified as I and six as F (Appendix G). This COA has high potential to contain microclimate refugia for amphibians (Table 11).

LOWER RIO GRANDE – CABALLO RESERVOIR



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	791.5
Arid West Interior Freshwater Emergent Marsh	*1*	1.0
Chihuahuan Desert Scrub	*4*	5555.0
Chihuahuan Ruderal Grassland	*5*	42.2
Chihuahuan Semi-Desert Grassland	*2*	445.7
Cliff, Scree, and Rock Vegetation	*4*	2.6
Desert Alkali-Saline Wetland	*1*	1249.5
Developed and Urban	*N/A*	1035.1
Introduced Riparian Vegetation	*5*	892.3
Madrean Lowland Evergreen Woodland	*4*	5.0
Open Water	*N/A*	2012.0
Southwest Lowland Riparian Forest	*1*	403.7
Southwest Lowland Riparian Shrubland	*1*	389.6
Warm Interior Chaparral	*4*	0.5
Warm-Desert Arroyo Riparian Scrub	*2*	895.2

Figure 39. Lower Rio Grande – Caballo Reservoir Conservation Opportunity Area.

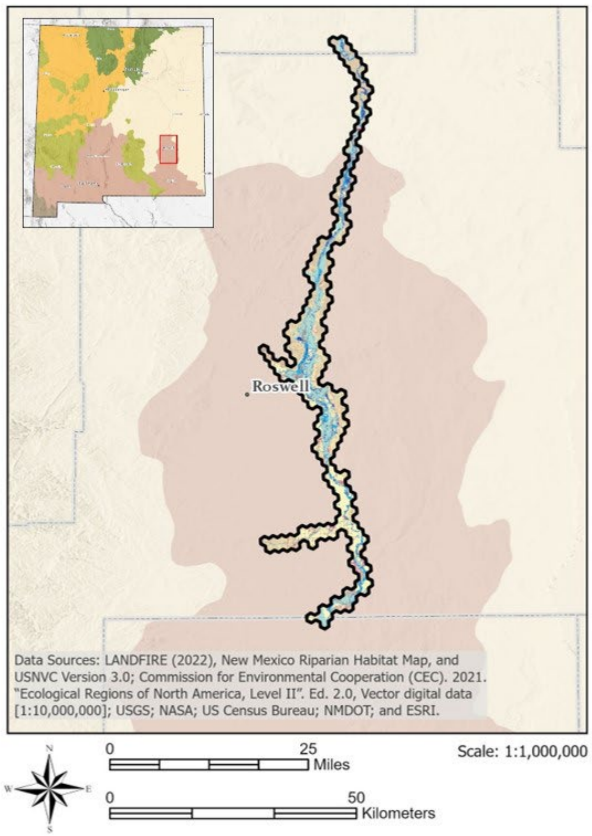
The Lower Rio Grande – Caballo Reservoir COA (Figure 39) covers approximately 13,732 ha (33,931 ac). It extends along the lower Rio Grande corridor from Williamsburg to Arrey and includes Caballo Reservoir.

The highest percentage of the land (~50%) in this COA is managed by NMSP, followed by 24% managed by the BLM. Approximately 21.5% is privately owned, and the SLO manages 4.5%. A very small portion (<0.5%) is managed by the BOR. This COA includes the Percha State Park/Caballo Lake State Park/Las Palomas Important Bird Area. Currently, none of this COA is protected.

The COA supports 10 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural lands, developed and urban spaces, and open water. The dominant habitat is Chihuahuan Desert Scrub (40%). In the riparian zone, Desert Alkali-Saline Wetland (9%), Warm-Desert Arroyo Riparian Scrub (7%), and Introduced Riparian Vegetation (6%) are the most prevalent. Perennial aquatic habitats include 30 km (19 mi) of warm-water streams, 5 km (3 mi) of cold-water streams, and 1,652 ha (4,082 ac) of warm-water reservoirs.

A total of 39 SGCN are found (either observed or with potential habitat) within the COA, including seven classified as I and nine as F (Appendix G). This COA has high potential to contain microclimate refugia for amphibians and reptiles (Table 11).

MIDDLE PECOS RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*9906.7*
Arid West Interior Freshwater Emergent Marsh	*1*	*2421.6*
Barren	*N/A*	*1177.8*
Chihuahuan Desert Scrub	*4*	*7154.7*
Chihuahuan Ruderal Grassland	*5*	*633.4*
Chihuahuan Semi-Desert Grassland	*2*	*14116.0*
Cliff, Scree, and Rock Vegetation	*4*	*153.1*
Desert Alkali-Saline Wetland	*1*	*11143.5*
Developed and Urban	*N/A*	*1531.3*
Great Plains Floodplain Forest	*1*	*3.2*
Great Plains Ruderal Grassland and Shrubland	*5*	*32.9*
Great Plains Sand Grassland and Shrubland	*3*	*113.0*
Great Plains Shortgrass Prairie	*3*	*3.1*
Great Plains Wet Meadow, Marsh, and Playa	*1*	*62.5*
Introduced Riparian Vegetation	*5*	*1745.7*
Madrean Lowland Evergreen Woodland	*4*	*11.0*
Open Water	*N/A*	*979.2*
Rocky Mountain Piñon-Juniper Woodland	*4*	*1.2*
Southwest Lowland Riparian Forest	*1*	*143.6*
Southwest Lowland Riparian Shrubland	*1*	*982.8*
Warm Interior Chaparral	*4*	*0.3*
Warm-Desert Arroyo Riparian Scrub	*2*	*2856.8*

Figure 40. Middle Pecos River Conservation Opportunity Area.

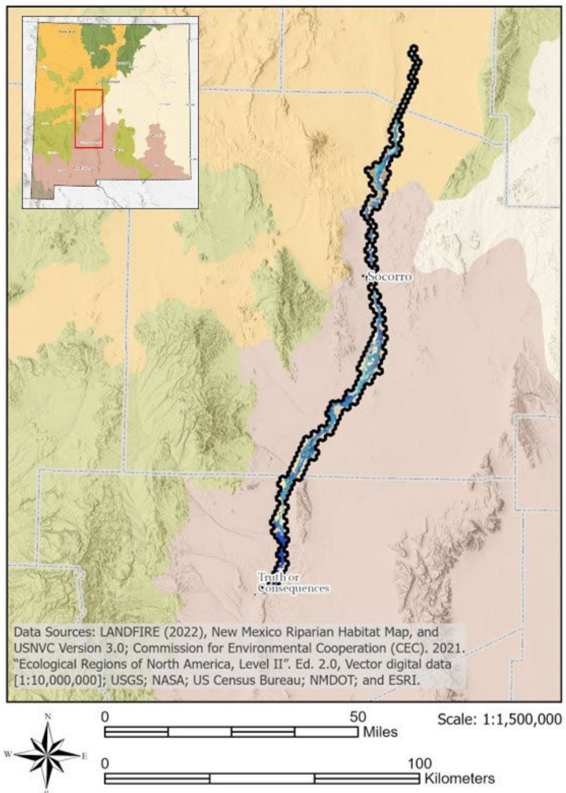
The Middle Pecos River COA (Figure 40) spans approximately 55,127 ha (136,222 ac) and extends about 70 km (44 mi) north and 50 km (31 mi) south of Roswell. It also includes the confluence of the Rio Felix and the Pecos River.

The majority of the land (~58%) in this COA is privately owned, while ~21% is managed by the BLM and 13% by the USFWS. The remaining 8% are state-managed lands, including those managed by the SLO (7%) and NMSP (1%). This COA also includes the Bitter Lake National Wildlife Refuge Important Bird Area. Approximately 10% of this COA is currently protected.

The COA supports 15 native vegetation habitats, three ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Chihuahuan Semi-Desert Grassland (26%), Desert Alkali-Saline Wetland (20%), and Chihuahuan Desert Scrub (13). Agricultural vegetation (18%) is also common. Perennial aquatic habitats include 202 km (125 mi) of warm-water streams and 23 ha (58 ac) of warm-water reservoirs.

A total of 58 SGCN are found (either observed or with potential habitat) within the COA, including 14 classified as I and 19 as F (Appendix G). This COA has very high potential to contain microclimate refugia for reptiles and high potential to contain microclimate refugia for amphibians (Table 11).

MIDDLE RIO GRANDE



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*7196.7*
Arid West Interior Freshwater Emergent Marsh	*1*	*2461.3*
Barren	*N/A*	*99.4*
Chihuahuan Desert Scrub	*4*	*14191.1*
Chihuahuan Ruderal Grassland	*5*	*687.0*
Chihuahuan Semi-Desert Grassland	*2*	*3589.6*
Cliff, Scree, and Rock Vegetation	*4*	*252.9*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*39.0*
Colorado Plateau Piñon-Juniper Woodland	*4*	*5.1*
Desert Alkali-Saline Wetland	*1*	*4364.7*
Developed and Urban	*N/A*	*2578.5*
Intermountain Arroyo Riparian Scrub	*2*	*104.6*
Intermountain Dry Shrubland and Grassland	*2*	*1052.6*
Intermountain Dwarf Sagebrush Shrubland	*4*	*222.4*
Intermountain Saltbush Shrubland	*4*	*3196.5*
Intermountain Tall Sagebrush Shrubland	*3*	*12.0*
Introduced Riparian Vegetation	*5*	*8559.8*
Madrean Lowland Evergreen Woodland	*4*	*69.3*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*307.7*
Open Water	*N/A*	*4473.5*
Rocky Mountain Lower Montane Forest	*4*	*0.4*
Rocky Mountain Montane Riparian Forest	*1*	*2.5*
Rocky Mountain Montane Shrubland	*3*	*0.7*
Rocky Mountain Piñon-Juniper Woodland	*4*	*2.2*
Southwest Lowland Riparian Forest	*1*	*7715.0*
Southwest Lowland Riparian Shrubland	*1*	*1466.4*
Warm Interior Chaparral	*4*	*39.7*
Warm-Desert Arroyo Riparian Scrub	*2*	*230.2*

Figure 41. Middle Rio Grande Conservation Opportunity Area.

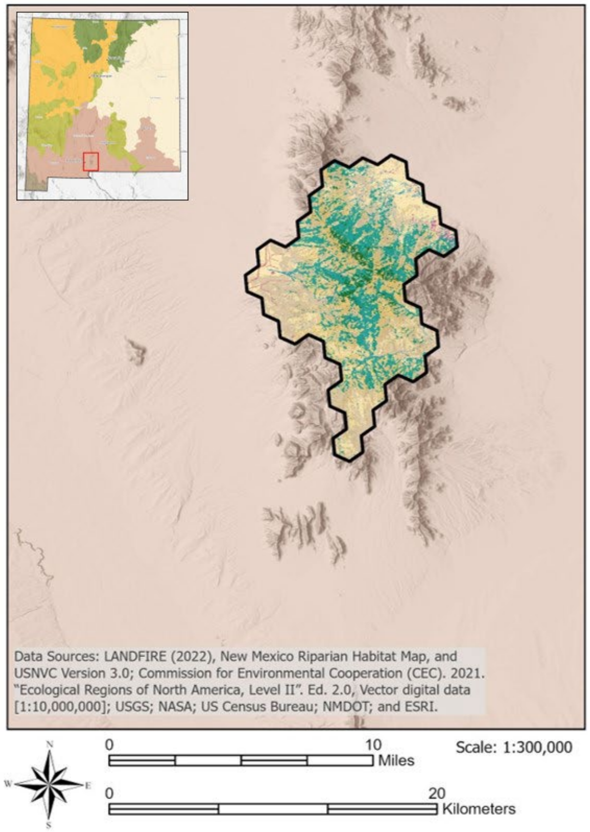
The Middle Rio Grande COA (Figure 41) spans approximately 62,938 ha (155,522 ac), extends from Belen downstream to Elephant Butte Dam, and encompasses much of the middle Rio Grande riparian corridor and the adjacent upland areas.

Approximately 42% of the land in this COA is privately owned, followed by NMSP managing 26.5%, the USFWS managing 20%, the BLM overseeing 6.5%, the New Mexico Department of Game and Fish managing 4%, and the SLO managing 1%. This COA includes three Important Bird Areas: Bosque del Apache National Wildlife Refuge, Elephant Butte Lake State Park, and Ladd S. Gordon Waterfowl Complex. Only 2% of this COA is currently protected.

The COA supports 21 native vegetation habitats, three ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Chihuahuan Desert Scrub (23%), Introduced Riparian Vegetation (14%), and Southwest Lowland Riparian Forest (12%). Additionally, Agricultural vegetation (11%) is common. Perennial aquatic habitats include 202 km (125 mi) of warm-water streams and 2,060 ha (5,090 ac) of warm-water reservoirs.

A total of 56 SGCN are found (either observed or with potential habitat) within the COA, including 14 classified as I and 10 as F (Appendix G). This COA has high potential to contain microclimate refugia for amphibians and reptiles (Table 11).

ORGAN MOUNTAINS



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*34.9*
Arid West Interior Freshwater Emergent Marsh	*1*	*1.0*
Chihuahuan Desert Scrub	*4*	*2260.3*
Chihuahuan Ruderal Grassland	*5*	*56.2*
Chihuahuan Semi-Desert Grassland	*2*	*3596.9*
Cliff, Scree, and Rock Vegetation	*4*	*2.8*
Developed and Urban	*N/A*	*66.3*
Introduced Riparian Vegetation	*5*	*0.2*
Madrean Lowland Evergreen Woodland	*4*	*2856.1*
Rocky Mountain Lower Montane Forest	*4*	*344.0*
Rocky Mountain Montane Shrubland	*3*	*57.3*
Southwest Lowland Riparian Forest	*1*	*96.2*
Southwest Lowland Riparian Shrubland	*1*	*134.0*
Warm Interior Chaparral	*4*	*2390.0*
Warm-Desert Arroyo Riparian Scrub	*2*	*25.0*

Figure 42. Organ Mountains Conservation Opportunity Area.

The Organ Mountains COA (Figure 42) spans 11,911 ha (29,432 ac), is located about 15 km (9 mi) from Las Cruces, and encompasses the majority of the Organ Mountains.

Approximately 50% of the land in this COA is managed by the DOD and 40% by the BLM, 10% is privately owned, and less than 0.1% is managed by the SLO. Approximately 41% of this COA is currently protected.

The area consists of 11 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation and developed and urban spaces. The dominant habitats include Chihuahuan Semi-Desert Grassland (30%), Madrean Lowland Evergreen Woodland (24%), Warm Interior Chaparral (20%), and Chihuahuan Desert Scrub (19%).

A total of 42 SGCN are found (either observed or with potential habitat) within the COA, including 10 classified as I and five as F (Appendix G). This COA has high potential to contain microclimate refugia for amphibians, birds, and mammals (Table 11).

Chapter 9: Madrean Archipelago Conservation Profile

SPECIES OF GREATEST CONSERVATION NEED (SGCN) AND THEIR HABITATS

The Madrean Archipelago ecoregion encompasses 4,334 km^2 (1,673 mi^2) of the southwestern corner of New Mexico but is at the northeastern corner of a 199,385 km^2 (76,983 mi^2) contiguous patch that extends west into southeastern Arizona and south to central Mexico along the eastern edge of the western Sierra Madre Mountains (CEC 2021). In New Mexico, elevations range from 1,175-2,574 m (3,855-8,445 ft) (USGS 2024a). Terrain consists of broad basins bordered by isolated, rugged mountains. The climate is a dry, subtropical steppe with hot summers and mild winters. From 1991 to 2020, the mean annual temperature range from 7-20 ^{o}C (44-68 ^{o}F) with 169-219 frost-free days, and precipitation averaged 41 cm (16 in) (range: 30-81 cm [12-32 in]), mostly occurring from July-September.

One hundred and seventeen SGCN occur in the Madrean Archipelago ecoregion; 40% are birds (Table 29, Table 31). The most common categories for SGCN within this ecoregion are Data Needs Species (54%) and Limited Conservation Opportunity Species (20%).

Table 29. Number of Species of Greatest Conservation Need in the Madrean Archipelago ecoregion.

Taxon \ Category[45]	F	I	D	L	Total
Amphibians	1	0	1	1	3
Bees	0	1	4	0	5
Birds	10	4	18	15	47
Crustaceans	0	0	1	0	1
Mammals	4	4	11	2	21
Molluscs	0	0	17	0	17
Moths and Butterflies	0	1	2	1	4
Reptiles	1	3	9	3	16
Total	17	14	63	23	117

In the Madrean Archipelago ecoregion, there are 13 terrestrial habitats that cover 4,118 km^2 (1,590 mi^2) or 95% of the landscape (Table 30, Figure 43). The remainder of the landscape contains miscellaneous land-cover types, primarily agricultural vegetation at 78 km^2 (30 mi^2) or about 2% of the landscape. Among the natural habitats, four are particularly characteristic of this ecoregion and comprise 92% of the area and two of these (Chihuahuan Semi-Desert Grassland and Madrean Lowland Evergreen Woodland) are described in this ecoregion chapter.

[45]Category abbreviations are: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.

The mountains support Madrean Lowland Evergreen Woodlands made up of a mixture of evergreen oaks (*Quercus* spp.) and dwarf conifers. At the highest elevations of the Animas Mountains, there is an isolated stand of Madrean Montane Forest and Woodland dominated by tall conifers. Along the foothills and extending out into the intermountain basins is Chihuahuan Semi-Desert Grassland, containing a mix of drought-tolerant grasses and shrubs. These grasslands are interspersed with Chihuahuan Desert Scrub (see Chihuahuan Desert ecoregion chapter for this description) and Desert Alkali-Saline Wetlands (see Colorado Plateaus ecoregion chapter for this description) are found in the basin bottoms.

The Madrean Archipelago in New Mexico supports no perennial water sources except for scattered springs, seeps, and cienegas (Figure 44).

Table 30. Terrestrial habitat types of the Madrean Archipelago ecoregion.

Habitat Category	USNVC Code	Habitat Name[46]	Tier[47]	Climate Vulnerability[48]	Area (km²)	(mi²)
Alpine and Montane Vegetation	M011	Madrean Montane Forest and Woodland	3	High	17	7
	M010	Madrean Lowland Evergreen Woodland	4	Moderate→Very High	224	86
	M091	Warm Interior Chaparral	4	Moderate→Very High	229	88
Desert Grassland and Scrub	M087	Chihuahuan Semi-Desert Grassland	2	Very High	2,315	894
	M086	Chihuahuan Desert Scrub	4	Very High	1,205	465
	M512	Chihuahuan Ruderal Grassland	5	--	47	18
Arroyo Riparian	M092	Warm-Desert Arroyo Riparian Scrub	2	--	8	3
Riparian Woodlands and Wetlands	M888	Arid West Interior Freshwater Emergent Marsh	1	--	2	0.7
	M082	Desert Alkali-Saline Wetland	1	--	50	19
	M036	Southwest Lowland Riparian Forest	1	--	12	5
	M076	Southwest Lowland Riparian Shrubland	1	--	6	2
	M298	Introduced Riparian Vegetation	5	--	0.4	0.2
Cliff, Scree, and Rock Vegetation	M887	Cliff, Scree, and Rock Vegetation	4	Very High	3	1
Other Land Cover	N/A	Agricultural Vegetation	5	--	78	30

[46] Terrestrial habitats are based on macrogroups of the United States Natural Vegetation Classification system (USNVC Version 3.0; https://usnvc.org/) except for the four Other Land Cover types; links to USNVC macrogroup descriptions are provided in the USNVC code column. Areas for upland habitat types are based on the 2022 LandFire Existing Vegetation Map for the continental US (LANDFIRE 2022), which was quality controlled by Natural Heritage New Mexico. Ecological systems in LANDFIRE (2022) were cross-walked to USNVC macrogroups. Areas for riparian vegetation types are based on the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap), also aggregated to macrogroups and embedded in the LANDFIRE (2022) map. Habitats listed in order by Tier (see below) and then alphabetically.

[47] Tiers reflect the priority for conservation and are based on the degree of imperilment within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. Ranks: N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure. Spatial patterns: linear, small patch, large patch, and matrix. Tier 1: N1, N2, N3 small patch/linear; Tier 2: N3 large patch or N4 small patch/linear; Tier 3: N3 matrix or N4 large patch; Tier 4: N4 matrix; Tier 5: N5 ruderal vegetation linear/large patch.

[48] Climate vulnerability levels were based on a vulnerability analysis performed for Ecological Response Units (ERUs) across New Mexico and Arizona (Triepke et al. (2014). The ERU classification system represents major ecosystem types of the southwest. Vulnerability for each ERU was calculated as the relative probability of type conversion. The ERUs were then cross-walked to the habitats shown here.

Habitat Category	USNVC Code	Habitat Name[46]	Tier[47]	Climate Vulnerability[48]	Area (km^2)	(mi^2)
	N/A	Barren	5	--	1	0.4
	N/A	Developed and Urban	5	--	12	5
	N/A	Open Water	5	--	0.46	0.18

Table 31. Species of Greatest Conservation Need (SGCN) in the Madrean Archipelago ecoregion.

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	Amphibians	F	C, De, Di, V	EC, EMCS, M010, M011, M036, M076, M298, M888, PLCP, PMCSS
Lowland Leopard Frog	*Lithobates yavapaiensis*	Amphibians	L	C, De, Di, V	EC, EMCS, M010, M011, M036, M076, M888, PLCP, PMCSS
Sonoran Desert Toad	*Incilius alvarius*	Amphibians	D	Di, V	EC, EMCS, M036, M076, M082, M086, M087, M092, PLCP, PMCSS
Austin's Fairy Bee	*Perdita austini*	Bees	D	C, De	M086
Half-scarlet Fairy Bee	*Perdita semicrocea*	Bees	I	C, De, V	M086, M087
Melittid Bee	*Hesperapis trochanterata*	Bees	D	V	
Morrison's Bumble Bee	*Bombus morrisoni*	Bees	D	C, De, V	M010, M011, M082, M086, M087, M091, M298, M512, M888
Sweat Bee	*Conanthalictus conanthi*	Bees	D	C, De, V	M082, M092

[49] Hyperlinks are to species booklets in the Biota Information System of New Mexico (https://bison-m.org/) for each SGCN in the Madrean Archipelago ecoregion. Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.
[50] Reason to include indicates which of five criteria for inclusion on the SGCN list a particular species met. Abbreviations are as follows: C = Climate Change Vulnerability; De = Decline; Di= Disjunct; E = Endemic; K = Keystone; V = Vulnerable.
[51] Aquatic habitat abbreviations are as follows: PLCP = Perennial Lakes, Cirques, Ponds; PMCSS = Perennial Marshes/Cienegas/Springs/Seeps; EMCS = Ephemeral Marshes/Cienegas/Springs; EC = Ephemeral Catchments. Habitat codes refer to United States National Vegetation Classification System designations, which are identified in Table 30 above.

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Abert's Towhee	*Melozone aberti aberti*	Birds	L	C, De, V	EMCS, M036, M076, M086, M087, M091, M092, M298, M888, PMCSS
Aplomado Falcon	*Falco femoralis septentrionalis*	Birds	L	C, V	M076, M086, M087
Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*	Birds	D	C, De, V	M086, M087, M887
Arizona Woodpecker	*Dryobates arizonae*	Birds	L	C, De, V	M010, M011, M036, M076, M091, M092
Baird's Sparrow	*Centronyx bairdii*	Birds	F	C, De, V	M086, M087
Bell's Vireo	*Vireo bellii*	Birds	F	C, De, Di, V	M010, M011, M036, M076, M086, M087, M092, M298
Bendire's Thrasher	*Toxostoma bendirei*	Birds	F	C, De, V	M010, M076, M082, M086, M087, M092, M887
Black-chinned Sparrow	*Spizella atrogularis evura*	Birds	D	C, De, V	M010, M036, M076, M086, M091, M092, M887
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	Birds	L	C, Di, V	M036, M087
Burrowing Owl	*Athene cunicularia hypugaea*	Birds	I	C, De, K, V	M036, M076, M082, M086, M087, M092, M887
Cassin's Finch	*Haemorhous cassinii*	Birds	D	C, De, K, V	M010, M011, M036, M076, M887

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Cassin's Sparrow	*Peucaea cassinii*	Birds	D	C, De, V	M010, M011, M076, M082, M086, M087, M091, M092
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	F	C, De, V	M010, M086, M087
Common Ground Dove	*Columbina passerina pallescens*	Birds	L	C, V	EMCS, M010, M036, M076, M082, M086, M087, M887, M888, PMCSS
Common Nighthawk	*Chordeiles minor*	Birds	D	C, De, V	EC, EMCS, M010, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Costa's Hummingbird	*Calypte costae*	Birds	L	C, De, Di, V	M010, M011, M036, M076, M086, M087, M092
Elegant Trogon	*Trogon elegans canescens*	Birds	L	C, De, V	EC, M010, M011, M036, M076
Elf Owl	*Micrathene whitneyi whitneyi*	Birds	D	C, V	M010, M011, M036, M076, M086, M087, M091
Flammulated Owl	*Psiloscops flammeolus*	Birds	D	C, V	M010, M011, M036, M076, M087, M298, M887
Gila Woodpecker	*Melanerpes uropygialis uropygialis*	Birds	L	C, De, Di, V	EMCS, M010, M036, M076, M086, M087, M298, M888, PMCSS
Golden Eagle	*Aquila chrysaetos canadensis*	Birds	D	C, Di, V	EC, EMCS, M010, M036, M076, M086, M087, M092, M887, M888, PMCSS

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Gray Vireo	*Vireo vicinior*	Birds	I	C, De, Di, V	M010, M011, M036, M082, M086, M087, M091, M092, M887
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	C, De, V	M010, M011, M036, M076, M082, M086, M087, M091, M092, M298, M887
Lucifer Hummingbird	*Calothorax lucifer*	Birds	L	C, De, Di, V	M010, M011, M036, M076, M086, M087, M091, M887
Lucy's Warbler	*Leiothlypis luciae*	Birds	D	C, De, V	EMCS, M010, M011, M036, M076, M086, M087, M092, M298, M512, M888, PMCSS
Mexican Chickadee	*Poecile sclateri eidos*	Birds	L	De, V	M010, M011, M036, M076
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	C, De, Di, V	M010, M011, M036, M091, M887, M888
Mexican Whip-poor-will	*Antrostomus arizonae arizonae*	Birds	D	C, De, V	M036, M076
Mountain Bluebird	*Sialia currucoides*	Birds	D	C, De, V	EMCS, M010, M011, M036, M076, M086, M087, M091, M887, M888, PMCSS
Mountain Plover	*Charadrius montanus*	Birds	F	C, De, Di, V	EC, M082, M086, M087
Northern Beardless-Tyrannulet	*Camptostoma imberbe ridgwayi*	Birds	L	C, V	M010, M011, M036, M076, M086, M087, M092

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Peregrine Falcon	*Falco peregrinus*	Birds	D	C, De, Di, V	EC, EMCS, M010, M011, M036, M076, M082, M086, M087, M091, M887, M888, PMCSS
Pygmy Nuthatch	*Sitta pygmaea melanotis*	Birds	D	C, De, V	M010, M011, M076, M887
Sprague's Pipit	*Anthus spragueii*	Birds	F	C, De, V	M086, M087
Thick-billed Kingbird	*Tyrannus crassirostris*	Birds	L	C, V	M010, M011, M036, M076, M091
Thick-billed Longspur	*Rhynchophanes mccownii*	Birds	F	C, De, V	M087
Varied Bunting	*Passerina versicolor*	Birds	L	C, V	M010, M036, M076, M086, M087, M091, M092, M887
Vesper Sparrow	*Pooecetes gramineus*	Birds	D	C, De, V	EMCS, M010, M036, M076, M086, M087, M092, M512, M888, PMCSS
Violet-crowned Hummingbird	*Leucolia violiceps ellioti*	Birds	L	C, Di, V	M010, M011, M036, M086, M087
Virginia's Warbler	*Leiothlypis virginiae*	Birds	F	C, De, V	M010, M011, M036, M076, M086, M087, M091, M092
Western Bluebird	*Sialia mexicana bairdi*	Birds	D	C, V	M010, M011, M036, M076, M086, M087, M091, M092, M887
Western Wood Pewee	*Contopus sordidulus*	Birds	D	C, De, V	M011, M036, M076, M091, M092

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Whiskered Screech-Owl	*Megascops trichopsis asperus*	Birds	F	C, De, V	M010, M011, M036, M076, M091
White-eared Hummingbird	*Basilinna leucotis borealis*	Birds	L	C, Di, V	M010
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	I	V	EMCS, M010, M011, M036, M076, M086, M087, M091, M092, M888, PMCSS
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	F	C, De, Di, V	EC, EMCS, M010, M011, M036, M298, PMCSS
Yellow-eyed Junco	*Junco phaeonotus palliatus*	Birds	D	C, Di, V	M010, M011, M036, M076, M086, M087, M092
Dumont's Fairy Shrimp	*Streptocephalus henridumontis*	Crustaceans	D	V	EC, PLCP
Allen's Big-eared Bat	*Idionycteris phyllotis*	Mammals	D	Di, V	EMCS, M010, M011, M036, M086, M887, M888, PMCSS
Arizona Shrew	*Sorex arizonae*	Mammals	L	C, V	EMCS, M010, M011, M036, M076, M888, PMCSS
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	D	C, De, K, V	M086, M087, M092
Big Free-tailed Bat	*Nyctinomops macrotis*	Mammals	D	C, Di, V	EMCS, M010, M011, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	F	C, De, K, V	M010, M036, M076, M086, M087
Cave Myotis	*Myotis velifer*	Mammals	I	Di, K, V	EMCS, M010, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Fringed Myotis	*Myotis thysanodes thysanodes*	Mammals	I	C, Di, K, V	EMCS, M010, M011, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Hooded Skunk	*Mephitis macroura milleri*	Mammals	D	C, V	M010, M011, M036, M076, M086, M087, M091, M092
Jaguar	*Panthera onca arizonensis*	Mammals	L	C, De, Di, V	EMCS, M010, M011, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	Mammals	F	C, Di, V	EMCS, M010, M011, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Mexican Gray Wolf	*Canis lupus baileyi*	Mammals	I	C, De, V	EMCS, M010, M011, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Mexican Long-nosed Bat	*Leptonycteris nivalis*	Mammals	F	C, De, Di, V	EMCS, M010, M011, M076, M086, M087, M091, M092, M887, M888, PMCSS

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Mexican Long-tongued Bat	*Choeronycteris mexicana*	Mammals	F	C, Di, V	EMCS, M010, M011, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Northern Pygmy Mouse	*Baiomys taylori ater*	Mammals	D	C, V	EMCS, M010, M076, M087, M092, PMCSS
Pocketed Free-tailed Bat	*Nyctinomops femorosaccus*	Mammals	D	C, Di, V	M010, M036, M076, M086, M087, M091, M092, M887, M888, PMCSS
Southern Pocket Gopher	*Thomomys umbrinus*	Mammals	D	V	M010, M011, M036, M076, M087, M091, M092
Western Red Bat	*Lasiurus blossevillii*	Mammals	D	C, Di, V	EMCS, M010, M011, M036, M076, M086, M888, PMCSS
Western Yellow Bat	*Dasypterus xanthinus*	Mammals	D	V	EMCS, M010, M036, M076, M086, M087, M092, M888, PMCSS
White-nosed Coati	*Nasua narica*	Mammals	D	V	M010, M011, M036, M076, M086, M091, M092, M887
White-sided Jackrabbit	*Lepus callotis gaillardi*	Mammals	I	C, De, V	M086, M087, M092
Yellow-nosed Cotton Rat	*Sigmodon ochrognathus*	Mammals	D	V	M010, M011, M036, M076, M087
Animas Mountains Holospira Snail	*Holospira animasensis*	Molluscs	D	C, Di, V	M010, M091

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Animas Peak Woodlandsnail	*Ashmunella animasensis*	Molluscs	D	C, Di, E, V	M010, M011, M887
Animas Talussnail	*Sonorella animasensis*	Molluscs	D	C, Di, E, V	M010, M011, M087, M091, M887
Apache Snaggletooth Snail	*Gastrocopta cochisensis*	Molluscs	D	C, Di, V	
Big Hatchet Woodlandsnail	*Ashmunella mearnsii*	Molluscs	D	C, Di, V	M010, M091, M887
Cross Holospira Snail	*Holospira crossei*	Molluscs	D	C, Di, V	M010, M011, M086, M087, M091, M887
Fringed Mountainsnail	*Radiocentrum ferrissi*	Molluscs	D	C, Di, E, V	M010, M011, M087, M091
Hacheta Grande Woodlandsnail	*Ashmunella hebardi*	Molluscs	D	C, Di, E, V	M010, M011, M087, M091, M887
Hacheta Mountainsnail	*Radiocentrum hachetanum*	Molluscs	D	C, Di, V	M010, M011, M887
Heart Vertigo Snail	*Vertigo hinkleyi*	Molluscs	D	C, Di, V	
Lang Canyon Talussnail	*Sonorella painteri*	Molluscs	D	C, Di, E, V	M010
Multirib Vallonia Snail	*Vallonia gracilicosta*	Molluscs	D	C, Di, V	
New Mexico Talussnail (Big Hatchet Mountains, Florida Mountains)	*Sonorella hachitana*	Molluscs	D	C, Di, V	M010, M087, M091, M887
New Mexico Talussnail (Peloncillo Mountains)	*Sonorella hachitana peloncillensis*	Molluscs	D	C, Di, E, V	M010, M887

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Shortneck Snaggletooth Snail	*Gastrocopta dalliana dalliana*	Molluscs	D	C, Di, V	M010
Vallonia Snail	*Vallonia sonorana*	Molluscs	D	C, Di, V	M010, M011
Whitewashed Rabdotus Snail	*Rabdotus dealbatus neomexicanus*	Molluscs	D	C, Di, V	M010, M086, M887
Southwestern Brown Moth	*Plagiomimicus astigmatosum*	Moths and Butterflies	D	C, V	
Sunrise Skipper	*Adopaeoides prittwitzi*	Moths and Butterflies	I	C, De, V	M010, M087, M091
Ursine Giant Skipper	*Megathymus ursus ursus*	Moths and Butterflies	D	V	M087
West Coast Lady	*Vanessa annabella*	Moths and Butterflies	L	De, V	M011, M086
Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	Reptiles	I	C, De, Di, V	M010, M011, M087, M091, M887
Giant Spotted Whiptail	*Aspidoscelis stictogramma*	Reptiles	D	C, De, V	M010, M036, M076, M086, M087, M091, M092
Gila Monster	*Heloderma suspectum*	Reptiles	D	C, De, Di, V	M010, M036, M076, M086, M087, M091, M887
Gray-checkered Whiptail	*Aspidoscelis dixoni*	Reptiles	D	C, De, V	M010, M011, M086, M087, M092
Green Rat Snake	*Senticolis triaspis intermedia*	Reptiles	D	V	M010, M011, M036, M076, M086, M087, M092

Common Name[49]	Scientific Name	Taxon	Category	Reason to Include[50]	Habitats[51]
Knobloch's Mountain Kingsnake	*Lampropeltis knoblochi*	Reptiles	L	C, De, Di, V	M010, M011, M036, M091
Madrean Mountain Spiny Lizard	*Sceloporus jarrovii jarrovii*	Reptiles	L	C, De, V	M010, M011, M036, M091, M887
Mojave Rattlesnake	*Crotalus scutulatus scutulatus*	Reptiles	D	V	M086, M087
Mountain Skink	*Plestiodon callicephalus*	Reptiles	D	De, V	M010, M011, M036, M076, M086, M087, M091
New Mexico Ridge-nosed Rattlesnake	*Crotalus willardi obscurus*	Reptiles	F	C, De, Di, V	M010, M011, M091, M887
Ornate Box Turtle	*Terrapene ornata*	Reptiles	I	C, V	M010, M036, M076, M086, M087, M092
Slevin's Bunchgrass Lizard	*Sceloporus slevini*	Reptiles	L	C, De, Di, V	M010, M011, M087
Sonoran Lyresnake	*Trimorphodon lambda*	Reptiles	D	V	M010, M011, M036, M076, M086, M091, M887
Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	Reptiles	I	C, De, Di, V	EC, EMCS, M010, M036, M076, M888, PLCP, PMCSS
Western Blind Snake	*Rena humilis segregus*	Reptiles	D	C, V	M010, M086, M087
Yaqui Black-headed Snake	*Tantilla yaquia*	Reptiles	D	C, V	M010, M036, M076, M086

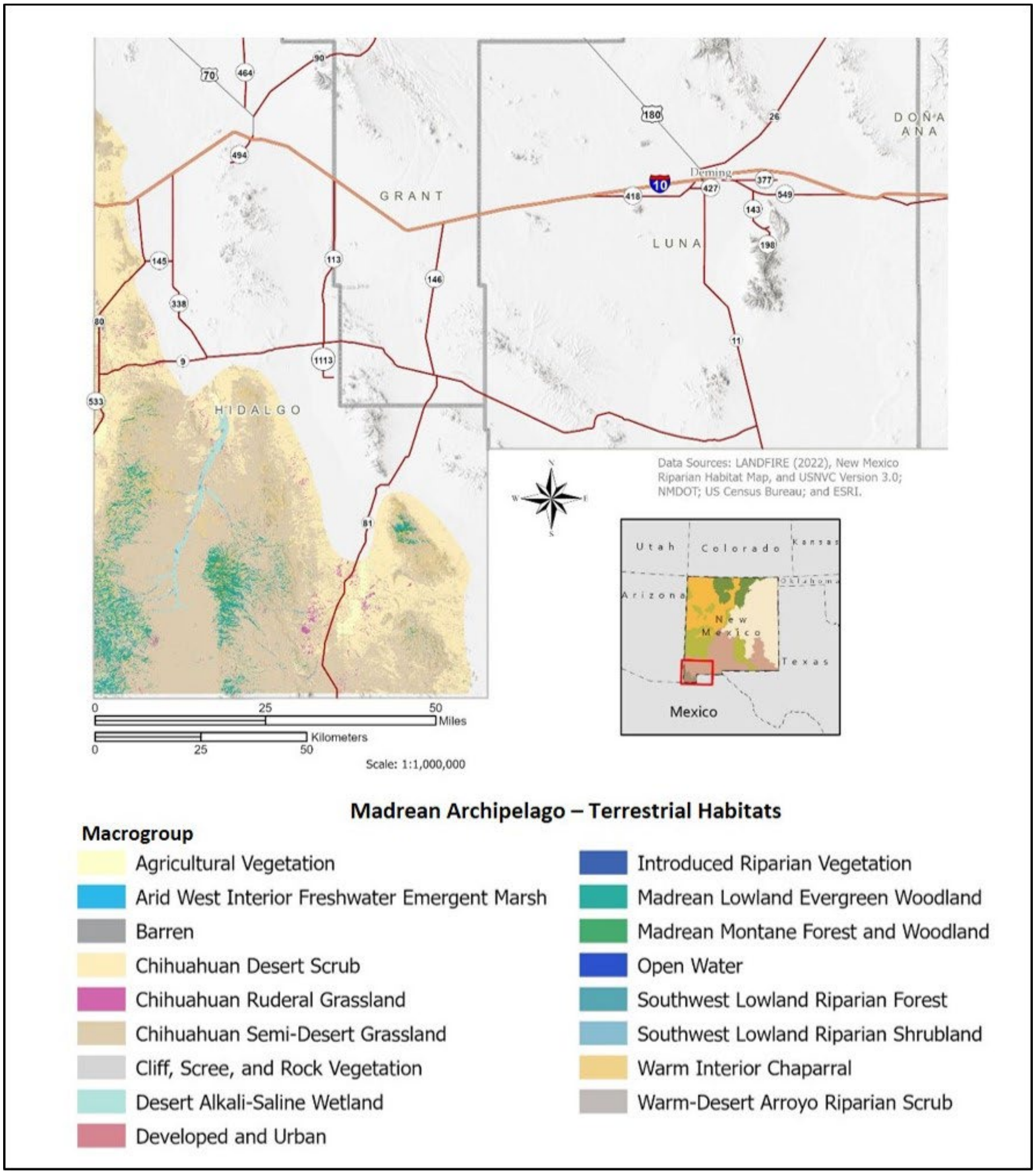


Figure 43. Terrestrial habitats in the Madrean Archipelago ecoregion.

Map based on LandFire 2022 Existing Vegetation Map (LANDFIRE 2022) crosswalked to macrogroups from the United States National Vegetation Classification system and on vegetation types from the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap) grouped to macrogroups.

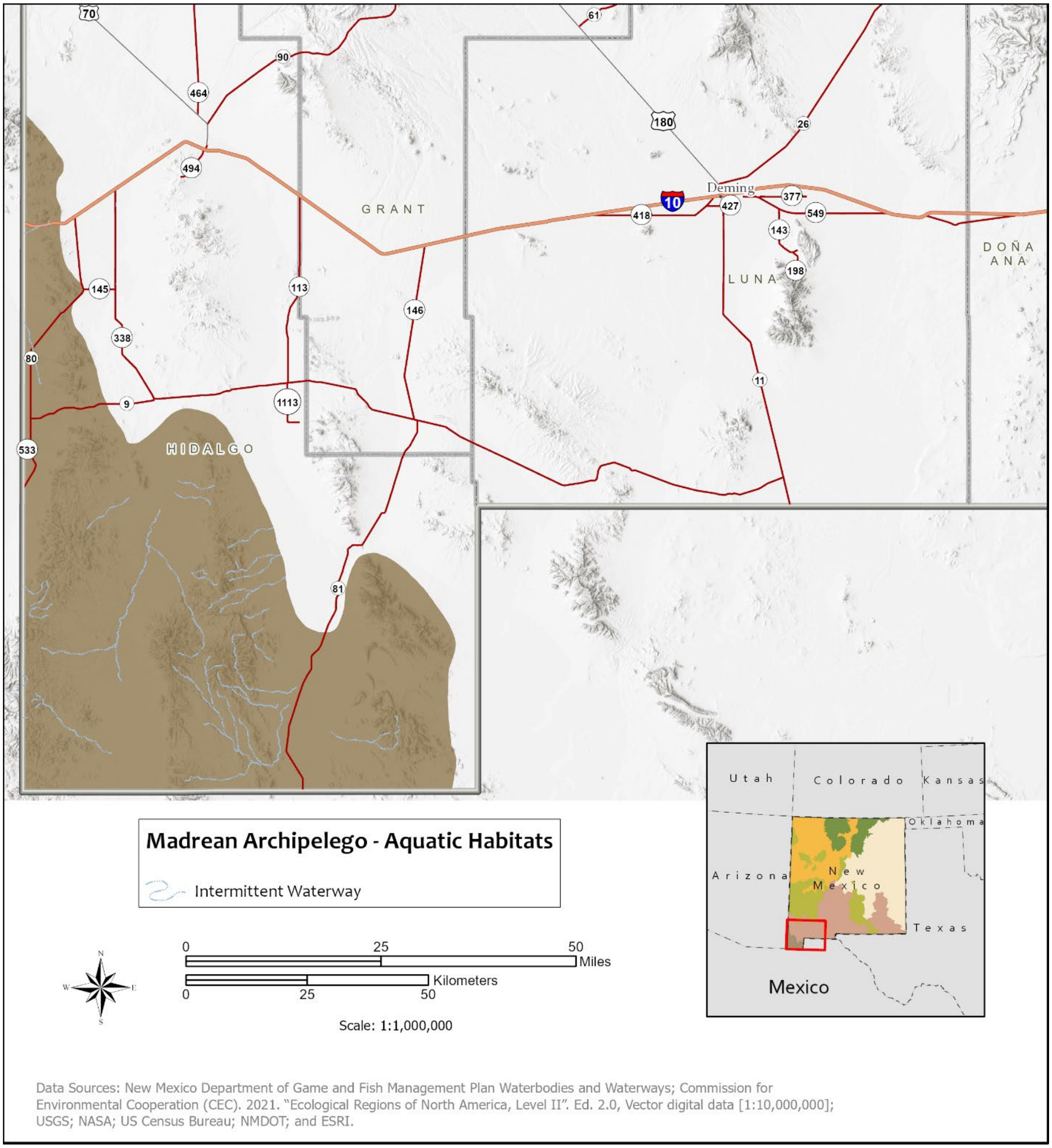


Figure 44. Aquatic habitats in the Madrean Archipelago ecoregion.

HABITAT DESCRIPTIONS

CHIHUAHUAN SEMI-DESERT GRASSLAND

Chihuahuan Semi-Desert Grassland **[M087]**[52] is found at 870-2,200 m (2,850-7,220 ft) elevation throughout the Chihuahuan Desert ecoregion and extends into the Madrean Archipelago, High Plains and Tablelands, and Arizona/New Mexico Mountains ecoregions. This diverse habitat is characterized by an open-to-dense herbaceous layer dominated by perennial grasses, but shrubs and subshrubs are typical components.

- In lowland settings of broad alluvial plains and flats and swales, dominant species may include tobosagrass (*Pleuraphis mutica*), alkali sacaton (*Sporobolus airoides*), giant sacaton (*S. wrightii*), or vine mesquite (*Panicum obtusum*).
- Grasslands on sandy sites are characterized by black grama (*Bouteloua eriopoda*) and mesa dropseed (*Sporobolus flexuosus*), often with soaptree yucca (*Yucca elata*) and/or Torrey's jointfir (*Ephedra torreyana*) present.

- Black grama, blue grama (*B. gracilis*), hairy grama (*B. hirsuta*), curly-mesquite (*Hilaria belangeri*), bush muhly (*Muhlenbergia porteri*), and curlyleaf muhly (*M. setifolia*) are representatives of upland piedmonts and foothills along with shrubs such as lechuguilla (*Agave lechuguilla*), sotols (*Dasylirion* spp.), beargrasses (*Nolina* spp.), and Torrey's yucca (*Y. torreyi*).
- This habitat also includes Madrean lower montane grasslands dominated by bullgrass (*Muhlenbergia emersleyi*) and New Mexico muhly (*M. pauciflora*).
- Grasslands on gypsiferous soils include gypsum grama (*B. breviseta*) and gyp dropseed (*S. nealleyi*) and herbaceous gypsophiles such as Hartweg's sundrops (*Calylophus hartwegii*) and hairy crinklemat (*Tiquilia hispidissima*).
- Periodic fires are prevalent in some of these grasslands with 10- to 30-year, or longer, return intervals. Historically, these grasslands have been heavily impacted by livestock grazing leading to degradation into Chihuahuan Ruderal Grassland **[M512]** habitat (see Chihuahuan Desert ecoregion chapter for this description). Soils range from deep, fine-textured loams or

[52] Complete descriptions of habitats can be viewed by clicking on hyperlinked United States National Vegetation Classification System codes.

clay loams (incipient mollisols) to sandy loams and include rocky and shallow alluvial fans and hill slopes. Impermeable caliche and argillic horizons are common.

MADREAN LOWLAND EVERGREEN WOODLAND

The Madrean Lowland Evergreen Woodland [**M010**] (also known as oak woodland or encinal) occurs at elevations of 1,300-2,225 m (4,265-7,230 ft) in the foothills, canyons, and gently sloping alluvial fan piedmonts (bajadas) and on the steeper colluvial foothill slopes, ridges, and mesa tops of the Arizona/New Mexico Mountains and Madrean Archipelago ecoregions. It also occurs in isolated locations of the Chihuahuan Desert ecoregion.

- At the upper elevation limit, woodlands can be found as small patches in a mosaic with Madrean montane forests. This habitat is characterized by a short (3-15 m [10-49 ft]), open-to-closed canopy of evergreen, conifer, and broad-leaved trees. Diagnostic species may have their center of distribution south of New Mexico, in the Sierra Madre of Mexico. These species include alligator juniper (*Juniperus deppeana*), Mexican piñon (*Pinus cembroides*), border piñon (*P. discolor*), Arizona white oak (*Quercus arizonica*), Emory oak (*Q. emoryi*), gray oak (*Q. grisea*), and Mexican blue oak (*Q. oblongifolia*). At the northern end of the range, communities may be dominated or co-dominated by northern tree species, including one-seed juniper (*J. monosperma*) and two-needle piñon (*P. edulis*), but Madrean species are always present.
- The understory may be sparse on some substrates or dominated by shrubs or grasses. Common shrubs include sacahuista (*Nolina microcarpa*), pungent oak (*Q. pungens*), Sonoran scrub oak (*Q. turbinella*), and banana yucca (*Yucca baccata*).
- Madrean grass species, such as bullgrass, longtongue muhly (*M. longiligula*), New Mexico muhly, piñon ricegrass (*Piptochaetium fimbriatum*), Pringle's speargrass (*P. pringlei*), and Texas bluestem (*Schizachyrium cirratum*), can be abundant.
- Fire regimes vary from stand-replacing, high-severity, but infrequent fires (or no fires) to low-severity, surface fires typical of savannas. Soils vary from thin and rocky and deep clay loamy to gravelly loamy, particularly in stands dominated by piñon (*Pinus* spp.) and juniper (*Juniperus* spp.).

THREATS AND CONSERVATION ACTIONS

Nine threats potentially could impact SGCN in 17 habitats within the Madrean Archipelago ecoregion (Table 32). These threats are summarized below and listed in the order presented by the IUCN (2022). The list does not reflect the order of threat severity.

- Agriculture and Aquaculture: Grazing practices that impact SGCN habitat and groundwater withdrawal for crops.
- Energy and Mining: Habitat fragmentation from renewable energy development, especially solar, and associated water needs; new mining operations.
- Transportation and Service Corridors: New large transmission lines and wildlife-vehicle collisions along Interstate 10 near Steins, New Mexico.
- Biological Resource Use: Collection of reptiles and amphibians
- Human Intrusion and Disturbance: Border security.
- Natural System Modifications: Groundwater withdrawal and fire in forests and woodlands.
- Invasive and Other Problematic Species, Genes, and Diseases: Invasion of habitats by non-native trees and non-native, invasive grasses and forbs; and potential infection of bats by *Pseudogymnoascus destructans*, which can cause white-nose syndrome, and of amphibians by chytrid fungus (*Batrachochytrium dendrobatidis*), which can cause chytridiomycosis.
- Pollution: Runoff from mining activities.
- Climate Change: Habitat alteration from prolonged drought and projected increasing aridity. Much of the Madrean Archipelago ecoregion may have higher potential to contain macroclimate refugia for amphibians, birds, mammals, and reptiles (Figure 15; Friggens et al. 2025). However, areas throughout the Bootheel Conservation Opportunity Area may become unsuitable for the gray vireo (*Vireo vicinior*) in future and much of the ecoregion does not contain microclimate refugia for vertebrate taxa (Table 12; NHNM 2024).

Conservation concerns include balancing livestock grazing with local SGCN habitat needs, groundwater withdrawal, restoring the natural role of fire in forest and woodland habitats, and facilitating wildlife movements across Interstate 10. The challenges associated with maintaining cost-effective livestock grazing while conserving SGCN in this ecoregion mirror those in the Chihuahuan Desert ecoregion. In particular, due to unpredictable and limited precipitation, forage availability is not predictable or abundant. Nevertheless, sharing information and collaborating with local ranchers and farmers are important components of a successful conservation strategy.

Withdrawal of groundwater for crop production has contributed to the decline and loss of several cienegas in this ecoregion. Determining sustainable levels of withdrawal and ways to more efficiently use available water are potential conservation actions.

The Peloncillo Mountains are a natural north-south corridor for wildlife. Interstate 10 bisects the mountains at Steins Pass, and the traffic there greatly diminishes movement by wildlife. Given the unique fauna of the Madrean Archipelago ecoregion, facilitating passage through this barrier should be a high conservation priority. This is further supported by the identification of this section of Interstate 10 as an important wildlife corridor in need of wildlife-vehicle collision mitigation in the New Mexico Wildlife Corridors Action Plan (Cramer et al. 2022).

Climate change is expected to cause a 66% decline in Chihuahuan Semi-Desert Grasslands and a 400% increase in Chihuahuan Desert Scrub habitat (Rehfeldt et al. 2006). In uplands, ocotillo (*Fouquieria splendens*) may decrease on south- and west-facing slopes and creosote (*Larrea tridentata*) may decrease in response to predicted decreases in cool season precipitation and increasing aridity (Munson et al. 2012). Agaves (*Agave* spp.) are expected to decline throughout much of the Madrean Archipelago ecoregion by 2050 and 2070 under most climate scenarios considered. This has implications for nectar-feeding bats, such as the Mexican long-nosed bat (*Leptonycteris nivalis*) (Gomez-Ruiz and Lacher 2019). Habitats with very high vulnerability to climate change are the Chihuahuan Desert Scrub; Chihuahuan Semi-Desert Grassland; and Cliff, Scree, and Rock Vegetation communities (Table 30; Triepke et al. 2014).

Table 32. Potential threats to habitat and associated SGCN in the Madrean Archipelago ecoregion.

Threat categories were derived from IUCN (2022).

Habitat \ Threat	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Arid West Interior Freshwater Emergent Marsh	X					X	X	X	X
Chihuahuan Desert Scrub	X	X	X	X	X	X	X		X
Chihuahuan Ruderal Grassland	X	X	X		X		X		
Chihuahuan Semi-Desert Grassland	X	X	X	X	X	X	X	X	X
Cliff, Scree, and Rock Vegetation		X	X		X				
Desert Alkali-Saline Wetland	X	X					X	X	X
Ephemeral Catchments						X	X		
Ephemeral Marshes/Cienegas/Springs						X	X		
Introduced Riparian Vegetation									
Madrean Lowland Evergreen Woodland	X	X	X	X	X	X		X	X
Madrean Montane Forest and Woodland	X	X	X	X	X	X		X	X
Perennial Lakes, Cirques, Ponds						X	X		
Perennial Marsh/Cienega/Spring/Seep	X	X	X	X	X	X	X	X	X
Southwest Lowland Riparian Forest	X	X	X	X	X	X	X	X	X
Southwest Lowland Riparian Shrubland	X	X	X	X	X	X	X	X	X
Warm Interior Chaparral									
Warm-Desert Arroyo Riparian Scrub	X	X	X			X	X	X	X

The following are proposed conservation actions for the Madrean Archipelago ecoregion, listed in order of priority within each IUCN threat category. Threat categories are listed according to the order presented by IUCN (2022).

AGRICULTURE AND AQUACULTURE:

- Determine where habitat restoration would benefit SGCN and work with federal, state, and private land managers to restore degraded rangelands to good or excellent condition. Monitor restoration results to develop and initiate any identified improvements to restoration practices. Potential collaborators: United States (US) Bureau of Land Management (BLM), US Forest Service (USFS), New Mexico State Land Office (SLO), private landowners.
- Establish baseline composition, condition, disturbance regimes, and function of major range habitats to inform habitat-restoration actions, particularly to address shrub invasion into historic grasslands and inform activities in riparian habitats. Potential collaborators: BLM, USFS, universities, private landowners.
- Determine how timing, intensity, and duration of livestock grazing affect SGCN and their habitats, including the interactions among grazing, fire, and the spread of invasive and other problematic species and among grazing, soil erosion (e.g., Pilon et al. 2017), and native riparian vegetation growth (e.g., Lucas et al. 2004). Potential collaborators: BLM, US Natural Resources Conservation Service (NRCS), USFS, New Mexico Department of Agriculture (NMDA), SLO, universities, private landowners.
- Promote expanded use of appropriate, cost-effective grazing practices that ensure long-term ecological sustainability for SGCN and their habitats (especially riparian habitats). These include actions such as rest-rotation grazing management and conservation easements (Gripne 2005) that contribute to recovery of rangelands impacted by drought and allow restoration activities to be completed. May also include the use of virtual fencing to keep livestock in desired locations and out of sensitive areas (USFS 2024). Potential collaborators: BLM, USFS, SLO, private landowners.
- Promote grazing systems that address local needs of livestock and for SGCN habitat, including riparian areas. When particular habitat components need improvement, coordinate with ranchers and resource managers to identify and implement modifications that would provide the desired habitat outcomes. Potential collaborators: BLM, USFS, SLO, private landowners.
- Balance irrigation and groundwater demands with the needs of aquatic communities, particularly those supporting native amphibian and springsnail populations. This may include promoting a transition from irrigated to dryland farming in areas where groundwater pumping and water scarcity threaten SGCN and their habitats. Potential collaborators: NRCS, New Mexico Office of the State Engineer (NMOSE), non-profit organizations, private landowners, water-management districts.
- Gather and assess current information on grazing practices and determine how the Department can support landowners that provide habitat for SGCN. Potential collaborators: BLM, NRCS, USFS, NMDA, SLO, private landowners.
- Employ existing incentive programs to promote persistence of productive wildlife habitat and native vegetation on private lands, SGCN conservation, and retirement of agricultural fields

and water rights where feasible. Support maintenance and growth of incentive programs. Potential collaborators: BLM, NRCS, US Fish and Wildlife Service (USFWS), NMDA, SLO, private landowners.

- Work with private landowners to improve irrigation processes and infrastructure to conserve water. Includes promoting the use of devices and models that improve water conservation and irrigation efficiency (Schaible and Aillery 2012, Wang 2019) to help conserve the structure and function of aquatic and riparian habitats. Potential collaborators: NRCS, NMOSE.
- Identify human-constructed water-retention structures (e.g., stock tanks, water troughs, and drinkers) that provide habitat for aquatic SGCN and other wildlife, particularly amphibians. Remove invasive species (e.g., bullfrogs [*Rana* (*Aquarana*) *catesbeiana*]) from these structures that may threaten native aquatic wildlife. Potential collaborators: BLM, USFS, universities, private landowners.
- Promote grazing systems that incorporate rested pastures and help improve overall range condition and enhance wildlife habitat health and function. In upland areas, these systems may include rest-rotation and/or deferred-rotation. In riparian areas, beneficial grazing practices may also include grazing in early spring and restricting summer grazing and redistribution practices such as herding and developing drinking water sources in upland areas. Especially during times of drought, rested pastures can provide forage reserves and relieve pressure on grazed pastures or allotments. Potential collaborators: BLM, NRCS, USFS, SLO, private landowners.
- Promote use of ecoregion-appropriate agricultural practices that provide habitat or resources or protect habitat quality (e.g., reduce erosion) for SGCN, including planting rows of trees between crops (McCarthy 2024) and pollinator-friendly practices such as planting pollinator habitat along field margins and underutilized areas, revegetating retired farmland with wildflowers, including pollinator-friendly forbs in cover-crop seed mixes (O'Brien and Arathi 2021), and conserving semi-natural habitat near agricultural fields (Shi et al. 2024). Potential collaborators: NRCS, USFWS, NMDA, private landowners.

ENERGY AND MINING:

- Determine where energy development and mineral extraction currently, and in the future, may affect SGCN. Work with regulatory agencies to develop permitting guidelines and policies that result in siting new development in areas that minimize impacts to SGCN. Potential collaborators: BLM, USFS, New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), New Mexico Bureau of Geology and Mineral Resources (NMBGMR), SLO, energy and mining companies.
- Identify and promote best management practices that minimize the impacts (especially habitat fragmentation and direct SGCN mortality) of energy development (including of renewable energy sources [Lovich and Ennen 2011, Copping et al. 2020, Levin et al. 2023]) and mining on SGCN and their aquatic and terrestrial habitats. This includes informing and supporting resource managers in the implementation of measures to prevent direct take of SGCN associated with energy extraction and mining (e.g., use of appropriate exclusionary netting and/or fencing, bird balls, and closed containment systems at toxic sites). May also

include increased use of small, localized installations (e.g., community solar development) rather than utility-scale developments (Bowlin et al. 2024). Potential collaborators: BLM, EMNRD, SLO, universities, energy and mining companies, municipalities.
- Reclaim disturbed habitats impacted by resource extraction as close as possible to pre-development conditions. Rehabilitate mining sites and associated access roads. Remove unneeded roads and any other abandoned infrastructure and equipment (e.g., pits, unused machinery). Restore native vegetation. Where feasible, maintain abandoned mines as habitat for bats and snakes by constructing appropriate bat gates on mine shafts and adits (Spanjer and Fenton 2005). Potential collaborators: BLM, USFS, USFWS, EMNRD, SLO, energy and mining companies, private landowners.
- Maintain and expand open communication with mining and energy companies and land-management agencies to minimize adverse impacts of development to SGCN. Potential collaborators: BLM, USFS, EMNRD, SLO, energy and mining companies.

TRANSPORTATION AND SERVICE CORRIDORS:

- Site, consolidate, and maintain utility corridors to minimize adverse effects to SGCN and their habitats. Reduce avian powerline collisions by using line markers and illumination with ultraviolet lights and by burying powerlines (Bateman et al. 2023). Avoid mowing rights-of-way during peak SGCN pollinator larvae abundance and avoid mowing patches of nectar resources important for pollinator SGCN (e.g., Xerces Society 2018). Potential collaborators: BLM, USFS, SLO, interested and affected members of the public, local governments, utility companies.
- Determine where roads, vehicle traffic, and utility lines are inhibiting or preventing movement of SGCN, including during migration. Identify and conserve natural habitat corridors, especially those at risk from future fragmentation by roads or utility lines. This may include reconnecting stream and wetland habitats that have been fragmented by roads, culverts, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Does not include structures that serve a beneficial role for wildlife (e.g., native fish barriers). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, USFS, New Mexico Department of Transportation (NMDOT), universities, non-profit organizations, private landowners, utility companies.
- Work with collaborators to complete mitigation measures that will increase the probability of safe passage across roads and near utility lines for affected SGCN. These include modifying barrier fences along roadways, constructing road crossings, placing warning signs for motorists, marking utility lines so they can be readily seen by birds, and placing safeguards that will reduce the probability of electrocution. Integrate benefits to SGCN in projects primarily designed and implemented to enhance safe passage for large mammals (e.g., projects implemented under the Wildlife Corridors Action Plan) (Cramer et al. 2022). Monitor the efficacy of mitigation measures and initiate any identified maintenance and improvements. Potential collaborators: BLM, USFS, NMDOT, SLO, private landowners, utility companies.
- Work with appropriate agencies to develop and enforce road-management plans (Crist et al. 2005). Potential collaborators: BLM, USFS.

BIOLOGICAL RESOURCE USE:

- Work with landowners and land-management agencies to use piñon-juniper woodlands in a manner that maintains healthy, and returns degraded, stands to an improved composition and function for SGCN, while protecting surrounding grassland communities from woody plant invasion. Potential collaborators: BLM, USFS, New Mexico State Forestry Division (SFD), SLO, private landowners.
- Enforce laws that protect SGCN populations that are often collected illegally, especially reptiles and amphibians. Longer-lived species, such as turtles, may be especially threatened by over-collection (Fitzgerald et al. 2004). Potential collaborators: BLM, USFS, USFWS, SLO.
- Support programs that educate the public about the importance of not illegally collecting or harassing SGCN, especially reptiles and amphibians (Pierce et al 2016). Potential collaborators: BLM, USFS, USFWS, SLO.
- Inform natural-resource law enforcement staff of the distribution, life history, and habitat needs of SGCN. Partner with them to enforce laws to protect SGCN populations and habitats. Potential collaborators: BLM, USFS.

HUMAN INTRUSIONS AND DISTURBANCE:

- Identify and characterize areas and routes frequented by off-highway vehicles (OHVs) and used by other recreationists, and use that information to assess the potential impacts to SGCN, other wildlife, and their habitats (e.g., Larson et al. 2016, Zeller et al. 2024). This includes identifying and characterizing areas used for and impacts from unauthorized dispersed camping (Marion et al. 2018). Potential collaborators: BLM, USFS, SLO, universities.
- Identify, designate, and promote areas for OHV and other recreational use, including dispersed camping, that avoid disturbance to, or modification of, SGCN habitats. Potential collaborators: BLM, USFS, SLO.
- Initiate a public-information campaign to inform and educate OHV users and other recreationists of both permitted and prohibited activities that can impact SGCN and other wildlife. This may include public-service announcements, print advertising, public meetings, and signs in areas frequented by OHV users and other recreationists. Ensure that the campaign presents information in ways, and using languages, accessible to a diverse public (LCJF 2022). Potential collaborators: BLM, USFS, SLO, local governments, non-profit organizations.
- Work with public land-management agencies to regularly review and update OHV travel routes and recreational trails open to the public and appropriate restrictions on recreation necessary to protect SGCN and other wildlife. Potential collaborators: BLM, USFS, SLO.
- Work with land-management agencies to improve OHV and other recreational law enforcement with passive measures (e.g., strategically located barricades) and active measures (e.g., monitoring and enforcement patrols) to reduce negative impacts of OHVs and other recreational activities on SGCN and other wildlife. Potential collaborators: US Customs and Border Protection (CBP), BLM, USFS, SLO.

- Work with the public to educate residents and recreationists about restrictions on and potential negative impacts of free-ranging, domestic pets, especially both domestic and feral cats (Loss et al. 2013b), on SGCN and other wildlife. Potential collaborators: universities, local governments, non-profit organizations.
- Reduce adverse effects of border enforcement activities on SGCN and sensitive habitats. Potential collaborators: BLM, CBP.

NATURAL SYSTEM MODIFICATIONS:

- Restore and protect aquatic, riparian, and wetland habitats and the surface and groundwater that supports them. Minimize activities that lead to gully formation, soil erosion, or a loss of soil health (e.g., soil fungal diversity) (Wagner 2023). Potential collaborators: BLM, NRCS, USFS, New Mexico Environment Department (NMED), SLO, private landowners.
- Design and implement riparian and aquatic habitat-restoration projects to benefit SGCN. This may include establishing priorities for habitat restoration and developing reach-specific plans. Monitor restoration projects to determine effectiveness (Block et al. 2001, Holste et al. 2022) and inform adaptive management. Potential collaborators: BLM, USFS, NMED, SFD, SLO, universities, private landowners.
- Determine beneficial fire frequencies and intensities and work with land-management agencies, sovereign Tribal entities, and private landowners to develop fire management plans and implement prescribed burns or cultural burns (Roos et al. 2021, Parks et al. 2023b, Eisenberg et al. 2024) that avoid disturbing SGCN during sensitive periods (e.g., nesting); maintain condition of sensitive habitats (e.g., riparian habitat), ecosystem components (e.g., soil microbial community) (Dove and Hart 2017, Brady et al. 2022), and ecosystem function (e.g., soil carbon storage) (Brady et al. 2022); enhance local diversity (Bowman et al. 2016, Eisenberg et al. 2024) and gene flow (Jones et al. 2023), including of SGCN such as pollinating insects; and protect people and property (Roos et al. 2021). Potential collaborators: BLM, USFS, SFD, SLO, universities, private landowners, Tribal natural-resource managers.
- As appropriate to local site conditions (e.g., topography, prevailing winds, disturbance history, infrastructure) (Urza et al. 2023) and not in persistent piñon-juniper woodlands (Romme et al. 2009, Darr et al. 2022), thin stands of trees in forests and woodlands to natural or historic densities that reduce the probability of insect and disease outbreaks and stand-replacing wildfires, and promote the growth of native understory cover (Redmond et al. 2023). Avoid unnecessary removal of large old-growth trees and snags, which serve as important wildlife habitat (Kalies and Rosenstock 2013); leave some juvenile trees or plant seedlings to promote establishment of new trees (Redmond et al. 2023); use best practices to maintain soil health (e.g., limiting pile burning and mastication where possible) (Ross et al. 2012); and evaluate treatment effectiveness (e.g., McKinney et al. 2022), including monitoring local SGCN populations. Potential collaborators: BLM, USFS, SFD, SLO, non-profit organizations.
- Determine responses of upland, and associated riparian/aquatic, communities that include SGCN to prescribed burns and wildfires (e.g., Saab et al. 2022). Where appropriate, integrate low-intensity fire and fuels reduction management into riparian ecosystem

conservation. Design and implement projects that reduce unnaturally high fire risk associated with increased fuel loads or lack of moist soils in riparian areas. Methods may include flooding and/or implementing environmental flows, mechanical removal of non-native woody plants and woody debris (Ellis 2001, Webb et al. 2019), and replanting native riparian vegetation (Queheillalt and Morrison 2006, Mosher and Bateman 2016). Potential collaborators: BLM, USFS, SFD, SLO, universities, private landowners.

- Encourage sustainable groundwater use to protect aquatic and riparian habitats from lowered groundwater tables. Promote water conservation, such as use of devices and models that facilitate optimal irrigation (Schaible and Aillery 2012, Storm et al. 2024) and estimate water consumption and withdrawal (Zhou et al. 2021) or temporary field fallowing (DBSA 2022) and dryland farming, especially of drought-adapted crops (McCarthy 2024), to conserve the structure and function of aquatic and riparian habitats. Promote the use of water data from groundwater monitoring networks (Pine et al. 2023) to inform water conservation and management strategies. Potential collaborators: NRCS, NMBGMR, NMDA, SLO, municipalities, private landowners, water-management districts.
- Promote post-fire management activities that are beneficial to SGCN. Includes minimizing ash flow into streams and other post-fire impacts to water quality (Rhoades et al. 2019a, Rhoades et al. 2019b), augmenting natural plant regeneration (e.g., planting tree seedlings in areas with appropriate microclimatic conditions) (Marchall et al. 2023) and protecting natural seed sources (Stevens et al. 2021), and encouraging heterogeneity (Ziegler et al. 2017, Owen et al. 2020). Potential collaborators: NRCS, USFS, NMED, SFD, SLO, non-profit organizations, private landowners.
- Restore, protect, and monitor important disjunct wildlife habitats, such as caves, limestone outcrops, and talus slopes. Potential collaborators: BLM, NRCS, USFS, EMNRD, SLO, non-profit organizations, private landowners.
- Reduce shrub encroachment in grassland habitats important to SGCN. This may be achieved through reduction of processes that promote shrub encroachment, implementation of a natural fire regime (Ravi et al. 2009), reseeding with native grasses, and shrub removal (Bestelmeyer et al. 2003). Potential collaborators: BLM, USFS, SLO, private landowners.
- Implement protections to conserve aquatic habitats within closed basins or hydrologic units not currently designated as Waters of the United States. Potential collaborators: BLM, USFS, NMED, NMOSE, private landowners.
- Determine amount, status, and trend of upland, aquatic, and riparian habitats; levels of fragmentation; and how SGCN might be affected. Identify appropriate locations and implement projects to enhance habitat quality and connectivity. or prevent further fragmentation. This may include re-connecting streams and aquatic habitats that have been fragmented by dams, diversions, and other man-made structures that isolate and preclude movement of semi-aquatic SGCN. Remove structures when feasible. May also include protecting and promoting the natural establishment, development, and succession of native riparian vegetation by addressing any locally limiting hydrological conditions (e.g., ensuring overbank flooding occurs at optimal times and establishment of early successional vegetation) (Hatten et al. 2010, Greco 2013, Stanek et al. 2021, Wohner et al. 2021). May further include emphasizing restoration in areas that will enhance connectivity between native riparian habitat patches (e.g., migratory stopover sites) (McNeil et al. 2013). Re-

establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, USFS, NMDOT, NMED, SFD, SLO, Soil and Water Conservation Districts (SWCDs), universities, non-profit organizations, private landowners, water-management districts.

- Survey and monitor perennial marshes/cienegas/springs/seeps habitats and the SGCN that inhabit them to determine changes in habitat quantity and quality and the status and trend of SGCN populations. Promote conservation efforts, such as protecting groundwater resources, that enhance the persistence and quality of these perennial aquatic habitats. Potential collaborators: BLM, USFS, NMED, SLO, universities.
- Promote public participation in restoration and conservation of watersheds. Potential collaborators: USFS, NMED, SFD, universities, private landowners, non-profit organizations.
- Inform interested and affected members of the public about the value of aquatic and riparian systems and maintaining in-stream flows in order to build support for conservation of aquatic and riparian species and habitat-restoration efforts. Potential collaborators: NRCS, USFS, NMED, universities, non-profit organizations, private landowners.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES:

- Work with appropriate agencies to enforce regulations to prevent the introduction and spread of non-native species. Potential collaborators: USFWS, NMDA.
- Design and implement protocols for early detection of invasive and other problematic species and diseases. Quickly respond to detection. Potential collaborators: BLM, NRCS, USFS, NMDA, NMED, SLO, universities, private landowners.
- Determine the distribution of all invasive and other problematic species and diseases found in New Mexico, assess related threats to SGCN, and develop and implement strategies to address these threats, including eradicating existing populations of non-native and invasive species when appropriate. When removing non-native vegetation, ensure that any SGCN that use this vegetation have suitable alternate habitat present (e.g., Sogge et al. 2013) and that site conditions support the restoration of native plants. If herbicide application cannot be avoided, limit impacts to pollinating insect SGCN by applying to smaller patches within the treatment area (e.g., Black et al. 2011) and spraying before target plants bloom (Hopwood et al. 2015). Potential collaborators: BLM, NRCS, USFS, NMDA, NMED, SLO, universities, non-profit organizations, private landowners.
- As needed, gather additional information regarding the distribution of exotic plants in riparian habitats (e.g., NHNM 2023). Determine the impact of exotic plants, and their removal and reduction, on SGCN and their habitats. Create and implement site-specific plans, with measurable goals and objectives, to restore the historic structure and composition of riparian habitats while minimizing negative impacts on SGCN and soil health (Wagner 2023). Prioritize removal of monoculture stands of non-native plants (e.g., Johnson et al. 2018b) and ensure that sufficient native riparian vegetation is locally available to SGCN and that local hydrological conditions support native vegetation regrowth. Since pollinating insects may use exotic riparian plants (e.g., Pendleton et al. 2011), minimize impacts of removing these plants on pollinating insect SGCN, including by avoiding herbicide application when plants are in bloom and treating the focal area in stages. Include post-implementation monitoring and maintenance for all riparian restoration projects. Document

and report restoration approaches used, including successes and failures (Shafroth et al. 2008, Sogge et al. 2013). Potential collaborators: BLM, NRCS, USFS, NMDA, SFD, SLO, SWCDs, universities, non-profit organizations, private landowners.

- Develop strategies to prevent emerging diseases from getting into New Mexico and develop and implement strategies that will inhibit the spread of ones already present (e.g., Clemons et al. 2024). This includes working with land-management agencies to control human access for recreation or other purposes as needed (Reynolds and Barton 2013), educating the public about what they can do to mitigate disease spread (e.g., Olson and Pilliod 2022), implementing appropriate hygiene guidelines for field researchers (e.g., Shapiro et al. 2024), and incorporating principles related to the interconnectedness of humans with local flora, fauna, and the natural environment (i.e., One Health) (AFWA 2023). Potential collaborators: BLM, USFS, NMED, SLO, universities.
- Restore native riparian plants (e.g., cottonwood [*Populus* spp.] and willow [*Salix* spp.]) and natural riparian ecosystem processes and functions following the removal or biocontrol of non-native plants. Ensure maintenance of adequate water supply for native plants. At sites with low water availability, restoration of native xeric plants may be more appropriate than hydroriparian and wetland plants. Stage and balance non-native plant removal and native habitat restoration over time, to avoid rapid loss of exotic woody riparian habitats for wildlife until native habitats can be developed (Sogge et al. 2013), and minimize herbicide use. Potential collaborators: BLM, USFS, NMED, SLO, universities, non-profit organizations, private landowners.
- Identify historic and current SGCN habitats infested with cheatgrass (*Bromus tectorum*). Work with landowners and land-management agencies to restore these areas to native vegetation. Promote land-management strategies that will inhibit the further spread of cheatgrass. Potential collaborators: BLM, USFS, SLO, private landowners

POLLUTION:

- Work with appropriate agencies that enforce mining and energy development regulations, Best Management Practices, and safeguards to protect water quality and minimize SGCN mortality associated with mining and energy development. Assess impacts to SGCN and their habitats from industrial activities, including mining and energy development. These impacts may include direct mortality, pollution from transport of extracted or waste products or from acid mind drainage, and sediment runoff from roads. Potential collaborators: BLM, USFS, EMNRD, NMED, SLO, energy and mining companies, local governments.
- Determine effects of, and implement actions to mitigate negative effects from, agrochemicals (e.g., neonicotinoids, other pesticides) (Sanchez-Bayo 2021, EPA 2023), synthetic chemicals (e.g., per- and polyfluoroalkyl substances [PFAS]), microplastics, and other pollutants (e.g., sewage, nutrients, toxic chemicals, sediment) on SGCN, especially pollinating insects, and their habitats. This includes solid waste that may entangle wildlife. Potential collaborators: US Environmental Protection Agency (EPA), NMDA, NMED, universities, local governments, private industry.

CLIMATE CHANGE AND SEVERE WEATHER:

- Determine how regional and global climate change will affect SGCN, vegetation patterns (e.g., Davis et al. 2019, Coop et al. 2020, Guiterman et al. 2022, Davis et al. 2023), and community (e.g., Rosenblad et al. 2023) and ecosystem processes and dynamics, including disturbance regimes. This includes identifying SGCN (e.g., Glick et al. 2011) and associated habitats that are most likely to be negatively affected by climate change, including impacts on travel corridors, habitat connectivity, and species and habitat ranges. Identification of environmental conditions or thresholds that could limit SGCN is especially important. Potential collaborators: BLM, USFS, USFWS, US Geological Survey (USGS), EMNRD, SLO, universities.
- Identify climate change (e.g., Michalak et al. 2020) or disturbance refugia (e.g., Rodman et al. 2023) for SGCN and their habitats and implement conservation actions to conserve, expand, or enhance these refugia. As appropriate, consider refugia when implementing conservation actions (e.g., focus on refugia when planting native plants to encourage reforestation following a fire) (Hennessy et al. 2024). Potential collaborators: US Bureau of Reclamation (BOR), USFS, USGS, universities.
- Identify and implement actions to mitigate the effects of climate change on SGCN and their habitats. These may include actions that assist in enhancing carbon sequestration in natural environments (e.g., appropriate forest conservation and management [Mo et al. 2023]), improving climate resilience of species and communities (e.g., Dyshko et al. 2024), or climate-smart projects that help maintain, or accommodate for or facilitate climate-related shifts in (e.g., Stanturf et al. 2024, USFWS 2024a), the distribution and natural functioning, including disturbance regimes, of these impacted species and habitats. Potential collaborators: BLM, USFS, USFWS, USGS, EMNRD, SLO, universities.
- Promote land-management practices, standards, and guidelines to conserve and/or restore structure and function of corridors that provide important habitat for SGCN and ability for animals to move as climate conditions change. This should include both mesic and xeric riparian communities that serve as important migratory corridors for birds and other wildlife while providing ecosystem services and wildlife corridors that link isolated mountain ranges (Powledge 2003) and coniferous forest patches. Potential collaborators: BLM, USFS, SLO, universities, private landowners.
- Develop new species recovery plans that consider the current status of and limiting factors for species, as well as projected future conditions for both species and their habitats. Consider full life cycles for migratory species when feasible (e.g., KFF 2021). Potential collaborators: USFWS, non-profit organizations, species working groups.
- Inform the public about potential adverse effects of continued climate change on SGCN and their habitats and encourage development of, and data collection under, citizen and community science projects focused on SGCN and their habitats. Potential collaborators: USFS, USFWS, USGS, SLO, universities, non-profit organizations.
- Monitor SGCN to determine long-term trends that correlate to ecosystem dynamics and habitat changes (e.g., Shirk et al. 2023). If feasible, identify potential limiting factors and develop and implement strategies to mitigate them. Potential collaborators: BLM, USFS, SLO, universities.

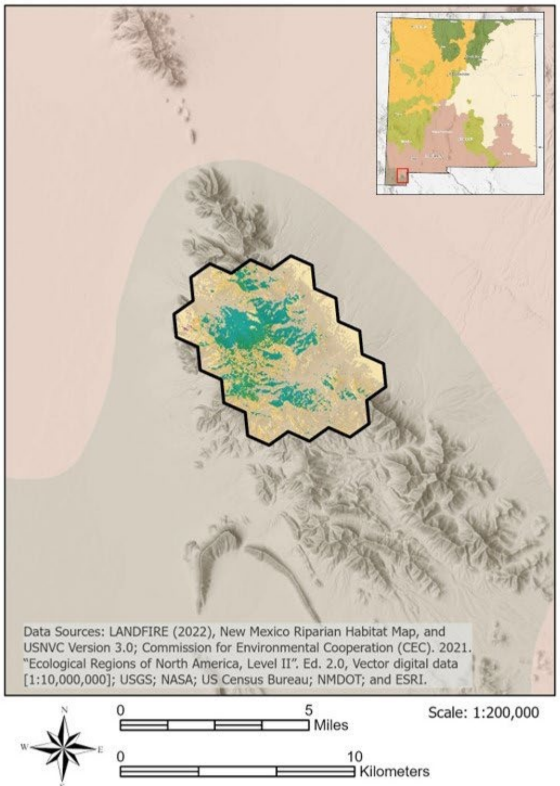
ACTIONS THAT ADDRESS MULTIPLE THREATS:

- Determine life history needs, ecology, distribution, movements, status, and trends of and threats to SGCN (especially invertebrates that are not currently monitored, riparian-obligate species, and herpetofauna [Pierce et al. 2016, Olson and Pilliod 2022]) and their habitats. Consider full annual cycles for migratory species when appropriate and logistically feasible (KFF 2021) and interactions with lower trophic levels that may drive SGCN status (e.g., EPA 2023). Use this information to develop and implement effective monitoring protocols and conservation actions, including actions to mitigate identified threats. Potential collaborators: BLM, USFS, SLO, universities, non-profit organizations, private industry, species working group.
- Assess the synergistic effects between climate change and other threats to SGCN and their habitats (e.g., Friggens et al. 2019, Parks et al. 2019). Incorporate appropriate climate adaptation strategies and frameworks into projects designed to address these synergistic effects. This may include enhancing connectivity (CEQ 2023), facilitating a species' innate adaptive capacity (Thurman et al. 2022), enhancing genetic diversity (Powell 2023), considering local adaptation (Meek et al. 2023), or considering whether it is most appropriate to resist, accept, or direct ecosystem transformation (Lynch et al. 2021, Stevens et al. 2021). Projects should acknowledge ecosystem dynamism and incorporate Indigenous Knowledge (e.g., Roos et al. 2022, Eisenberg et al. 2024), nature-based solutions (Warnell et al. 2023), and experimentation (Guiterman et al. 2022) when appropriate. Potential collaborators: BLM, USFS, USGS, universities.
- Identify or develop an accessible, jointly used database to document the status and condition of, threats to, and conservation actions implemented across aquatic, riparian, and upland habitats. Identify data gaps (e.g., Ganey et al. 2017) and implement standardized methods to gather habitat data (e.g., Vollmer et al. 2018, Shirk et al. 2023) and to monitor the success of conservation actions (e.g., Davis and Pinto 2021), including impacts on local SGCN populations. Synthesize existing information (e.g., Jain et al. 2021) and apply modeling techniques to aid in evaluating success when appropriate (e.g., Parks et al. 2018). Adjust future conservation actions as needed based on observed outcomes. Potential collaborators: BLM, BOR, US National Park Service (NPS), US Army Corps of Engineers (USACE), USFS, USFWS, USGS, NMED, SFD, SLO, universities.
- Evaluate the effectiveness of public education and outreach efforts regarding threats to SGCN and their habitats and the ways that the public can assist in threat mitigation (KFF 2021). Modify outreach activities as needed in response to evaluation outcomes. Potential collaborators: BLM, USFS, USGS, NMED, SFD, SLO, universities, local governments, non-profit organizations.
- Where appropriate, incorporate native, pollinator-friendly plants (Glenny et al. 2022) or native plants adapted to projected future climatic conditions at the restoration site (e.g., Meek et al. 2023, Stanturf et al. 2024) into seed mixes and live plantings used in the restoration of lands affected by grazing, fire, resource extraction, energy development, or urban development. Consider reclamation site conditions, genetic diversity, and resilience to local threats when producing seedlings (Davis and Pinto 2021) and consider appropriate climate analogs when identifying appropriate seed sources (e.g., Richardson et al. 2024).

When focused on benefiting pollinators, prioritize plants that are attractive to pollinators, especially SGCN; support pollinators throughout the growing season (Glenny et al. 2023); provide food for caterpillars of insect SGCN (e.g., Dumroese et al. 2016); and produce pollen with high nutritional diversity (Vaudo et al. 2024). Potential collaborators: BLM, NRCS, USFS, SFD, SLO, energy and mining companies, non-profit organizations, private landowners.

CONSERVATION OPPORTUNITY AREAS

BIG HATCHET MOUNTAINS



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*0.2*
Chihuahuan Desert Scrub	*4*	*613.9*
Chihuahuan Ruderal Grassland	*5*	*6.3*
Chihuahuan Semi-Desert Grassland	*2*	*2249.6*
Madrean Lowland Evergreen Woodland	*4*	*732.2*
Madrean Montane Forest and Woodland	*3*	*219.2*
Southwest Lowland Riparian Forest	*1*	*3.1*
Southwest Lowland Riparian Shrubland	*1*	*1.8*
Warm Interior Chaparral	*4*	*831.0*

Figure 45. Big Hatchet Mountains Conservation Opportunity Area.

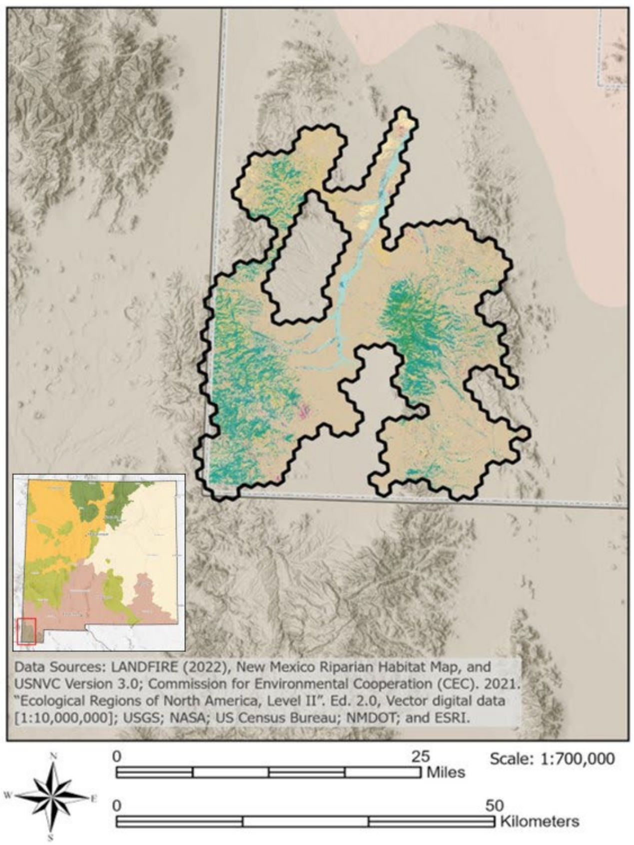
The Big Hatchet Mountains Conservation Opportunity Area (COA) (Figure 45) spans approximately 4,670 ha (11,540 ac) in southwestern New Mexico and is about 100 km (62 mi) southeast of Lordsburg.

The majority of the COA is managed by the BLM (84%) with a sizable portion managed by the SLO (16%). Approximately 84% of this COA is currently protected.

The COA supports seven native vegetation habitats, one ruderal vegetation type, and agricultural vegetation. The dominant habitat is Chihuahuan Semi-Desert Grassland (48%), followed by Warm Interior Chaparral (18%), Madrean Lowland Evergreen Woodland (16%), and Chihuahuan Desert Scrub (13%).

A total of 44 SGCN are found (either observed or with potential habitat) within the COA, including seven classified as Conservation Impact Species (I) and eight as Current Focal Species (F) (Appendix G). Most of this COA, and areas north and south of this COA, may represent a climate refugia for the banded rock rattlesnake (*Crotalus lepidus klauberi*) through 2075 (NHNM 2024).

BOOTHEEL



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*125.3*
Arid West Interior Freshwater Emergent Marsh	*1*	*106.3*
Barren	*N/A*	*45.8*
Chihuahuan Desert Scrub	*4*	*3408.7*
Chihuahuan Ruderal Grassland	*5*	*716.9*
Chihuahuan Semi-Desert Grassland	*2*	*82591.5*
Cliff, Scree, and Rock Vegetation	*4*	*30.2*
Desert Alkali-Saline Wetland	*1*	*3295.3*
Developed and Urban	*N/A*	*37.5*
Introduced Riparian Vegetation	*5*	*2.1*
Madrean Lowland Evergreen Woodland	*4*	*18443.5*
Madrean Montane Forest and Woodland	*3*	*1431.6*
Open Water	*N/A*	*34.3*
Southwest Lowland Riparian Forest	*1*	*1120.4*
Southwest Lowland Riparian Shrubland	*1*	*417.4*
Warm Interior Chaparral	*4*	*12421.9*
Warm-Desert Arroyo Riparian Scrub	*2*	*712.6*

Figure 46. Bootheel Conservation Opportunity Area.

The Bootheel COA (Figure 46) spans approximately 129,305 ha (319,519 ac) in the Animas and Peloncillo Mountains and is about 100 km (62 mi) south of Lordsburg.

The majority of the land (~66%) in this COA is privately owned, while the remaining 34% is managed by the USFS (19%), the BLM (10%), and the SLO (5%). This COA contains four Important Bird Areas: Clanton Canyon, Guadalupe Canyon, Gray Ranch Grasslands, and the Animas Mountains. Approximately 16% of the COA is currently protected.

The COA supports 11 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Chihuahuan Semi-Desert Grassland (64%), Madrean Lowland Evergreen Woodland (14%), and Warm Interior Chaparral (10%).

A total of 86 SGCN are found (either observed or with potential habitat) within the COA, including 13 classified as I and 14 as F (Appendix G). The eastern and western portions of this COA, and areas north of this COA, may remain or become suitable for the banded rock rattlesnake over the next 50 years (NHNM 2024). This COA has high potential to contain macroclimate refugia for terrestrial species in general (Table 11).

Chapter 10: Arizona/New Mexico Mountains Conservation Profile

SPECIES OF GREATEST CONSERVATION NEED (SGCN) AND THEIR HABITATS

The Arizona/New Mexico Mountains ecoregion in New Mexico is comprised of nine separate mountain complexes totaling 46,895 km^2 (18,106 mi^2). The largest is part of a 110,936 km^2 (42,832 mi^2) complex that extends from western New Mexico through central Arizona (CEC 2021). In New Mexico, elevations range from 1,120 to 3,625 m (3,675 to 12,057 ft) (USGS 2024a), and terrain consists of steep mountains and some deeply dissected plateaus. Climates include desert, mid-latitude steppe, and subarctic. From 1991 to 2020, mean annual temperatures ranged from 2 to 20 °C (36 to 68 °F) depending largely upon elevation; annual precipitation averaged 47 cm (18 in) (range: 18 to 112 cm [8-44 in]) (AdaptWest 2022) with half occurring from December to March as rain or snow and half occurring from July to September as summer thundershowers.

This ecoregion contains the second largest number (236) of SGCN among the ecoregions in New Mexico (Table 33, Table 35). Birds are the dominant taxa, comprising 36% of SGCN in the ecoregion. Species considered Data Needs Species make up the largest category (57%) and Conservation Impact Species make up the second largest category (18%) of SGCN in the ecoregion (Table 33).

Table 33. Number of Species of Greatest Conservation Need in the Arizona/New Mexico Mountains ecoregion.

Taxon \ Category[53]	F	I	D	L	Total
Amphibians	1	6	1	1	9
Bees	0	1	5	1	7
Beetles	0	0	1	0	1
Birds	10	7	56	13	86
Crustaceans	0	0	6	0	6
Fish	16	1	1	1	19
Flies	0	0	3	0	3
Mammals	7	4	17	1	29
Molluscs	1	3	31	0	35
Moths and Butterflies	0	18	6	3	27
Reptiles	0	3	8	3	14

[53] Category abbreviations are: F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.

Category[53] / Taxon	F	I	D	L	Total
Total	35	43	135	23	236

In the Arizona/New Mexico Mountains ecoregion, there are 27 terrestrial habitats stretching from near the Colorado border in the northwest to the Texas border in the southeast and covering 46,249 km^2 (17,857 mi^2) or nearly 99% of the landscape (Table 34, Figure 47). The remainder of the landscape contains miscellaneous land-cover types, mostly developed and urban at 1% of the ecoregion. The mountains support a mixture of Rocky Mountain forest and woodland habitats (37% of the ecoregion) to the north and Madrean forests and woodlands (22%) and Warm Interior Chaparral (3%) to the south. At lower elevations of the foothills and valley slopes, there are cool semi-desert grasslands and shrublands to the north (14%) and warm desert grasslands and shrublands to the south (15% of the ecoregion). Among the habitats found in this ecoregion, the Madrean Montane Forest and Woodland and Warm Interior Chaparral habitats are described in this ecoregion chapter.

This ecoregion contains 10 (four cold-water, six warm-water) publicly accessible reservoirs and ponds encompassing 436 ha (1,078 ac) (Figure 48). The largest, Bluewater Lake, accounts for more than half (250 ha [618 ac]) of that surface area. The ecoregion also contains 2,544 km (1,581 mi) of perennial streams, roughly evenly split between cold-water (1,275 km [792 mi]) and warm-water (1,268 km [788 mi]) habitats.

Table 34. Terrestrial habitat types of the Arizona/New Mexico Mountains ecoregion.

Habitat Category	USNVC Code	Habitat Name[54]	Tier[55]	Climate Vulnerability[56]	Area (km^2)	(mi^2)
Alpine and Montane Vegetation	M547	Rocky Mountain Subalpine-Montane Meadow and Grassland	2	Moderate	566	219
	M011	Madrean Montane Forest and Woodland	3	Low→Moderate	1,180	456
	M049	Rocky Mountain Montane Shrubland	3	Moderate	770	297
	M896	Colorado Plateau Piñon-Juniper Woodland	4	Low→Moderate	6,003	2,318
	M010	Madrean Lowland Evergreen Woodland	4	Low→Moderate	9,063	3,499
	M022	Rocky Mountain Lower Montane Forest	4	Moderate	10,491	4,051
	M897	Rocky Mountain Piñon-Juniper Woodland	4	Low→Moderate	1,595	616
	M020	Rocky Mountain Subalpine-High Montane Conifer Forest	4	Moderate	242	94
	M091	Warm Interior Chaparral	4	Moderate	1,529	590
Plains-Mesa Grassland	M053	Great Plains Shortgrass Prairie	3	Moderate→Very High	375	145
	M498	Great Plains Ruderal Grassland and Shrubland	5	--	22	9
Desert Grassland and Scrub	M087	Chihuahuan Semi-Desert Grassland	2	Moderate	6,254	2,415
	M171	Intermountain Dry Shrubland and Grassland	2	Low→Moderate	4,384	1,693
	M169	Intermountain Tall Sagebrush Shrubland	3	Moderate	653	252

[54] Terrestrial habitats are based on macrogroups of the United States Natural Vegetation Classification system (USNVC Version 3.0; https://usnvc.org/) except for the four Other Land Cover types; links to USNVC macrogroup descriptions are provided in the USNVC code column. Areas for upland habitat types are based on the 2022 LandFire Existing Vegetation Map for the continental US (LANDFIRE 2022), which was quality controlled by Natural Heritage New Mexico. Ecological systems in LANDFIRE (2022) were cross-walked to USNVC macrogroups. Areas for riparian vegetation types are based on the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap), also aggregated to macrogroups and embedded in the LANDFIRE (2022) map. Habitats listed in order by Tier (see below) and then alphabetically. Does not include habitats that have less than 0.1 square miles present in the ecoregion.

[55] Tiers reflect the priority for conservation and are based on the degree of imperilment within the US according to the NatureServe Conservation Status Assessment (Faber-Langendoen et al. 2012) and the spatial pattern of the habitat. Ranks: N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure. Spatial patterns: linear, small patch, large patch, and matrix. Tier 1: N1, N2, N3 small patch/linear; Tier 2: N3 large patch or N4 small patch/linear; Tier 3: N3 matrix or N4 large patch; Tier 4: N4 matrix; Tier 5: N5 ruderal vegetation linear/large patch.

[56] Climate vulnerability levels were based on a vulnerability analysis performed for Ecological Response Units (ERUs) across New Mexico and Arizona (Triepke et al. (2014). The ERU classification system represents major ecosystem types of the southwest. Vulnerability for each ERU was calculated as the relative probability of type conversion. The ERUs were then cross-walked to the habitats shown here.

Habitat Category	USNVC Code	Habitat Name[54]	Tier[55]	Climate Vulnerability[56]	Area (km²)	(mi²)
	M086	Chihuahuan Desert Scrub	4	Moderate	586	226
	M093	Intermountain Saltbush Shrubland	4	Moderate	398	154
	M512	Chihuahuan Ruderal Grassland	5	--	92	36
	M499	Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	--	213	82
Arroyo Riparian	M092	Warm-Desert Arroyo Riparian Scrub	2	--	29	11
Riparian Woodland and Wetland	M888	Arid West Interior Freshwater Emergent Marsh	1	--	73	28
	M082	Desert Alkali-Saline Wetland	1	Moderate	76	29
	M893	Montane-Subalpine Wet Shrubland and Wet Meadow	1	--	122	47
	M034	Rocky Mountain Montane Riparian Forest	1	--	178	69
	M036	Southwest Lowland Riparian Forest	1	--	192	74
	M076	Southwest Lowland Riparian Shrubland	1	--	16	6
	M298	Introduced Riparian Vegetation	5	--	22	8
Cliff, Scree, and Rock Vegetation	M887	Cliff, Scree, and Rock Vegetation	4	Moderate	1,124	434
Other Land Cover	N/A	Agricultural Vegetation	5	--	67	26
	N/A	Barren	5	--	68	26
	N/A	Developed and Urban	5	--	452	174
	N/A	Open Water	5	--	25	10

Table 35. Species of Greatest Conservation Need (SGCN) in the Arizona/New Mexico Mountains ecoregion.

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Arizona Toad	*Anaxyrus microscaphus microscaphus*	Amphibians	I	C, De, V	EC, M010, M011, M022, M034, M036, M076, M086, M087, M298, M893, M896, M897, PCWS, PWWS
Arizona Treefrog	*Dryophytes wrightorum*	Amphibians	D	C, De, Di, V	EC, EMCS, M010, M011, M020, M022, M034, M888, M896, M897, PCWS, PMCSS
Boreal Chorus Frog	*Pseudacris maculata*	Amphibians	I	C, De, Di, V	EC, EMCS, M020, M022, M034, M036, M076, M547, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS

57 Hyperlinks are to species booklets in the Biota Information System of New Mexico (https://bison-m.org/) for each SGCN in the Arizona/New Mexico Mountains ecoregion. Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.
58 Reason to include indicates which of five criteria for inclusion on the SGCN list a particular species met. Abbreviations are as follows: C = Climate Change Vulnerability; De = Decline; Di= Disjunct; E = Endemic; K = Keystone; V = Vulnerable.
59 Aquatic habitat abbreviations are as follows: PCWS = Perennial Cold-Water Streams; PWWS = Perennial Warm-Water Streams; PLCP = Perennial Lakes, Cirques, Ponds; PMCSS = Perennial Marshes/Cienegas/Springs/Seeps; PCWR = Perennial Cold-Water Reservoirs; PWWR = Perennial Warm-Water Reservoirs; EMCS = Ephemeral Marshes/Cienegas/Springs; EC = Ephemeral Catchments. Habitat codes refer to United States National Vegetation Classification System designations, which are identified in Table 34 above.

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	Amphibians	F	C, De, Di, V	EC, EMCS, M010, M011, M020, M022, M034, M036, M076, M298, M888, M893, PCWS, PLCP, PMCSS, PWWS
Lowland Leopard Frog	*Lithobates yavapaiensis*	Amphibians	L	C, De, Di, V	EC, EMCS, M010, M011, M034, M036, M076, M888, M896, PCWS, PLCP, PMCSS, PWWS
Northern Leopard Frog	*Lithobates pipiens*	Amphibians	I	C, De, Di, V	EC, EMCS, M020, M022, M034, M049, M298, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Plains Leopard Frog	*Lithobates blairi*	Amphibians	I	C, De, Di, V	EC, EMCS, M034, M036, M053, M076, M082, M087, M092, M888, M893, PCWS, PLCP, PMCSS
Rio Grande Leopard Frog	*Lithobates berlandieri*	Amphibians	I	C, V	EC, EMCS, M036, M076, M092, M888, PCWS, PMCSS, PWWS
Sacramento Mountain Salamander	*Aneides hardii*	Amphibians	I	C, De, Di, E, V	M010, M011, M020, M022, M034
Bare Fairy Bee	*Perdita aperta*	Bees	D	C, De, V	M087, M093, M171, M499
Cockerell's Bumble Bee	*Bombus cockerelli*	Bees	I	E, V	M011, M022
Mighty Leaf-cutter Bee	*Megachile fortis*	Bees	L	V	M022

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Mimbres Miner Bee	*Andrena mimbresensis*	Bees	D	C, De, E, V	M896, M897
Morrison's Bumble Bee	*Bombus morrisoni*	Bees	D	C, De, V	M010, M011, M020, M022, M034, M049, M053, M082, M086, M087, M091, M093, M169, M171, M298, M498, M512, M888, M897
Neff's Miner Bee	*Andrena neffi*	Bees	D	C, De, E, V	M896, M897
Volger's Mining Bee	*Andrena vogleri*	Bees	D	E	M896, M897
Wood's Jewel Beetle	*Chrysina woodi*	Beetles	D	V	
Abert's Towhee	*Melozone aberti aberti*	Birds	L	C, De, V	EMCS, M036, M076, M086, M087, M091, M092, M093, M298, M888, PMCSS
American Dipper	*Cinclus mexicanus unicolor*	Birds	D	C, V	EC, M034, M893, PCWR, PCWS, PLCP, PWWR, PWWS
American Kestrel	*Falco sparverius sparverius*	Birds	D	De, V	EMCS, M010, M011, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M171, M547, M888, M893, M896, M897, PMCSS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Bald Eagle	*Haliaeetus leucocephalus*	Birds	D	C, Di, V	EC, EMCS, M010, M011, M020, M022, M034, M036, M049, M053, M076, M082, M086, M087, M091, M093, M169, M171, M547, M887, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS
Band-tailed Pigeon	*Patagioenas fasciata*	Birds	D	De, V	EC, M010, M011, M020, M022, M034, M036, M049, M076, M087, M091, M169, M893, M896, M897, PCWS, PWWS
Bank Swallow	*Riparia riparia riparia*	Birds	D	C, De, Di, V	EC, EMCS, M034, M036, M076, M092, M888, PCWR, PCWS, PMCSS, PWWR, PWWS
Bell's Vireo	*Vireo bellii*	Birds	F	C, De, Di, V	M010, M011, M034, M036, M053, M076, M086, M087, M092, M298, M547, M897
Bendire's Thrasher	*Toxostoma bendirei*	Birds	F	C, De, V	M010, M020, M022, M053, M076, M082, M086, M087, M092, M093, M169, M171, M887, M896, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Black Rosy-Finch	*Leucosticte atrata*	Birds	F	C, De, Di, V	M010, M020, M022, M169, M547, M896, M897
Black-chinned Sparrow	*Spizella atrogularis evura*	Birds	D	C, De, V	M010, M036, M076, M086, M091, M092, M887, M896, M897
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	D	C, V	M010, M011, M020, M022, M034, M036, M049, M076, M086, M091, M092, M171, M887, M893, M896, M897
Black-throated Sparrow	*Amphispiza bilineata*	Birds	D	De, V	M053, M086, M087, M092, M169, M547, M896, M897
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	Birds	L	C, Di, V	M034, M036, M087
Broad-tailed Hummingbird	*Selasphorus platycercus platycercus*	Birds	D	De, V	M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M547, M893, M896, M897
Brown Pelican	*Pelecanus occidentalis carolinensis*	Birds	L	V	EC, PCWS, PLCP, PWWS
Brown-capped Rosy-Finch	*Leucosticte australis*	Birds	F	C, De, Di, V	M010, M020, M022, M087, M169, M547, M887, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Bullock's Oriole	*Icterus bullockii*	Birds	D	C, De, V	EC, EMCS, M034, M036, M076, M086, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Burrowing Owl	*Athene cunicularia hypugaea*	Birds	I	C, De, K, V	M036, M053, M076, M082, M086, M087, M092, M093, M169, M171, M547, M887, M896, M897
Cactus Wren	*Campylorhynchus brunneicapillus couesi*	Birds	D	De, Di, V	M036, M053, M076, M086, M087, M171
Canyon Towhee	*Melozone fusca*	Birds	D	De, V	M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M547, M896, M897
Canyon Wren	*Catherpes mexicanus conspersus*	Birds	D	De, Di, V	M887
Cassin's Finch	*Haemorhous cassinii*	Birds	D	C, De, K, V	M010, M011, M020, M022, M034, M036, M076, M169, M887, M893, M896, M897
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	F	C, De, V	M010, M020, M022, M053, M086, M087, M169, M171, M547, M896, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Chipping Sparrow	*Spizella passerina arizonae*	Birds	D	C, De, K, V	EMCS, M011, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M171, M547, M888, M893, M896, M897, PMCSS
Clark's Grebe	*Aechmophorus clarkii*	Birds	D	Di, V	EC, EMCS, M888, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Clark's Nutcracker	*Nucifraga columbiana*	Birds	D	C, De, V	EC, M010, M011, M020, M022, M034, M087, M547, M893, M896, M897, PCWS, PWWS
Common Black Hawk	*Buteogallus anthracinus anthracinus*	Birds	D	C, V	EC, EMCS, M010, M011, M022, M034, M036, M076, M086, M087, M091, M092, M887, M888, PCWS, PMCSS, PWWS
Common Nighthawk	*Chordeiles minor*	Birds	D	C, De, V	EC, EMCS, M010, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M171, M547, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Costa's Hummingbird	*Calypte costae*	Birds	L	C, De, Di, V	M010, M011, M020, M022, M034, M036, M076, M086, M087, M092
Elegant Trogon	*Trogon elegans canescens*	Birds	L	C, De, V	EC, M010, M011, M022, M036, M076, PCWS, PWWS
Elf Owl	*Micrathene whitneyi whitneyi*	Birds	D	C, V	M010, M011, M036, M076, M086, M087, M091, M896, M897
Evening Grosbeak	*Coccothraustes vespertinus*	Birds	D	C, De, V	M010, M011, M020, M022, M034, M036, M049, M076, M091, M169, M887, M893, M896, M897
Ferruginous Hawk	*Buteo regalis*	Birds	D	C, Di, V	EMCS, M010, M022, M036, M053, M076, M086, M087, M092, M169, M171, M547, M887, M888, M896, M897, PMCSS
Flammulated Owl	*Psiloscops flammeolus*	Birds	D	C, V	M010, M011, M020, M022, M034, M036, M049, M053, M076, M087, M298, M547, M887, M893, M896, M897
Gila Woodpecker	*Melanerpes uropygialis uropygialis*	Birds	L	C, De, Di, V	EMCS, M010, M034, M036, M076, M086, M087, M298, M888, PMCSS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Golden Eagle	*Aquila chrysaetos canadensis*	Birds	D	C, Di, V	EC, EMCS, M010, M020, M022, M034, M036, M053, M076, M086, M087, M092, M169, M171, M547, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS
Grace's Warbler	*Setophaga graciae*	Birds	I	C, De, V	M011, M020, M022, M034, M036, M049, M076, M887, M893, M896, M897
Gray Vireo	*Vireo vicinior*	Birds	I	C, De, Di, V	M010, M011, M022, M034, M036, M049, M082, M086, M087, M091, M092, M093, M169, M171, M887, M896, M897
Greater Pewee	*Contopus pertinax pallidiventris*	Birds	L	C, De, V	M010, M011, M020, M022, M034, M893
Green-tailed Towhee	*Pipilo chlorurus*	Birds	D	C, De, V	EC, EMCS, M010, M020, M022, M034, M036, M049, M053, M076, M086, M091, M092, M169, M171, M547, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	C, De, V	M010, M011, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M169, M547, M887, M893, M896, M897
Killdeer	*Charadrius vociferus vociferus*	Birds	D	De, Di, V	EC, EMCS, M053, M086, M087, M092, M169, M171, M888, PCWR, PCWS, PMCSS, PWWR, PWWS
Lark Sparrow	*Chondestes grammacus strigatus*	Birds	D	C, De, V	EMCS, M010, M036, M053, M076, M086, M087, M091, M092, M169, M171, M547, M888, M896, M897, PMCSS
Lazuli Bunting	*Passerina amoena*	Birds	L	De, V	EC, EMCS, M034, M036, M049, M076, M091, M092, M169, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Lewis's Woodpecker	*Melanerpes lewis*	Birds	D	C, De, V	M011, M020, M022, M034, M036, M076, M169, M893, M896, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	C, De, V	M010, M011, M034, M036, M049, M053, M076, M082, M086, M087, M091, M092, M093, M169, M171, M298, M547, M887, M896, M897
Lucifer Hummingbird	*Calothorax lucifer*	Birds	L	C, De, Di, V	M010, M011, M036, M076, M086, M087, M091, M171, M887
Lucy's Warbler	*Leiothlypis luciae*	Birds	D	C, De, V	EMCS, M010, M011, M022, M034, M036, M076, M086, M087, M092, M169, M298, M512, M888, PMCSS
Mexican Chickadee	*Poecile sclateri eidos*	Birds	L	De, V	M010, M011, M036, M076
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	C, De, Di, V	M010, M011, M020, M022, M034, M036, M049, M091, M547, M887, M888, M893
Mexican Whip-poor-will	*Antrostomus arizonae arizonae*	Birds	D	C, De, V	M020, M022, M034, M036, M076, M893, M896, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Mountain Bluebird	*Sialia currucoides*	Birds	D	C, De, V	EMCS, M010, M011, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M169, M171, M547, M887, M888, M893, M896, M897, PMCSS
Mountain Chickadee	*Poecile gambeli gambeli*	Birds	D	C, De, V	M020, M022, M034, M036, M076, M547, M893, M896, M897
Mountain Plover	*Charadrius montanus*	Birds	F	C, De, Di, V	EC, M053, M082, M086, M087, M093, M169, M171, M499, M547, PCWS, PWWS
Olive Warbler	*Peucedramus taeniatus arizonae*	Birds	D	C, V	M011, M020, M022, M034, M893
Olive-sided Flycatcher	*Contopus cooperi*	Birds	D	C, De, V	M010, M011, M020, M022, M034, M036, M076, M887, M893, M896, M897
Peregrine Falcon	*Falco peregrinus*	Birds	D	C, De, Di, V	EC, EMCS, M010, M011, M020, M022, M034, M036, M049, M053, M076, M082, M086, M087, M091, M169, M547, M887, M888, M893, M896, M897, PCWS, PMCSS, PWWS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Pine Siskin	*Spinus pinus*	Birds	D	C, De, V	M011, M020, M022, M034, M036, M049, M076, M091, M092, M169, M547, M893, M896, M897
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	F	C, De, K, V	EMCS, M010, M011, M020, M022, M034, M049, M086, M087, M091, M169, M171, M887, M893, M896, M897, PMCSS
Plumbeous Vireo	*Vireo plumbeus*	Birds	D	C, De, V	M010, M011, M020, M022, M034, M036, M049, M076, M091, M893, M896, M897
Pygmy Nuthatch	*Sitta pygmaea melanotis*	Birds	D	C, De, V	M010, M011, M020, M022, M034, M049, M076, M887, M893, M897
Pyrrhuloxia	*Cardinalis sinuatus sinuatus*	Birds	D	De, V	EMCS, M036, M053, M076, M086, M087, M092, M547, M888, M896, M897, PMCSS
Red-faced Warbler	*Cardellina rubrifrons*	Birds	D	C, De, V	M010, M011, M020, M022, M034, M036, M076, M887, M893, M896, M897
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	Birds	L	De, V	M036, M076

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Birds	D	C, V	M011, M020, M022, M034, M036, M049, M076, M091, M092, M893, M896, M897
Sage Thrasher	*Oreoscoptes montanus*	Birds	D	C, De, V	M036, M053, M076, M086, M087, M092, M169, M547, M896, M897
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Birds	D	C, De, V	M049, M053, M082, M086, M087, M091, M092, M093, M169, M171, M547, M887
Savannah Sparrow	*Passerculus sandwichensis*	Birds	D	C, De, V	EC, EMCS, M053, M086, M087, M092, M169, M171, M547, M888, M896, M897, PCWS, PMCSS
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	I	C, De, V	EC, EMCS, M034, M036, M076, M082, M298, M547, M888, M893, PCWS, PLCP, PMCSS, PWWS
Spotted Towhee	*Pipilo maculatus*	Birds	D	C, De, V	M010, M011, M020, M022, M034, M036, M049, M076, M086, M091, M092, M169, M893, M896, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Steller's Jay	*Cyanocitta stelleri macrolopha*	Birds	D	De, V	EC, M010, M011, M020, M022, M034, M036, M076, M092, M893, M896, M897, PCWS
Varied Bunting	*Passerina versicolor*	Birds	L	C, V	M010, M036, M076, M086, M087, M091, M092, M887
Verdin	*Auriparus flaviceps ornatus*	Birds	D	De, V	M036, M076, M086, M087, M092
Vesper Sparrow	*Pooecetes gramineus*	Birds	D	C, De, V	EMCS, M010, M036, M049, M053, M076, M086, M087, M092, M169, M171, M499, M512, M547, M888, M896, M897, PMCSS
Violet-green Swallow	*Tachycineta thalassina lepida*	Birds	D	C, De, Di, V	EC, EMCS, M010, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M547, M887, M888, M893, M896, M897, PCWR, PCWS, PMCSS, PWWR, PWWS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Virginia's Warbler	*Leiothlypis virginiae*	Birds	F	C, De, V	M010, M011, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M547, M893, M896, M897
Western Bluebird	*Sialia mexicana bairdi*	Birds	D	C, V	M010, M011, M020, M022, M034, M036, M049, M076, M086, M087, M091, M092, M169, M171, M547, M887, M893, M896, M897
Western Grebe	*Aechmophorus occidentalis*	Birds	D	De, V	EC, EMCS, M888, PCWR, PCWS, PLCP, PMCSS
Western Wood Pewee	*Contopus sordidulus*	Birds	D	C, De, V	M011, M020, M022, M036, M049, M076, M091, M092, M896, M897
Whiskered Screech-Owl	*Megascops trichopsis asperus*	Birds	F	C, De, V	M010, M011, M022, M036, M076, M091
White-throated Swift	*Aeronautes saxatalis saxatalis*	Birds	D	C, Di, V	EC, EMCS, M020, M022, M034, M036, M053, M076, M086, M087, M092, M169, M547, M887, M888, M893, M896, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	Birds	D	C, K, V	M011, M020, M022, M034, M036, M076, M887, M893, M896, M897
Wilson's Warbler	*Cardellina pusilla*	Birds	L	C, De, V	EC, EMCS, M020, M022, M034, M036, M076, M092, M888, M893, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	I	V	EMCS, M010, M011, M020, M022, M034, M036, M049, M076, M086, M087, M091, M092, M169, M547, M888, M893, M896, M897, PMCSS
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	F	C, De, Di, V	EC, EMCS, M010, M011, M034, M036, M298, PCWS, PMCSS, PWWS
Yellow-billed Cuckoo	*Coccyzus americanus americanus*	Birds	D	C, De, V	M010, M011, M034, M036, M298, PCWS
Beavertail Fairy Shrimp	*Thamnocephalus platyurus*	Crustaceans	D	De, Di, V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Clam Shrimp	*Eulimnadia follisimilis*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Great Plains Fairy Shrimp	*Streptocephalus texanus*	Crustaceans	D	V	EC, PCWR, PCWS, PLCP, PWWR, PWWS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Packard's Fairy Shrimp	*Branchinecta packardi*	Crustaceans	D	V	EC, M020, PCWR, PCWS, PLCP, PWWR, PWWS
Scud	*Hyalella azteca*	Crustaceans	D	C, V	EC, PCWR, PCWS, PLCP, PWWR, PWWS
Short Finger Clam Shrimp	*Lynceus brevifrons*	Crustaceans	D	V	EC
Chihuahua Chub	*Gila nigrescens*	Fish	F	C, De, Di, V	PCWS, PMCSS, PWWS
Desert Sucker	*Catostomus clarkii*	Fish	F	C, V	PWWS
Gila Chub	*Gila intermedia*	Fish	F	C, De, Di, V	PWWS
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	Fish	L	C, De, V	PMCSS
Gila Trout	*Oncorhynchus gilae*	Fish	F	C, De, Di, V	PCWS
Gray Redhorse	*Moxostoma congestum*	Fish	F	C, De, Di, V	PWWR, PWWS
Headwater Catfish	*Ictalurus lupus*	Fish	D	C, V	PWWS
Headwater Chub	*Gila nigra*	Fish	F	C, Di, V	PCWS, PWWS
Loach Minnow	*Rhinichthys cobitis*	Fish	F	C, De, Di, V	PWWS
Pecos Gambusia	*Gambusia nobilis*	Fish	F	C, Di, V	PMCSS
Pecos Pupfish	*Cyprinodon pecosensis*	Fish	F	C, Di, V	PMCSS, PWWS
Rio Grande Chub	*Gila pandora*	Fish	F	C, De, Di, V	PCWR, PCWS, PWWR, PWWS
Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	Fish	F	C, De, Di, V	PCWS
Rio Grande Silvery Minnow	*Hybognathus amarus*	Fish	I	C, De, Di, V	PWWS
Rio Grande Sucker	*Catostomus plebeius*	Fish	F	C, De, V	PCWS, PWWS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Roundtail Chub	*Gila robusta*	Fish	F	C, De, Di, V	PCWS, PWWS
Sonora Sucker	*Catostomus insignis*	Fish	F	C, V	PWWS
Spikedace	*Meda fulgida*	Fish	F	C, De, Di, V	PWWS
Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	Fish	F	C, De, V	PWWS
Crandall's Hornet Fly	*Spilomyia crandalli*	Flies	D	C, De, V	M011
Southwestern Slender Bee Fly	*Thevenetimyia speciosa*	Flies	D	V	M893
Yellow-tailed Hornet Fly	*Spilomyia kahli*	Flies	D	V	M893
Allen's Big-eared Bat	*Idionycteris phyllotis*	Mammals	D	Di, V	EMCS, M010, M011, M020, M022, M036, M049, M086, M547, M887, M888, M893, M897, PMCSS
Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	Mammals	D	V	M010, M011, M020, M022, M034, M036, M076
Arizona Montane Vole	*Microtus montanus arizonensis*	Mammals	F	C, De, V	EMCS, M011, M020, M022, M034, M169, M547, M888, M893, PMCSS
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	D	C, De, K, V	M053, M086, M087, M092, M169, M171, M896

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Big Free-tailed Bat	*Nyctinomops macrotis*	Mammals	D	C, Di, V	EMCS, M010, M011, M022, M034, M036, M049, M076, M086, M087, M091, M092, M171, M887, M888, M893, M896, M897, PMCSS
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	F	C, De, K, V	M010, M036, M053, M076, M086, M087, M169, M547, M896, M897
Cave Myotis	*Myotis velifer*	Mammals	I	Di, K, V	EMCS, M010, M036, M053, M076, M086, M087, M091, M092, M887, M888, PMCSS
Eastern Red Bat	*Lasiurus borealis*	Mammals	D	Di, V	M010, M036, M076, M086, M087, M092
Fringed Myotis	*Myotis thysanodes thysanodes*	Mammals	I	C, Di, K, V	EMCS, M010, M011, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M171, M887, M888, M893, M896, M897, PMCSS
Gray-collared Chipmunk	*Neotamias cinereicollis cinereicollis*	Mammals	D	V	M020, M022, M034, M049, M547, M887
Gray-footed Chipmunk	*Neotamias canipes*	Mammals	D	V	M010, M020, M022, M049, M547, M887, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Gunnison's prairie dog	*Cynomys gunnisoni*	Mammals	F	C, De, K, V	M020, M022, M049, M053, M086, M087, M092, M093, M169, M171, M499, M547, M896, M897
Hoary Bat	*Aeorestes cinereus cinereus*	Mammals	D	C, De, Di, V	EMCS, M010, M011, M020, M022, M034, M036, M049, M076, M086, M087, M091, M092, M169, M171, M547, M888, M893, M896, M897, PMCSS
Holzner's Cottontail Rabbit	*Sylvilagus holzneri*	Mammals	D	C, V	M010, M011, M020, M022, M049, M547
Hooded Skunk	*Mephitis macroura milleri*	Mammals	D	C, V	M010, M011, M022, M036, M049, M076, M086, M087, M091, M092, M897
Jaguar	*Panthera onca arizonensis*	Mammals	L	C, De, Di, V	EMCS, M010, M011, M020, M022, M036, M049, M053, M076, M086, M087, M091, M092, M547, M887, M888, PMCSS
Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	Mammals	F	C, Di, V	EMCS, M010, M011, M036, M053, M076, M086, M087, M091, M092, M169, M547, M887, M888, M896, M897, PMCSS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Mexican Gray Wolf	*Canis lupus baileyi*	Mammals	I	C, De, V	EMCS, M010, M011, M020, M022, M036, M049, M053, M076, M086, M087, M091, M092, M169, M171, M547, M887, M888, M896, M897, PMCSS
Mexican Long-nosed Bat	*Leptonycteris nivalis*	Mammals	F	C, De, Di, V	EMCS, M010, M011, M022, M049, M053, M076, M086, M087, M091, M092, M547, M887, M888, PMCSS
Mexican Long-tongued Bat	*Choeronycteris mexicana*	Mammals	F	C, Di, V	EMCS, M010, M011, M020, M022, M036, M053, M076, M086, M087, M091, M092, M169, M547, M887, M888, PMCSS
New Mexico Jumping Mouse	*Zapus hudsonius luteus (= Zapus luteus luteus)*	Mammals	I	C, De, Di, V	EMCS, M011, M020, M022, M034, M036, M053, M076, M547, M888, M893, M896, M897, PCWS, PMCSS, PWWS
Peñasco Least Chipmunk	*Neotamias minimus atristriatus*	Mammals	F	C, De, Di, E, V	M011, M020, M022, M049, M053, M169, M547, M887, M893, M896
Southern Red-backed Vole	*Myodes gapperi*	Mammals	D	C, V	M020, M022, M034, M547, M887, M893

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Southwestern Little Brown Myotis	*Myotis occultus*	Mammals	D	C, Di, V	EMCS, M010, M011, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M171, M547, M887, M888, M893, M896, M897, PMCSS
Spotted Bat	*Euderma maculatum*	Mammals	D	Di, V	EMCS, M011, M020, M022, M034, M036, M049, M053, M076, M086, M087, M091, M092, M169, M171, M298, M547, M887, M888, M893, M896, M897, PMCSS
Western Red Bat	*Lasiurus blossevillii*	Mammals	D	C, Di, V	EMCS, M010, M011, M022, M036, M076, M086, M888, PMCSS
White-nosed Coati	*Nasua narica*	Mammals	D	V	M010, M011, M022, M036, M076, M086, M091, M092, M887, M896
Yellow-nosed Cotton Rat	*Sigmodon ochrognathus*	Mammals	D	V	M010, M011, M022, M036, M076, M087, M897
Yuma Myotis	*Myotis yumanensis yumanensis*	Mammals	D	C, De, Di, V	EMCS, M022, M034, M036, M049, M076, M086, M087, M091, M092, M171, M887, M888, M893, M896, M897, PMCSS

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Alamosa Springsnail	*Pseudotryonia alamosae*	Molluscs	F	C, De, Di, E, V	PMCSS
Bearded Mountainsnail	*Oreohelix barbata*	Molluscs	D	C, Di, V	M020, M022, M896, M897
Black Range Mountainsnail	*Oreohelix metcalfei*	Molluscs	D	C, Di, V	M020, M022, M887, M896, M897
Black Range Mountainsnail	*Oreohelix metcalfei cuchillensis*	Molluscs	D	C, Di, E, V	M887, M896, M897
Black Range Woodlandsnail	*Ashmunella cockerelli*	Molluscs	D	C, Di, V	M010, M022, M049, M547
Burnt Corral Pyrg	*Pyrgulopsis similis*	Molluscs	D	E, V	M010, M011
Capitan Woodlandsnail	*Ashmunella pseudodonta*	Molluscs	D	C, Di, V	M010, M011, M022, M053, M087, M171, M499, M897
Cockerell Holospira Snail	*Holospira cockerelli*	Molluscs	D	C, Di, V	M022, M887, M896, M897
Cooke's Peak Woodlandsnail	*Ashmunella macromphala*	Molluscs	D	C, Di, E, V	M010, M087, M091, M887
Diablo Mountainsnail	*Oreohelix houghi*	Molluscs	D	C, Di, V	M093, M169, M171, M887, M896

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Dry Creek Woodlandsnail	*Ashmunella tetrodon*	Molluscs	D	C, Di, V	M010, M022, M034, M036, M082, M087
Dry Creek Woodlandsnail	*Ashmunella tetrodon fragilis*	Molluscs	D	C, Di, E, V	M087
False Marsh Slug	*Deroceras heterura*	Molluscs	D	C, Di, V	M010, M020, M022, M034
Gila Springsnail	*Pyrgulopsis gilae*	Molluscs	I	C, E, V	PMCSS
Guadelupe Woodlandsnail	*Ashmunella carlsbadensis*	Molluscs	D	C, Di, V	M010
Iron Creek Woodlandsnail	*Ashmunella mendax*	Molluscs	D	C, Di, V	M010, M020, M022, M896, M897
Jordan Spring Pyrg	*Pyrgulopsis marilynae*	Molluscs	D	E, V	M034
Magdalena Mountainsnail	*Oreohelix magdalenae*	Molluscs	D	C, Di, V	M022, M049
Mineral Creek Mountainsnail	*Oreohelix pilsbryi*	Molluscs	D	C, Di, E, V	M034, M049, M887
Morgan Creek Mountainsnail	*Oreohelix swopei*	Molluscs	D	C, Di, V	M034, M082
Mountainsnail	*Oreohelix nogalensis*	Molluscs	D	C, Di, E, V	M020, M022
Multirib Vallonia Snail	*Vallonia gracilicosta*	Molluscs	D	C, Di, V	M020, M022
New Mexico Hot Springsnail	*Pyrgulopsis thermalis*	Molluscs	I	E, V	PMCSS
Northern Threeband	*Humboldtiana ultima*	Molluscs	D	C, Di, V	M010, M896, M897
Ovate Vertigo Snail	*Vertigo ovata*	Molluscs	D	C, Di, V	EMCS, M036, M076, M086, M888, PMCSS
Pinos Altos Mountainsnail	*Oreohelix confragosa*	Molluscs	D	C, Di, E, V	

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Rocky Mountainsnail	*Oreohelix strigosa depressa*	Molluscs	D	C, Di, V	M020, M022
Silver Creek Woodlandsnail	*Ashmunella binneyi*	Molluscs	D	C, Di, V	M010, M020, M022, M091
Socorro Mountainsnail	*Oreohelix neomexicana*	Molluscs	D	C, Di, V	M020, M022, M887, M896, M897
Socorro Springsnail	*Pyrgulopsis neomexicana*	Molluscs	I	C, De, Di, E, V	PMCSS
Sonoran Snaggletooth Snail	*Gastrocopta prototypus*	Molluscs	D	C, Di, V	M036, M076, M896, M897
Subalpine Mountainsnail	*Oreohelix subrudis*	Molluscs	D	C, Di, V	M020, M022
Vertigo Snail	*Vertigo concinnula*	Molluscs	D	C, Di, V	M020, M022, M896, M897
Whitewater Creek Woodlandsnail	*Ashmunella danielsi*	Molluscs	D	C, Di, V	M010, M011, M022, M036
Woodlandsnail	*Ashmunella rhyssa*	Molluscs	D	C, Di, V	M020, M022, M896, M897
Anicia Checkerspot	*Euphydryas anicia*	Moths and Butterflies	I	C, V	M020, M022, M049
Apache Northern Crescent	*Phyciodes cocyta apache*	Moths and Butterflies	I	C, E, V	M010, M022
Carlsbad Agave-Borer	*Agathymus neumoegeni carlsbadensis*	Moths and Butterflies	I	C, De, V	M049, M086, M087, M091, M547
Lafontaine's Cutworm Moth	*Euxoa lafontainei*	Moths and Butterflies	I	E, V	M087

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Monarch	*Danaus plexippus*	Moths and Butterflies	L	C, De, Di, V	M010, M011, M020, M022, M034, M036, M049, M053, M082, M086, M087, M091, M092, M169, M171, M298, M512, M888, M897
Mottled Duskywing	*Erynnis martialis*	Moths and Butterflies	L	De, V	M022, M049, M091
Mountain Checkered-skipper	*Pyrgus xanthus*	Moths and Butterflies	D	De, V	M010, M020, M022, M034, M049, M091, M093, M169, M171, M547, M893, M896, M897
Nokomis Silverspot	*Speyeria (Argynnis) nokomis*	Moths and Butterflies	I	C, De, Di, V	M036, M076
Nokomis Silverspot	*Speyeria (Argynnis) nokomis nokomis*	Moths and Butterflies	I	C, De, Di, V	M034, M171, M893
Orange Giant Skipper	*Agathymus neumoegeni neumoegeni*	Moths and Butterflies	D	C, V	M022, M087
Organ Mountains Poling's Hairstreak	*Satyrium polingi organensis*	Moths and Butterflies	I	C, E, V	M049, M091
Rhesus Skipper	*Polites rhesus*	Moths and Butterflies	D	C, V	M010, M011, M022, M034, M036, M053, M087, M091, M169, M171, M896, M897
Rindge's Emerald Moth	*Nemoria rindgei*	Moths and Butterflies	I	V	M022, M082, M086, M087, M091, M512
Sacramento Mountains Borer Moth	*Papaipema dribi*	Moths and Butterflies	D	E, V	

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Sacramento Mountains Checkerspot Butterfly	*Euphydryas anicia cloudcrofti*	Moths and Butterflies	I	C, E, V	M020, M022, M049, M091, M547
Sacramento Mountains Coral Hairstreak	*Satyrium titus carrizozo*	Moths and Butterflies	I	C, E, V	M020, M049
Sacramento Mountains Emerald Moth	*Nemoria subsequens*	Moths and Butterflies	I	E, V	M091
Sacramento Mountains Silvery Blue Butterfly	*Glaucopsyche lygdamus ruidoso*	Moths and Butterflies	I	C, E, V	M020, M022, M049, M547
Sacramento Mountains Western Green Hairstreak	*Callophrys affinis albipalpus*	Moths and Butterflies	I	C, E, V	M020, M022, M049, M091
Sacramento Mountains White-lined Hairstreak	*Callophrys sheridanii sacramento*	Moths and Butterflies	I	C, De, E, V	M020, M022, M049
Sacred Boisduval's Blue	*Icaricia icarioides sacre*	Moths and Butterflies	I	C, De, E, V	M020, M022, M049, M547
Sierra Blanca Margined White	*Pieris marginalis siblanca*	Moths and Butterflies	I	C, E, V	M010, M011, M022, M034, M091, M171
Socorro Chryxus Arctic	*Oeneis chryxus socorro*	Moths and Butterflies	I	C, E, V	M020
Ursine Giant Skipper	*Megathymus ursus ursus*	Moths and Butterflies	D	V	M087
West Coast Lady	*Vanessa annabella*	Moths and Butterflies	L	De, V	M011, M020, M022, M049, M053, M086, M169, M171, M897
White Sands Owlet Moth	*Aleptina arenaria*	Moths and Butterflies	I	E, V	M020, M086
Zuni Flower Moth	*Schinia zuni*	Moths and Butterflies	D	V	M171, M893

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
[Arizona Black Rattlesnake]()	*Crotalus cerberus*	Reptiles	I	C, De, Di, V	M010, M011, M020, M022, M036, M076, M091, M092, M547, M887, M896, M897, PMCSS
[Banded Rock Rattlesnake]()	*Crotalus lepidus klauberi*	Reptiles	I	C, De, Di, V	M010, M011, M020, M022, M049, M087, M091, M887, M896, M897
[Gila Monster]()	*Heloderma suspectum*	Reptiles	D	C, De, Di, V	M010, M036, M076, M086, M087, M091, M887, M896
[Gray-banded Kingsnake]()	*Lampropeltis alterna*	Reptiles	D	De, V	M076, M086, M087, M092, M887
[Mojave Rattlesnake]()	*Crotalus scutulatus scutulatus*	Reptiles	D	V	M086, M087
[Mottled Rock Rattlesnake]()	*Crotalus lepidus lepidus*	Reptiles	D	C, De, V	M086, M887, M896, M897
[Narrow-headed Gartersnake]()	*Thamnophis rufipunctatus*	Reptiles	L	C, De, Di, V	EC, EMCS, M010, M011, M022, M034, M036, M076, M888, PCWS, PMCSS, PWWS
[North American Racer]()	*Coluber constrictor*	Reptiles	D	C, De, Di, V	M022, M036, M053, M076, M092, M547, M896, M897
[Northern Mexican Gartersnake]()	*Thamnophis eques megalops*	Reptiles	L	C, De, Di, V	EC, EMCS, M011, M022, M036, M076, M888, PCWS, PMCSS, PWWS
[Ornate Box Turtle]()	*Terrapene ornata*	Reptiles	I	C, V	M010, M036, M053, M076, M086, M087, M092, M896, M897

Common Name[57]	Scientific Name	Taxon	Category	Reason to Include[58]	Habitats[59]
Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	Reptiles	L	C, De, Di, V	M010, M011, M020, M022, M049, M091, M896, M897
Smooth Greensnake	*Opheodrys vernalis blanchardi*	Reptiles	D	De, V	EMCS, M020, M022, M034, M547, M888, M893, PMCSS
Sonoran Lyresnake	*Trimorphodon lambda*	Reptiles	D	V	M010, M011, M036, M076, M086, M091, M887, M896, M897
Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	Reptiles	I	C, De, Di, V	EC, EMCS, M010, M036, M076, M888, M897, PCWR, PCWS, PLCP, PMCSS, PWWR, PWWS
Western Blind Snake	*Rena humilis segregus*	Reptiles	D	C, V	M010, M086, M087

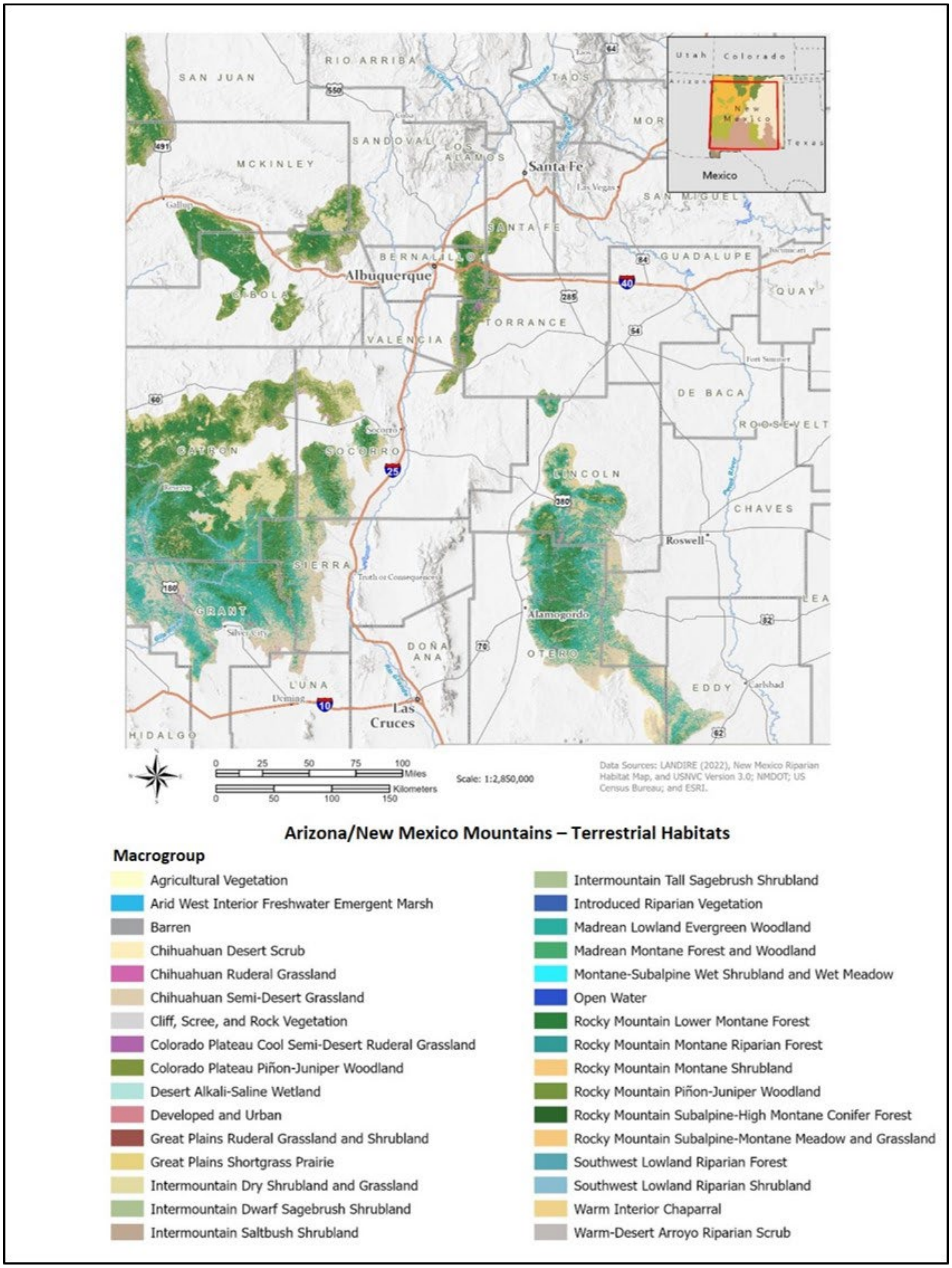


Figure 47. Terrestrial habitats in the Arizona/New Mexico Mountains ecoregion.

Map based on LandFire 2022 Existing Vegetation Map (LANDFIRE 2022) crosswalked to macrogroups from the United States National Vegetation Classification system and on vegetation types from the New Mexico Riparian Habitat Map (https://nhnm.unm.edu/riparian/nmripmap) grouped to macrogroups.

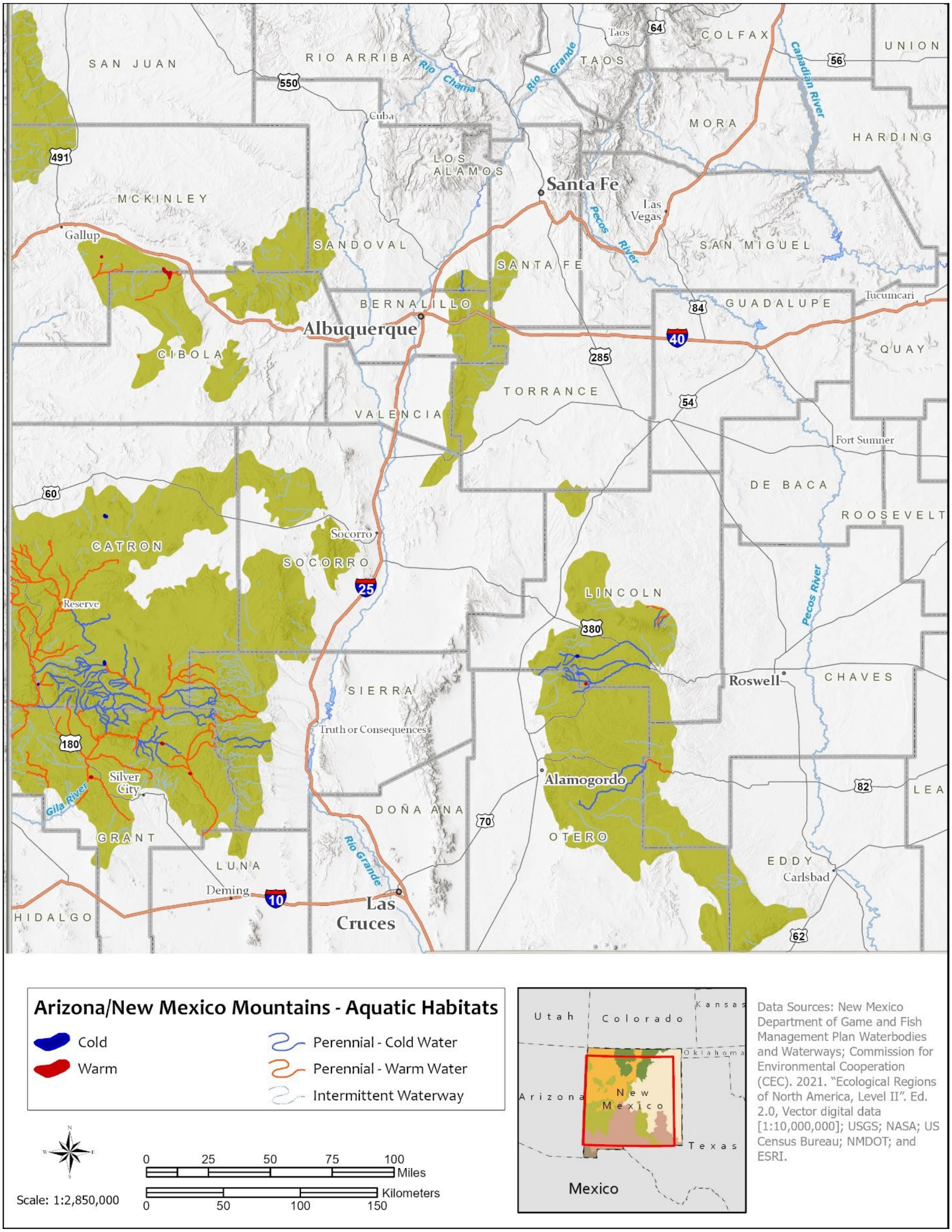


Figure 48. Aquatic habitats in the Arizona/New Mexico Mountains ecoregion.

HABITAT DESCRIPTIONS

MADREAN MONTANE FOREST AND WOODLAND

The Madrean Montane Forest and Woodland **[M011]**[60] is found from low to mid-montane elevations (1,460-2700 m [4,790-8860 ft]) of the Arizona/New Mexico Mountains and Madrean Archipelago ecoregions and in isolated locations in the mountains of the Chihuahuan Desert ecoregion.

- In New Mexico, these forest habitats are dominated or co-dominated by conifers that include Arizona pine (*Pinus arizonica*), Apache pine (*P. engelmannii*), ponderosa pine (*P. ponderosa*), Chihuahuan pine (*P. leiophylla*), and, occasionally, Arizona cypress (*Hesperocyparis arizonica*). Stands are typically co-dominated by evergreen oak trees (*Quercus* spp.) such as Arizona white oak (*Q. arizonica*), gray oak (*Q. grisea*), silverleaf oak (*Q. hypoleucoides*), canyon live oak (*Q. chrysolepis*), and Emory oak (*Q. emoryi*). Stands range from 15-30 m (49-98 ft) in height with open (10-20% cover) to moderately closed canopies (20-60%); occasionally more dense stands occur.
- An open-to-moderately dense shrub layer can be present and include chaparral or montane shrub species such as pointleaf manzanita (*Arctostaphylos pungens*), Fendler's ceanothus (*Ceanothus fendleri*), alderleaf mountain mahogany (*Cercocarpus montanus*), Sonoran scrub oak (*Q. turbinella*), and Wright's silktassel (*Garrya wrightii*).
- Open stands often have moderate-to-dense cover of perennial grasses such as bullgrass (*Muhlenbergia emersleyi*), longtongue muhly (*M longiligula*), screwleaf muhly (*M. straminea*), and Texas bluestem (*Schizachyrium cirratum*), particularly in inter-tree spaces.
- While forb cover can be low, species diversity can be high. Common examples are aromatic false pennyroyal (*Hedeoma hyssopifolia*), grassleaf pea (*Lathyrus graminifolius*), hairy-tuft four o'clock (*Mirabilis comata*), and New Mexico groundsel (*Packera neomexicana*).
- Fire regimes vary from mixed severity (surface and canopy fires) in the more closed-canopy forests to low-severity, mostly frequent surface fires typical of woodland savannas. Substrates generally are rocky with lithic soils but stands with a grass-dominated understory tend to occur on less steep and rocky slopes and have finer-textured soils.

[60] Complete descriptions of habitats can be viewed by clicking on hyperlinked United States National Vegetation Classification System codes.

WARM INTERIOR CHAPARRAL

The Warm Interior Chaparral **[M091]** habitat predominantly found in the Arizona/New Mexico Mountains ecoregion and in mountains within the Chihuahuan Desert and Madrean Archipelago ecoregions. It is characterized by moderate-to-dense canopies of mostly evergreen sclerophyllous shrubs that are less than <3 m (10 ft) tall. It is commonly found at mid elevations (1,300-2500 m [4,500- 8,000 ft]).

- The shrub layer can be diverse. Diagnostic shrub species include Sonoran scrub oak, pointleaf manzanita, and desert ceanothus (*Ceanothus greggii*), but other shrubs may be common including hairy mountain mahogany (*Cercocarpus montanus* var. *paucidentatus*), Wright's silktassel, pungent oak (*Quercus pungens*), Pinchot's juniper (*Juniperus pinchotii*), and skunkbush sumac (*Rhus trilobata*).
- The herbaceous layer is variable in cover but often sparse. Common species include hairy grama (*Bouteloua hirsuta*), cane bluestem (*Bothriochloa barbinodis*), plains lovegrass (*Eragrostis intermedia*), common wolfstail (*Lycurus phleoides*), and bullgrass.
- Many of the shrub species in this habitat are fire adapted. The role of fire is complex, but, in general, it can be responsible for maintaining this habitat across broad areas and as large patches in a woodland matrix.

THREATS AND CONSERVATION ACTIONS

Ten threats potentially could impact SGCN in 35 habitats within the Arizona/New Mexico Mountains ecoregion (Table 36). These threats are summarized below and listed in the order presented by the IUCN (2022). The list does not reflect the order of threat severity.

- Development: Home developments in forest and riparian areas.
- Agriculture and Aquaculture: Grazing practices that inhibit ecological processes of the Madrean forests and woodlands and riparian habitats.
- Energy and Mining: Disturbance and habitat loss from mining and potential future renewable energy development.
- Transportation and Service Corridors: Safe passage across roads, especially near Bent, Ruidoso, and Silver City, New Mexico (Cramer 2022). Forest fragmentation from utility corridors.
- Biological Resource Use: Wood harvesting.
- Human Intrusion and Disturbance: Off-highway vehicle (OHV) use, unauthorized dispersed camping, and increasing recreation in National Forests and designated wilderness areas, especially in alpine habitats and during SGCN breeding seasons.
- Natural System Modifications: Unnaturally high densities of trees due to fire suppression resulting in catastrophic wildfires.
- Invasive and Other Problematic Species, Genes, and Diseases: Invasion of riparian habitats by tamarisk (*Tamarix* spp.) or other exotic plants; and potential infection of bats by *Pseudogymnoascus destructans*, which can cause white-nose syndrome, and of amphibians by chytrid fungus (*Batrachochytrium dendrobatidis*), which can cause chytridiomycosis.
- Pollution: Runoff from mining activities.
- Climate Change: Habitat alteration from prolonged drought and projected increasing aridity. Portions of the Sacramento Mountains and Gila region have a high potential to contain macro- and microclimate refugia, especially for birds and mammals. These areas also have some potential to contain macro- and microclimate refugia for amphibians and high potential to contain macroclimate refugia for reptiles and cold-water fish. The Manzano and Sandia Mountains have high potential to contain microclimate refugia for all five categories of vertebrate taxa (Figure 15; Friggens et al. 2025). In general, a higher percentage of this ecoregion has the potential to provide microrefugia for amphibians, birds, and mammals and macro refugia for both aquatic and terrestrial species than any other ecoregion (Table 12). However, habitat suitability for the pinyon jay (*Gymnorhinus cyanocephalus*) may decline in most of the Apache Box Conservation Opportunity Area (COA), along the eastern edge of the Black Range COA, and in the northern portion of the Lower Gila River COA in future (NHNM 2024).

Conservation concerns include restoring the natural role of fire in forest habitats and restoring and conserving riparian and aquatic habitats, including those along the Gila River that are threatened by water withdrawals. Wildfires are becoming larger and more intense in this ecoregion. This trend is the result of unnatural densities of trees coupled with warming temperatures, increased occurrence and intensity of drought, and general trends towards increasing aridity. Some wildfires have been allowed to burn, and some prescribed fires have been set, where no homes or developments were threatened. These fires, when properly managed so that they burn at low-to-moderate intensity, can reset forest conditions help reduce the intensity of future fires and ensure these fires help to rejuvenate, rather than damage, forest habitats. Conservation actions to restore forest health, protect private property, and maintain the long-term suitability of SGCN habitat should be high priorities for this ecoregion.

Areas within the Arizona/New Mexico Mountains ecoregion were warmer (with an increase of 0.8 °C [1.5 °F]) and drier (with 2 cm [0.8 in] less precipitation) for the time period 1991 to 2020 compared to 1961 to 1990 (AdaptWest Project 2022).

This region contains a diverse set of habitats. With continued climate change, distribution and growth rates of two-needle piñon (*Pinus edulis*), Engelmann spruce (*Picea engelmannii*), Douglas-fir (*Pseudotsuga menziesii*), and Utah juniper (*Juniperus osteosperma*) are predicted to decline (Rehfeldt et al. 2006, Williams et al. 2010). These declines will be characterized by substantial shifts upslope (100-500 m (328-1,640ft)) and to more northerly aspects (Rehfeldt et al. 2006). Ponderosa pine and Douglas-fir at lower elevations of their distribution are likely to be at greatest risk for drought-induced mortality, and these species have already declined in the Zuni Mountains, whereas two-needle piñon may be vulnerable to mortality throughout its range (Williams et al. 2010, Wylie 2016). Suitable environmental conditions for the southwestern white pine (*Pinus strobiformis*) are projected to contract in both the Gila region and Sacramento Mountains (Shirk et al. 2018). In contrast, the distribution of Gambel oak (*Quercus gambelii*) is expected to increase across the region (Rehfeldt et al. 2006). At least one species of plant among 66 that were modeled is expected to experience unsuitable climatic conditions by 2060 across portions of the Sacramento Mountains and much of the Guadalupe Mountains in the Arizona/New Mexico Mountains ecoregion; some areas in the central part of the Sacramento Mountains are however projected to have suitable conditions for all modeled plants over this same timeframe (Thomas et al. 2023). Portions of the Gila National Forest, Guadalupe Mountains, Sacramento Mountains, and San Mateo Mountains are anticipated to experience a shift of at least one half of a plant hardiness zone by 2020-2050 compared to 2012 (Miller 2022), with implications for the continued survival of local plants. Rare plants associated with cool, shaded, north-facing slopes are anticipated to slow or potentially no recovery following future high-severity fires in the Gila National Forest (Roth 2016). The habitat with the greatest vulnerability to climate change in this ecoregion is Great Plains Shortgrass Prairie (moderate to very high) (Table 34; Triepke et al. 2014).

Table 36. Potential threats to habitat and associated SGCN in the Arizona/New Mexico Mountains ecoregion.

Threat categories were derived from IUCN (2022).

Habitat \ Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Arid West Interior Freshwater Emergent Marsh		X					X	X	X	X
Chihuahuan Desert Scrub		X	X	X	X	X	X	X		X
Chihuahuan Ruderal Grassland		X	X	X		X		X		
Chihuahuan Semi-Desert Grassland		X	X	X	X	X	X	X	X	X
Cliff, Scree, and Rock Vegetation			X	X		X				
Colorado Plateau Cool Semi-Desert Ruderal Grassland		X	X			X		X		
Colorado Plateau Piñon-Juniper Woodland	X	X	X	X	X	X	X	X	X	X
Desert Alkali-Saline Wetland		X	X					X	X	X
Ephemeral Catchments							X	X		
Ephemeral Marshes/Cienegas/Springs							X	X		
Great Plains Ruderal Grassland and Shrubland		X	X			X		X		
Great Plains Shortgrass Prairie		X	X			X	X	X		X
Intermountain Dry Shrubland and Grassland		X	X			X		X	X	X
Intermountain Saltbush Shrubland		X				X		X	X	X
Intermountain Tall Sagebrush Shrubland		X	X					X	X	X
Introduced Riparian Vegetation										
Madrean Lowland Evergreen Woodland	X	X	X	X	X	X	X		X	X
Madrean Montane Forest and Woodland	X	X	X	X	X	X	X		X	X
Montane-Subalpine Wet Shrubland and Wet Meadow		X				X	X			X
Perennial Cold-Water Reservoirs	X						X	X		X

Habitat \ Threat	Development	Agriculture and Aquaculture	Energy and Mining	Transportation and Service Corridors	Biological Resource Use	Human Intrusions and Disturbance	Natural System Modifications	Invasive and Other Problematic Species	Pollution	Climate Change and Severe Weather
Perennial Cold-Water Streams	X	X	X	X	X	X	X	X	X	X
Perennial Lakes, Cirques, Ponds							X	X		
Perennial Marsh/Cienega/Spring/Seep		X	X	X	X	X	X	X	X	X
Perennial Warm-Water Reservoirs		X					X	X	X	X
Perennial Warm-Water Streams		X					X	X	X	X
Rocky Mountain Lower Montane Forest	X	X	X	X	X	X	X			X
Rocky Mountain Montane Riparian Forest	X	X	X		X	X	X	X	X	X
Rocky Mountain Montane Shrubland	X	X	X			X	X			X
Rocky Mountain Piñon-Juniper Woodland	X	X	X	X	X	X	X	X	X	X
Rocky Mountain Subalpine-High Montane Conifer Forest	X			X	X	X	X			X
Rocky Mountain Subalpine-Montane Meadow and Grassland	X			X	X	X	X			X
Southwest Lowland Riparian Forest		X	X	X	X	X	X	X	X	X
Southwest Lowland Riparian Shrubland		X	X	X	X	X	X	X	X	X
Warm Interior Chaparral	X		X			X	X			X
Warm-Desert Arroyo Riparian Scrub		X	X	X			X	X	X	X

The following are proposed conservation actions for the Arizona/New Mexico Mountains ecoregion, listed in order of priority within each threat category (IUCN 2022). Threat categories are listed according to the order presented by IUCN (2022).

DEVELOPMENT:

- Reduce impacts of housing developments by establishing development standards that ensure habitat integrity and functionality while minimizing wildfire threats to private residences in the wildland urban interface. Potential collaborators: local governments, municipalities.
- Participate in public-involvement opportunities when proposed developments might threaten the persistence of SGCN and their habitats. Potential collaborators: non-profit organizations, private landowners.

AGRICULTURE AND AQUACULTURE:

- Determine where habitat restoration would benefit SGCN and work with federal, state, Tribal, and private land managers to restore degraded rangelands to good or excellent condition. Monitor restoration results to develop and initiate any identified improvements to restoration practices. Potential collaborators: United States (US) Bureau of Land Management (BLM), US Forest Service (USFS), New Mexico State Land Office (SLO), private land managers, Tribal natural-resource managers.
- Determine how timing, intensity, and duration of livestock grazing affect SGCN and their habitats, including the interactions among grazing, fire, and the spread of invasive and other problematic species and among grazing, soil erosion (e.g., Pilon et al. 2017), and native riparian vegetation growth (e.g., Lucas et al. 2004). Potential collaborators: BLM, US Natural Resources Conservation Service (NRCS), USFS, New Mexico Department of Agriculture (NMDA), SLO, universities, private landowners, Tribal natural-resource managers.
- Establish baseline composition, condition, disturbance regimes, and function of major range habitats to inform habitat-restoration activities, including addressing tree invasion into grassland meadows and activities in riparian habitats. Potential collaborators: BLM, USFS, SLO, universities, private landowners, Tribal natural-resource managers.
- Promote expanded use of appropriate, cost-effective grazing practices that ensure long-term ecological sustainability for SGCN and their habitats (especially riparian habitats). These include actions such as rest-rotation grazing management and conservation easements (Gripne 2005) that contribute to recovery of rangelands impacted by drought and allow restoration activities to be completed. May also include the use of virtual fencing to keep livestock in desired locations and out of sensitive areas (USFS 2024). Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.
- Promote grazing systems that address local needs of livestock and for SGCN habitat, including riparian areas. When particular habitat components need improvement, coordinate with ranchers and resource managers to identify and implement modifications that would provide the desired habitat outcomes. Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.

- Gather and assess current information on grazing practices and determine how the Department can support landowners that provide habitat for SGCN. Potential collaborators: BLM, NRCS, USFS, NMDA, SLO, private landowners, Tribal natural-resource managers.
- Balance irrigation and groundwater demands with the needs of aquatic communities, particularly those supporting native fish, amphibian, and springsnail populations. This may include promoting a transition from irrigated to dryland farming in areas where groundwater pumping and water scarcity threaten SGCN and their habitats. Potential collaborators: US Bureau of Reclamation (BOR), NRCS, US Army Corps of Engineers (USACE), New Mexico Office of the State Engineer (NMOSE), non-profit organizations, private landowners, Tribal natural-resource managers, water-management districts.
- Work with private landowners to improve irrigation processes and infrastructure to conserve water. Includes promoting the use of devices and models that improve water conservation and irrigation efficiency (Schaible and Aillery 2012, Wang 2019) to help conserve the structure and function of aquatic and riparian habitats. Potential collaborators: NRCS, NMOSE.
- Identify human-constructed water-retention structures (e.g., stock tanks, water troughs, and drinkers) that provide habitat for aquatic SGCN and other wildlife, particularly amphibians. Remove invasive species (e.g., bullfrogs [*Rana* (*Aquarana*) *catesbeiana*]) from these structures that may threaten native aquatic wildlife. Potential collaborators: BLM, USFS, universities, private landowners, Tribal natural-resource managers.
- Where appropriate, promote the use of flood irrigation for crops such as grass hay in historic riparian floodplains of upper watershed regions to mimic natural processes (i.e., seasonal flooding) and benefit SGCN and other wildlife (Donnelly et al. 2024). Potential collaborators: NRCS, NMDA, non-profit organizations, private landowners, Tribal natural-resource managers.
- Promote grazing systems that incorporate rested pastures and help improve overall range condition and enhance wildlife habitat health and function. In upland areas, these systems may include rest-rotation and/or deferred-rotation. In riparian areas, beneficial grazing practices may also include grazing in early spring and restricting summer grazing and redistribution practices such as herding and developing drinking water sources in upland areas. Especially during times of drought, rested pastures can provide forage reserves and relieve pressure on grazed pastures or allotments. Potential collaborators: BLM, NRCS, USFS, SLO, private landowners, Tribal natural-resource managers.
- Promote use of ecoregion-appropriate agricultural practices that provide habitat or resources or protect habitat quality (e.g., reduce erosion) for SGCN, including planting rows of trees between crops (McCarthy 2024) and pollinator-friendly practices such as planting pollinator habitat along field margins and underutilized areas, revegetating retired farmland with wildflowers, including pollinator-friendly forbs in cover-crop seed mixes (O’Brien and Arathi 2021), and conserving semi-natural habitat near agricultural fields (Shi et al. 2024). Potential collaborators: NRCS, USFWS, NMDA, private landowners, Tribal natural-resource managers.

ENERGY AND MINING:

- Determine where energy development and mineral extraction currently, and in the future, may affect SGCN. Work with regulatory agencies to develop permitting guidelines and policies that result in siting new development in areas that minimize impacts to SGCN. Potential collaborators: BLM, USFS, New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), New Mexico Bureau of Geology and Mineral Resources (NMBGMR), SLO, energy and mining companies.
- Reclaim disturbed habitats impacted by resource extraction as close as possible to pre-development conditions. Rehabilitate mining sites and associated access roads. Remove unneeded roads and any other abandoned infrastructure and equipment (e.g., pits, unused machinery). Restore native vegetation. Where feasible, maintain abandoned mines as habitat for bats and snakes by constructing appropriate bat gates on mine shafts and adits (Spanjer and Fenton 2005). Potential collaborators: BLM, USFS, US Fish and Wildlife Service (USFWS), EMNRD, SLO, energy and mining companies, private landowners.
- Identify and promote best management practices that minimize the impacts (especially habitat fragmentation and direct SGCN mortality) of energy development (including of renewable energy sources [Lovich and Ennen 2011, Copping et al. 2020, Levin et al. 2023]) and mining on SGCN and their aquatic and terrestrial habitats. This includes informing and supporting resource managers in the implementation of measures to prevent direct take of SGCN associated with energy extraction and mining (e.g., use of appropriate exclusionary netting and/or fencing, bird balls, and closed containment systems at toxic sites). May also include increased use of small, localized installations (e.g., community solar development) rather than utility-scale developments (Bowlin et al. 2024). Potential collaborators: BLM, EMNRD, SLO, universities, energy and mining companies, municipalities.
- Maintain and expand open communication with mining and energy companies and land-management agencies to minimize adverse impacts of development to SGCN. Potential collaborators: BLM, USFS, EMNRD, SLO, energy and mining companies.

TRANSPORTATION AND SERVICE CORRIDORS:

- Site, consolidate, and maintain utility corridors to minimize adverse effects to SGCN and their habitats. Reduce avian powerline collisions by using line markers and illumination with ultraviolet lights and by burying powerlines (Bateman et al. 2023). Avoid mowing rights-of-way during peak SGCN pollinator larvae abundance and avoid mowing patches of nectar resources important for pollinator SGCN (e.g., Xerces Society 2018). Potential collaborators: BLM, USFS, SLO, interested and affected members of the public, local governments, utility companies.
- Determine where roads, vehicle traffic, and utility lines are inhibiting or preventing movement of SGCN, including during migration. Identify and conserve natural habitat corridors, especially those at risk from future fragmentation by roads or utility lines. This may include reconnecting stream and wetland habitats that have been fragmented by roads, culverts, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Does not include structures that serve a beneficial role for wildlife (e.g.,

native fish barriers). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, US National Park Service (NPS), USFS, New Mexico Department of Transportation (NMDOT), universities, non-profit organizations, private landowners, utility companies.
- Work with collaborators to complete mitigation measures that will increase the probability of safe passage across roads and near utility lines for affected SGCN. These include modifying barrier fences along roadways, constructing road crossings, placing warning signs for motorists, marking utility lines so they can be readily seen by birds, and placing safeguards that will reduce the probability of electrocution. Integrate benefits to SGCN in projects primarily designed and implemented to enhance safe passage for large mammals (e.g., projects implemented under the Wildlife Corridors Action Plan) (Cramer et al. 2022). Monitor the efficacy of mitigation measures and initiate any identified maintenance and improvements. Potential collaborators: BLM, USFS, NMDOT, SLO, private landowners, utility companies, Tribal resource management entities.
- Work with appropriate agencies to develop and enforce road-management plans (Crist et al. 2005). Potential collaborators: BLM, USFS.

BIOLOGICAL RESOURCE USE:

- Determine the distribution (historic, current, and future), composition, disturbance regimes, and function of piñon-juniper woodlands and savannas needed by SGCN and SGCN prevalence in these habitats. Potential collaborators: BLM, NPS, USFS, universities, private landowners, Tribal natural-resource managers.
- Develop and implement strategies to sustainably harvest wood products while retaining pine-oak regeneration, old-growth trees, large diameter snags, and coarse woody debris at densities needed by SGCN. Potential collaborators: BLM, USFS, New Mexico State Forestry Division (SFD), SLO, private landowners.
- Work with landowners and land-management agencies to use forests and woodlands in a manner that maintains healthy, and returns degraded, stands to an improved composition and function for SGCN. Potential collaborators: BLM, NPS, USFS, SFD, SLO, private landowners.
- Inform natural-resource law enforcement officers of the distribution, life history, and habitat needs of SGCN. Partner with them to enforce laws to protect SGCN populations and habitats. Potential collaborators: BLM, NPS, USFS.

HUMAN INTRUSIONS AND DISTURBANCE:

- Identify and characterize areas and routes frequented by OHVs, including snowmobiles, and used by other recreationists, and use that information to assess the potential impacts to SGCN, other wildlife, and their habitats (e.g., Larson et al. 2016, Cretois et al. 2023, Zeller et al. 2024). This includes identifying and characterizing areas used for and impacts from unauthorized dispersed camping (Marion et al. 2018) and winter recreation activities (e.g., downhill and cross-country skiing, snowmobiling, and snowshoeing) (Morris 2024). Potential collaborators: BLM, NPS, USFS, SLO, universities, Tribal natural-resource managers.

- Identify, designate, and promote areas for OHV and other recreational use, including dispersed camping, that avoid disturbance to, or modification of, SGCN habitats. Potential collaborators: BLM, NPS, USFS, SLO.
- Initiate a public-information campaign to inform and educate OHV users and other recreationists of both permitted and prohibited activities that can impact SGCN and other wildlife. This may include public-service announcements, print advertising, public meetings, and signs in areas frequented by OHV users and other recreationists. Ensure that the campaign presents information in ways, and using languages, accessible to a diverse public (LCJF 2022). Potential collaborators: BLM, NPS, USFS, SLO, local governments, non-profit organizations.
- Work with public land-management agencies to regularly review and update OHV travel routes and recreational trails open to the public and appropriate restrictions on recreation necessary to protect SGCN and other wildlife. Potential collaborators: BLM, NPS, USFS, SLO.
- Work with land-management agencies to improve OHV and other recreational law enforcement with passive measures (e.g., strategically located barricades) and active measures (e.g., monitoring and enforcement patrols) to reduce negative impacts of OHVs and other recreational activities on SGCN and other wildlife. Potential collaborators: BLM, NPS, USFS, SLO.
- Work with the public to educate residents and recreationists about restrictions on and potential negative impacts of free-ranging, domestic pets, especially both domestic and feral cats (Loss et al. 2013b), on SGCN and other wildlife. Potential collaborators: universities, municipalities, non-profit organizations.
- Discourage recreation development in aspen (*Populus* spp.) stands to reduce exposure of aspens to injury and fungal infections. Potential collaborators: USFS.

NATURAL SYSTEM MODIFICATIONS:

- As appropriate to local site conditions (e.g., topography, prevailing winds, disturbance history, infrastructure) (Urza et al. 2023) and not in persistent piñon-juniper woodlands (Romme et al. 2009, Darr et al. 2022), thin stands of trees in forests and woodlands to natural or historic densities that reduce the probability of insect and disease outbreaks and stand-replacing wildfires. Avoid unnecessary removal of large old-growth trees and snags, which serve as important wildlife habitat (Kalies and Rosenstock 2013); use best practices to maintain soil health (e.g., Tomao et al. 2020), including retaining sufficient seed trees and sources of mycorrhizal inoculum (Simard et al. 2021); implement landscape- and regional-scale heterogeneity in treatment design (Bradley 2009); and evaluate treatment effectiveness (e.g., McKinney et al. 2022, Davis et al. 2024, Hood et al. 2024), including monitoring local SGCN populations. Potential collaborators: BLM, USFS, SFD, SLO, non-profit organizations.
- Restore and protect aquatic, riparian, wetland, and wet meadow habitats, particularly springs and cienegas, and the surface and groundwater that supports them. Minimize activities that lead to gully formation, soil erosion, or a loss of soil health (e.g., soil fungal diversity) (Wagner 2023). Potential collaborators: BLM, NPS, NRCS, USFS, New Mexico

Environment Department (NMED), SLO, private landowners, Tribal natural-resource managers.

- Design and implement riparian and aquatic habitat-restoration projects to benefit SGCN. This may include establishing priorities for habitat restoration and developing reach-specific plans. May also include designing and implementing low-tech, process-based restoration techniques (Wheaton et al. 2019) to restore degraded headwater stream systems and improve SGCN habitat and reintroducing keystone species including American beavers (*Castor canadensis*) (Baker and Cade 1995, McKinstry et al. 2001, Grudzinski et al. 2022) and native fishes. Monitor restoration projects to determine effectiveness (Block et al. 2001. Holste et al. 2022) and to inform adaptive management. Potential collaborators: BLM, NPS, USFS, NMED, SFD, SLO, universities, non-profit organizations, private landowners, Tribal natural-resource managers.
- Determine beneficial fire frequencies and intensities and work with land-management agencies, sovereign Tribal entities, and private landowners to develop fire management plans that thoroughly consider local environmental conditions (e.g., weather, fuel conditions, landscape characteristics, local wildlife) (Russell et al. 2024) and implement prescribed burns or cultural burns (Parks et al. 2023b, Eisenberg et al. 2024) that avoid disturbing SGCN during sensitive periods (e.g., nesting); maintain condition of sensitive habitats (e.g., riparian habitat), ecosystem components (e.g., soil microbiotic community [Dove and Hart 2017, Brady et al. 2022, Nelson et al. 2022], regenerating seedlings [Owen et al. 2020]), and ecosystem function (e.g., soil carbon storage, nutrient cycling) (Brady et al. 2022, Nelson et al. 2022); enhance local diversity (Bowman et al. 2016, Eisenberg et al. 2024) and gene flow (Jones et al. 2023), including of SGCN such as pollinating insects; and protect people and property (USFS 2022). Potential collaborators: BLM, NPS, USFS, SFD, SLO, universities, private landowners, Tribal natural-resource managers.
- Determine responses of upland, and associated riparian/aquatic, communities that include SGCN to prescribed burns and wildfires (e.g., Saab et al. 2022). Where appropriate, integrate low-intensity fire and fuels reduction management into riparian ecosystem conservation. Design and implement projects that reduce unnaturally high fire risk associated with increased fuel loads or lack of moist soils in riparian areas. Methods may include flooding and/or implementing environmental flows, mechanical removal of non-native woody plants (e.g., tamarisk) and woody debris (Ellis 2001, Webb et al. 2019) and replanting native riparian vegetation (Queheillalt and Morrison 2006, Mosher and Bateman 2016). Potential collaborators: BLM, NPS, USFS, SLO, universities, private landowners, water-management districts.
- Promote post-fire management activities that are beneficial to SGCN. Includes minimizing ash flow into streams and other post-fire impacts to water quality (Rhoades et al. 2019a, Rhoades et al. 2019b), augmenting natural plant regeneration (e.g., planting tree seedlings in areas with appropriate microclimatic conditions) (Marchall et al. 2023) and protecting natural seed sources (Stevens et al. 2021), and encouraging heterogeneity (Ziegler et al. 2017, Owen et al. 2020). Potential collaborators: NRCS, NPS, USFS, NMED, SFD, SLO, non-profit organizations, private landowners, Tribal natural-resource managers.

- Restore, protect, and monitor important disjunct wildlife habitats, such as caves, limestone outcrops, and talus slopes. Potential collaborators: BLM, NPS, NRCS, USFS, EMNRD, SLO, non-profit organizations, private landowners.
- Assess the impacts of stream-flow magnitude, frequency, timing, duration, and rate of change on riparian ecosystems and the effects of hydrologic alterations on these ecosystems. Determine flows needed to sustain SGCN and their habitats and the effects of flow modification by upstream dams and of upland disturbances in local watersheds (Goeking and Tarboton 2022). Work with agencies that manage dams and reservoirs to ensure released environmental flows match amounts and timing of flows needed for persistence of native riparian communities and associated SGCN, including allowing for overbank flows to coincide with seed dispersal from native vegetation (e.g., Greco 2013) and when saturated soil can best benefit SGCN prey. Potential collaborators: BOR, USACE, USFWS, US Geological Survey (USGS), NMED, NMOSE, universities, private industry.
- Determine amount, status, and trend of upland, aquatic, and riparian habitats; levels of fragmentation; and how SGCN might be affected. Identify appropriate locations and implement projects to enhance habitat quality and connectivity or prevent further fragmentation. This may include re-connecting streams and aquatic habitats that have been fragmented by dams, diversions, and other man-made structures that isolate and preclude movement of aquatic and semi-aquatic SGCN. Remove structures when feasible; otherwise, improve existing infrastructure by incorporating passage features for aquatic organisms (e.g., fish ladders). May also include protecting and promoting the natural establishment, development, and succession of native riparian vegetation by addressing any locally limiting hydrological conditions (e.g., ensuring overbank flooding occurs at optimal times and establishment of early successional vegetation) (Hatten et al. 2010, Greco 2013, Stanek et al. 2021, Wohner et al. 2021). May further include emphasizing restoration in areas that will enhance connectivity between native riparian habitat patches (e.g., migratory stopover sites) (McNeil et al. 2013). Re-establish SGCN in areas where extirpated and appropriate. Potential collaborators: BLM, NPS, USFS, NMDOT, NMED, SFD, SLO, Soil and Water Conservation Districts (SWCDs), universities, non-profit organizations, private landowners, Tribal natural-resource managers, water-management districts.
- Encourage aquatic habitat-improvement projects, such as creating ponds and oxbows near stream systems and stock tank improvements, to benefit aquatic SGCN (Stuart and Ward 2009, Stone et al. 2022). Potential collaborators: BLM, NPS, NRCS, USFS, NMED, SLO, private landowners, Tribal natural-resource managers.
- Survey and monitor perennial marshes/cienegas/springs/seeps habitats and the SGCN that inhabit them to determine changes in habitat quantity and quality and the status and trend of SGCN populations. Promote conservation efforts, such as protecting groundwater resources, that enhance the persistence and quality of these perennial aquatic habitats. Potential collaborators: BLM, USFS, NMED, SLO, universities, Tribal natural-resource managers.
- Encourage sustainable groundwater use to protect aquatic and riparian habitats from lowered groundwater tables. Promote water conservation, such as use of devices and models that facilitate optimal irrigation (Schaible and Aillery 2012, Storm et al. 2024) and estimate water consumption and withdrawal (Zhou et al. 2021) or temporary field fallowing

(DBSA 2022) and dryland farming, especially of drought-adapted crops (McCarthy 2024), to conserve the structure and function of aquatic and riparian habitats. Promote the use of water data from groundwater monitoring networks (Pine et al. 2023) to inform water conservation and management strategies. Potential collaborators: NRCS, NMBGMR, NMDA, SLO, municipalities, private landowners, water-management districts.
- Promote public participation in restoration and conservation of watersheds. Potential collaborators: NPS, USFS, NMED, SFD, universities, private landowners, non-profit organizations.
- Inform interested and affected members of the public about the value of aquatic and riparian systems and maintaining in-stream flows in order to build support for conservation of aquatic and riparian species and habitat-restoration efforts. Potential collaborators: NRCS, NPS, USFS, NMED, universities, non-profit organization, private landowners.

INVASIVE AND OTHER PROBLEMATIC SPECIES, GENES, AND DISEASES:

- Work with appropriate agencies to enforce regulations to prevent the introduction and spread of non-native species. Potential collaborators: USFWS, NMDA.
- Determine the distribution of all invasive and other problematic species and diseases found in New Mexico, assess related threats to SGCN, and develop and implement strategies to address these threats, including eradicating existing populations of non-native and invasive species when appropriate. When removing non-native vegetation, ensure that any SGCN that use this vegetation have suitable alternate habitat present (e.g., Sogge et al. 2013) and that site conditions support the restoration of native plants. If herbicide application cannot be avoided, limit impacts to pollinating insect SGCN by applying to smaller patches within the treatment area (e.g., Black et al. 2011) and spraying before target plants bloom (Hopwood et al. 2015). Potential collaborators: BLM, NRCS, USFS, NMDA, NMED, SLO, universities, non-profit organizations, private landowners.
- Design and implement protocols for early detection of invasive and other problematic species and diseases. Quickly respond to detection. Potential collaborators: BLM, NPS, NRCS, USFS, NMDA, NMED, SLO, universities, private landowners.
- Develop strategies to prevent emerging diseases from getting into New Mexico and develop and implement strategies that will inhibit the spread of ones already present (e.g., Clemons et al. 2024). This includes working with land-management agencies to control human access for recreation or other purposes as needed (Reynolds and Barton 2013), educating the public about what they can do to mitigate disease spread (e.g., Olson and Pilliod 2022), implementing appropriate hygiene guidelines for field researchers (e.g., Shapiro et al. 2024), and incorporating principles related to the interconnectedness of humans with local flora, fauna, and the natural environment (i.e., One Health) (AFWA 2023). Potential collaborators: BLM, NPS, USFS, NMED, SLO, universities.
- Identify historic and current SGCN habitats infested with cheatgrass (*Bromus tectorum*). Work with landowners and land-management agencies to restore these areas to native vegetation. Promote land-management strategies that will inhibit the further spread of cheatgrass. Potential collaborators: BLM, USFS, SLO, private landowners, Tribal natural-resource managers.

- As needed, gather additional information regarding the distribution of tamarisk and other exotic plants in riparian habitats (e.g., NHNM 2023). Determine the impact of exotic plants, and their removal and reduction, on SGCN and their habitats. Create and implement site-specific plans, with measurable goals and objectives, to restore the historic structure and composition of riparian habitats while minimizing negative impacts on SGCN and soil health (Wagner 2023). Prioritize removal of monoculture stands of non-native plants (e.g., Johnson et al. 2018b) and ensure that sufficient native riparian vegetation is locally available to SGCN and that local hydrological conditions support native vegetation regrowth. Since pollinating insects may use exotic riparian plants (e.g., Pendleton et al. 2011), minimize impacts of removing these plants on pollinating insect SGCN, including by avoiding herbicide application when plants are in bloom and treating the focal area in stages. Include post-implementation monitoring and maintenance for all riparian restoration projects. Document and report restoration approaches used, including successes and failures (Shafroth et al. 2008, Sogge et al. 2013). Potential collaborators: BLM, NRCS, USFS, NMDA, SFD, SLO, Soil and Water Conservation Districts, universities, non-profit organizations, private landowners.
- Continue current efforts to prevent the infestation of aquatic habitats in New Mexico by zebra and quagga mussels and other aquatic invasive species. This includes informing anglers and boaters of the importance of not introducing invasive and other problematic species and providing them with information on how to prevent the spread of aquatic invasive species. Potential collaborators: BLM, USFS, NMED, New Mexico State Parks (NMSP), universities, non-profit organizations.
- Where feasible, reestablish native aquatic communities in perennial streams and restored aquatic habitats. Potential collaborators: BLM, USFS, NMED, SLO, non-profit organizations, private landowners.
- Restore native riparian plants (e.g., cottonwood [*Populus* spp.] and willow [*Salix* spp.]) and natural riparian ecosystem processes and functions following the removal or biocontrol of tamarisk and other non-native plants. Ensure maintenance of adequate water supply for native plants. At sites with low water availability, restoration of native xeric plants may be more appropriate than hydroriparian and wetland plants. Stage and balance non-native plant removal and native habitat restoration over time, to avoid rapid loss of exotic woody riparian habitats for wildlife until native habitats can be developed (Sogge et al. 2013), and minimize herbicide use. Potential collaborators: BLM, NPS, USFS, NMED, SLO, universities, non-profit organizations, private landowners, Tribal natural-resource managers.
- Proactively restore native riparian vegetation in areas likely to be most altered by the tamarisk beetle (*Diorhabda* spp.; i.e., large tamarisk monocultures [Johnson et al. 2018b] in river systems where the hydrology has been highly altered). Protect and sustain existing stands of native riparian vegetation that may serve as important refugia in areas currently or likely to be affected by the tamarisk beetle (Paxton et al. 2011, Sogge et al. 2013). Potential collaborators: BLM, USFS, NMED, SLO, universities, non-profit organizations, private landowners.
- Consider the impact of honeybee apiaries on wildlands and restrict their placement in areas where native bee SGCN occur. Honeybees can pose a disease spillover risk for wild bees

(Tehel et al. 2016). Potential collaborators: universities, non-profit organizations, private landowners.

POLLUTION:

- Work with appropriate agencies that enforce mining and energy development regulations, Best Management Practices, and safeguards to protect water quality and minimize SGCN mortality associated with mining and energy development. Assess impacts to SGCN and their habitats from industrial activities, including mining and energy development. These impacts may include direct mortality, pollution from transport of extracted or waste products or from acid mine drainage, and sediment runoff from roads. Potential collaborators: BLM, USFS, EMNRD, NMED, SLO, energy and mining companies, local governments.
- Determine effects of, and implement actions to mitigate negative effects from, agrochemicals (e.g., neonicotinoids, other pesticides) (Sanchez-Bayo 2021, EPA 2023), synthetic chemicals (e.g., per- and polyfluoroalkyl substances [PFAS]), microplastics, and other pollutants (e.g., sewage, nutrients, toxic chemicals, sediment) on SGCN, especially fish and pollinating insects, and their habitats. This includes solid waste that may entangle wildlife. Potential collaborators: US Environmental Protection Agency (EPA), NMDA, NMED, universities, local governments, private industry.

CLIMATE CHANGE AND SEVERE WEATHER:

- Determine how regional and global climate change will affect SGCN, vegetation patterns (e.g., Davis et al. 2019, Coop et al. 2020, Guiterman et al. 2022, Davis et al. 2023), and community (e.g., Rosenblad et al. 2023) and ecosystem processes and dynamics, including disturbance regimes. This includes identifying SGCN (e.g., Glick et al. 2011) and associated habitats that are most likely to be negatively affected by climate change, including impacts on travel corridors, habitat connectivity, and species and habitat ranges. Identification of environmental conditions or thresholds that could limit SGCN is especially important. Potential collaborators: BLM, NPS, USFS, USFWS, USGS, EMNRD, SLO, universities.
- Identify climate change (e.g., Michalak et al. 2020) or disturbance refugia (e.g., Rodman et al. 2023) for SGCN and their habitats and implement conservation actions to conserve, expand, or enhance these refugia. As appropriate, consider refugia when implementing conservation actions (e.g., focus on refugia when planting native plants to encourage reforestation following a fire) (Hennessy et al. 2024). Potential collaborators: BOR, USFS, USGS, universities.
- Identify and implement actions to mitigate the effects of climate change on SGCN and their habitats. These may include actions that assist in enhancing carbon sequestration in natural environments (e.g., appropriate forest conservation and management [Mo et al. 2023]), improving climate resilience of species and communities (e.g., Dyshko et al. 2024), or climate-smart projects that help maintain, or accommodate for or facilitate climate-related shifts in (e.g., Stanturf et al. 2024, USFWS 2024a), the distribution and natural functioning, including disturbance regimes, of these impacted species and habitats. Potential collaborators: BLM, NPS, USFS, USFWS, USGS, EMNRD, SLO, universities, Tribal natural-resource managers.

- Promote land-management practices, standards, and guidelines to conserve and/or restore structure and function of corridors that provide important habitat for SGCN and ability for animals to move as climate conditions change. This should include both mesic and xeric riparian communities that serve as important migratory corridors for birds and other wildlife while providing ecosystem services and wildlife corridors that link isolated mountain ranges (Powledge 2003) and coniferous forest patches. Potential collaborators: BLM, NPS, USFS, SLO, universities, private landowners, Tribal natural-resource managers.
- Develop new species recovery plans that consider the current status of and limiting factors for species, as well as projected future conditions for both species and their habitats. Consider full life cycles for migratory species when feasible (e.g., KFF 2021). Potential collaborators: USFWS, non-profit organizations, species working groups.
- Inform the public about the potential adverse effects of continued climate change on SGCN and their habitats and encourage development of, and data collection under, citizen and community science projects focused on SGCN and their habitats. Potential collaborators: USFS, USFWS, USGS, NMSP, SLO, universities, non-profit organizations.
- Monitor SGCN to determine long-term trends that correlate to ecosystem dynamics and habitat changes (e.g., Shirk et al. 2023). If feasible, identify potential limiting factors and develop and implement strategies to mitigate them. Potential collaborators: BLM, NPS, USFS, SLO, universities, Tribal natural-resource managers.

ACTIONS THAT ADDRESS MULTIPLE THREATS:

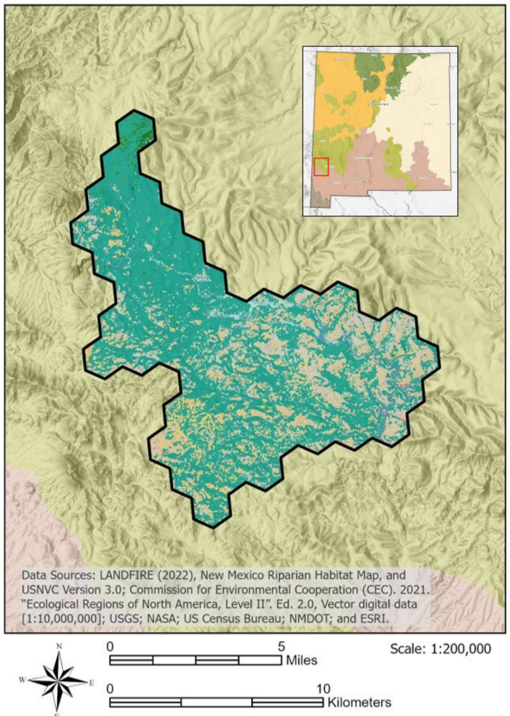
- Determine life history needs, ecology, distribution, movements, status and trends of and threats to SGCN (especially invertebrates that are not currently monitored, riparian-obligate species, herpetofauna [Pierce et al. 2016, Olson and Pilliod 2022], and rare native fishes) and their habitats. Consider full annual cycles for migratory species when appropriate and logistically feasible (KFF 2021) and interactions with lower trophic levels that may drive SGCN status (e.g., EPA 2023). Use this information to develop and implement effective monitoring protocols and conservation actions, including actions to mitigate identified threats. Potential collaborators: BLM, NPS, USFS, SLO, universities, non-profit organizations, private industry, species working groups, Tribal natural-resource managers.
- Assess the synergistic effects between climate change and other threats to SGCN and their habitats (e.g., Friggens et al. 2019, Parks et al. 2019). Incorporate appropriate climate adaptation strategies and frameworks into projects designed to address these synergistic effects. This may include enhancing connectivity (CEQ 2023), facilitating a species' innate adaptive capacity (Thurman et al. 2022), enhancing genetic diversity (Powell 2023), considering local adaptation (Meek et al. 2023), or considering whether it is most appropriate to resist, accept, or direct ecosystem transformation (Lynch et al. 2021, Stevens et al. 2021). Projects should acknowledge ecosystem dynamism and incorporate Indigenous Knowledge (e.g., Roos et al. 2022, Eisenberg et al. 2024), nature-based solutions (Warnell et al. 2023), and experimentation (Guiterman et al. 2022) when appropriate. Potential collaborators: BLM, NPS, USFS, USGS, universities, Tribal natural-resource managers.
- Identify or develop an accessible, jointly used database to document the status and condition of, threats to, and conservation actions implemented across aquatic, riparian, and

upland habitats. Identify data gaps (e.g., Ganey et al. 2017) and implement standardized methods to gather habitat data (e.g., Vollmer et al 2018, Shirk et al. 2023) and to monitor the success of conservation actions (e.g., Davis and Pinto 2021), including impacts on local SGCN populations. Synthesize existing information (e.g., Jain et al. 2021) and apply modeling techniques to aid in evaluating success when appropriate (e.g., Parks et al. 2018). Adjust future conservation actions as needed based on observed outcomes. Potential collaborators: BLM, BOR, NPS, USACE, USFS, USFWS, USGS, NMED, SFD, SLO, universities.

- Evaluate the effectiveness of public education and outreach efforts regarding threats to SGCN and their habitats and the ways that the public can assist in threat mitigation (KFF 2021). Modify outreach activities as needed in response to evaluation outcomes. Potential collaborators: BLM, NPS, USFS, USGS, NMED, NMSP, SFD, SLO, universities, local governments, non-profit organizations.
- Where appropriate, incorporate native, pollinator-friendly plants (Glenny et al. 2022) or native plants adapted to projected future climatic conditions at the restoration site (e.g., Meek et al. 2023, Stanturf et al. 2024) into seed mixes and live plantings used in the restoration of lands affected by grazing, fire, resource extraction, energy development, or urban development. Consider reclamation site conditions, genetic diversity, and resilience to local threats when producing seedlings (Davis and Pinto 2021) and consider appropriate climate analogs when identifying appropriate seed sources (e.g., Richardson et al. 2024). When focused on benefiting pollinators, prioritize plants that are attractive to pollinators, especially SGCN; support pollinators throughout the growing season (Glenny et al. 2023); provide food for caterpillars of insect SGCN (e.g., Dumroese et al. 2016); and produce pollen with high nutritional diversity (Vaudo et al. 2024). Potential collaborators: BLM, NPS, NRCS, USFS, SFD, SLO, energy and mining companies, non-profit organizations, private landowners, Tribal natural-resource managers.

CONSERVATION OPPORTUNITY AREAS

APACHE BOX



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*0.5*
Arid West Interior Freshwater Emergent Marsh	*1*	*1.1*
Chihuahuan Ruderal Grassland	*5*	*35.8*
Chihuahuan Semi-Desert Grassland	*2*	*2280.9*
Cliff, Scree, and Rock Vegetation	*4*	*1395.2*
Desert Alkali-Saline Wetland	*1*	*121.2*
Developed and Urban	*N/A*	*1.6*
Introduced Riparian Vegetation	*5*	*2.7*
Madrean Lowland Evergreen Woodland	*4*	*8587.4*
Madrean Montane Forest and Woodland	*3*	*131.4*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*0.3*
Rocky Mountain Lower Montane Forest	*4*	*84.3*
Rocky Mountain Montane Riparian Forest	*1*	*2.3*
Rocky Mountain Montane Shrubland	*3*	*3.9*
Southwest Lowland Riparian Forest	*1*	*346.8*
Southwest Lowland Riparian Shrubland	*1*	*0.2*
Warm Interior Chaparral	*4*	*967.5*
Warm-Desert Arroyo Riparian Scrub	*2*	*23.8*

Figure 49. Apache Box Conservation Opportunity Area.

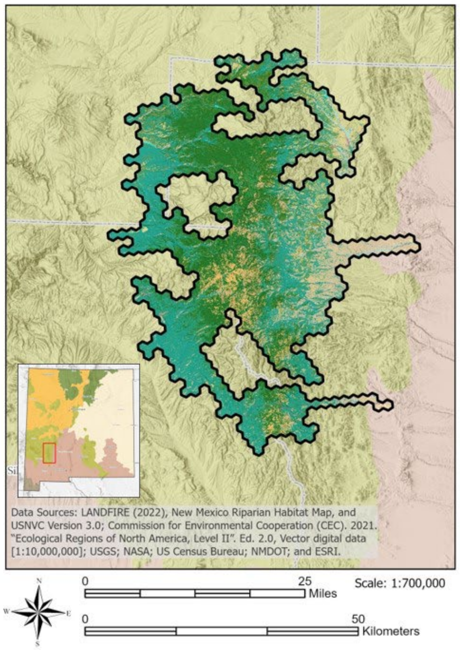
The Apache Box COA (Figure 49) spans approximately 14,021 ha (34,647 ac) in southwestern New Mexico and is located north of Verdin and the lower Gila River, west of Cliff, and at the southern tip of the Gila National Forest. This COA includes parts of the Apache Box Wilderness Study Area.

The majority (~63%) of the land in this COA is privately owned, with 15% managed by the BLM, 10.5% by the USFS, and 11.5% by the SLO). Approximately 15% of this COA is currently protected.

The COA supports 14 native vegetation habitats, two ruderal or introduced vegetation types, and agricultural vegetation and developed and urban areas. The dominant habitats are Madrean Lowland Evergreen Woodland (61%) and Chihuahuan Semi-Desert Grassland (16%). Perennial aquatic habitats include 38 km (24mi) of warm-water streams.

A total of 41 SGCN are found (either observed or with potential habitat) within the COA, including 10 classified as Conservation Impact Species (I) and eight as Current Focal Species (F) (Appendix G). Much of this COA, and surrounding areas, may represent a climate refugia for the banded rock rattlesnake (*Crotalus lepidus klauberi*) through 2075 or may become suitable for this species over the same timeframe (NHNM 2024). This COA has very high potential to contain macroclimate refugia for terrestrial species in general and some potential to contain microclimate refugia for mammals (Table 11).

BLACK RANGE MOUNTAINS



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	43.9
Arid West Interior Freshwater Emergent Marsh	1	65.3
Barren	N/A	2.7
Chihuahuan Desert Scrub	4	515.4
Chihuahuan Ruderal Grassland	5	129.6
Chihuahuan Semi-Desert Grassland	2	12971.7
Cliff, Scree, and Rock Vegetation	4	3695.7
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	266.0
Colorado Plateau Piñon-Juniper Woodland	4	15474.2
Desert Alkali-Saline Wetland	1	1097.5
Developed and Urban	N/A	476.1
Intermountain Dry Shrubland and Grassland	2	4638.5
Intermountain Saltbush Shrubland	4	46.0
Intermountain Tall Sagebrush Shrubland	3	82.4
Introduced Riparian Vegetation	5	18.6
Madrean Lowland Evergreen Woodland	4	59318.7
Madrean Montane Forest and Woodland	3	10035.4
Montane-Subalpine Wet Shrubland and Wet Meadow	1	483.8
Open Water	N/A	62.6
Rocky Mountain Lower Montane Forest	4	45684.6
Rocky Mountain Montane Riparian Forest	1	2321.1
Rocky Mountain Montane Shrubland	3	6544.2
Rocky Mountain Subalpine-High Montane Conifer Forest	4	734.1
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	4285.8
Southwest Lowland Riparian Forest	1	1037.0
Southwest Lowland Riparian Shrubland	1	80.8
Warm Interior Chaparral	4	5507.9
Warm-Desert Arroyo Riparian Scrub	2	221.9

Figure 50. Black Range Mountains Conservation Opportunity Area.

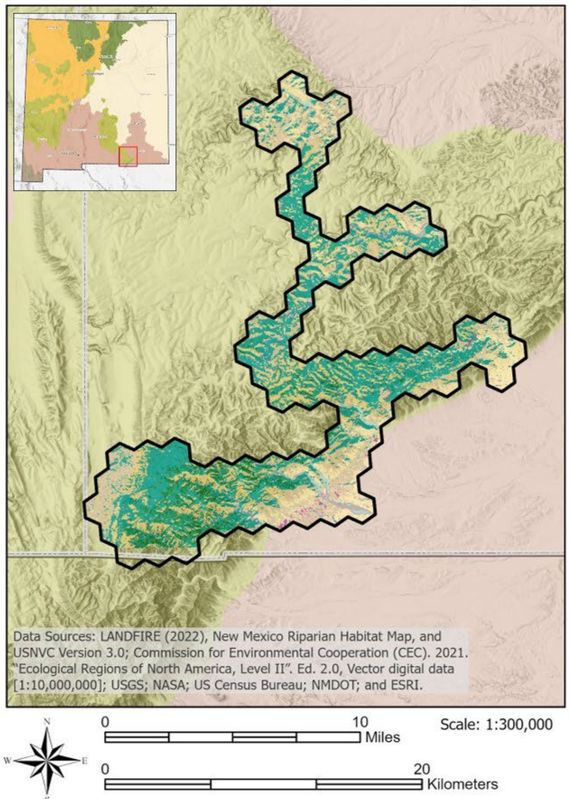
The Black Range Mountains COA (Figure 50) encompasses approximately 176,024 ha (434,964 ac) and is located on the easternmost side of the Gila National Forest in western New Mexico.

The majority of the land (~87%) in this COA is managed by the USFS, while approximately 11% is privately owned. The remaining 2% is managed by the BLM and the SLO. This COA intersects two Important Bird Areas: Ladder Ranch and Emory Pass. Approximately 68% of this COA is currently protected.

The COA supports 21 native vegetation habitats, three ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Madrean Lowland Evergreen Woodland (34%) and Rocky Mountain Lower Montane Forest (26%), with smaller areas of Colorado Plateau Piñon-Juniper Woodland (9%), Chihuahuan Semi-Desert Grassland (7%), and Madrean Montane Forest and Woodland (6%). Perennial aquatic habitats include 181 km (113 mi) of warm-water streams and 120 km (75 mi) of cold-water streams.

A total of 84 SGCN are found (either observed or with potential habitat) within the COA, including 14 classified as I and 24 as F (Appendix G). The northern and southern portions of this COA, and areas north of this COA, may remain or become suitable for the pinyon jay over the next 50 years. Much of the eastern and southern portions of this COA, and areas east of this COA, may remain or become suitable for the banded rock rattlesnake over the same timeframe (NHNM 2024). This COA has very high potential to contain microclimate refugia for birds in general, high potential to contain microclimate refugia for mammals, and some potential to contain microclimate refugia for amphibians (Table 11).

GUADALUPE MOUNTAINS



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*1.7*
Arid West Interior Freshwater Emergent Marsh	*1*	*6.2*
Barren	*N/A*	*2.6*
Chihuahuan Desert Scrub	*4*	*2824.4*
Chihuahuan Ruderal Grassland	*5*	*109.3*
Chihuahuan Semi-Desert Grassland	*2*	*4976.4*
Cliff, Scree, and Rock Vegetation	*4*	*0.8*
Desert Alkali-Saline Wetland	*1*	*173.1*
Developed and Urban	*N/A*	*6.9*
Great Plains Shortgrass Prairie	*3*	*156.7*
Madrean Lowland Evergreen Woodland	*4*	*293.6*
Madrean Montane Forest and Woodland	*3*	*346.2*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*1.4*
Open Water	*N/A*	*25.1*
Rocky Mountain Lower Montane Forest	*4*	*817.0*
Rocky Mountain Montane Riparian Forest	*1*	*28.9*
Rocky Mountain Montane Shrubland	*3*	*38.8*
Rocky Mountain Piñon-Juniper Woodland	*4*	*258.4*
Rocky Mountain Subalpine-High Montane Conifer Forest	*4*	*1.5*
Rocky Mountain Subalpine-Montane Meadow and Grassland	*2*	*8.9*
Southwest Lowland Riparian Forest	*1*	*240.3*
Southwest Lowland Riparian Shrubland	*1*	*56.4*
Warm Interior Chaparral	*4*	*3337.3*
Warm-Desert Arroyo Riparian Scrub	*2*	*330.5*

Figure 51. Guadalupe Mountains Conservation Opportunity Area.

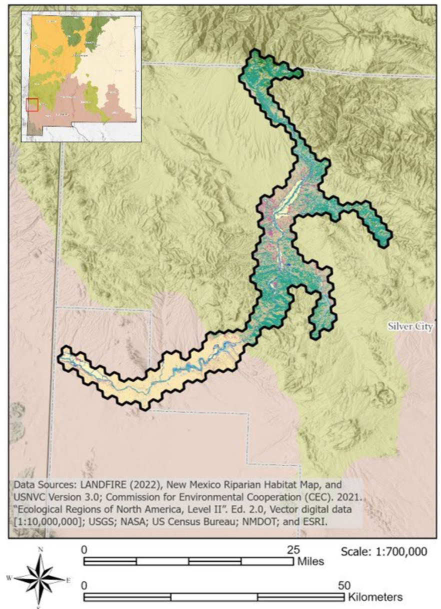
The Guadalupe Mountains COA (Figure 51) covers approximately 22,515 ha (55,637 ac) in southeastern New Mexico. It is situated at the southern end of the Guadalupe Mountains in New Mexico, about 55 km (34 mi) southwest of Carlsbad

Nearly 80% of the land in this COA is managed by the USFS (60%) and NPS (19.5%), while the remaining area is distributed among the BLM (~10%), SLO (1%), and private ownership (9.5%). Approximately 56% of this COA is currently protected.

The COA supports 19 native vegetation habitats, one ruderal vegetation type, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Chihuahuan Semi-Desert Grassland (22%), Warm Interior Chaparral (15%), and Chihuahuan Desert Scrub (13%).

A total of 42 SGCN are found (either observed or with potential habitat) within the COA, including 11 classified as I and nine as F (Appendix G). This COA has very high potential to contain microclimate refugia for mammals, high potential to contain microclimate refugia for birds, and some potential to contain microclimate refugia for amphibians (Table 11).

LOWER GILA RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	2565.8
Arid West Interior Freshwater Emergent Marsh	1	223.2
Barren	N/A	25.7
Chihuahuan Desert Scrub	4	13293.1
Chihuahuan Ruderal Grassland	5	1744.6
Chihuahuan Semi-Desert Grassland	2	14615.3
Cliff, Scree, and Rock Vegetation	4	2646.5
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	0.5
Colorado Plateau Piñon-Juniper Woodland	4	451.7
Desert Alkali-Saline Wetland	1	1090.1
Developed and Urban	N/A	837.6
Great Plains Ruderal Grassland and Shrubland	5	0.2
Intermountain Saltbush Shrubland	4	13.4
Introduced Riparian Vegetation	5	380.6
Madrean Lowland Evergreen Woodland	4	17785.9
Madrean Montane Forest and Woodland	3	330.2
Montane-Subalpine Wet Shrubland and Wet Meadow	1	6.3
Open Water	N/A	468.4
Rocky Mountain Lower Montane Forest	4	698.2
Rocky Mountain Montane Riparian Forest	1	92.0
Rocky Mountain Montane Shrubland	3	187.2
Rocky Mountain Subalpine-High Montane Conifer Forest	4	0.1
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	5.1
Southwest Lowland Riparian Forest	1	2696.0
Southwest Lowland Riparian Shrubland	1	760.9
Warm Interior Chaparral	4	3579.9
Warm-Desert Arroyo Riparian Scrub	2	1019.6

Figure 52. Lower Gila River Conservation Opportunity Area.

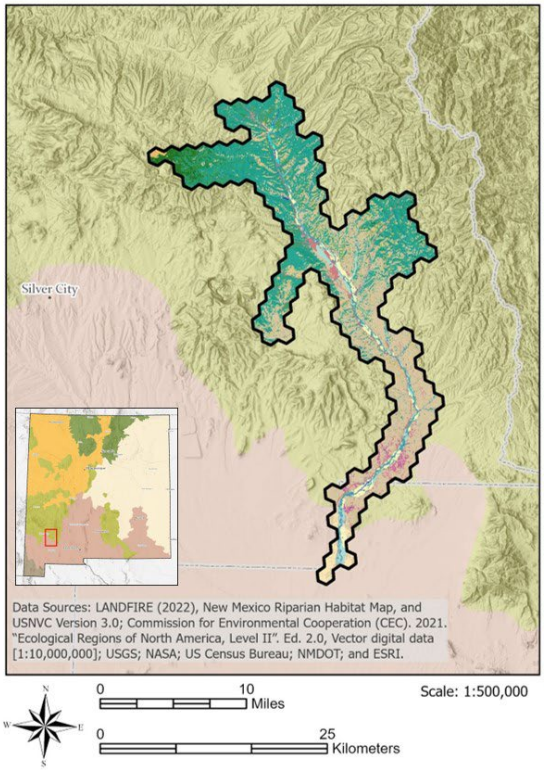
The Lower Gila River COA (Figure 52) spans approximately 65,663 ha (162,257 ac) and extends from the Arizona state line upstream (northeastward) to an elevation of approximately 1,981 meters (6,500 ft), where the river becomes confined. It also includes the lower reaches of Bear and Mogollon Creeks.

Land ownership within this COA is diverse, with approximately 40% being privately owned. The USFS manages about 30% and BLM manages around 20%. State-managed lands, including those under the SLO (8%) and the New Mexico Department of Game and Fish (Department) (2.5%), make up the remainder of the area. This COA also includes three Important Bird Areas: Gila Bird Area, Gila-Cliff Area, and the Lower Gila Box. Approximately 29% of the COA is currently protected.

The COA supports 19 native vegetation habitats, four ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant upland terrestrial habitats include Madrean Lowland Evergreen Woodland (27%), Chihuahuan Semi-Desert Grassland (22%), and Chihuahuan Desert Scrub (20%), while Southwest Lowland Riparian Forest (5%) is prevalent in the valley bottoms. Perennial aquatic habitats include 23 km (14 mi) of warm-water streams, 192 km (120 mi) of cold-water streams, and 26 ha (64 ac) of warm-water reservoirs.

A total of 85 SGCN are found (either observed or with potential habitat) within the COA, including 15 classified as I and 19 as F (Appendix G). Only a small area in the center of this COA, and some areas east and south of this COA, may represent a climate refugia for the pinyon jay through 2075 (NHNM 2024). This COA has high potential to contain microclimate refugia for mammals and some potential to contain microclimate refugia for birds in general and macroclimate refugia for terrestrial species in general (Table 11).

MIMBRES RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*1024.7*
Arid West Interior Freshwater Emergent Marsh	*1*	*39.0*
Barren	*N/A*	*36.3*
Chihuahuan Desert Scrub	*4*	*760.2*
Chihuahuan Ruderal Grassland	*5*	*627.2*
Chihuahuan Semi-Desert Grassland	*2*	*14168.0*
Cliff, Scree, and Rock Vegetation	*4*	*792.1*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*3.2*
Colorado Plateau Piñon-Juniper Woodland	*4*	*611.9*
Desert Alkali-Saline Wetland	*1*	*906.1*
Developed and Urban	*N/A*	*1052.2*
Intermountain Saltbush Shrubland	*4*	*11.5*
Intermountain Tall Sagebrush Shrubland	*3*	*0.2*
Introduced Riparian Vegetation	*5*	*63.5*
Madrean Lowland Evergreen Woodland	*4*	*15778.0*
Madrean Montane Forest and Woodland	*3*	*1035.5*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*125.2*
Open Water	*N/A*	*103.1*
Rocky Mountain Lower Montane Forest	*4*	*1196.6*
Rocky Mountain Montane Riparian Forest	*1*	*352.5*
Rocky Mountain Montane Shrubland	*3*	*170.9*
Rocky Mountain Subalpine-Montane Meadow and Grassland	*2*	*9.6*
Southwest Lowland Riparian Forest	*1*	*1256.6*
Southwest Lowland Riparian Shrubland	*1*	*54.8*
Warm Interior Chaparral	*4*	*2785.3*
Warm-Desert Arroyo Riparian Scrub	*2*	*283.5*

Figure 53. Mimbres River Conservation Opportunity Area.

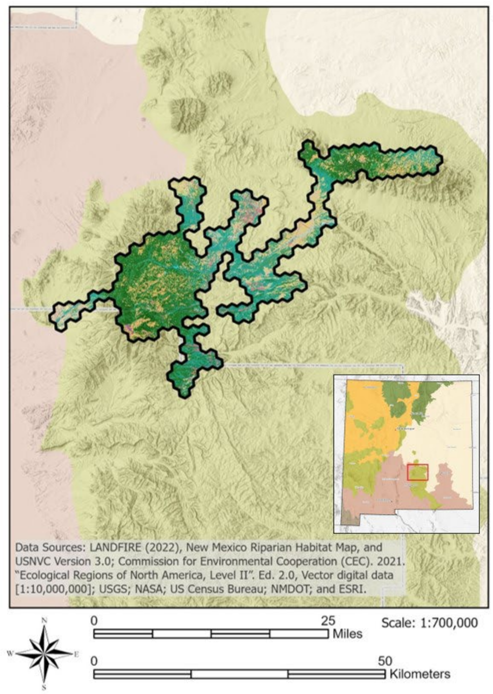
The Mimbres River COA (Figure 53) spans approximately 43,299 ha (106,995 ac) and extends from the Mimbres River around Faywood Hot Springs upstream to the base of the Black Range Mountains and about 14 km (8.7 mi) north of Mimbres.

Approximately 58% of the land in this COA is privately owned, while the USFS manages about 31.5%. The SLO manages 8%, followed by the BLM with 1.5%, and the Department with 1%. This COA contains two Important Bird Areas: Mimbres River and Emory Pass. Additionally, 15% of this COA is currently protected.

The COA consists of 19 native vegetation habitats, three ruderal or introduced vegetation types, and with agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Madrean Lowland Evergreen Woodland (36%) and Chihuahuan Semi-Desert Grassland (33%). Perennial aquatic habitats include 96 km (60 mi) of warm-water streams, 1 km (0.6 mi) of cold-water streams, and 12 ha (30 ac) of warm-water reservoirs.

A total of 55 SGCN are found (either observed or with potential habitat) within the COA, including 11 classified as I and 12 as F (Appendix G). The northernmost portion of this COA, and areas east and west of this COA, may represent a climate refugia for the pinyon jay through 2075. Most of the edges of this COA may represent a climate refugia for the banded rock rattlesnake through 2075, and areas east and west of this COA may become or remain suitable for this species over the next 50 years (NHNM 2024). This COA has high potential to contain microclimate refugia for birds in general and mammals (Table 11).

NORTHERN SACRAMENTO AND CAPITAN MOUNTAINS



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*71.7*
Arid West Interior Freshwater Emergent Marsh	*1*	*183.8*
Barren	*N/A*	*30.2*
Chihuahuan Desert Scrub	*4*	*279.2*
Chihuahuan Ruderal Grassland	*5*	*123.7*
Chihuahuan Semi-Desert Grassland	*2*	*6415.3*
Cliff, Scree, and Rock Vegetation	*4*	*11.5*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*505.0*
Desert Alkali-Saline Wetland	*1*	*206.5*
Developed and Urban	*N/A*	*2153.3*
Great Plains Ruderal Grassland and Shrubland	*5*	*93.2*
Great Plains Shortgrass Prairie	*3*	*976.0*
Intermountain Dry Shrubland and Grassland	*2*	*1086.8*
Intermountain Tall Sagebrush Shrubland	*3*	*4.8*
Introduced Riparian Vegetation	*5*	*9.6*
Madrean Lowland Evergreen Woodland	*4*	*17315.6*
Madrean Montane Forest and Woodland	*3*	*3722.6*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*303.6*
Open Water	*N/A*	*45.1*
Rocky Mountain Lower Montane Forest	*4*	*18975.9*
Rocky Mountain Montane Riparian Forest	*1*	*791.5*
Rocky Mountain Montane Shrubland	*3*	*4262.1*
Rocky Mountain Piñon-Juniper Woodland	*4*	*1859.8*
Rocky Mountain Subalpine-High Montane Conifer Forest	*4*	*1486.4*
Rocky Mountain Subalpine-Montane Meadow and Grassland	*2*	*2312.6*
Southwest Lowland Riparian Forest	*1*	*609.3*
Southwest Lowland Riparian Shrubland	*1*	*117.3*
Warm Interior Chaparral	*4*	*3112.7*
Warm-Desert Arroyo Riparian Scrub	*2*	*7.7*

Figure 54. Northern Sacramento and Capitan Mountains Conservation Opportunity Area.

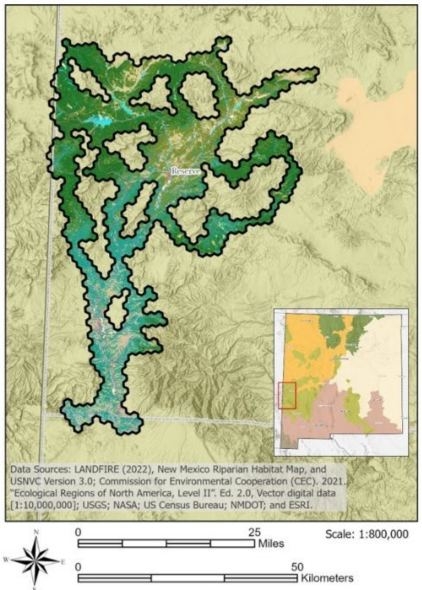
The Northern Sacramento and Capitan Mountains COA (Figure 54) spans approximately 67,034 ha (165,643 ac) and is located just north of Ruidoso and west of Lincoln. The COA encompasses the northernmost portion of the Sacramento Mountains and the Capitan Mountains.

Approximately 53% of the land in this COA is managed by the USFS, and 27% is privately owned. The remaining 20% is managed by the US Department of Energy (DOE) (11%), the BLM (7%), and the SLO (2%). The Hondo Valley Important Bird Area lies within this COA. Approximately 34% of the COA is currently protected.

The COA consists of 21 native vegetation habitats, four ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats include Rocky Mountain Lower Montane Forest (28%), Madrean Lowland Evergreen Woodland (26%), and Chihuahuan Semi-Desert Grassland (10%). Perennial aquatic habitats include 4 km (2.5 mi) of warm-water streams, 149 km (93 mi) of cold-water streams, 14 ha (35 ac) of warm-water reservoirs, and 19 ha (46 ac) of cold-water reservoirs.

A total of 51 SGCN are found (either observed or with potential habitat) within the COA, including 16 classified as I and nine as F (Appendix G). Much of this COA may represent a climate refugia for the Grace's warbler (*Setophaga graciae*) through 2075, excluding the southern and east-central edges (NHNM 2024). This COA has very high potential to contain microclimate refugia for birds in general and mammals and macroclimate refugia for terrestrial species in general. This COA also has some potential to contain microclimate refugia for amphibians and macroclimate refugia for aquatic species (Table 11).

SAN FRANCISCO RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	944.5
Arid West Interior Freshwater Emergent Marsh	1	175.2
Barren	N/A	7.0
Chihuahuan Ruderal Grassland	5	493.3
Chihuahuan Semi-Desert Grassland	2	4948.6
Cliff, Scree, and Rock Vegetation	4	8641.0
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	59.1
Colorado Plateau Piñon-Juniper Woodland	4	36641.6
Desert Alkali-Saline Wetland	1	1405.5
Developed and Urban	N/A	2664.7
Great Plains Ruderal Grassland and Shrubland	5	0.8
Intermountain Dry Shrubland and Grassland	2	7595.0
Intermountain Saltbush Shrubland	4	15.8
Intermountain Tall Sagebrush Shrubland	3	164.9
Introduced Riparian Vegetation	5	69.9
Madrean Lowland Evergreen Woodland	4	40495.0
Madrean Montane Forest and Woodland	3	4374.3
Montane-Subalpine Wet Shrubland and Wet Meadow	1	1880.6
Open Water	N/A	446.8
Rocky Mountain Lower Montane Forest	4	59671.3
Rocky Mountain Montane Riparian Forest	1	1436.3
Rocky Mountain Montane Shrubland	3	1006.6
Rocky Mountain Subalpine-High Montane Conifer Forest	4	36.7
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	1376.6
Southwest Lowland Riparian Forest	1	3070.2
Southwest Lowland Riparian Shrubland	1	28.3
Warm Interior Chaparral	4	5894.7
Warm-Desert Arroyo Riparian Scrub	2	42.3

Figure 55. San Francisco River Conservation Opportunity Area.

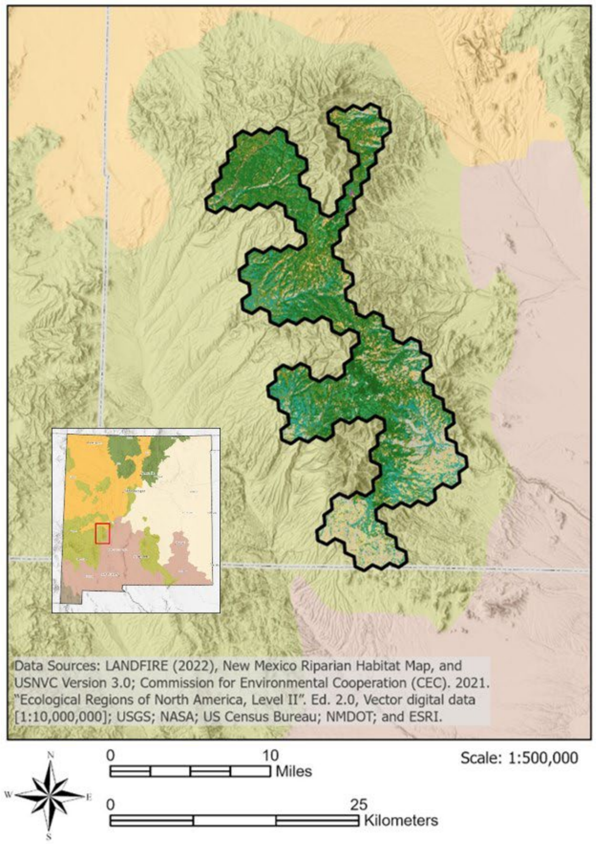
The San Francisco River COA (Figure 55) spans approximately 185,608 ha (458,608 ac) in western New Mexico. It extends from Glenwood north to about 25 km (15 mi) north of Reserve and includes portions of the Brushy, Saliz, San Francisco, and Tularosa Mountains. The COA also encompasses a large portion of the San Francisco watershed and flows downstream to Glenwood.

The majority of this COA is managed by the USFS (92%), with the remaining 8% privately owned, except for a negligible portion managed by the SLO (<0.1%). Additionally, 26% of the COA is currently protected.

The COA consists of 20 native vegetation habitats, four ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats are Rocky Mountain Lower Montane Forest (32%), Madrean Lowland Evergreen Woodland (22%), and Colorado Plateau Piñon-Juniper Woodland (20%). Although they make up a small percentage of the COA overall, Southwest Lowland Riparian Forest (2%) and Montane-Subalpine Wet Shrubland and Wet Meadow (1%) are the most prevalent riparian vegetation types along the COA's riparian corridors. Perennial aquatic habitats within the COA include 485 km (302 mi) of warm-water streams, 69 km (43 mi) of cold-water streams, and 1 ha (2 ac) of cold-water reservoirs.

A total of 77 SGCN are found (either observed or with potential habitat) within the COA, including 15 classified as I and 17 as F (Appendix G). Most of this COA, except the southernmost edge, and areas north and east of this COA may represent a climate refugia for the pinyon jay through 2075 (NHNM 2024). This COA has very high potential to contain macroclimate refugia for terrestrial species in general and high potential to contain microclimate refugia for birds in general and mammals and macroclimate refugia for aquatic species (Table 11).

SAN MATEO MOUNTAINS



Habitat	Tier	Area (ha)
Arid West Interior Freshwater Emergent Marsh	*1*	*5.7*
Chihuahuan Ruderal Grassland	*5*	*7.7*
Chihuahuan Semi-Desert Grassland	*2*	*1726.1*
Cliff, Scree, and Rock Vegetation	*4*	*2577.8*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*82.5*
Colorado Plateau Piñon-Juniper Woodland	*4*	*8960.6*
Desert Alkali-Saline Wetland	*1*	*0.1*
Developed and Urban	*N/A*	*75.4*
Intermountain Dry Shrubland and Grassland	*2*	*2344.3*
Intermountain Saltbush Shrubland	*4*	*12.7*
Intermountain Tall Sagebrush Shrubland	*3*	*200.6*
Introduced Riparian Vegetation	*5*	*4.7*
Madrean Lowland Evergreen Woodland	*4*	*5072.1*
Madrean Montane Forest and Woodland	*3*	*2505.0*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*17.7*
Open Water	*N/A*	*5.6*
Rocky Mountain Lower Montane Forest	*4*	*13442.7*
Rocky Mountain Montane Riparian Forest	*1*	*305.8*
Rocky Mountain Montane Shrubland	*3*	*1661.0*
Rocky Mountain Subalpine-High Montane Conifer Forest	*4*	*628.3*
Rocky Mountain Subalpine-Montane Meadow and Grassland	*2*	*185.2*
Southwest Lowland Riparian Forest	*1*	*58.1*
Southwest Lowland Riparian Shrubland	*1*	*1.4*
Warm Interior Chaparral	*4*	*1035.9*
Warm-Desert Arroyo Riparian Scrub	*2*	*5.0*

Figure 56. San Mateo Mountains Conservation Opportunity Area.

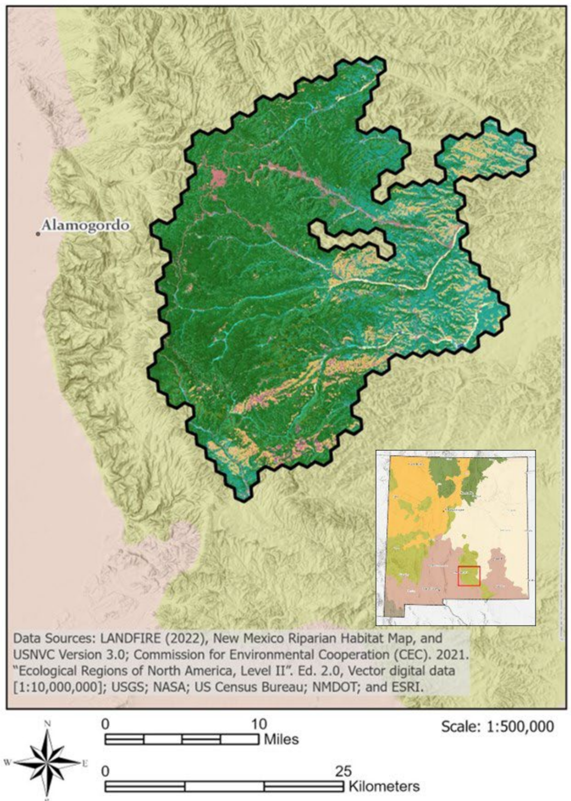
The San Mateo Mountains COA (Figure 56) spans approximately 40,942 ha (101,168 ac) and is located about 64 km (40 mi) southwest of Socorro. It encompasses the higher elevations of the San Mateo Mountains and extends from north to south.

Nearly the entire COA is managed by the USFS (99%); just 1% is privately owned. Approximately 60% of the COA is currently protected.

The COA supports 20 native vegetation habitats, three ruderal or introduced vegetation types, and developed and urban spaces and open water. The dominant habitats are Rocky Mountain Lower Montane Forest (33%),Colorado Plateau Piñon-Juniper Woodland (22%), and Madrean Lowland Evergreen Woodland (12%).

A total of 43 SGCN are found (either observed or with potential habitat) within the COA, including 11 classified as I and seven as F (Appendix G). This COA has high potential to contain microclimate refugia for birds and mammals and some potential to contain microclimate refugia for amphibians and macroclimate refugia for terrestrial species (Table 11).

SOUTHERN SACRAMENTO MOUNTAINS



Habitat	Tier	Area (ha)
Agricultural Vegetation	*N/A*	*653.4*
Arid West Interior Freshwater Emergent Marsh	*1*	*376.9*
Chihuahuan Ruderal Grassland	*5*	*351.6*
Chihuahuan Semi-Desert Grassland	*2*	*2384.6*
Cliff, Scree, and Rock Vegetation	*4*	*1.5*
Colorado Plateau Cool Semi-Desert Ruderal Grassland	*5*	*1164.1*
Desert Alkali-Saline Wetland	*1*	*32.9*
Developed and Urban	*N/A*	*2417.4*
Great Plains Ruderal Grassland and Shrubland	*5*	*49.3*
Great Plains Shortgrass Prairie	*3*	*231.3*
Introduced Riparian Vegetation	*5*	*45.5*
Madrean Lowland Evergreen Woodland	*4*	*17130.4*
Madrean Montane Forest and Woodland	*3*	*15331.5*
Montane-Subalpine Wet Shrubland and Wet Meadow	*1*	*713.9*
Open Water	*N/A*	*12.6*
Rocky Mountain Lower Montane Forest	*4*	*44227.8*
Rocky Mountain Montane Riparian Forest	*1*	*835.5*
Rocky Mountain Montane Shrubland	*3*	*3039.8*
Rocky Mountain Piñon-Juniper Woodland	*4*	*1330.3*
Rocky Mountain Subalpine-High Montane Conifer Forest	*4*	*6430.1*
Rocky Mountain Subalpine-Montane Meadow and Grassland	*2*	*2874.9*
Southwest Lowland Riparian Forest	*1*	*444.8*
Southwest Lowland Riparian Shrubland	*1*	*19.1*
Warm Interior Chaparral	*4*	*2988.5*
Warm-Desert Arroyo Riparian Scrub	*2*	*9.1*

Figure 57. Southern Sacramento Mountains Conservation Opportunity Area.

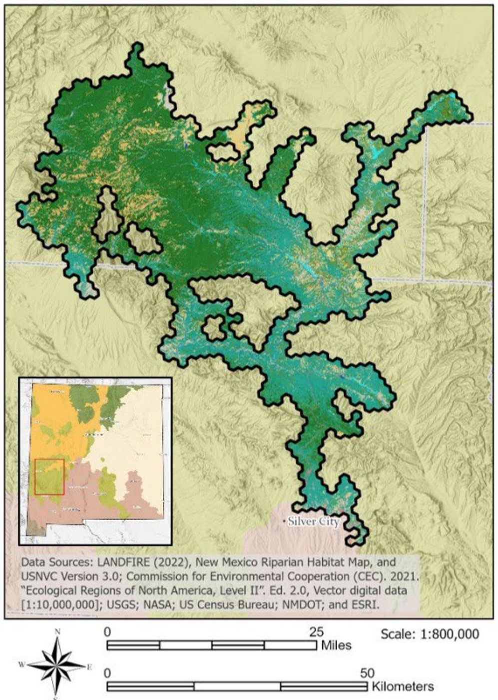
The Southern Sacramento Mountains COA (Figure 57) spans approximately 103,009 ha (254,539 ac). It is located about 20 km (12 mi) east of Alamogordo, nestled between Cloudcroft and Mayhill, and encompasses the southern portion of the Sacramento Mountains.

Approximately 74% of the COA is managed by the USFS, about 19% is privately owned, 6% consists of Tribal lands, and 1% is managed by the SLO. The Important Bird Area Peñasco Canyon is located within this COA. Only 1% of the COA is currently protected.

The COA supports 18 native vegetation habitats, four ruderal or introduced vegetation types, and agricultural vegetation, developed and urban spaces, and open water. The dominant habitats are Rocky Mountain Lower Montane Forest (43%), Madrean Lowland Evergreen Woodland (17%), and Madrean Montane Forest and Woodland (15%). Perennial aquatic habitats within the COA include 86 km (53 mi) of cold-water streams.

A total of 48 SGCN are found (either observed or with potential habitat) within the COA, including 16 classified as I and five as F (Appendix G). Much of this COA, excluding the easternmost edges, and areas north of this COA may represent a climate refugia for the Grace's warbler through 2075. Portions of the eastern edge of this COA may become suitable for the gray vireo (*Vireo vicinior*) over the next 50 years (NHNM 2024). This COA has very high potential to contain microclimate refugia for birds in general and mammals and some potential to contain macroclimate refugia for terrestrial species in general (Table 11).

UPPER GILA RIVER



Habitat	Tier	Area (ha)
Agricultural Vegetation	N/A	32.7
Arid West Interior Freshwater Emergent Marsh	1	180.1
Barren	N/A	8.3
Chihuahuan Desert Scrub	4	76.5
Chihuahuan Ruderal Grassland	5	156.6
Chihuahuan Semi-Desert Grassland	2	4291.6
Cliff, Scree, and Rock Vegetation	4	8257.5
Colorado Plateau Cool Semi-Desert Ruderal Grassland	5	126.7
Colorado Plateau Piñon-Juniper Woodland	4	16810.8
Desert Alkali-Saline Wetland	1	86.4
Developed and Urban	N/A	1463.0
Great Plains Ruderal Grassland and Shrubland	5	0.3
Intermountain Dry Shrubland and Grassland	2	7124.3
Intermountain Saltbush Shrubland	4	40.6
Intermountain Tall Sagebrush Shrubland	3	39.4
Introduced Riparian Vegetation	5	11.3
Madrean Lowland Evergreen Woodland	4	73289.3
Madrean Montane Forest and Woodland	3	16711.3
Montane-Subalpine Wet Shrubland and Wet Meadow	1	2340.9
Open Water	N/A	207.7
Rocky Mountain Lower Montane Forest	4	90164.3
Rocky Mountain Montane Riparian Forest	1	3631.7
Rocky Mountain Montane Shrubland	3	7407.2
Rocky Mountain Subalpine-High Montane Conifer Forest	4	3022.8
Rocky Mountain Subalpine-Montane Meadow and Grassland	2	7867.6
Southwest Lowland Riparian Forest	1	583.2
Southwest Lowland Riparian Shrubland	1	71.6
Warm Interior Chaparral	4	7188.1
Warm-Desert Arroyo Riparian Scrub	2	34.1

Figure 58. Upper Gila River Conservation Opportunity Area.

The Upper Gila River COA (Figure 58) spans approximately 251,656 ha (621,853 ac), extends from Silver City northward to the Gila River headwaters, and encompasses the central portion of the Mogollon Mountains.

The majority of the land (~96%) in this COA is managed by the USFS, while about 3.5% is privately owned. Less than 1% is managed by the BLM, the SLO, the Department, and the DOE. Approximately 70% of this COA is currently protected.

The COA supports 21 native vegetation habitats, four ruderal or introduced vegetation types, and agricultural vegetation, barren areas, developed and urban spaces, and open water. The dominant habitats are Rocky Mountain Lower Montane Forest (36%) and Madrean Lowland Evergreen Woodland (29%). Perennial aquatic habitats include 269 km (167 mi) of warm-water streams, 579 km (360 mi) of cold-water streams, 27 ha (67 ac) of warm-water reservoirs, and 38 ha (94 ac) of cold-water reservoirs.

A total of 86 SGCN are found (either observed or with potential habitat) within the COA, including 16 classified as I and 19 as F (Appendix G). Areas around the edges, but not in the centermost regions, of this COA, and north and, to some extent, south of this COA, may remain or become suitable for the pinyon jay over the next 50 years. The southern half of this COA may represent a climate refugia for the banded rock rattlesnake through 2075, and areas south and northeast of this COA may remain or become suitable for this species over the same timeframe (NHNM 2024). This COA has high potential to contain microclimate refugia for birds in general and mammals and macroclimate refugia for aquatic species and terrestrial species in general (Table 11).

Chapter 11: Monitoring

Fundamentally, monitoring functions to observe and assess the progress or quality of something over time. The nature of the characteristic or phenomenon being monitored helps to determine the duration of monitoring. This duration can vary from very short periods, for something like a colony of bacteria, to very long periods for long-lived animals and plant communities. The complexity of wildlife, habitats, and ecosystems means that there are countless combinations of species, interactions, and communities that could be observed and documented through monitoring. In addition to the range of subjects to be monitored, the purpose of monitoring helps to define and determine the monitoring approach. Lindenmayer and Likens (2010) categorize monitoring into three types: passive, mandated, and question driven. Passive monitoring is stimulated by curiosity or the love of learning. Mandated monitoring is required by statute or policy and typically tries to identify trends. Question-driven monitoring is based on a conceptual model and can lead to testing predictions.

The State Wildlife Action Plan (SWAP) for New Mexico must incorporate three categories of monitoring to meet the requirements of the State Wildlife Grants (SWG) Program. These categories include: species and habitats, effectiveness of conservation actions, and adaptive management. Monitoring of species and habitats and effectiveness of conservation actions may be passive, mandated, or question-driven, depending on the context in which monitoring takes place. In contrast, adaptive management depends on question-driven monitoring to provide information that can lead to changes in management. Monitoring in this context is defined as "*the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective.*" This chapter discusses the importance of monitoring in species and habitat conservation, identifies some accepted approaches, and discusses data access and dissemination considerations for each monitoring category. The content is not exhaustive but provides a solid understanding of what and how monitoring needs to be done and an overview of how it can be most efficiently organized and presented. Appropriate citations will direct the reader to sources of more detailed information.

SPECIES AND HABITAT MONITORING

The first category of monitoring, species and habitats, encompasses a great diversity of potential data-collection techniques. There are 505 Species of Greatest Conservation Need (SGCN) identified in this SWAP, any one of which could be a subject of monitoring and many of which require extensive data collection to assess their current status (i.e., Data Needs Species). For any species, potential variables of concern could include factors acting at both the individual and population levels. These include but are not limited to: genetic diversity, growth rates, population composition, age structure, disease burden, parasite load, environmental contaminants, predation, and behavior. All wildlife species depend on suitable habitats. Even though humans classify vegetation communities into discrete assemblages, different species of wildlife have distinct requirements and utilize the same vegetation types differently. Assessing the condition or status of a habitat is frequently limited to observations of plant assemblage composition and structure that is used as a proxy for community and habitat health. Monitoring also can include assessing very specific components of a wildlife species' habitat that may have limited importance to other species utilizing the same habitat. Ultimately, there are an infinite number of variables associated with species and their habitats that could be monitored. Neither the New Mexico Department of Game and Fish (Department) nor any of the other entities engaged in monitoring in the State have the capacity or financial resources required to conduct comprehensive wildlife or habitat monitoring for all SGCN. However, Land of Enchantment Legacy Funds (75-12-1 through 75-12-2 New Mexico Statutes Annotated 1978) and Government Results and Opportunity Program Funds (NMHR 2025) allocated to the Department starting in 2024 and 2025, respectively, for work on SGCN have dramatically expanded financial resources available for these activities.

Specific Department mandates for species monitoring originate primarily through individual grants that Department staff prepare and execute, sometimes in coordination with contractors and other partners. Monitoring also is a requirement under the New Mexico Wildlife Conservation Act (WCA; 17-2-37 through 17-2-46 New Mexico Statutes Annotated 1978). This includes the requirement to generate a biennial status assessment of all State-Threatened or -Endangered wildlife. These mandates cover only a fraction of the 505 SGCN. However, as of 2026, the Department is required to publish on its website data collected on SGCN and the use of state and federal funds for the support and recovery of SGCN (NMS 2025). There are many other potential sources of information that can provide data useful in assessing the status of species and habitats. Peer-reviewed publications are a valuable source of species information that may address management concerns. Related sources of information include academic theses and dissertations that investigate questions and/or species of interest to the Department. The Department supports Share with Wildlife (SwW) projects that target SGCN and their habitats, and SwW project reports can provide valuable, though typically short-duration (2-3 years maximum), monitoring data (https://wildlife.dgf.nm.gov/conservation/share-with-wildlife/reports/). The Department also issues Scientific Collecting permits to scientists from institutions across the country. Annual collecting permit reports can provide data on both species and habitats when spatially explicit location information is included. As is the case with SwW projects, these permit reports may not provide repeated monitoring data unless the associated research is being conducted as part of a multiyear project. There are a host of local, state, and federal agencies and institutions that conduct independent investigations that may include species and habitats in New Mexico and thus could yield valuable species or habitat information. Regardless of whether this research is a result of mandated information collection (e.g., permit compliance) or of academic studies with applications to wildlife conservation and management, it may be of use to the Department.

The Department and other interested parties may focus their efforts on answering the most pressing questions to effectively manage their resources. With 505 SGCN and 38 habitats, it is imperative that planned species and/or habitat monitoring initiatives be prioritized to focus resources where they will be most useful in supporting conservation needs. All of the SGCN and habitats described in this SWAP have been evaluated and assigned to categories based on conservation action priority (i.e., Current Focal Species, Conservation Impact Species, and Limited Conservation Opportunity Species) and type (i.e., Data Needs Species), which can serve as an initial guide to selecting species or habitats for monitoring. Conservation Opportunity Areas (COAs) or Riparian COAs (RCOAs) potentially could be used to further focus monitoring and conservation activities in areas of the State that contain especially high biodiversity and where restoration and conservation activities can best enhance connectivity of high quality, biodiverse habitats, respectively.

EFFECTIVENESS OF CONSERVATION ACTIONS

The sheer number of species and habitats in New Mexico and limitations on funding and number of available staff precludes the Department from attempting to intensively monitor even a fraction of these species and habitats. In contrast, the number of Department-implemented conservation actions is much smaller and more possible to monitor. Even when other agency- and institution-supported conservation actions are considered, the overall number of actions is still comparatively limited and the potential to track and assess success of these actions is greater. Not only is the universe of potential efforts more limited, but funding sources for conservation actions often require subsequent monitoring of action success. As with species and habitats monitoring, there are multiple entities implementing conservation actions and monitoring results. Thus, the Department can benefit from monitoring efforts being carried out by other agencies and institutions and, where necessary, can target specific conservation actions lacking adequate monitoring when implementing its own monitoring programs. No comprehensive compilation, nor infrastructure for such compilation, currently exists for use in assessing whether the portfolio of implemented conservation actions is improving the overall status of wildlife species and habitats across the State. However, there are publicly accessible databases that attempt to gather information on certain types of conservation actions (e.g., vegetation treatments; https://www.arcgis.com/apps/webappviewer/index.html?id=d078ddb32b8143c69245723d63afb08c&extent=-12318914.305,3835902.736,-11291600.6448,4413155.1736,102100, https://nmssp.org/#/app/map) or actions being taken in specific geographies (e.g., middle Rio Grande; https://webapps.usgs.gov/mrgescpmap/). A coordinated effort among resource managers to compile in a database and disseminate results of monitoring programs in the State in a format that is comparable between projects and over time should be a priority for SWAP implementation.

At the project-level, targeted conservation actions with specific, desired outcomes naturally lead to question-driven monitoring efforts that can help to identify success. There may be a limited number of conservation action categories that need to be monitored, but there could be a wide range of variables that, if measured, would provide meaningful indicators of success. Thus, even with a comparatively limited number of projects, there could be a much larger number of suitable variables measured and monitoring approaches used. Monitoring project-level success is therefore impractical for all conservation actions that are described in, and may be implemented under, the SWAP. However, by focusing conservation projects using COAs, RCOAs, and other prioritization approaches, resource managers can collectively identify specific conservation targets that will inform monitoring approaches and definitions of project success. Careful planning is a necessary component of developing monitoring programs that will yield suitable data to assess the success of conservation actions.

ADAPTIVE MANAGEMENT

The third SWG-required category of monitoring is that necessary to implement adaptive management. In New Mexico, the Department actively manages game and sport fish populations, which require ongoing monitoring to assess status relative to demand for resources. In contrast, there are Department-led active management programs for a smaller percentage of SGCN or other nongame species. The WCA-mandated biennial status assessments determine whether changes in species listing designations are warranted. The WCA does not require that specific conservation actions be developed or implemented as a result of those assessments. Active adaptive management programs for nongame species in the State are often led by cooperating agencies participating in multi-agency initiatives focused on Threatened and/or Endangered species. For these initiatives, the Department is typically part of a collaborative effort that is responding to species-specific recovery objectives. Management actions taken by the Department involve measures such as conserving native fish through non-native removals or hatchery production of fry to augment wild populations. The Department also has fulltime biologists dedicated to implementing actions to further the conservation and recovery of specific federally listed species, including the Gila trout (*Oncorhynchus gilae*), lesser prairie-chicken (*Tympanuchus pallidicinctus*), and Mexican gray wolf (*Canis lupus baileyi*). In some cases, the Department is not the lead agency and results of monitoring do not necessarily lead directly to altered management. Examples of efforts where the Department is the lead agency include, but are not limited to, efforts made with respect to the following species: Alamosa springsnail (*Pseudotryonia alamosae*), Arkansas River shiner (*Notropis girardi*), blue sucker (*Cycleptus elongatus*), boreal toad (*Anaxyrus boreas boreas*), Chihuahua chub (*Gila nigrescens*), Gila chub (*Gila intermedia*), Gila trout, gray redhorse (*Moxostoma congestum*), loach minnow (*Rhinichthys cobitis*), North American river otter (*Lontra canadensis*), Pecos pupfish (*Cyprinodon pecosensis*), Pecos springsnail (*Pyrgulopsis pecosensis*), peppered chub (*Macrhybopsis tetranema*), Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*), spikedace (*Meda fulgida*), Socorro isopod (*Thermosphaeroma thermophilum*), Texas hornshell (*Popenaias popeii*), White Sands pupfish (*Cyprinodon tularosa*), whiskered screech owl (*Megascops trichopsis asperus*), and white-tailed ptarmigan (*Lagopus leucura altipetens*). The Department plans to develop, either on its own or in collaboration with other agencies, an accessible database to track the implementation of conservation actions under the SWAP and potentially under other planning documents. Initial conversations around the development of such a conservation action tracker are underway with Natural Heritage New Mexico (NHNM) and others.

SOURCES OF MONITORING INFORMATION

The scientific literature on wildlife and habitat monitoring is broad and complex with numerous references devoted to monitoring everything from single species to entire ecoregions. A compendium of current references would provide, at best, a cursory overview of existing sources. There are many online sources of scientific publications provided by government agencies, university libraries, and commercial and non-profit web search engines. Some of the websites that compile and provide this information are based at established institutions that will continue to provide this service and improve their performance over time. Other sources of information are the product of commercial ventures with variable durability. The Department has attempted to provide a starting point for locating references that can guide the user in designing effective and robust monitoring methodologies and programs. These websites, and others like them, can help provide access to the existing literature and identify additional portals for literature searches that will return numerous and diverse examples of wildlife and habitat monitoring approaches.

- US Fish and Wildlife Service Library: http://fwslibrary.worldcat.org/
- US Geological Survey, Publications Warehouse: http://pubs.er.usgs.gov/
- The Library of Congress, E-Resources Online Catalog: https://eresources.loc.gov/search~S9/m?SEARCH=Free
- Biodiversity Heritage Library: http://www.biodiversitylibrary.org/
- Public Library of Science: https://www.plos.org/
- Science.gov: https://science.gov/

In addition to these websites, several potentially useful foundational sources include:

- Busch, D. E., and J. C. Trexler. 2003. Monitoring ecosystems: interdisciplinary approaches for evaluating ecoregional initiatives. Island Press, Washington, D.C., USA.
- Gitzen, R. A., J. J. Millspaugh, A. B. Cooper, and D. S. Licht. 2012. Design and analysis of long-term ecological monitoring studies. Cambridge University Press, Cambridge, GBR.
- Elzinga, C. L., D. W. Salzer, and J. W. Willoughby. 1998. Measuring and monitoring plant populations. US Department of the Interior, Bureau of Land Management Technical Reference 1730-1, Denver, Colorado, USA.
- Silvy, N. J., editor. 2020 The wildlife techniques manual. Eighth edition, Volumes 1 and 2. Johns Hopkins University Press, Baltimore, Maryland, USA.

Many references for collecting data on different types of species can be found in NMDGF (2024a).

GUIDANCE FOR MONITORING SGCN

Based on the limited resources available, the Department’s proposed strategy for addressing the needs of wildlife and associated habitats in the State includes: relying on partners; facilitating data organization and storage; and using indices, targeted monitoring, and new technologies. Employing these approaches will permit the Department to maximize the impact of limited resources, develop stronger collaborative relationships, benefit from a diverse array of perspectives, build on extant information management efforts, and contribute to efficient and economical monitoring approaches. In summary, the SWAP monitoring approach consists of: 1) a coordinated, centralized effort that pulls together results of biological monitoring from multiple entities in New Mexico; 2) selected species- and habitat-specific monitoring that addresses mandates of collaborators across the State and emerging high-priority conservation needs; 3) monitoring of broad-scale environmental variables that serve as ecological drivers for SGCN populations; 4) identifying and promoting monitoring techniques that efficiently generate community-level or multi-species status information; 5) utilizing biological monitoring results to assess the success of representative conservation actions described in this SWAP; and 6) compiling and disseminating monitoring results in formats that can serve resource managers across the State. These approaches complement one another in positioning the Department and its collaborators to understand and track the status of species, habitats, and conservation actions.

Despite the numerous examples of monitoring-related efforts in which the Department has participated (Table 37), the fact that many of them are led or contributed to by other entities is evidence that the Department is not alone in performing wildlife-related monitoring activities. The Department recognizes that it lacks the capacity to accomplish all needed monitoring, especially for SGCN and their priority habitats. However, as mentioned earlier in this chapter, this capacity will be greatly expanded as a result of the Land of Enchantment Legacy Funds and Government Results and Opportunity Program funds allocated to the Department starting in 2024 and 2025, respectively. The Department anticipates hiring new staff dedicated to working on SGCN and, in the next decade, substantively increasing the number of surveys it can conduct annually and diversity of species it can monitor. Responsibilities of other agencies include: monitoring Threatened and Endangered species and wildlife of conservation concern related to land-management planning and natural-resource project implementation and monitoring as described in established recovery plans, conservation agreements, and other documents. As the only agency in New Mexico with specific mandates for the management of wildlife populations across the State, the Department is uniquely positioned to coordinate assistance from its collaborators in compiling and disseminating monitoring results statewide. By encouraging land-management agencies, educational institutions, environmental consulting companies, non-profit environmental organizations, and independent researchers to refer to the SWAP and incorporate its guidance into decisions on what and where to monitor, the Department can increase monitoring of SGCN and their priority habitats. The Department will need to maintain active, ongoing communication with existing partners, promote the SWAP, and try to cultivate new collaborators in performing and compiling information on monitoring. Active communication has the added benefit of putting the Department in a position of potentially being able to influence the kind of monitoring that is conducted and the utility of the data produced.

Table 37. Current monitoring of Species of Greatest Conservation Need.

Data gathered include current status, presence/absence, population trend, and other demographic parameters. Documents and entities that support and/or direct monitoring are recovery plans, conservation agreements, and conservation teams. This list does not identify all species monitored or all monitoring efforts for each species.

SGCN Common Name	SGCN Scientific Name	Taxonomic Group	Category	Monitoring Action[61]	Monitoring Entities or Partners[62]
Arizona Toad	*Anaxyrus microscaphus microscaphus*	Amphibians	I	M(a)	USFS, USFWS, Department, University
Arizona Treefrog	*Dryophytes wrightorum*	Amphibians	D	M(o)	Department, University
Barking Frog	*Craugastor augusti latrans*	Amphibians	L	M(p)	BLM, Department, EMNRD
Blanchard's Cricket Frog	*Acris blanchardi*	Amphibians	I	M(o)	BLM, University
Boreal Chorus Frog	*Pseudacris maculata*	Amphibians	I	M(p)	Department, University
Boreal Toad	*Anaxyrus boreas boreas*	Amphibians	F	CA, CT, M(a)	USFS, Department, University, Private
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	Amphibians	F	CA, CT, M(a)	USFS, USFWS, Department, NGO
Jemez Mountains Salamander	*Plethodon neomexicanus*	Amphibians	F	CT, M(a)	NPS, USFS, USFWS, Department, University
Lowland Leopard Frog	*Lithobates yavapaiensis*	Amphibians	L	M(o)	USFS, Department
Northern Leopard Frog	*Lithobates pipiens*	Amphibians	I	M(p)	USFS, Department, University, Private

[61] CA = Conservation Agreement or Recovery Plan; CT = Conservation/Recovery Team; M = Monitoring (a) = at least once per year; (p) = periodically (but less than annually); (o) = opportunistically; (n) = no known current or recent monitoring. For M(a), just for birds, the following subscripts represent surveys and monitoring conducted during the b = breeding season; f = fall; w = wintering season; and y = year-round.
[62] Entities that monitor species include: AGFD = Arizona Game and Fish Department; BLM = United States (US) Bureau of Land Management; BOR = US Bureau of Reclamation; Department = New Mexico Department of Game and Fish; DOD = US Department of Defense; DOE = US Department of Energy; EMNRD = New Mexico Energy, Minerals, and Natural Resources Department; NGO = Non-governmental organization; NMISC = New Mexico Interstate Stream Commission; NPS = US National Park Service; NSF = US National Science Foundation; SLO = New Mexico State Land Office; USFS = US Forest Service; USFWS = US Fish and Wildlife Service; USGS = US Geological Survey.

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Plains Leopard Frog	*Lithobates blairi*	Amphibians	I	M(o)	Department, University
Rio Grande Leopard Frog	*Lithobates berlandieri*	Amphibians	I	M(o)	USFS, Department
Sacramento Mountain Salamander	*Aneides hardii*	Amphibians	I	CT, M(a)	USFS, Department, University
Sonoran Desert Toad	*Incilius alvarius*	Amphibians	D	M(o)	Department, University
Western Narrow-mouthed Toad	*Gastrophryne olivacea*	Amphibians	L	M(o)	University
Andrenid Bee	*Macrotera magniceps*	Bees	D	M(o)	NSF, USFWS, University
Andrenid Bee	*Perdita biparticeps*	Bees	D	M(n)	
Andrenid Bee	*Perdita claripennis*	Bees	D	M(n)	
Andrenid Bee	*Perdita geminata*	Bees	D	M(n)	
Andrenid Bee	*Perdita grandiceps*	Bees	D	M(n)	
Andrenid Bee	*Perdita maculipes*	Bees	D	M(n)	
Andrenid Bee	*Perdita senecionis*	Bees	D	M(n)	
Andrenid Bee	*Perdita tarda*	Bees	D	M(n)	
Austin’s Fairy Bee	*Perdita austini*	Bees	D	M(o)	NSF, USFWS, University
Bare Fairy Bee	*Perdita aperta*	Bees	D	M(o)	NSF, USFWS, University
Beloved Fairy Bee	*Perdita cara*	Bees	D	M(o)	NSF, USFWS, University
Brave Digger Bee	*Anthophora vallorum*	Bees	D	M(n)	
Chihuahuan Desert Digger Bee	*Anthophora chihuahua*	Bees	D	M(n)	
Cockerell's Bumble Bee	*Bombus cockerelli*	Bees	I	M(n)	
Dakota Leaf-cutter Bee	*Megachile dakotensis*	Bees	L	M(n)	
Half-scarlet Fairy Bee	*Perdita semicrocea*	Bees	I	M(o)	NSF, USFWS, University

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Melittid Bee	*Hesperapis trochanterata*	Bees	D	M(o)	NSF, USFWS, University
Mighty Leaf-cutter Bee	*Megachile fortis*	Bees	L	M(n)	
Mimbres Miner Bee	*Andrena mimbresensis*	Bees	D	M(n)	
Morrison's Bumble Bee	*Bombus morrisoni*	Bees	D	M(o)	NPS, University
Neff's Miner Bee	*Andrena neffi*	Bees	D	M(n)	
Sand Dune Wool-carder Bee	*Anthidium rodecki*	Bees	D	M(n)	
Southern Plains Bumble Bee	*Bombus fraternus*	Bees	D	M(n)	
Southwest Leaf-cutter Bee	*Megachile melanderi*	Bees	D	M(n)	
Sweat Bee	*Conanthalictus conanthi*	Bees	D	M(o)	NSF, USFWS, University
Thirsty Plasterer Bee	*Colletes aridus*	Bees	D	M(o)	NSF, USFWS, University
Triton Fairy Bee	*Perdita trinotata*	Bees	I	M(o)	NSF, USFWS, University
Volger's Mining Bee	*Andrena vogleri*	Bees	D	M(n)	
Watson's Mason Bee	*Osmia watsoni*	Bees	D	M(o)	NSF, USFWS, University
Western Bumble Bee	*Bombus occidentalis*	Bees	D	M(n)	
White Sands Sweat Bee	*Lasioglossum argammon*	Bees	I	M(o)	NSF, USFWS, University
Anthony Blister Beetle	*Lytta mirifica*	Beetles	I	M(n)	
Wood's Jewel Beetle	*Chrysina woodi*	Beetles	D	M(n)	
Abert's Towhee	*Melozone aberti aberti*	Birds	L	M(n)	
American Bittern	*Botaurus lentiginosus*	Birds	D	M(n)	

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American Dipper	*Cinclus mexicanus unicolor*	Birds	D	M(n)	
American Kestrel	*Falco sparverius sparverius*	Birds	D	$M(a)_{b, f}$	USGS, University, Department, NGO
American Pipit	*Anthus rubescens*	Birds	D	M(n)	
American Tree Sparrow	*Spizelloides arborea ochracea*	Birds	D	M(n)	
Aplomado Falcon	*Falco femoralis septentrionalis*	Birds	L	CT, $M(a)_{b}$	BLM, USFWS, Private
Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*	Birds	D	M(n)	
Arizona Woodpecker	*Dryobates arizonae*	Birds	L	M(n)	
Baird's Sparrow	*Ammodramus bairdii*	Birds	F	CA, $M(a)_{w}$	DOD, USFWS, Department, NGO
Bald Eagle	*Haliaeetus leucocephalus*	Birds	D	M(n)	
Band-tailed Pigeon	*Patagioenas fasciata*	Birds	D	$M(a)_{b}$	USGS
Bank Swallow	*Riparia riparia riparia*	Birds	D	M(n)	
Bell's Vireo	*Vireo bellii*	Birds	F	$M(a)_{b}$	BOR, USGS, Department, NGO, Private
Bendire's Thrasher	*Toxostoma bendirei*	Birds	F	CT, $M(a)_{b}$	USFWS, USGS, University
Bewick's Wren	*Thryomanes bewickii*	Birds	D	$M(a)_{b}$	USGS, Department
Black Rosy-Finch	*Leucosticte atrata*	Birds	F	$M(a)_{w}$, CT	USFWS, Department, University, NGO
Black Swift	*Cypseloides niger borealis*	Birds	L	M(n)	
Black-billed Magpie	*Pica hudsonia*	Birds	D	$M(a)_{b}$	USGS, Department
Black-chinned Sparrow	*Spizella atrogularis evura*	Birds	D	$M(a)_{b}$	USGS

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Black-headed Grosbeak	*Pheucticus melanocephalus*	Birds	D	$M(a)_b$	USGS, Department
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	D	$M(a)_b$	USGS, Department
Black-throated Sparrow	*Amphispiza bilineata*	Birds	D	$M(a)_b$	USGS, Department
Boreal Owl	*Aegolius funereus*	Birds	L	M(n)	
Brewer's Sparrow	*Spizella breweri*	Birds	D	$M(a)_b$	USGS, Department
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	Birds	L	M(n)	
Broad-tailed Hummingbird	*Selasphorus platycercus platycercus*	Birds	D	$M(a)_b$	USGS, Department, Private
Brown Pelican	*Pelecanus occidentalis carolinensis*	Birds	L	M(n)	
Brown-capped Rosy-Finch	*Leucosticte australis*	Birds	F	$M(a)_{b,\ w}$	USFWS, Department, University, NGO
Buff-breasted Flycatcher	*Empidonax fulvifrons pygmaeus*	Birds	L	M(n)	
Bullock's Oriole	*Icterus bullockii*	Birds	D	$M(a)_b$	USGS, Department
Burrowing Owl	*Athene cunicularia hypugaea*	Birds	I	$M(a)_b$	DOD, USFWS, USGS, Department, University, NGO, Private
Cactus Wren	*Campylorhynchus brunneicapillus couesi*	Birds	D	$M(a)_b$	USGS
Canyon Towhee	*Melozone fusca*	Birds	D	$M(a)_b$	USGS, Department
Canyon Wren	*Catherpes mexicanus conspersus*	Birds	D	$M(a)_b$	USGS, Department
Cassin’s Finch	*Haemorhous cassinii*	Birds	D	$M(a)_b$	USGS, Department
Cassin’s Sparrow	*Peucaea cassinii*	Birds	D	$M(a)_b$	USGS, Department

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Cassin's Kingbird	*Tyrannus vociferans vociferans*	Birds	D	$M(a)_b$	USGS, Department
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	F	CA, $M(a)_w$	DOD, USFWS, Department, NGO
Chihuahuan Meadowlark	*Sturnella lilianae*	Birds	D	$M(a)_b$	USGS, Department
Chihuahuan Raven	*Corvus cryptoleucus*	Birds	D	$M(a)_b$	USGS, Department
Chipping Sparrow	*Spizella passerina arizonae*	Birds	D	$M(a)_b$	USGS, Department
Clark's Grebe	*Aechmophorus clarkii*	Birds	D	M(n)	
Clark's Nutcracker	*Nucifraga columbiana*	Birds	D	$M(a)_b$	USGS, Department
Cliff Swallow	*Petrochelidon pyrrhonota*	Birds	D	$M(a)_b$	USGS, Department
Common Black Hawk	*Buteogallus anthracinus anthracinus*	Birds	D	M(n)	
Common Ground Dove	*Columbina passerina pallescens*	Birds	L	M(n)	
Common Nighthawk	*Chordeiles minor*	Birds	D	$M(a)_b$	USGS, Department, NGO
Costa's Hummingbird	*Calypte costae*	Birds	L	M(n)	
Eastern Bluebird	*Sialia sialis*	Birds	D	M(n)	
Elegant Trogon	*Trogon elegans canescens*	Birds	L	M(n)	
Elf Owl	*Micrathene whitneyi whitneyi*	Birds	D	M(n)	
Evening Grosbeak	*Coccothraustes vespertinus*	Birds	D	$M(a)_b$	USGS
Ferruginous Hawk	*Buteo regalis*	Birds	D	$M(a)_b$	USGS
Field Sparrow	*Spizella pusilla arenacea*	Birds	D	M(n)	
Flammulated Owl	*Psiloscops flammeolus*	Birds	D	$M(a)_b$	NGO

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Gila Woodpecker	*Melanerpes uropygialis uropygialis*	Birds	L	M(n)	
Golden Eagle	*Aquila chrysaetos canadensis*	Birds	D	$M(a)_y$	DOD, USGS, University, NGO
Grace’s Warbler	*Setophaga graciae*	Birds	I	$M(a)_b$	USGS, Department
Grasshopper Sparrow	*Ammodramus savannarum perpallidus*	Birds	D	$M(a)_b$	USGS
Gray Vireo	*Vireo vicinior*	Birds	I	$M(a)_b$	DOD, USGS, Department, NGO, Private
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	Birds	F	$M(a)_w$	USFWS, Department, University, NGO
Greater Pewee	*Contopus pertinax pallidiventris*	Birds	L	M(n)	
Greater Yellowlegs	*Tringa melanoleuca*	Birds	D	M(n)	
Green-tailed Towhee	*Pipilo chlorurus*	Birds	D	$M(a)_b$	USGS
Harris's Hawk	*Parabuteo unicinctus harrisi*	Birds	D	$M(a)_b$	USGS
Horned Lark	*Eremophila alpestris*	Birds	D	$M(a)_b$	USGS, Department
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	$M(a)_b$	USGS, Department
Killdeer	*Charadrius vociferus vociferus*	Birds	D	$M(a)_b$	USGS, Department
Lapland Longspur	*Calcarius lapponicus alascensis*	Birds	D	M(n)	
Lark Bunting	*Calamospiza melanocorys*	Birds	D	$M(a)_b$	USGS, Department
Lark Sparrow	*Chondestes grammacus strigatus*	Birds	D	$M(a)_b$	USGS, Department
Lazuli Bunting	*Passerina amoena*	Birds	L	$M(a)_b$	USGS

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Least Tern	*Sternula antillarum athalassos*	Birds	L	M(o)	BOR, USFWS
Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*	Birds	F	CT, $M(a)_y$	BLM, USFWS, Department, NGO
Lewis's Woodpecker	*Melanerpes lewis*	Birds	D	$M(a)_b$	USGS
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	$M(a)_b$	USGS, Department
Long-billed Curlew	*Numenius americanus americanus*	Birds	D	$M(a)_b$	USFWS, USGS, Department, University
Long-billed Dowitcher	*Limnodromus scolopaceus*	Birds	D	M(n)	
Long-eared Owl	*Asio otus*	Birds	D	M(n)	
Lucifer Hummingbird	*Calothorax lucifer*	Birds	L	M(n)	
Lucy's Warbler	*Leiothlypis luciae*	Birds	D	$M(a)_b$	USGS
Mexican Chickadee	*Poecile sclateri eidos*	Birds	L	M(n)	
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	CA, CT, $M(a)_b$	DOE, NPS, USFS, NGO, Private
Mexican Whip-poor-will	*Antrostomus arizonae arizonae*	Birds	D	M(n)	
Mountain Bluebird	*Sialia currucoides*	Birds	D	$M(a)_b$	USGS, Department, University
Mountain Chickadee	*Poecile gambeli gambeli*	Birds	D	$M(a)_b$	USGS, Department
Mountain Plover	*Charadrius montanus*	Birds	F	CT, $M(a)_b$	USFWS, Department, NGO
Neotropic Cormorant	*Phalacrocorax brasilianus*	Birds	L	M(o)	Department
Northern Beardless Tyrannulet	*Camptostoma imberbe ridgwayi*	Birds	L	M(n)	
Northern Harrier	*Circus hudsonius*	Birds	D	$M(a)_b$	USGS, Department
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Birds	D	$M(a)_b$	USGS

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Olive Warbler	*Peucedramus taeniatus arizonae*	Birds	D	M(n)	
Olive-sided Flycatcher	*Contopus cooperi*	Birds	D	$M(a)_b$	USGS
Peregrine Falcon	*Falco peregrinus*	Birds	D	$M(a)_{b, f}$	USGS, NGO
Phainopepla	*Phainopepla nitens lepida*	Birds	D	$M(a)_b$	USGS
Pine Grosbeak	*Pinicola enucleator montana*	Birds	D	M(n)	
Pine Siskin	*Spinus pinus*	Birds	D	$M(a)_b$	USGS
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	F	CA, CT, $M(a)_y$	DOD, DOE, USFWS, USGS, Department, University, NGO
Piping Plover	*Charadrius melodus circumcinctus*	Birds	L	M(n)	
Plumbeous Vireo	*Vireo plumbeus*	Birds	D	$M(a)_b$	USGS, Department
Prairie Falcon	*Falco mexicanus*	Birds	D	$M(a)_b$	USGS, NGO
Purple Martin	*Progne subis*	Birds	D	$M(a)_b$	USGS, Department
Pygmy Nuthatch	*Sitta pygmaea melanotis*	Birds	D	$M(a)_b$	USGS, Department
Pyrrhuloxia	*Cardinalis sinuatus sinuatus*	Birds	D	$M(a)_b$	USGS
Red-faced Warbler	*Cardellina rubrifrons*	Birds	D	M(n)	
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinas*	Birds	L	$M(a)_b$	USGS, Department
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Birds	D	$M(a)_b$	USGS
Rock Wren	*Salpinctes obsoletus obsoletus*	Birds	D	$M(a)_b$	USGS, Department
Sage Thrasher	*Oreoscoptes montanus*	Birds	D	$M(a)_b$	USGS, Department
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Birds	D	$M(a)_b$	USGS, Department

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Savannah Sparrow	*Passerculus sandwichensis*	Birds	D	$M(a)_b$	USGS
Scott's Oriole	*Icterus parisorum*	Birds	D	$M(a)_b$	USGS
Short-eared Owl	*Asio flammeus flammeus*	Birds	D	M(n)	
Snowy Plover	*Charadrius nivosus*	Birds	L	M(n)	
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	I	CT, $M(a)_b$	BOR, USFWS, NGO
Spotted Sandpiper	*Actitis macularius*	Birds	D	$M(a)_b$	USGS
Spotted Towhee	*Pipilo maculatus*	Birds	D	$M(a)_b$	USGS, Department
Sprague’s Pipit	*Anthus spragueii*	Birds	F	CA, $M(a)_w$	DOD, USFWS, Department, NGO
Steller's Jay	*Cyanocitta stelleri macrolopha*	Birds	D	$M(a)_b$	USGS, Department
Thick-billed Kingbird	*Tyrannus crassirostris*	Birds	L	M(n)	
Thick-billed Longspur	*Rhynchophanes mccownii*	Birds	F	CA, $M(a)_w$	DOD, USFWS, Department, NGO
Varied Bunting	*Passerina versicolor*	Birds	L	M(n)	
Verdin	*Auriparus flaviceps ornatus*	Birds	D	$M(a)_b$	USGS
Vesper Sparrow	*Pooecetes gramineus*	Birds	D	$M(a)_b$	USGS, Department
Violet-crowned Hummingbird	*Leucolia violiceps ellioti*	Birds	L	M(n)	
Violet-green Swallow	*Tachycineta thalassina lepida*	Birds	D	$M(a)_b$	USGS, Department
Virginia’s Warbler	*Leiothlypis virginiae*	Birds	F	$M(a)_b$	USGS, Department
Western Bluebird	*Sialia mexicana bairdi*	Birds	D	$M(a)_b$	DOE, USGS, Department, University
Western Grebe	*Aechmophorus occidentalis*	Birds	D	M(n)	
Western Kingbird	*Tyrannus verticalis*	Birds	D	$M(a)_b$	USGS, Department

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Western Meadowlark	*Sturnella neglecta*	Birds	D	$M(a)_b$	USGS, Department
Western Sandpiper	*Calidris mauri*	Birds	L	M(n)	
Western Wood Pewee	*Contopus sordidulus*	Birds	D	$M(a)_b$	USGS, Department
Whiskered Screech-Owl	*Megascops trichopsis asperus*	Birds	F	$M(a)_b$	Department
White-eared Hummingbird	*Basilinna leucotis borealis*	Birds	L	M(n)	
White-tailed Ptarmigan	*Lagopus leucura altipetens*	Birds	F	$M(a)_y$	Department, University
White-throated Swift	*Aeronautes saxatalis saxatalis*	Birds	D	$M(a)_b$	USGS
Williamson’s Sapsucker	*Sphyrapicus thyroideus nataliae*	Birds	D	$M(a)_b$	USGS
Wilson's Warbler	*Cardellina pusilla*	Birds	L	$M(a)_b$	USGS
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	I	$M(a)_b$	USGS, Department
Yellow-billed Cuckoo (eastern pop)	*Coccyzus americanus americanus*	Birds	D	$M(a)_b$	USGS
Yellow-billed Cuckoo (western pop)	*Coccyzus americanus occidentalis*	Birds	F	CT, $M(a)_b$	BOR, USFWS, Department, NGO
Yellow-eyed Junco	*Junco phaeonotus palliatus*	Birds	D	M(n)	
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Birds	D	$M(a)_b$	USGS
Alkali Fairy Shrimp	*Branchinecta mackini*	Crustaceans	D	M(n)	
Beavertail Fairy Shrimp	*Thamnocepahlus platyurus*	Crustaceans	D	M(n)	
BLNWR cryptic species Amphipod	*Gammarus* sp. (unnamed)	Crustaceans	D	M(a)	USFWS, Department
Bowman’s Fairy Shrimp	*Streptocephalus thomasbowmani*	Crustaceans	D	M(n)	

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Brine Shrimp	*Artemia franciscana*	Crustaceans	D	M(n)	
Clam Shrimp	*Eulimnadia follismilis*	Crustaceans	D	M(n)	
Colorado Fairy Shrimp	*Branchinecta coloradensis*	Crustaceans	D	M(n)	
Conchas Crayfish	*Faxonius deanae*	Crustaceans	D	M(o)	EMNRD
Cylindrical Cyst Clam Shrimp	*Eulimnadia cylindrova*	Crustaceans	D	M(n)	
Desert Fairy Shrimp	*Streptocephalus dorothae*	Crustaceans	D	M(n)	
Desert Tadpole Shrimp	*Triops newberryi*	Crustaceans	D	M(n)	
Diversity Clam Shrimp	*Eulimnadia diversa*	Crustaceans	D	M(n)	
Dumont's Fairy Shrimp	*Streptocephalus henridumontis*	Crustaceans	D	M(n)	
Fuzzy Cyst Clam Shrimp	*Eulimnadia antlei*	Crustaceans	D	M(n)	
Great Plains Fairy Shrimp	*Streptocephalus texanus*	Crustaceans	D	M(n)	
Knobblip Fairy Shrimp	*Eubranchipus bundyi*	Crustaceans	D	M(n)	
Lynch Tadpole Shrimp	*Lepidurus lemmoni*	Crustaceans	D	M(n)	
Mackin Fairy Shrimp	*Streptocephalus mackini*	Crustaceans	D	M(n)	
Mexican Beavertail Fairy Shrimp	*Thamnocephalus mexicanus*	Crustaceans	D	M(n)	
Moore's Fairy Shrimp	*Streptocephalus moorei*	Crustaceans	D	M(n)	
Noel's Amphipod	*Gammarus desperatus*	Crustaceans	F	CA, CT, M(a)	USFWS, Department
Packard's Fairy Shrimp	*Branchinecta packardi*	Crustaceans	D	M(n)	
Playa Clam Shrimp	*Leptestheria compleximanus*	Crustaceans	D	M(n)	
Scud	*Hyalella azteca*	Crustaceans	D	M(n)	

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Short Finger Clam Shrimp	*Lynceus brevifrons*	Crustaceans	D	M(n)	
Sitting Bull Spring cryptic species Amphipod	*Gammarus* sp. (unnamed)	Crustaceans	D	M(n)	
Socorro Isopod	*Thermosphaeroma thermophilum*	Crustaceans	F	CA, M(a)	USFWS, Department, University, Local Government
Southern Plains Crayfish	*Procambarus simulans simulans*	Crustaceans	D	M(n)	
Sublette's Fairy Shrimp	*Phallocryptis subletti*	Crustaceans	D	M(n)	
Texan Clam Shrimp	*Eulimnadia texana*	Crustaceans	D	M(n)	
Versatile Fairy Shrimp	*Branchinecta lindahli*	Crustaceans	D	M(n)	
Arkansas River Shiner	*Notropis girardi*	Fish	F	CA, CT, M(a)	USFWS, Department, University
Bigscale Logperch	*Percina macrolepida*	Fish	L	M(o)	USFWS, Department
Blue Sucker	*Cycleptus elongatus*	Fish	F	M(a)	USFWS, Department, NGO
Central Stoneroller	*Campostoma anomalum*	Fish	L	M(o)	Department
Chihuahua Chub	*Gila nigrescens*	Fish	F	CA, CT, M(a)	USFS, USFWS, Department
Colorado Pikeminnow	*Ptychocheilus lucius*	Fish	F	CA, CT, M(a)	BLM, USFWS, Department, University, NGO, Private, Tribe
Desert Sucker	*Catostomus clarkii*	Fish	F	M(o)	USFS, Department
Gila Chub	*Gila intermedia*	Fish	F	CA, CT, M(p)	USFS, USFWS, Department
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	Fish	L	CA, CT, M(p)	Department, Private Landowner
Gila Trout	*Oncorhynchus gilae*	Fish	F	CA, CT, M(a)	USFS, USFWS, Department
Gray Redhorse	*Moxostoma congestum*	Fish	F	M(a)	USFWS, Department, NGO
Greenthroat Darter	*Etheostoma lepidum*	Fish	I	M(o)	USFWS, Department
Headwater Catfish	*Ictalurus lupus*	Fish	D	M(n)	

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Headwater Chub	*Gila nigra*	Fish	F	CA, CT, M(p)	USFS, USFWS, Department
Loach Minnow	*Rhinichthys cobitis*	Fish	F	CA, CT, M(a)	USFS, USFWS, Department
Longnose Gar	*Lepisosteus osseus*	Fish	L	M(a)	USFWS, Department
Mexican Tetra	*Astyanax mexicanus*	Fish	I	M(a)	USFWS, Department
Mottled Sculpin	*Cottus bairdi*	Fish	L	M(o)	Department
Pecos Bluntnose Shiner	*Notropis simus pecosensis*	Fish	F	CA, CT, M(a)	USFWS
Pecos Gambusia	*Gambusia nobilis*	Fish	F	M(a)	USFWS, Department
Pecos Pupfish	*Cyprinodon pecosensis*	Fish	F	CA, CT, M(a)	BLM, USFWS, Department, EMNRD, University
Peppered Chub	*Macrhybopsis tetranema*	Fish	F	CA, CT, M(a)	USFWS, Department, University
Plains Minnow	*Hybognathus placitus*	Fish	L	M(a)	USFWS, Department
Razorback Sucker	*Xyrauchen texanus*	Fish	F	CA, CT, M(a)	BLM, USFWS, Department, University, NGO, Private, Tribe
Rio Grande Chub	*Gila pandora*	Fish	F	CA, CT, M(a)	BLM, USFS, USFWS, Department, University, Private, Tribe
Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	Fish	F	CA, CT, M(a)	USFS, Department
Rio Grande Shiner	*Notropis jemezanus*	Fish	I	M(a)	USFWS
Rio Grande Silvery Minnow	*Hybognathus amarus*	Fish	I	CA, CT, M(a)	BOR, USFWS, NMISC
Rio Grande Sucker	*Catostomus plebeius*	Fish	F	CA, CT, M(a)	BLM, USFS, USFWS, Department, University, Private, Tribe
Roundnose Minnow	*Dionda episcopa*	Fish	I	M(o)	
Roundtail Chub	*Gila robusta*	Fish	F	CA, CT, M(a)	USFS, USFWS, Department, Tribe
Smallmouth Buffalo	*Ictiobus bubalus*	Fish	I	M(o)	Department
Sonora Sucker	*Catostomus insignis*	Fish	F	M(o)	USFS, Department

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Southern Redbelly Dace	*Chrosomus erythrogaster*	Fish	L	M(n)	
Speckled Chub	*Macrhybopsis aestivalis*	Fish	I	M(a)	USFWS, Department
Spikedace	*Meda fulgida*	Fish	F	CA, CT, M(a)	USFS, USFWS, Department
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	L	M(o)	USFS
White Sands Pupfish	*Cyprinodon tularosa*	Fish	F	CA, CT, M(a)	DOD, USFWS, Department
Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	Fish	F	CA, M(a)	USFS, USFWS, Department, NGO, Tribe
Alamogordo Window Fly	*Caenotus inornatus*	Flies	D	M(n)	
Crandall's Hornet Fly	*Spilomyia crandalli*	Flies	D	M(n)	
Dune Flower-loving Fly	*Apiocera bilineata*	Flies	D	M(n)	
Painter's Mydas Fly	*Rhaphiomidas painteri*	Flies	I	M(n)	
Prairie Bee Fly	*Poecilognathus scolopax*	Flies	D	M(n)	
Rio Grande Flower-loving Fly	*Apiocera hamata*	Flies	D	M(n)	
Small Window Fly	*Caenotus minutus*	Flies	D	M(n)	
Southwestern Slender Bee Fly	*Thevenetimyia speciosa*	Flies	D	M(n)	
Yellow-tailed Hornet Fly	*Spilomyia kahli*	Flies	D	M(n)	
Allen's Big-eared Bat	*Idionycteris phyllotis*	Mammals	D	M(o)	BLM, USFS, University
American Beaver	*Castor canadensis*	Mammals	I	CT, M(a)	BLM, USFS, Department, University, NGO, Private, Tribe
American Mink	*Neogale vison*	Mammals	D	M(o)	Department, Private
American Pika	*Ochotona princeps*	Mammals	L	M(p)	NPS, USGS
Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	Mammals	D	M(o)	University
Arizona Montane Vole	*Microtus montanus arizonensis*	Mammals	F	M(p)	USFS, Department, University

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Arizona Shrew	*Sorex arizonae*	Mammals	L	M(n)	
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	D	M(n)	
Big Free-tailed Bat	*Nyctinomops macrotis*	Mammals	D	M(o)	BLM, USFS, University
Black-footed Ferret	*Mustela nigripes*	Mammals	F	CA, CT, M(o)	Department, Private Landowner
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	F	CT, M(p)	BLM, Department, Private Landowner
Canada Lynx	*Lynx canadensis*	Mammals	L	CT, M(n)	
Cave Myotis	*Myotis velifer*	Mammals	I	M(o)	BLM, NPS, USFS
Common Porcupine	*Erethizon dorsatum*	Mammals	D	M(o)	Private
Desert Pocket Gopher	*Geomys arenarius*	Mammals	D	M(n)	
Eastern Red Bat	*Lasiurus borealis*	Mammals	D	M(o)	USGS
Ermine Weasel	*Mustela richardsonii*	Mammals	D	M(o)	Department, Private
Fringed Myotis	*Myotis thysanodes thysanodes*	Mammals	I	M(o)	BLM, USFS, USGS
Gray-collared Chipmunk	*Neotamias cinereicollis cinereicollis*	Mammals	D	M(n)	
Gray-footed Chipmunk	*Neotamias canipes*	Mammals	D	M(o)	Department, University
Gunnison’s Prairie Dog	*Cynomys gunnisoni*	Mammals	F	CT, M(p)	BLM, USFS, USFWS, Department, University, Private Landowner, Tribe
Heather Vole	*Phenacomys intermedius intermedius*	Mammals	D	M(n)	
Hoary Bat	*Aeorestes cinereus cinereus*	Mammals	D	M(o)	BLM, NPS, USFS, USGS
Holzner's Cottontail Rabbit	*Sylvilagus holzneri*	Mammals	D	M(n)	

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Hooded Skunk	*Mephitis macroura milleri*	Mammals	D	M(o)	Department
Jaguar	*Panthera onca arizonensis*	Mammals	L	CT, M(o)	USFWS
Least Shrew	*Cryptotis parva*	Mammals	F	M(p)	Department
Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	Mammals	F	CT, M(a)	Department, University
New Mexico Jumping Mouse	*Zapus hudsonius luteus (=Zapus luteus luteus)*	Mammals	I	CA, CT, M(p)	USFS, USFWS, University
Mexican Gray Wolf	*Canis lupus baileyi*	Mammals	I	CA, CT, M(a)	USFWS, AGFD, Department
Mexican Long-nosed Bat	*Leptonycteris nivalis*	Mammals	F	CA, CT, M(o)	Department, University
Mexican Long-tongued Bat	*Choeronycteris mexicana*	Mammals	F	M(n)	
North American River Otter	*Lontra canadensis*	Mammals	F	M(o)	Department, NGO, Tribe
Northern Pygmy Mouse	*Baiomys taylori ater*	Mammals	D	M(n)	
Organ Mountains Colorado Chipmunk	*Neotamias quadrivittatus australis*	Mammals	I	M(p)	BLM, DOD, Department, University
Oscura Mountains Colorado Chipmunk	*Neotamias quadrivittatus oscuraensis*	Mammals	I	M(p)	DOD, University
Pacific Marten	*Martes caurina*	Mammals	F	M(p)	NPS, USFS, Department, Private
Peñasco Least Chipmunk	*Neotamias minimus atristriatus*	Mammals	F	CT, M(p)	USFS, Department, Tribe
Pocketed Free-tailed Bat	*Nyctinomops femorosaccus*	Mammals	D	M(n)	
Prairie Vole	*Microtus ochrogaster haydenii*	Mammals	D	M(n)	

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Snowshoe Hare	*Lepus americanus bairdii*	Mammals	D	M(n)	
Southern Pocket Gopher	*Thomomys umbrinus*	Mammals	D	M(n)	
Southern Red-backed Vole	*Myodes gapperi*	Mammals	D	M(n)	
Southwestern Little Brown Myotis	*Myotis occultus*	Mammals	D	M(o)	BLM, USFS, USGS
Spotted Bat	*Euderma maculatum*	Mammals	D	M(o)	BLM, USFS, University
Thirteen-lined Ground Squirrel	*Ictidomys tridecemlineatus*	Mammals	D	M(n)	
Tri-colored Bat	*Perimyotis subflavus*	Mammals	F	CT, M(o)	BLM, NPS, USFWS, USGS
Western Jumping Mouse	*Zapus princeps princeps*	Mammals	D	M(n)	
Western Red Bat	*Lasiurus blossevillii*	Mammals	D	M(o)	USGS
Western Water Shrew	*Sorex navigator*	Mammals	D	M(n)	
Western Yellow Bat	*Dasypterus xanthinus*	Mammals	D	M(n)	
White-nosed Coati	*Nasua narica*	Mammals	D	M(o)	Department, University
White-sided Jackrabbit	*Lepus callotis gaillardi*	Mammals	I	M(n)	
White-tailed Jackrabbit	*Lepus townsendii campanius*	Mammals	D	M(n)	
Yellow-bellied Marmot	*Marmota flaviventris*	Mammals	D	M(n)	
Yellow-nosed Cotton Rat	*Sigmodon ochrognathus*	Mammals	D	M(n)	
Yuma Myotis	*Myotis yumanensis yumanensis*	Mammals	D	M(o)	BLM, USFS, USGS
Alamosa Springsnail	*Pseudotryonia alamosae*	Molluscs	F	CA, M(a)	USFWS, Department, Private
Animas Mountains Holospira Snail	*Holospira animasensis*	Molluscs	D	M(n)	

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Animas Peak Woodlandsnail	*Ashmunella animasensis*	Molluscs	D	M(n)	
Animas Talussnail	*Sonorella animasensis*	Molluscs	D	M(n)	
Apache Snaggletooth Snail	*Gastrocopta cochisensis*	Molluscs	D	M(n)	
Bearded Mountainsnail	*Oreohelix barbata*	Molluscs	D	M(n)	
Big Hatchet Woodlandsnail	*Ashmunella mearnsii*	Molluscs	D	M(n)	
Bishop Tubeshell Snail	*Coelostemma pyrgonasta*	Molluscs	D	M(n)	
Black Range Mountainsnail	*Oreohelix metcalfei*	Molluscs	D	M(n)	
Black Range Mountainsnail	*Oreohelix metcalfei cuchillensis*	Molluscs	D	M(n)	
Black Range Woodlandsnail	*Ashmunella cockerelli*	Molluscs	D	M(n)	
Burnt Corral Pyrg	*Pyrgulopsis similis*	Molluscs	D	M(n)	
Capitan Woodlandsnail	*Ashmunella pseudodonta*	Molluscs	D	M(n)	
Chupadera Springsnail	*Pyrgulopsis chupaderae*	Molluscs	F	CA, M(a)	USFWS, Department, NGO, Private Landowner
Cockerell Holospira Snail	*Holospira cockerelli*	Molluscs	D	M(n)	
Cooke’s Peak Woodlandsnail	*Ashmunella macromphala*	Molluscs	D	M(o)	Department, Private
Creeping Ancylid Snail	*Ferrissia rivularis*	Molluscs	D	M(n)	
Cross Holospira Snail	*Holospira crossei*	Molluscs	D	M(o)	Department, Private
Diablo Mountainsnail	*Oreohelix houghi*	Molluscs	D	M(n)	
Doña Ana Talussnail	*Sonorella todseni*	Molluscs	D	M(o)	Department, Private
Dry Creek Woodlandsnail	*Ashmunella tetrodon*	Molluscs	D	M(n)	

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Dry Creek Woodlandsnail	*Ashmunella tetrodon fragilis*	Molluscs	D	M(n)	
False Marsh Snail	*Deroceras heterura*	Molluscs	D	M(n)	
Florida Mountain Woodlandsnail	*Ashmunella walkeri*	Molluscs	D	M(n)	
Franklin Mountain Talussnail	*Sonorella metcalfi*	Molluscs	D	M(n)	
Franklin Mountain Woodlandsnail	*Ashmunella pasonis pasonis*	Molluscs	D	M(n)	
Fringed Mountainsnail	*Radiocentrum ferrissi*	Molluscs	D	M(o)	Department, Private
Gila Springsnail	*Pyrgulopsis gilae*	Molluscs	I	M(n)	
Goat Mountain Woodlandsnail	*Ashmunella harrisi*	Molluscs	D	M(n)	
Guadalupe Woodlandsnail	*Ashmunella carlbadensis*	Molluscs	D	M(n)	
Hacheta Grande Woodlandsnail	*Ashmunella hebardi*	Molluscs	D	M(o)	Department, Private
Hacheta Mountainsnail	*Radiocentrum hachetanum*	Molluscs	D	M(n)	
Heart Vertigo Snail	*Vertigo hinkleyi*	Molluscs	D	M(n)	
Iron Creek Woodlandsnail	*Ashmunella mendax*	Molluscs	D	M(n)	
Jemez Woodlandsnail	*Ashmunella ashmuni*	Molluscs	D	M(n)	
Jordan Spring Pyrg	*Pyrgulopsis marilynae*	Molluscs	D	M(n)	
Koster's Springsnail	*Juturnia kosteri*	Molluscs	F	CA, CT, M(a)	USFWS, Department
Lake Fingernailclam	*Musculium lacustre*	Molluscs	D	M(n)	
Lang Canyon Talussnail	*Sonorella painteri*	Molluscs	D	M(n)	
Lilljeborg's Peaclam	*Pisidium lilljeborgi*	Molluscs	D	M(n)	
Long Fingernailclam	*Musculium transversum*	Molluscs	D	M(n)	

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Magdalena Mountainsnail	*Oreohelix magdalenae*	Molluscs	D	M(n)	
Maple Canyon Woodlandsnail	*Ashmunella todseni*	Molluscs	D	M(n)	
Metcalf Holospira Snail	*Holospira metcalfi*	Molluscs	D	M(o)	Department, Private
Mineral Creek Mountainsnail	*Oreohelix pilsbryi*	Molluscs	D	M(o)	Department, Private
Morgan Creek Mountainsnail	*Oreohelix swopei*	Molluscs	D	M(n)	
Mount Riley Woodlandsnail	*Ashmunella rileyensis*	Molluscs	D	M(n)	
Mountainsnail	*Oreohelix nogalensis*	Molluscs	D	M(n)	
Multirib Vallonia Snail	*Vallonia gracilicosta*	Molluscs	D	M(n)	
New Mexico Hot Springsnail	*Pyrgulopsis thermalis*	Molluscs	I	M(n)	
New Mexico Ramshorn Snail	*Pecosorbis kansasensis*	Molluscs	D	M(n)	
New Mexico Talussnail (Big Hatchet Mountains, Florida Mountains)	*Sonorella hachitana*	Molluscs	D	M(o)	Department, Private
New Mexico Talussnail (Peloncillo Mountains)	*Sonorella hachitana peloncillensis*	Molluscs	D	M(n)	
Northern Treeband Snail	*Humboldtiana ultima*	Molluscs	D	M(n)	
Organ Mountain Woodlandsnail	*Ashmunella organensis*	Molluscs	D	M(n)	
Ovate Vertigo Snail	*Vertigo ovata*	Molluscs	D	M(n)	
Paper Pondshell	*Utterbackia imbecillis*	Molluscs	D	M(n)	
Pecos Assiminea	*Assiminea pecos*	Molluscs	F	CA, CT, M(a)	USFWS, Department

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Pecos Springsnail	*Pyrgulopsis pecosensis*	Molluscs	F	M(a)	USFWS, Department
Pinos Altos Mountainsnail	*Oreohelix confragosa*	Molluscs	D	M(n)	
Rocky Mountainsnail	*Oreohelix strigosa depressa*	Molluscs	D	M(n)	
Roswell Springsnail	*Pyrgulopsis roswellensis*	Molluscs	F	CA, CT, M(a)	USFWS, Department
Ruidoso Snaggletooth Snail	*Gastrocopta ruidosensis*	Molluscs	D	M(n)	
Salinas Peak Woodlandsnail	*Ashmunella salinasensis*	Molluscs	D	M(n)	
San Augustin Mountainsnail	*Oreohelix litoralis*	Molluscs	D	M(n)	
Sangre de Cristo Woodlandsnail	*Ashmunella thomsoniana*	Molluscs	D	M(n)	
Shortneck Snaggletooth Snail	*Gastrocopta dalliana dalliana*	Molluscs	D	M(n)	
Silver Creek Woodlandsnail	*Ashmunella binneyi*	Molluscs	D	M(o)	Department, Private
Socorro Mountainsnail	*Oreohelix neomexicana*	Molluscs	D	M(n)	
Socorro Springsnail	*Pyrgulopsis neomexicana*	Molluscs	I	M(o)	Private Landowner
Sonoran Snaggletooth Snail	*Gastrocopta prototypus*	Molluscs	D	M(n)	
Star Gyro	*Gyraulus crista*	Molluscs	D	M(n)	
Subalpine Mountainsnail	*Oreohelix subrudis*	Molluscs	D	M(n)	
Swamp Fingernailclam	*Musculium partumeium*	Molluscs	D	M(n)	

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Texas Hornshell	*Popenaias popeii*	Molluscs	F	CA, CT, M(a)	USFWS, Department, University, NGO, Private Landowner
Tularosa Springsnail	*Juturnia tularosae*	Molluscs	D	M(n)	
Vallonia Snail	*Vallonia sonorana*	Molluscs	D	M(n)	
Vertigo Snail	*Vertigo concinnula*	Molluscs	D	M(n)	
Whitewashed Rabdotus Snail	*Rabdotus dealbatus neomexicanus*	Molluscs	D	M(n)	
Whitewater Creek Woodlandsnail	*Ashmunella danielsi*	Molluscs	D	M(n)	
Woodlandsnail	*Ashmunella amblya cornudasensis*	Molluscs	D	M(n)	
Woodlandsnail	*Ashmunella auriculata*	Molluscs	D	M(n)	
Woodlandsnail	*Ashmunella kochii*	Molluscs	D	M(n)	
Woodlandsnail	*Ashmunella rhyssa*	Molluscs	D	M(n)	
Wrinkled Marshsnail	*Stagnicola caperata*	Molluscs	D	M(o)	Department, University
Anicia Checkerspot	*Euphydryas anicia*	Moths and Butterflies	I	M(n)	
Apache Northern Crescent	*Phyciodes cocyta apache*	Moths and Butterflies	I	M(n)	
Blanchard's Pelochrista Moth	*Pelochrista blanchardi*	Moths and Butterflies	D	M(n)	
Capulin Mountain Alberta Arctic	*Oeneis alberta capulinensis*	Moths and Butterflies	I	M(n)	
Carlsbad Agave-borer	*Agathymus neumoegeni carlsbadensis*	Moths and Butterflies	I	M(n)	
Colorado Melissa Arctic	*Oeneis melissa lucilla*	Moths and Butterflies	I	M(n)	
Colorado Rita Dotted-blue	*Euphilotes rita coloradensis*	Moths and Butterflies	I	M(n)	

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Dotted Checkerspot	*Poladryas minuta*	Moths and Butterflies	D	M(n)	
Lafontaine's Cutworm Moth	*Euxoa lafontainei*	Moths and Butterflies	I	M(n)	
Landry's Flower Moth	*Arotrura landryorum*	Moths and Butterflies	I	M(n)	
Magdalena Alpine Butterfly	*Erebia magdalena magdalena*	Moths and Butterflies	I	M(n)	
Monarch	*Danaus plexippus*	Moths and Butterflies	L	M(o)	NGO
Mottled Duskywing	*Erynnis martialis*	Moths and Butterflies	L	M(n)	
Mountain Checkered-skipper	*Pyrgus xanthus*	Moths and Butterflies	D	M(o)	NGO
New Mexico Desert Blue	*Euphilotes ellisii anasazi*	Moths and Butterflies	I	M(n)	
Nokomis Silverspot	*Speyeria (Argynnis) nokomis*	Moths and Butterflies	I	M(n)	
Nokomis Silverspot	*Speyeria (Argynnis) nokomis nokomis*	Moths and Butterflies	I	CT, M(a)	USFS, USFWS
Orange Giant Skipper	*Agathymus neumeogeni*	Moths and Butterflies	D	M(n)	
Organ Mountains Poling's Hairstreak	*Satyrium polingi organensis*	Moths and Butterflies	I	M(n)	
Pogue's Flower Moth	*Schinia poguei*	Moths and Butterflies	I	M(n)	
Questa Skipper	*Ochlodes yuma anasazi*	Moths and Butterflies	I	M(n)	
Raton Mesa Boisduval's Blue	*Icaricia icarioides nigrafem*	Moths and Butterflies	I	M(n)	
Raton Mesa Northwestern Fritillary	*Argynnis hesperis ratonensis*	Moths and Butterflies	I	M(n)	

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Raton Mesa Silvery Blue	*Glaucopsyche lygdamus erico*	Moths and Butterflies	I	M(n)	
Rhena Crossline Skipper	*Polites origenes rhena*	Moths and Butterflies	L	M(n)	
Rhesus Skipper	*Polites rhesus*	Moths and Butterflies	D	M(n)	
Rindge's Emerald Moth	*Nemoria rindgei*	Moths and Butterflies	I	M(n)	
Rocky Mountain Polixenes Arctic	*Oeneis polixenes brucei*	Moths and Butterflies	I	M(n)	
Sacramento Mountains Borer Moth	*Papaipema dribi*	Moths and Butterflies	D	M(n)	
Sacramento Mountains Checkerspot Butterfly	*Euphydryas anicia cloudcrofti*	Moths and Butterflies	I	CT, M(a)	USFS, USFWS, University, NGO
Sacramento Mountains Coral Hairstreak	*Satyrium titus carrizozo*	Moths and Butterflies	I	M(n)	
Sacramento Mountains Emerald Moth	*Nemoria subsequens*	Moths and Butterflies	I	M(n)	
Sacramento Mountains Silvery Blue Butterfly	*Glaucopsyche lygdamus ruidoso*	Moths and Butterflies	I	M(n)	
Sacramento Mountains Western Green Hairstreak	*Callophrys affinis albipalpus*	Moths and Butterflies	I	M(n)	
Sacramento Mountains White-lined Hairstreak	*Callophrys sheridanii sacramento*	Moths and Butterflies	I	M(n)	
Sacred Boisduval's Blue	*Icaricia icarioides sacre*	Moths and Butterflies	I	M(n)	
Sierra Blanca Margined White	*Pieris marginalis siblanca*	Moths and Butterflies	I	M(n)	
Snow's Lustrous Copper	*Lycaena cupreus snowi*	Moths and Butterflies	I	M(n)	

SGCN Common Name	SGCN Scientific Name	Taxonomic Group	Category	Monitoring Action[61]	Monitoring Entities or Partners[62]
Socorro Chryxus Arctic	*Oeneis chryxus socorro*	Moths and Butterflies	I	M(n)	
Southwestern Brown Moth	*Plagiomimicus astigmatosum*	Moths and Butterflies	D	M(n)	
Sunrise Skipper	*Adopaeoides prittwitzi*	Moths and Butterflies	I	M(n)	
Ursine Giant Skipper	*Megathymus ursus ursus*	Moths and Butterflies	D	M(n)	
West Coast Lady Butterfly	*Vanessa annabella*	Moths and Butterflies	L	M(o)	NGO
Western Hobomok Skipper	*Lon hobomok wetona*	Moths and Butterflies	I	M(n)	
White Sand Twirler Moth	*Chionodes bustosorum*	Moths and Butterflies	I	M(n)	
White Sands Cutworm Moth	*Protogygia whitesandensis*	Moths and Butterflies	I	M(n)	
White Sands Dune Moth	*Areniscythris whitesands*	Moths and Butterflies	I	M(n)	
White Sands Owlet Moth	*Aleptina arenaria*	Moths and Butterflies	I	M(n)	
White Sands Yinyang Moth	*Cochylis yinyangana*	Moths and Butterflies	I	M(n)	
Wiest's Sphinx Moth	*Euproserpinus wiesti*	Moths and Butterflies	D	M(n)	
Yuma Skipper	*Ochlodes yuma yuma*	Moths and Butterflies	D	M(n)	
Zuni Flower Moth	*Schinia zuni*	Moths and Butterflies	D	M(n)	
Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	Reptiles	D	M(p)	USFWS, Department, University
Arizona Black Rattlesnake	*Crotalus cerberus*	Reptiles	I	M(o)	USFS, Department, Private

SGCN Common Name	SGCN Scientific Name	Taxonomic Group	Category	Monitoring Action[61]	Monitoring Entities or Partners[62]
Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	Reptiles	I	M(o)	DOD, NPS, Department, University
Big Bend Slider	*Trachemys gaigeae*	Reptiles	F	M(p)	USFWS, Department, EMNRD, Private
Bleached Earless Lizard	*Holbrookia maculata ruthveni*	Reptiles	D	M(n)	
Bolson's Tortoise	*Gopherus flavomarginatus*	Reptiles	L	M(a)	USFWS, Private
Dunes Sagebrush Lizard	*Sceloporus arenicolus*	Reptiles	F	CT, M(a)	BLM, SLO, University, NGO, Private
Giant Spotted Whiptail	*Aspidoscelis stictogramma*	Reptiles	D	M(o)	Department
Gila Monster	*Heloderma suspectum*	Reptiles	D	M(o)	Department
Gray-banded Kingsnake	*Lampropeltis alterna*	Reptiles	D	CA, M(a)	NPS
Gray-checkered Whiptail	*Aspidoscelis dixoni*	Reptiles	D	M(o)	Department
Green Rat Snake	*Senticolis triaspis intermedia*	Reptiles	D	M(o)	University, Private Landowner
Knobloch's Mountain Kingsnake	*Lampropeltis knoblochi*	Reptiles	L	M(o)	USFS, Department, Private
Little White Whiptail	*Aspidoscelis arizonae gypsi*	Reptiles	D	M(n)	
Madrean Mountain Spiny Lizard	*Sceloporus jarrovii jarrovii*	Reptiles	L	M(o)	USFWS, University, Private
Midland Smooth Softshell Turtle	*Apalone mutica mutica*	Reptiles	D	M(a)	University
Mojave Rattlesnake	*Crotalus scutulatus scutulatus*	Reptiles	D	M(o)	University, Private
Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	Reptiles	D	M(o)	DOD, NPS, University
Mountain Skink	*Plestiodon callicephalus*	Reptiles	D	M(o)	Department

SGCN Common Name	SGCN Scientific Name	Taxonomic Group	Category	Monitoring Action[61]	Monitoring Entities or Partners[62]
Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	Reptiles	L	CA, CT, M(a)	USFS, USFWS, Department, University
New Mexico Ridge-nosed Rattlesnake	*Crotalus willardi obscurus*	Reptiles	F	M(p)	USFS, USFWS, Department, Private Landowner
North American Racer	*Coluber constrictor*	Reptiles	D	M(o)	Private
Northern Mexican Gartersnake	*Thamnophis eques megalops*	Reptiles	L	CT, M(p)	USFS, USFWS, Department, Private
Ornate Box Turtle	*Terrapene ornata*	Reptiles	I	M(o)	Department, University, Private
Plains Gartersnake	*Thamnophis radix*	Reptiles	D	M(n)	
Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	Reptiles	L	M(o)	USFS, Department, Private
Slevin’s Bunchgrass Lizard	*Sceloporus slevini*	Reptiles	L	M(o)	Department
Smooth Greensnake	*Opheodrys vernalis blanchardi*	Reptiles	D	M(o)	USFS, Private
Sonoran Lyresnake	*Trimorphodon lambda*	Reptiles	D	M(n)	
Sonoran Mud Turtle	*Kinosternon sonoriense*	Reptiles	I	M(a)	Department, University
Texas Lyresnake	*Trimorphodon vilkinsonii*	Reptiles	D	M(n)	
Texas Spotted Whiptail	*Aspidoscelis gularis gularis*	Reptiles	D	M(n)	
Trans-Pecos Rat Snake	*Bogertophis subocularis subocularis*	Reptiles	D	M(n)	
Western Blind Snake	*Rena humilis segregus*	Reptiles	D	M(n)	
Western Massasauga	*Sistrurus tergeminus*	Reptiles	I	M(p)	USFWS, Department, University, Private
Western Painted Turtle	*Chrysemys picta bellii*	Reptiles	D	M(a)	Private

SGCN Common Name	SGCN Scientific Name	Taxonomic Group	Category	Monitoring Action[61]	Monitoring Entities or Partners[62]
Western River Cooter	*Pseudemys gorzugi*	Reptiles	F	M(p)	Department, University, Private
Yaqui Black-headed Snake	*Tantilla yaquia*	Reptiles	D	M(n)	
Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	Reptiles	D	M(o)	BLM, Department, University, NGO

As monitoring data are generated by the Department and collaborators, ensuring that it is as widely available as possible will amplify the value of the effort and the utility of the results. The Department is working closely with NHNM, which maintains the Biota Information System for New Mexico (BISON-M; https://bison-m.org/), which contains information on many previously funded SwW projects and other publications; the New Mexico Environmental Review Tool (NMERT; https://nmert.org/), which includes New Mexico Crucial Habitat Assessment Tool (NMCHAT; http://nmchat.org/) data layers; uses collection permit data to inform both BISON-M and the NMERT; and helps to maintain and update the New Mexico SWAP website (https://nmswap.org/). The aforementioned websites, along with the New Mexico Riparian Habitat Map (NMRipMap; https://nhnm.unm.edu/riparian/nmripmap) and RCOAs (https://nhnm.unm.edu/rcoas), constitute wildlife-relevant components of a broader Conservation Information System (CIS), hosted by NHNM, that is intended to share as much conservation-relevant information regarding the plants and animals and especially biodiverse habitats of New Mexico as possible with members of the public and the conservation community. This community is mostly composed of federal and state land and natural-resources management agencies, including Tribal natural-resource managers. The Department continues to work with NHNM to maintain current, and build new, components of the CIS and promote the CIS as a repository of monitoring activities and data.

A readily available, comprehensive source of information about monitoring that has been or is being done in New Mexico provides context for the Department to identify specific needs for monitoring that it is uniquely qualified to meet. When the Department can effectively prioritize where to use its limited resources, it can be instrumental in addressing specific needs. Many of those needs are likely to be related to conservation program efficacy. Because the Department receives a significant share of its funding through the Office of Conservation Investment at the United States (US) Fish and Wildlife Service, especially from the Wildlife and Sport Fish Restoration and the State Wildlife Grants Programs, there are reporting requirements and identified outcomes that must be achieved for all projects implemented using federal funds. Focusing on an appropriate subset of those conservation actions implemented through federal grants with associated reporting requirements will permit the Department to meet its obligations to these grant programs and continue to conserve New Mexico’s wildlife. Recording and making these actions searchable is a primary goal of creating a conservation action tracker in partnership with NHNM, as mentioned earlier in this chapter.

At the other end of the spectrum from specific, tightly focused monitoring efforts is the general assessment of the status of habitats and species on an annual or seasonal basis. Weather or climate metrics are used to characterize geophysical drivers of biological systems and communities. There are many different climate indices that have been developed to assess climatic conditions around the world, in the southwestern United States, and within New Mexico (e.g., Enquist et al. 2008, Williams et al. 2013, AdaptWest Project 2022). Characterizing both winter conditions (including precipitation and snowpack) and the summer monsoon season is pertinent to evaluating both ecosystem health and the impacts of climate change. The monsoon season may be especially important because, currently, that is when much of the State’s precipitation falls that generates plant growth and has a direct impact on the environmental conditions controlling the survival and reproduction of most SGCN. An index that summarizes recent past conditions may be more useful than a predictive index with associated uncertainties. These environmental indices can then be calibrated using long-term data sets for species with extensive population survey data. One or a few summary indicators of climatic conditions statewide could provide Department biologists with a systematic, unbiased assessment that can be used to evaluate the likely condition of habitats and species, determine whether and where conditions could be of concern, and proactively consider additional or more intensive monitoring of particular species or habitats. The Department is also developing a terrestrial habitat map in collaboration with NHNM. Once fully developed, this map can provide baseline habitat information to inform Department restoration and climate adaptation actions.

The Department will identify, assess, and, where appropriate, apply emerging technologies that can facilitate accurate species and habitat monitoring and do it more efficiently. One such technology that the Department has utilized in multiple SwW projects and for the management of multiple native fish species is the isolation and analysis of environmental DNA (eDNA), which is a valuable tool for detecting the presence of aquatic and terrestrial species. eDNA can be used to detect rare and difficult to detect species as well as to survey broader biological communities (Andersen et al. 2012, Spear et al. 2015, Huang et al. 2022, Lynggaard et al. 2022). The following is taken from Thomsen and Willerslev (2015):

"*All conservation efforts to save biodiversity essentially depend on the monitoring of species and populations to obtain reliable distribution patterns and population size estimates. Such monitoring has traditionally relied on physical identification of species by visual surveys and counting of individuals. However, traditional monitoring techniques remain problematic due to difficulties associated with correct identification of cryptic species or juvenile life stages, a continuous decline in taxonomic expertise, non-standardized sampling, and the invasive nature of some survey techniques. Hence, there is urgent need for alternative and efficient techniques for large-scale biodiversity monitoring. Environmental DNA (eDNA) – defined here as: genetic material obtained directly from environmental samples (soil, sediment, water, etc.) without any obvious signs of biological source material – is an efficient, non-invasive and easy-to-standardize sampling approach. Coupled with sensitive, cost-efficient and ever-advancing DNA sequencing technology, it may be an appropriate candidate for the challenge of biodiversity monitoring*".

Over the period in which this SWAP is used as a guide, the Department will continue to assess needs for and opportunities to monitor the species, habitats, and conservation actions identified in this document. The continually evolving CIS and possible future conservation action tracker represent important avenues where conservation information can be efficiently distributed among natural-resource managers to inform and improve future conservation actions for SGCN.

Chapter 12: Implementation, Review, and Revision

Element 6 requires that the State Wildlife Action Plan (SWAP) for New Mexico describe periodic review procedures at intervals not to exceed 10 years. **Element 7** requires plans for coordinating SWAP development, implementation, review, and revision with federal, state, and local agencies and Indian Tribes that manage significant land and water areas or administer programs that affect the conservation of Species of Greatest Conservation Need (SGCN) or their habitats. **Element 8** affirms that broad public participation is an essential element of developing and implementing each state's SWAP. This chapter addresses future compliance with these requirements. The agency, Tribal, and public engagement activities associated with the development of the 2025 SWAP are described in Chapters 1 and 2 and Appendices A through D.

IMPLEMENTATION

The SWAP development process has provided a strategic level of planning that has identified over 100 prioritized conservation actions and many research, survey, and monitoring needs. Operational planning will include coordination with local, state, and federal government agencies, Tribes, non-profit organizations, and interested publics and issuance of invitations, where appropriate or as required by state and federal environmental and archaeological regulation compliance processes, to these entities to contribute to project design and implementation. The New Mexico Department of Game and Fish (Department) will encourage working and cost sharing with these important partners in conservation and, where necessary, engage and oversee contractors to implement some projects (e.g., projects funded through the Department's Share with Wildlife program; https://wildlife.dgf.nm.gov/conservation/share-with-wildlife/reports/). The Department will, to the extent practical, integrate with action planning associated with US Forest Service Forest Management Plans, US Bureau of Land Management Resource Management Plans, US Department of Defense Integrated Natural Resource Management Plans, and land-use allocation by the New Mexico State Land Office; these agencies collectively are responsible for natural-resource management across approximately 44% of New Mexico's land surface. As mentioned in Chapter 11, the Department plans to develop a publicly accessible database that partners and interested members of the public can use to track the implementation of the SWAP and use of State Wildlife Grant and other SGCN-focused funds.

REVIEW AND REVISION

The Department will submit its next 10-year, comprehensive review and revision of the SWAP by October 1, 2035. In the meantime, the Department will be responsive to changing conditions and new information and, in appropriate collaboration with agencies, Tribes, non-profit organizations, and interested publics, may amend the SWAP before fall 2035 if conditions warrant. The query developed in the process of selecting SGCN for the 2025 SWAP was specifically designed to enable the Department to make more frequent updates to the SGCN list if needed.

AGENCY COORDINATION AND PUBLIC INVOLVEMENT

Approximately 56% of New Mexico's land area is under federal, state, and Tribal jurisdiction; of that, the Department directly controls only about 104,018 ha (257,035 ac). The Department's ability to substantially affect a significant portion of key habitats and associated SGCN in the State will therefore depend upon close collaboration with federal, state, and Tribal governments. To facilitate future coordination, review, and revision of the SWAP, the Department will maintain the list of contacts from the 2025 SWAP Core Team and request updated contacts from Core Team member organizations, and additional agencies and organizations as needed, prior to coordinating on specific projects or initiating minor or major SWAP reviews and revisions. For Tribal coordination, the Department will act in accordance with the State-Tribal Collaboration Act (New Mexico Statutes Annotated 1978 11-18-1 through 11-18-5; https://nmonesource.com/nmos/nmsa/en/nav_date.do) and will recognize the sovereignty of Tribal governments. Accordingly, Tribal leaders will be notified in writing of opportunities for participation in the implementation, review, or revision of the SWAP and invited to designate appropriate persons to represent them in consultation and collaboration. Through these processes, the Department will coordinate with federal, state, local, and Tribal governments to review and revise the SWAP and design, implement, and fund monitoring, survey, research, and other projects that are consistent with our respective conservation interests.

Approximately 43% of New Mexico lands are under private management and many private entities have economic and recreational interests in the use and management of State and federal lands. The inter-related challenges of maintaining a healthy economy, accommodating growth, and conserving the State's biodiversity only can be overcome through the awareness and support of a broad spectrum of decision makers and publics. The Department will therefore broadly publicize its intent to review and revise the SWAP early in the decision-making process and all public comment opportunities so that interested and affected parties are made aware of Department activities related to the SWAP and all opportunities to express their views, exchange information, and otherwise influence decisions.

Effective agency and Tribal coordination or public participation and avoidance of conflict require that all parties possess a clear understanding of the sequence and timing of the decision-making process and make relevant contributions at appropriate stages. Therefore, in planning both agency and Tribal coordination and public involvement the Department will:

- Establish a clear decision-making process for the SWAP implementation, review, or revision event under consideration.
- Designate stages within the decision-making process warranting inter-agency or Tribal coordination or public involvement.
- For each designated stage, specify the objectives for involving agencies, Tribes, or publics and identify the information exchange required to attain these objectives.
- Identify agencies, Tribes, and publics that are affected by, or might otherwise inform or collaborate in, the decision-making process.

- Identify special considerations that may influence the process through which the information exchange might be best be accomplished, and design and implement appropriate techniques or events.

Chapter 13: Regional Conservation Efforts

The task of conserving and managing New Mexico’s fish and wildlife, including the Species of Greatest Conservation Need (SGCN) listed in this State Wildlife Action Plan (SWAP), is far too large and complex for one agency to achieve alone. This task requires cross-jurisdictional and cross-State boundary collaboration. Although the New Mexico Department of Game and Fish (Department) is the lead agency for developing and implementing the SWAP, this document is designed to be a statewide plan that any partners in implementing conservation actions to benefit New Mexico’s SGCN, including agencies and organizations in neighboring states, can use to guide these efforts. The Department actively sought input on substantive portions of this document from a diversity of organizations that work in New Mexico and have expertise and authorities relevant to the content of the SWAP (see Appendix B). It also met regularly with SWAP coordinators and similar personnel from neighboring and other southwestern states throughout the 2025 SWAP review and revision process. Department staff are actively involved in conservation activities that benefit a diversity of SGCN and entail collaboration with researchers and managers in other states. This chapter discusses current regional conservation efforts and coordination with other southwestern states during the 2025 SWAP review and revision process and identifies SGCN that are shared with neighboring states with which New Mexico has multiple ecoregions in common. This SWAP also pulls on national ecoregion boundaries and habitat and threat classification systems that can be easily compared to other states that use the same systems. Use of these systems is recommended as a best practice to ensure efficiency in collaboration among states (MLI 2024). Continued and expanded regional coordination is necessary to ensure successful SWAP implementation, especially the conservation of SGCN whose geographic ranges cross both state and international boundaries. The importance of considering conservation action implementation regionally is highlighted by the prevalence of migratory birds that breed in New Mexico but winter in Mexico and Central America (Figure 59).

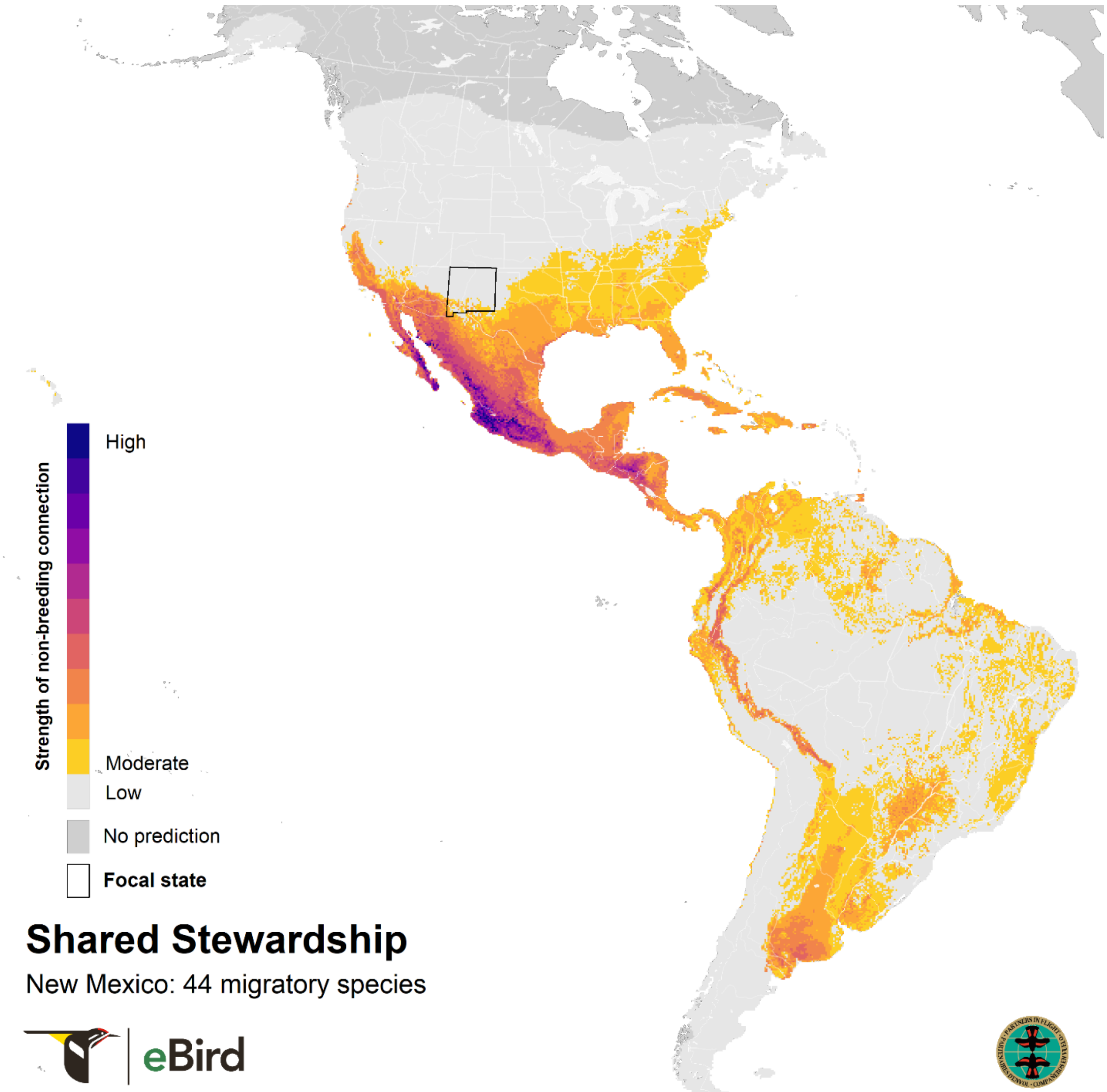

Figure 59. Map of locations where 44 migratory birds that breed in New Mexico winter across North, Central, and South America.

Map obtained from Southern Wings (https://southern-wings.fishwildlife.org/online-guide/new-mexico).

REGIONAL SGCN CONSERVATION EFFORTS

The Department is engaged in a diversity of regional conservation efforts. This section provides examples rather than an exhaustive list of all such efforts. As highly mobile animals that can travel long distances, there are a diversity of regional conservation efforts focused on birds. Joint ventures are collaborative, regional partnerships that bring together government agencies, non-profit organizations, corporations, tribes, and individuals under the guidance of national and international bird conservation plans to design and implement landscape-scale conservation efforts. New Mexico is located within the Intermountain West and Playa Lakes Joint Ventures and is a partner in regional planning and management initiatives for these groups. The Department has also coordinated with the Rio Grande Joint Venture regarding grassland-focused conservation activities in southern New Mexico. New Mexico is also a voting member of the Central Flyway Council and a non-voting member of the Pacific Flyway Council. These flyways coordinate bird conservation, research, and management across the western United States (US), Mexico, and Canada among public wildlife agencies for the purpose of protecting and conserving migratory birds in this region. Flyway councils also participate in the annual process of setting migratory bird policy and regulations within the US. The Department also participates in the Partners in Flight's Western Working Group, which supports cohesive conservation partnerships in the US, Mexico, and Canada, and in multiple species-specific working groups that coordinate at the range-wide scale, including for desert thrashers (focal New Mexico SGCN are the Bendire's thrasher [*Toxostoma bendirei*] and loggerhead shrike [*Lanius ludovicianus*]), the pinyon jay (*Gymnorhinus cyanocephalus*), rosy-finches (black rosy-finch [*Leucosticte atrata*], brown-capped rosy-finch [*L. australis*], gray-crowned rosy-finch [*L. tephrocotis*]), and the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*; highlighted in the case study below).

There are multiple regional conservation efforts and teams focused on federally listed mammals, keystone species such as the Gunnison's prairie dog (*Cynomys gunnisoni*) and American beaver (*Castor canadensis*), and migratory or wide-ranging species, such as bats focused on by the Western Bat Working Group. As part of the recovery planning process for the New Mexico jumping mouse (*Zapus hudsonius luteus = Zapus luteus luteus*), in which the Department is a partner, researchers developed a range-wide habitat suitability model that covers much of New Mexico and parts of eastern Arizona and southern Colorado. This model identifies areas outside of current species management units that could be prioritized for future species surveys, where suitable conditions are especially scarce and therefore where local populations may be particularly prone to extirpation, and pertinent for any future species reintroduction efforts (Martinez-Fonseca et al. 2024).

The Western Association of Fish and Wildlife Agencies (WAFWA) created a Conservation Plan for the Gunnison's prairie dog in 2007 in response to the decline of this species as a result of habitat loss, direct mortality from shooting and other anthropogenic eradication efforts, and disease. This plan calls for population trend monitoring and the four states in this species' geographic range (Arizona, Colorado, New Mexico, and Utah) completed four to five surveys during the period from 2005 to 2022. If prairie dog occupancy declines by more than 40% over the course of three years, then the plan calls for states to increase their survey frequency and implement conservation actions. In 2022, it was determined that occupancy had decreased range wide by 68% between 2010 and 2022, driven mostly by a 78% decline in New Mexico over that time (Clement 2023). As a result, survey intervals will be compressed, and new surveys are anticipated in 2025 (pers. comm. J. Stuart, Department). For another keystone species, the black-tailed prairie dog (*C. ludovicianus*), the Department contributed data to modeling efforts focused on identifying landscapes suitable for prairie dog conservation. These models considered ecological, political, and social factors and combined habitat suitability modeling with analyses based on a conservation planning tool. Model results show that habitat suitability is likely to decline in southeastern New Mexico and other areas on the southern and eastern edges of this species' range. In future, only the very northeastern corner of New Mexico hosts areas that represent conservation priorities; areas north of New Mexico contain larger areas likely to be particularly important for the conservation of this species in future, including eastern Colorado, Montana, and Wyoming and western South Dakota (Davidson et al. 2022; https://cnhp.colostate.edu/projects/hotr/).

There are multiple efforts by the Department and its partners to conserve and restore American beaver populations in New Mexico. American beavers are considered keystone species due to the impacts of their dam-building behavior, which creates wetland ecosystems that support or are used by a high diversity of species (e.g., 80% of protected birds) (Lang et al. 2024, USFWS 2025). The Department is a partner in the New Mexico Beaver Coalition whose purpose is to bring together a diverse group of state, federal, Tribal, non-profit, and for-profit agencies and organizations and individuals to share information, coordinate activities, and identify common interests and opportunities to work collaboratively to expand the distribution of beavers across New Mexico. The Department conducts surveys to determine occupied beaver habitats in the State and is working to model potential beaver restoration sites across the State. Other partners are developing a Statewide beaver dam survey. There are numerous active habitat-restoration projects in the upper Rio Grande basin, above Cochiti Reservoir, for which at least one objective is to restore functional beaver colonies.

There are long-term recovery efforts focused on two amphibian SGCN, the boreal toad (*Anaxyrus boreas boreas*) and Chiricahua leopard frog (*Lithobates chiricahuensis*) that involve collaboration with other western states. The Boreal Toad Conservation Team (BTCT) formed in 1994 and includes the Department, state wildlife agencies in Colorado and Wyoming, and multiple federal agencies. The actions of the team have been guided by various agreements and Memoranda of Understanding. A conservation plan for this species, intended to guide the conservation, recovery, and management of the boreal toad, was originally crafted in 2001 and revised in 2014 to 2015 and 2023 (BTCT 2023). Per the terms of their Conservation Agreement with the BTCT, the Department conducts surveys in historic habitats for the boreal toad and annually compiles inventory and monitoring data for the one known boreal toad population in New Mexico and for other potentially suitable sites. It has also cooperated with Colorado to obtain and release boreal toads in New Mexico. For the Chiricahua leopard frog, a recovery plan was crafted in 2007 (USFWS 2007) and a captive breeding program was established in collaboration with the Turner Endangered Species Fund. Frog surveys, including swabbing individual frogs for the chytrid fungus (*Batrachochytrium dendrobatidis*; *Bd*), have been conducted in collaboration with federal agencies and the Arizona Game and Fish Department. Chiricahua leopard frog recovery activities have included extensive reintroduction efforts, which have met with mixed success, especially in areas impacted by wildfire or *Bd*.

The Department works closely with partners in Colorado to conserve and restore three fish SGCN, the Rio Grande chub (*Gila pandora*), Rio Grande sucker (*Catostomus plebeius*), and Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*). Cross state boundary Conservation Agreements ensure a sustained commitment by agencies in both New Mexico and Colorado to the protection and restoration of these species and their habitats. One substantive example of the outcomes of this cross-boundary collaboration is the successful completion of the Rio Costilla restoration project, a large-scale effort initiated in the early 2000s that successfully restored these three native fishes to waters in both New Mexico and Colorado.

2025 REVIEW AND REVISION COORDINATION WITH NEIGHBORING STATES

As described above, regional collaboration occurs across the western US, but the large size of western states can make the coordination of native species conservation efforts across state boundaries challenging. As a result, many efforts to implement SWAPs in western states occur within state boundaries. Other Association of Fish and Wildlife Agency (AFWA) regions have Wildlife Diversity or SWAP committees (e.g., Northeast and Midwest AFWA). States in these regions have been effectively aligning their SWAPs. Recognizing the need for better SWAP coordination among states, state agency representatives from Arizona, California, New Mexico, Nevada, and Utah began meeting monthly in 2021 (Colorado and Texas joined this group in 2023) with a primary goal of sharing information pertinent to the SWAP review and revision process. Ultimately, this informal Southwest Group is interested in better coordinating SWAP content and implementation across state boundaries.

The Southwest Group organized a WAFWA Wildlife Diversity/SWAP workshop in January 2023, at the annual meeting of the Wildlife Diversity Program Managers AFWA working group in Nevada, to discuss opportunities to further collaborate across state borders and align SWAPs. The primary recommendation developed by workshop participants was the formation of a WAFWA Wildlife Diversity/SWAP committee to allow for ongoing coordination among western states, both during the SWAP review and revision process and during the SWAP implementation phase. The formation of such a committee was approved at the 2023 summer WAFWA meeting in New Mexico. Since its formation, this WAFWA committee has ensured that state representatives that aren't able to attend WAFWA in-person meetings are still able to participate by holding virtual meetings. These meetings provide opportunities for state agency representatives to share information on their interstate coordination processes and other information pertinent to SWAP review, revision, submission, and implementation (e.g., lessons learned from states that have recently completed the 10-year review and revision process, information on innovations and how states are incorporating climate change to their SWAPs, guidance on the SWAP submission and regional review team participation process). The Southwest Group has continued to meet monthly and has submitted a competitive State Wildlife Grant application for a project focused on assessing habitat connectivity for a diversity of species across three southwestern states.

SGCN SHARED WITH NEIGHBORING STATES

Due to the large size of western states, the number of SGCN that these states have in common tends to decline the more states are included in the comparison. To help focus regional conservation efforts for conservation practitioners interested in benefiting species for which New Mexico constitutes an important part of their geographic range, the Department collaborated with the following neighboring states to compile a list of SGCN that a majority have in common and their SGCN tier or other category indicate they are a higher priority (Table 38): Arizona, Colorado, Texas, and Utah. Oklahoma was not approached due to the small amount of border shared with New Mexico and the fact that New Mexico and Oklahoma only have one ecoregion (High Plains and Tablelands) in common. A total of 35 species in the following taxonomic groups were included as SGCN in New Mexico, listed as higher priority by the majority of states that include the species in their SWAPs (i.e., listed as SGCN or Tier 1 in other states or Current Focal Species or Conservation Impact Species in New Mexico), and was included in a minimum of two states other than New Mexico: amphibians, birds, fish, mammals, reptiles. Broader taxonomic groups that didn't appear in SWAPs for all five states considered were removed from the process of comparing state SGCN lists (e.g., various groups of insects, crustaceans, molluscs, and plants).

Table 38. Higher priority Species of Greatest Conservation Need (SGCN) shared with neighboring states.

The states that list each species as a SGCN are indicated with X's. The total number of states considered for which a species is listed as a SGCN is shown in the last column. Latin and common names match those used elsewhere in this document rather than names used by other states.

Common Name	Scientific Name	Taxonomic Category	New Mexico	Colorado	Arizona	Texas	Utah	State Count
Arizona Toad	*Anaxyrus microscaphus microscaphus*	Amphibians	X		X		X	3
Boreal Toad	*Anaxyrus boreas boreas*	Amphibians	X	X			X	3
Northern Leopard Frog	*Lithobates pipiens*	Amphibians	X	X	X		X	4
Aplomado Falcon	*Falco femoralis septentrionalis*	Birds	X		X	X		3
Bendire's Thrasher	*Toxostoma bendirei*	Birds	X		X		X	3
Black Rosy-Finch	*Leucosticte atrata*	Birds	X	X			X	3
Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*	Birds	X	X		X		3
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	X	X	X	X	X	5
Mountain Plover	*Charadrius montanus*	Birds	X	X	X	X		4
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	X	X	X		X	4
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	X	X	X	X	X	5
Thick-billed Longspur	*Rhynchophanes mccownii*	Birds	X	X	X	X		4
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	X	X	X	X	X	5
Colorado Pikeminnow	*Ptychocheilus lucius*	Fish	X	X	X		X	4
Desert Sucker	*Catostomus clarkii*	Fish	X		X		X	3
Peppered Chub	*Macrhybopsis tetranema*	Fish	X	X		X		3
Plains Minnow	*Hybognathus placitus*	Fish	X	X		X		3

Common Name	Scientific Name	Taxonomic Category	New Mexico	Colorado	Arizona	Texas	Utah	State Count
Razorback Sucker	*Xyrauchen texanus*	Fish	X	X	X		X	4
Rio Grande Chub	*Gila pandora*	Fish	X	X		X		3
Rio Grande Sucker	*Catostomus plebeius*	Fish	X	X	X			3
Roundtail Chub	*Gila robusta*	Fish	X	X	X		X	4
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	X	X		X		3
Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	Fish	X	X	X		X	4
American Pika	*Ochotona princeps*	Mammals	X	X			X	3
Black-footed Ferret	*Mustela nigripes*	Mammals	X	X	X	X	X	5
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	X	X	X	X		4
Cave Myotis	*Myotis velifer*	Mammals	X		X	X		3
Fringed Myotis	*Myotis thysanodes thysanodes*	Mammals	X	X	X	X	X	5
Gunnison's prairie dog	*Cynomys gunnisoni*	Mammals	X	X	X		X	4
Hoary Bat	*Aeorestes cinereus cinereus*	Mammals	X	X	X	X	X	5
New Mexico Jumping Mouse	*Zapus hudsonius luteus (=Zapus luteus luteus)*	Mammals	X	X	X			3
Tri-colored Bat	*Perimyotis subflavus*	Mammals	X	X		X		3
Gila Monster	*Heloderma suspectum*	Reptiles	X		X		X	3
Ornate Box Turtle	*Terrapene ornata*	Reptiles	X	X	X	X		4
Western Massasauga	*Sistrurus tergeminus*	Reptiles	X	X	X	X		4

Case Study 1: Southwestern Collaboration: Western Yellow-billed Cuckoo

State wildlife managers face a persistent structural challenge to the effective conservation of wide-ranging and migratory SGCN: coordination among states. The threats these SGCN face accumulate across migrations and seasons and are rarely confined to state or national jurisdictions. Research shows that effective conservation actions must be coordinated across the full annual cycle (FAC) of these species (Marra et al. 2015, Schuster et al. 2019), meeting species' needs when and where they occur. The FAC encompasses a species full range of habitat associations and biological activities throughout a year including breeding, non-breeding, and migration/dispersal periods (Marra et al. 2015). Thus, conservation actions that focus on migratory birds need to span political boundaries and emphasize approaches with the greatest return on investment. The AFWA Southern Wings program has been designed to facilitate cross-boundary work focused on neotropical migratory birds.

This section explores one migrant that is a priority and was listed as an SGCN in circa 2015 SWAPs for six southwestern states and Texas (USGS 2024b). It outlines current and potential future collaborative efforts to better conserve this important species. Conservation of wide-ranging, migrant species at the state level is critical; however, it's also important to understand the value of coordinating each state's resources and conservation initiatives in the context of delivering population-level conservation successes.

The recovery and sustainability of regionally important SGCNs, such as the federally Threatened western yellow-billed cuckoo, depends on cross-border (state and international) collaboration. Western states encompass important breeding habitats for the western yellow-billed cuckoo (Hughes 2020), including federally designated critical habitats within Arizona, California, Colorado, Idaho, New Mexico, Texas, and Utah (USFWS 2021) (Figure 60). River corridors represent especially important habitat for this subspecies across its range; xeroriparian habitat is consistently used in southeastern Arizona.

From 2021 to 2023, 11 western state wildlife agencies, including those in several southwestern states (i.e., Arizona, California, Colorado, Nevada, New Mexico, Utah, and Texas), worked with county, federal, non-profit organization, and Tribal partners on a western yellow-bill cuckoo-focused Competitive State Wildlife Grant (C-SWG) to survey over 400 locations, model important occupancy features, develop a range-wide distribution model, and investigate cuckoo detectability using autonomous recording units (Stanek et al. 2025). The Western Yellow-billed Cuckoo Working Group (https://www.yellowbilledcuckoo.org/), comprised of consultant, federal, non-profit organization, state, and university members, promotes western yellow-billed cuckoo science, conservation, recovery, and partnerships. This working group has also adopted the Road to Recovery process (https://r2rbirds.org/tipping-point-species/yellow-billed-cuckoo/), which integrates biological and social science to identify and address specific causes of cuckoo declines throughout its annual cycle.

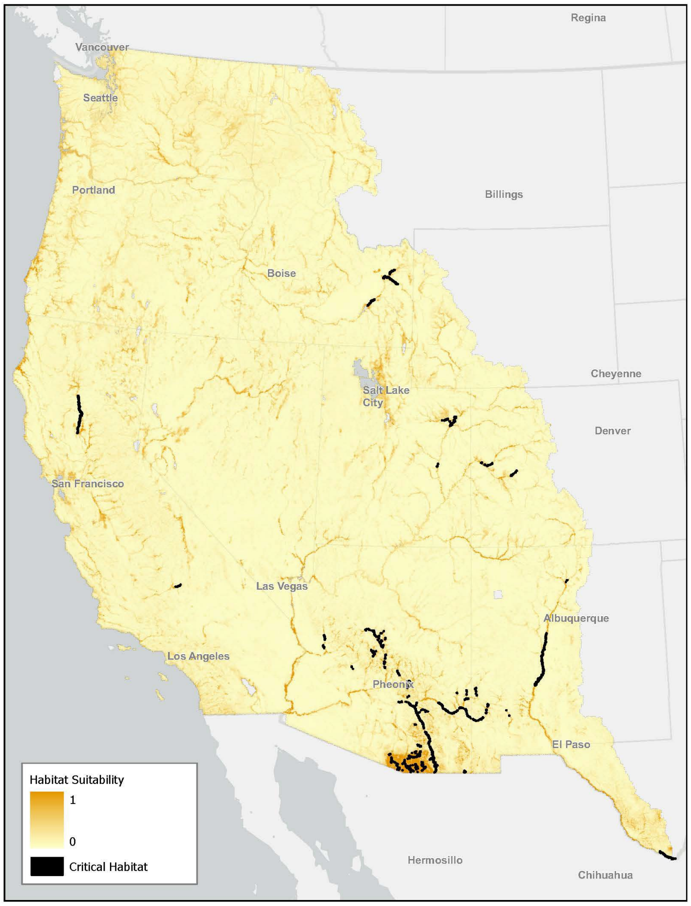

Figure 60. Map of habitat suitability and critical habitat for the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) in the United States.

As the above examples show, conservation and management of SGCN regularly require working beyond state and national borders. Watersheds (such as the Gila River watershed, which contains western yellow-billed cuckoo critical habitat) and flyways (important regional partnerships for bird conservation) often encompass all or parts of multiple states and require complex coordination among many partners and jurisdictions to improve conditions and provide needed habitat. Recovery of declining species that have large ranges, like the western yellow-billed cuckoo, requires coordination with partners and agencies with interest and jurisdiction throughout the species' range. This includes partnerships between neighboring states and with regional or international organizations and alliances (e.g., Partners in Flight) that can accomplish needed conservation actions to achieve shared goals.

Threats to landscapes and ecosystems used by birds, such as the western yellow-billed cuckoo, vary by country and region during the migratory and non-breeding season but include habitat loss and degradation including through deforestation, alteration of hydrology, commodity agriculture (palm oil) and associated habitat conversion for agricultural use, illegal logging, pesticide use, contaminants, and insufficient enforcement in protected areas. Projects need to consider the needs and interests of local communities and support from international partners that have a common interest in the focal species' conservation to be successful. International conservation actions intended to curb these threats include the acquisition and protection of lands used as migratory pathways and non-breeding sites; education of landowners on regenerative agricultural and ranching practices, including shade-grown coffee farming; the creation and maintenance of native tree nurseries; and reforestation efforts.

To address these threats, multiple southwestern states have committed to participating in cross-border, FAC conservation for migratory species, including the western yellow-billed cuckoo. This commitment is imperative to the improvement and long-term sustainability of species like the yellow-billed cuckoo (*Coccyzus americanus*) that migrate and winter south of the US (Figure 61). Actions that require implementation of FAC conservation and were identified by the western yellow-billed cuckoo working group as important to implement on wintering grounds for this subspecies include conserving the Gran Chaco (scrub-forest formation); identifying and conserving critical stopover sites in tropical dry forests and other habitats; and identifying population-specific migratory routes. There are at least three Southern Wings projects and work by other organizations and researchers that have addressed, or currently are addressing, some of these and other important actions for the yellow-billed cuckoo (Southern Wings 2025, Stanley et al. 2025). The urgent need for additional work in the yellow-billed cuckoo's non-breeding grounds presents new collaborative opportunities for states to advance FAC conservation of the species.

In summary, FAC conservation is important to consider for many SGCN. Many breeding birds in southwestern states are neotropical migrants and spend up to eight months of the year beyond the borders of the US, some traveling thousands of miles each way. The millions of migratory birds of different species that breed across Canada and the US and winter in relatively small geographies within Mexico, Central America, South America, and the Caribbean during migration and the non-breeding season put into perspective the importance of international, FAC conservation work.

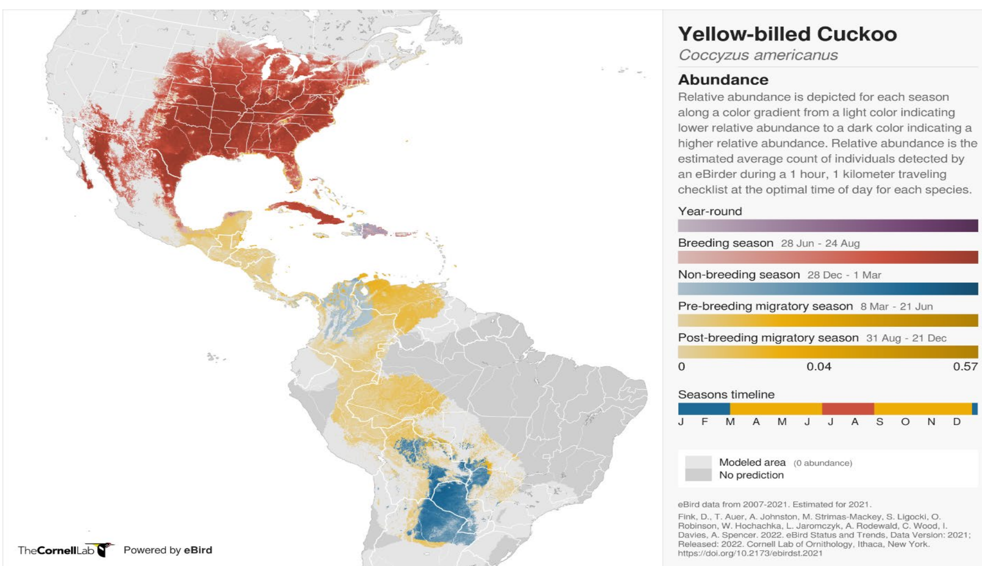

Figure 61. Yellow-billed cuckoo (*Coccyzus americanus*)[63] abundance map across its full annual cycle (Fink et al. 2022).

[63] Map includes both eastern (*Coccyzus americanus americanus*) and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) subspecies.

Case Study 2: Modeling Species Distributions Across the Southwestern US

During the 2025 SWAP review and revision process, the Department coordinated with other state wildlife agencies in the southwest and staff from the Southwest Region of the Science Applications (SA) program at US Fish and Wildlife Service to select focal species for a regional species distribution modeling effort. SA staff actively participated in many of the regional coordination meetings among SWAP coordinators and similar staff described above and expressed a strong interest in supporting SWAP review and revision efforts. Developing regional models of species presence and projections of future distributions of suitable environmental conditions is an important first step in guiding future collaborative, on-the-ground conservation actions across state boundaries. Based on input from state agencies in Arizona, New Mexico, Nevada, Texas, and Utah, the SA program selected nine birds that are SGCN in multiple southwestern states (and are all SGCN in New Mexico's 2025 SWAP) to model. They used eBird (https://ebird.org/home) as a source for species occurrence data and included a variety of environmental variables ranging from relative humidity to elevation and land-cover type. They projected current models to future conditions in 2040-2060 and 2080-2100. Full model results for all nine birds are available online (https://das.ecosphere.fws.gov/content/03f753d8-6793-4394-8e7b-25be5704334d/). The results for the current model for the burrowing owl (*Athene cunicularia hypugaea*) highlight the importance of the High Plains and Tablelands ecoregion in particular for this species and the eastern part of New Mexico and adjacent areas Colorado, Oklahoma, and Texas for conserving this species (Figure 62).

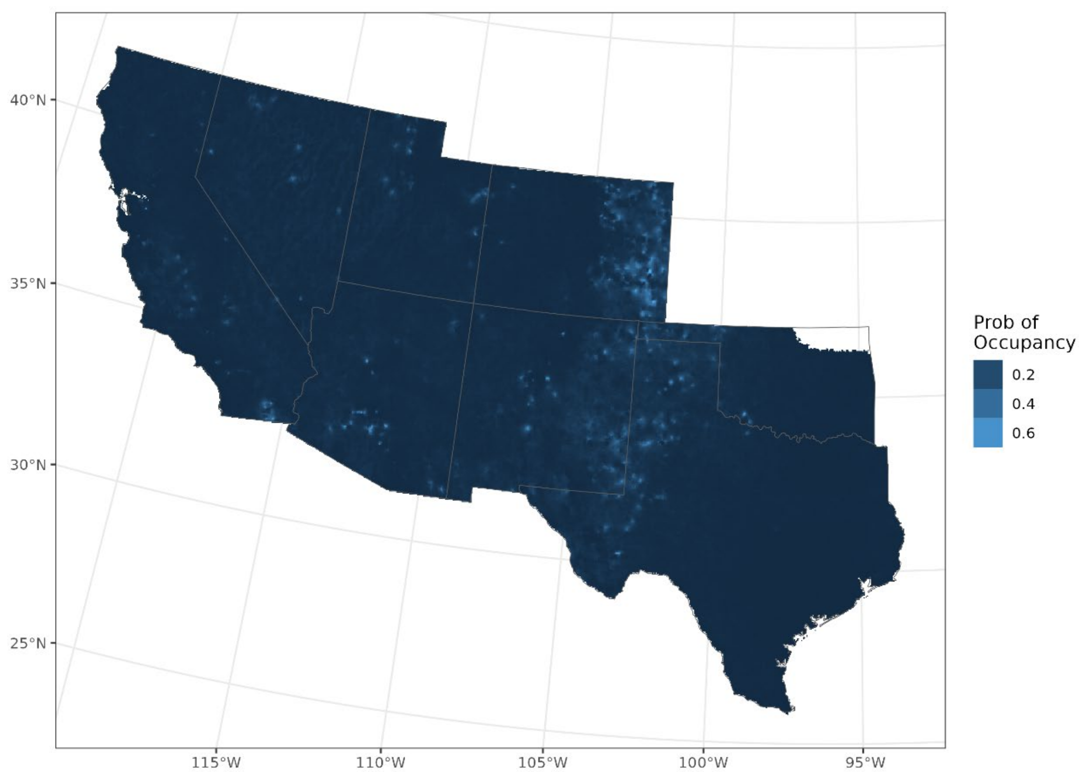

Figure 62. Model of occupancy probability for the burrowing owl (*Athene cunicularia hypugaea*) across the southwestern United States.

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Appendices

APPENDIX A: TRIBAL ENTITIES INVITED TO CONSULT ON NEW MEXICO'S 2025-2035 STATE WILDLIFE ACTION PLAN

Tribal Entity	Tribal Entity
Comanche Nation of Oklahoma	Pueblo of Taos
Fort Sill Apache Tribe of Oklahoma	Pueblo of Tesuque
Jicarilla Apache Nation	Pueblo of Zia
Kiowa Indian Tribe of Oklahoma	Pueblo of Zuni
Mescalero Apache Tribe	Southern Ute Indian Tribe
Navajo Nation	The Hopi Tribe
Ohkay Owingeh	White Mountain Apache Tribe
Pueblo of Acoma	Ysleta del Sur Pueblo
Pueblo of Cochiti	
Pueblo of Isleta	
Pueblo of Jemez	
Pueblo of Laguna	
Pueblo of Nambé	
Pueblo of Picuris	
Pueblo of Pojoaque	
Pueblo of Sandia	
Pueblo of San Felipe	
Pueblo of San Ildefonso	
Pueblo of Santa Ana	
Pueblo of Santa Clara	
Pueblo of Santo Domingo	

APPENDIX B: PARTICIPANTS IN THE CORE TEAM TO REVISE NEW MEXICO'S 2025-2035 STATE WILDLIFE ACTION PLAN

Organization	Name
Advocates for Snake Preservation	M. Amarello
Audubon Southwest	J. Hayes
CEHMM	E. Wirth
Defenders of Wildlife	B. Bird
Eastern New Mexico University	D. Davis
Farm and Livestock Bureau	T. Rivera
Interstate Stream Commission/Office of the State Engineer	C. Cunningham
Los Alamos National Lab	J. Stanek
New Mexico BioPark Society	A. Walker
New Mexico Cattle Growers' Association	B. Corn, T. Paterson, A. Spindle
New Mexico Department of Energy, Minerals, and Natural Resources	J. Pederson, R. Stokes
New Mexico Environment Department	K. Lacey
New Mexico Highlands University	J. Rivas
New Mexico Museum of Natural History	J. Malaney
New Mexico State Land Office	K. Adamczyk, W. Barnes
New Mexico State University	J. Frey, Z. Klein, K. Pregler
New Mexico State University- Cooperative Extension Service	W. Jaremko-Wright
New Mexico Institute of Mining and Technology	B. Duval
New Mexico Wild	G. VeneKlasen
New Mexico Wildlife Federation	C. Martinez del Rio, B. Wolf
Private Individual	S. Cary
Trout Unlimited	G. Hanks, T. Mitchell
University of New Mexico	T. Giermakowski, R. Norwood
US Army Corps of Engineers	S. Jentsch
US Bureau of Land Management	J. Kendall, S. Torrez
US Bureau of Reclamation	G. Vance
US Fish and Wildlife Service	R. Allen, W. Amy, M. Boggie
US Forest Service	E. Nelson, J. Padilla, Y. Paroz

Organization	Name
US National Park Service	S. Zanoni
Western New Mexico University	K. Whiteman
WildEarth Guardians	C. Smith
Wildlands Network	M. Dax
Wildlife for All	K. Bixby
Xerces Society	C. Fallon, K. Haase, S. Killingsworth

APPENDIX C: ENTITIES AND INDIVIDUALS PROVIDING COMMENTS ON THE DRAFT SPECIES OF GREATEST CONSERVATION NEED (SGCN) LIST

The purpose of the public presentations given at two hybrid, public meetings in July 2024 was to present on SGCN selection criteria and the categorization process. A draft SGCN list for New Mexico's 2025-2035 State Wildlife Action Plan was available for public comment prior to the public meetings.

Organization/Individual[64]	Organization/Individual
Amigos Bravos*	New Mexico Department of Game and Fish
Animal Protection New Mexico	New Mexico State Game Commission
Backcountry Hunters and Anglers	New Mexico State Land Office
Beaver Believer Communication Work Group*	New Mexico State University
Bruce Lance*	New Mexico Wildlife Federation*
California Department of Fish and Wildlife*	NV5
Carroll Petrie Foundation	Peggy Nelson*
Catherine Watts*	Philip Ratcliff*
Cheryl Bluford	Raul Madrid
Christopher Campbell*	Rio Grande Return*
City of Albuquerque Open Space	Sandra Couch*
Dan Ritzman*	Santos Trevino
Deborah Guerra*	Sierra Club*
Defenders of Wildlife	Southwest Alliance for a Safe Future
Douglas Kaufman*	The Institute of Ecotechnics*
Eduardo Sanchez	University of New Mexico*
Gary Ferguson	Water Sentinels
Glenn Lorton*	Western Yellow-billed Cuckoo Working Group*
Jacob Ferguson	
Jan Cohen, M.Ed.	
Kiera Rivera	
Laurie Firor*	
Maida Henderson*	
Maureen Havey*	
Michael Clendenin*	
Natural Heritage New Mexico	
New Mexico Cattle Growers' Association*	

[64] Asterisks denote individuals or organizations that submitted written comments regarding the draft 2025 SGCN list. Individual names are listed in the event that no organization affiliation is known. Some organizations both attended a public meeting and submitted a written comment.

APPENDIX D: ENTITIES AND INDIVIDUALS PROVIDING COMMENTS ON THE FINAL DRAFT VERSION OF THE STATE WILDLIFE ACTION PLAN (SWAP)

Organization/Individual[65]	Organization/Individual
Amigos Bravos*	New Mexico Department of Game and Fish
Animal Protection New Mexico	New Mexico State Game Commission
Backcountry Hunters and Anglers	New Mexico State Land Office
Beaver Believer Communication Work Group*	New Mexico State University
Bruce Lance*	New Mexico Wildlife Federation*
California Department of Fish and Wildlife*	NV5
Carroll Petrie Foundation	Peggy Nelson*
Catherine Watts*	Philip Ratcliff*
Cheryl Bluford	Raul Madrid
Christopher Campbell*	Rio Grande Return*
City of Albuquerque Open Space	Sandra Couch*
Dan Ritzman*	Santos Trevino
Deborah Guerra*	Sierra Club*
Defenders of Wildlife	Southwest Alliance for a Safe Future
Douglas Kaufman*	The Institute of Ecotechnics*
Eduardo Sanchez	University of New Mexico*
Gary Ferguson	Water Sentinels
Glenn Lorton*	Western Yellow-billed Cuckoo Working Group*
Jacob Ferguson	
Jan Cohen, M.Ed.	
Kiera Rivera	
Laurie Firor*	
Maida Henderson*	
Maureen Havey*	
Michael Clendenin*	
Natural Heritage New Mexico	
New Mexico Cattle Growers' Association*	

[65] All individuals or organizations that submitted written comments regarding the final draft version of the 2025 SWAP are listed. Individual names are listed in the event that no organization affiliation is known.

APPENDIX E: THREATS AND FACTORS THAT MAY INFLUENCE NEW MEXICO SPECIES OF GREATEST CONSERVATION NEED (SGCN), 2025-2035

Threats[66] are listed in Table 8 and follow Salafsky et al. (2008) and IUCN (2022). Taxa not included as SGCN in the 2017 SWAP are marked with an * in the Common Name column. Please see Literature Cited section that follows this table for complete information about numbered references.

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Arizona Toad	*Anaxyrus microscaphus microscaphus*	Amph.	I	X	X					X	X		X	16, 45, 157, 206, 222, 226
Arizona Treefrog	*Dryophytes wrightorum*	Amph.	D		X					X	X		X	2, 16, 157
Barking Frog	*Craugastor augusti latrans*	Amph.	L	X				X		X	X		X	16, 157, 226
Blanchard's Cricket Frog*	*Acris blanchardi*	Amph.	I	X						X	X	X		16
Boreal Chorus Frog	*Pseudacris maculata*	Amph.	I		X					X	X		X	16, 106, 157
Boreal Toad	*Anaxyrus boreas boreas*	Amph.	F	X				X		X	X	X	X	32, 157, 164, 183, 226, 235
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	Amph.	F		X	X	X			X	X	X	X	2, 16, 106, 112, 157, 183, 226, 238
Jemez Mountains Salamander	*Plethodon neomexicanus*	Amph.	F	X	X	X	X	X	X	X	X	X	X	109, 157, 164, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 226, 275
Lowland Leopard Frog	*Lithobates yavapaiensis*	Amph.	L					X		X	X		X	16, 106, 157, 164, 183, 226
Northern Leopard Frog	*Lithobates pipiens*	Amph.	I	X	X	X	X			X	X	X	X	2, 16, 106, 157, 183, 235, 241, 243
Plains Leopard Frog	*Lithobates blairi*	Amph.	I					X		X	X	X	X	16, 157

[66] Threat abbreviations are as follows: Agr = Agriculture and Aquaculture; Bio = Biological Resource Use; Cli = Climate Change and Severe Weather; Dev = Residential and Commercial Development; Ene = Energy Production and Mining; Hum = Human Intrusions and Disturbance; Inv = Invasive and Other Problematic Species, Genes and Diseases; Nat = Natural System Modifications; Pol = Pollution; Tra = Transportation and Service Corridors.
[67] Hyperlinks are to species booklets for each SGCN in the Biota Information System of New Mexico (https://bison-m.org/). Species booklets provide currently available information regarding species' abundance and distribution in New Mexico.
[68] Amph. = Amphibians, Beet. = Beetles; Crust. = Crustaceans, Mam. = Mammals, Mol. = Molluscs, Moths = Moths and Butterflies, Rept. = Reptiles.
[69] F = Current Focal Species, I = Conservation Impact Species, D = Data Needs Species, L = Limited Conservation Opportunity Species.

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Rio Grande Leopard Frog	*Lithobates berlandieri*	Amph.	I	X						X	X		X	16, 157
Sacramento Mountain Salamander	*Aneides hardii*	Amph.	I				X	X		X	X		X	69, 109, 157, 164, 165, 174, 226, 275
Sonoran Desert Toad	*Incilius alvarius*	Amph.	D		X		X	X		X	X	X		16, 106, 157, 275
Western Narrow-mouthed Toad	*Gastrophryne olivacea*	Amph.	L	X	X			X		X	X	X	X	16, 154, 157, 164, 204, 226
Andrenid Bee*	*Macrotera magniceps*	Bees	D										X	16
Andrenid Bee*	*Perdita biparticeps*	Bees	D								X	X		16
Andrenid Bee*	*Perdita claripennis*	Bees	D								X	X		16
Andrenid Bee*	*Perdita geminata*	Bees	D								X	X		16
Andrenid Bee*	*Perdita grandiceps*	Bees	D								X	X		16
Andrenid Bee*	*Perdita maculipes*	Bees	D								X	X		16
Andrenid Bee*	*Perdita senecionis*	Bees	D								X	X		16
Andrenid Bee*	*Perdita tarda*	Bees	D								X	X		16
Austin's Fairy Bee*	*Perdita austini*	Bees	D								X	X	X	16, 110, 190
Bare Fairy Bee*	*Perdita aperta*	Bees	D										X	16
Beloved Fairy Bee*	*Perdita cara*	Bees	D										X	16
Brave Digger Bee*	*Anthophora vallorum*	Bees	D										X	16
Chihuahuan Desert Digger Bee*	*Anthophora chihuahua*	Bees	D										X	16
Cockerell's Bumble Bee*	*Bombus cockerelli*	Bees	I									X		16
Dakota Leaf-cutter Bee*	*Megachile dakotensis*	Bees	L	X	X					X				16
Half-scarlet Fairy Bee*	*Perdita semicrocea*	Bees	I										X	16
Melittid Bee*	*Hesperapis trochanterata*	Bees	D											None available
Mighty Leaf-cutter Bee*	*Megachile fortis*	Bees	L		X			X						16
Mimbres Miner Bee*	*Andrena mimbresensis*	Bees	D							X	X	X	X	16, 190, 234
Morrison's Bumble Bee*	*Bombus morrisoni*	Bees	D		X					X			X	16
Neff's Miner Bee*	*Andrena neffi*	Bees	D							X	X	X	X	16, 190, 234
Sand Dune Wool-carder Bee*	*Anthidium rodecki*	Bees	D						X					16

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Southern Plains Bumble Bee*	*Bombus fraternus*	Bees	D							X	X	X	X	230
Southwest Leaf-cutter Bee*	*Megachile melanderi*	Bees	D											None available
Sweat Bee*	*Conanthalictus conanthi*	Bees	D										X	16
Thirsty Plasterer Bee*	*Colletes aridus*	Bees	D										X	198
Triton Fairy Bee*	*Perdita trinotata*	Bees	I										X	16
Volger's Mining Bee*	*Andrena vogleri*	Bees	D								X	X		16
Watson's Mason Bee*	*Osmia watsoni*	Bees	D								X	X	X	110, 190, 231, 232
Western Bumble Bee*	*Bombus occidentalis*	Bees	D								X	X		16, 92, 146
White Sands Sweat Bee*	*Lasioglossum argammon*	Bees	I							X			X	16
Anthony Blister Beetle*	*Lytta mirifica*	Beet.	I						X				X	17
Wood's Jewel Beetle*	*Chrysina woodi*	Beet.	D	X				X						16
Abert's Towhee	*Melozone aberti aberti*	Birds	L	X	X			X		X	X	X	X	16, 157, 164
American Bittern	*Botaurus lentiginosus*	Birds	D	X	X		X	X	X	X		X	X	16, 157, 204
American Dipper*	*Cinclus mexicanus unicolor*	Birds	D									X	X	16
American Kestrel*	*Falco sparverius sparverius*	Birds	D				X	X				X		3, 44
American Pipit*	*Anthus rubescens*	Birds	D	X			X			X		X		16
American Tree Sparrow*	*Spizelloides arborea ochracea*	Birds	D				X						X	16, 143
Aplomado Falcon	*Falco femoralis septentrionalis*	Birds	L	X	X	X	X			X		X	X	157, 164, 226, 277
Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*	Birds	D		X		X			X		X	X	16, 157, 164
Arizona Woodpecker*	*Dryobates arizonae*	Birds	L	X				X					X	158, 201
Baird's Sparrow	*Centronyx bairdii*	Birds	F	X	X	X	X			X	X	X	X	3, 157, 164, 201, 216, 277
Bald Eagle	*Haliaeetus leucocephalus*	Birds	D	X		X	X	X	X	X	X	X	X	16, 157, 164, 204
Band-tailed Pigeon*	*Patagioenas fasciata*	Birds	D					X			X			201, 204
Bank Swallow	*Riparia riparia riparia*	Birds	D	X			X			X		X	X	16, 157
Bell's Vireo	*Vireo bellii*	Birds	F	X	X		X	X		X	X	X	X	16, 155, 157, 164, 204

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Bendire's Thrasher	*Toxostoma bendirei*	Birds	F		X	X	X			X	X	X	X	16, 18, 43, 47, 62, 157, 201
Bewick's Wren*	*Thryomanes bewickii*	Birds	D				X	X		X		X	X	16
Black Rosy-Finch*	*Leucosticte atrata*	Birds	F					X				X	X	16, 157, 201, 226
Black Swift	*Cypseloides niger*	Birds	L	X					X	X		X	X	17, 149, 194
Black-billed Magpie*	*Pica hudsonia*	Birds	D					X				X	X	16, 143
Black-chinned Sparrow	*Spizella atrogularis evura*	Birds	D				X			X			X	16, 157
Black-headed Grosbeak*	*Pheucticus melanocephalus*	Birds	D				X	X				X	X	16, 53, 129
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	D	X		X	X	X		X	X	X	X	16, 53, 157
Black-throated Sparrow*	*Amphispiza bilineata*	Birds	D				X					X		3, 16
Boreal Owl	*Aegolius funereus*	Birds	L	X				X		X			X	157, 164, 226
Brewer's Sparrow*	*Spizella breweri*	Birds	D				X					X	X	3, 16
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	Birds	L	X	X			X		X	X	X	X	134, 157, 164
Broad-tailed Hummingbird*	*Selasphorus platycercus platycercus*	Birds	D					X		X				16, 129
Brown Pelican*	*Pelecanus occidentalis carolinensis*	Birds	L	X				X				X		81, 164
Brown-capped Rosy-Finch	*Leucosticte australis*	Birds	F							X			X	157, 201, 226, 276
Buff-breasted Flycatcher*	*Empidonax fulvifrons pygmaeus*	Birds	L				X							16
Bullock's Oriole*	*Icterus bullockii*	Birds	D				X	X				X	X	16
Burrowing Owl	*Athene cunicularia hypugaea*	Birds	I	X	X	X	X	X	X	X	X	X	X	3, 16, 44, 90, 157, 235, 277, 283
Cactus Wren*	*Campylorhynchus brunneicapillus couesi*	Birds	D						X	X	X			16, 278
Canyon Towhee*	*Melozone fusca*	Birds	D									X		16
Canyon Wren*	*Catherpes mexicanus conspersus*	Birds	D				X					X		16
Cassin's Finch	*Haemorhous cassinii*	Birds	D	X			X	X		X		X	X	16, 157, 226

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Cassin's Kingbird*	*Tyrannus vociferans vociferans*	Birds	D				X	X				X	X	3, 16, 143
Cassin's Sparrow	*Peucaea cassinii*	Birds	D		X	X		X		X	X	X	X	3, 16, 157, 277
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	F		X	X	X			X	X	X	X	16, 157, 201, 216, 226, 277
Chihuahuan Meadowlark*	*Sturnella lilianae*	Birds	D	X	X	X	X	X		X		X	X	3, 15, 16, 277
Chihuahuan Raven*	*Corvus cryptoleucus*	Birds	D					X				X		16
Chipping Sparrow*	*Spizella passerina arizonae*	Birds	D				X			X		X	X	16, 53
Clark's Grebe	*Aechmophorus clarkii*	Birds	D	X					X	X			X	16, 157
Clark's Nutcracker	*Nucifraga columbiana*	Birds	D	X				X		X		X	X	16, 129, 157, 226
Cliff Swallow*	*Petrochelidon pyrrhonota*	Birds	D				X			X	X	X	X	16
Common Black Hawk	*Buteogallus anthracinus anthracinus*	Birds	D	X				X	X	X			X	157, 164, 226
Common Ground Dove	*Columbina passerina pallescens*	Birds	L	X				X		X			X	16, 157, 164
Common Nighthawk	*Chordeiles minor*	Birds	D	X			X			X		X	X	16, 157
Costa's Hummingbird	*Calypte costae*	Birds	L	X	X			X		X	X	X	X	134, 157, 164
Eastern Bluebird*	*Sialia sialis*	Birds	D				X				X	X	X	3, 16
Elegant Trogon	*Trogon elegans canescens*	Birds	L	X	X			X	X	X			X	16, 155, 157, 164, 201
Elf Owl	*Micrathene whitneyi whitneyi*	Birds	D	X					X	X			X	16, 157
Evening Grosbeak	*Coccothraustes vespertinus*	Birds	D	X			X			X	X	X	X	16, 157, 283
Ferruginous Hawk*	*Buteo regalis*	Birds	D	X	X	X	X	X		X		X	X	3, 16, 44, 277
Field Sparrow*	*Spizella pusilla arenacea*	Birds	D		X		X						X	16, 143
Flammulated Owl	*Psiloscops flammeolus*	Birds	D					X		X		X	X	16, 138, 157, 201
Gila Woodpecker	*Melanerpes uropygialis uropygialis*	Birds	L	X				X		X	X		X	16, 157, 164
Golden Eagle*	*Aquila chrysaetos canadensis*	Birds	D	X		X		X	X			X	X	16, 44, 141, 204
Grace's Warbler	*Setophaga graciae*	Birds	I	X	X		X	X		X		X	X	16, 39, 157, 201, 236
Grasshopper Sparrow*	*Ammodramus savannarum perpallidus*	Birds	D		X	X	X			X		X	X	3, 16, 201, 226, 277

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Gray Vireo	*Vireo vicinior*	Birds	I	X	X	X	X	X		X	X	X	X	16, 49, 50, 53, 157, 164, 201
Gray-crowned Rosy-Finch*	*Leucosticte tephrocotis*	Birds	F									X	X	16, 226, 276
Greater Pewee*	*Contopus pertinax pallidiventris*	Birds	L				X						X	16
Greater Yellowlegs*	*Tringa melanoleuca*	Birds	D							X			X	16, 143
Green-tailed Towhee*	*Pipilo chlorurus*	Birds	D	X			X					X	X	16, 143
Harris's Hawk*	*Parabuteo unicinctus harrisi*	Birds	D			X	X		X					15
Horned Lark*	*Eremophila alpestris*	Birds	D	X	X	X	X	X		X		X	X	3, 16, 277, 280
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	I	X		X		X		X		X	X	15, 16, 157
Killdeer*	*Charadrius vociferus vociferus*	Birds	D	X			X			X		X	X	16, 280
Lapland Longspur*	*Calcarius lapponicus alascensis*	Birds	D				X					X	X	16, 143
Lark Bunting*	*Calamospiza melanocorys*	Birds	D		X	X	X			X		X	X	3, 16, 277
Lark Sparrow*	*Chondestes grammacus strigatus*	Birds	D		X	X	X			X		X	X	3, 16
Lazuli Bunting*	*Passerina amoena*	Birds	L				X							16
Least Tern	*Sternula antillarum athalassos*	Birds	L	X				X	X	X		X	X	16, 157, 164, 226
Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*	Birds	F	X	X	X	X	X		X	X	X	X	15, 16, 30, 147, 150, 157, 201, 226, 239, 242, 264, 272, 277, 279
Lewis's Woodpecker	*Melanerpes lewis*	Birds	D		X			X		X		X	X	16, 157, 201
Loggerhead Shrike	*Lanius ludovicianus*	Birds	D	X	X	X	X			X		X	X	3, 157, 204, 277
Long-billed Curlew	*Numenius americanus americanus*	Birds	D	X	X	X		X		X	X		X	16, 119, 157, 277
Long-billed Dowitcher*	*Limnodromus scolopaceus*	Birds	D							X			X	16, 143
Long-eared Owl*	*Asio otus*	Birds	D									X		283
Lucifer Hummingbird	*Calothorax lucifer*	Birds	L	X	X			X	X	X	X	X	X	16, 134, 157, 164, 201
Lucy's Warbler	*Leiothlypis luciae*	Birds	D	X	X		X	X		X		X	X	16, 157
Mexican Chickadee*	*Poecile sclateri eidos*	Birds	L	X										158

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	I	X	X	X		X		X	X		X	16, 61, 157, 201, 226
Mexican Whip-poor-will	*Antrostomus arizonae arizonae*	Birds	D				X	X		X			X	16, 157, 201, 203
Mountain Bluebird	*Sialia currucoides*	Birds	D				X			X	X	X	X	3, 16, 157
Mountain Chickadee*	*Poecile gambeli gambeli*	Birds	D				X	X		X		X	X	16, 129, 143
Mountain Plover	*Charadrius montanus*	Birds	F	X	X	X	X	X		X	X	X	X	16, 142, 157, 277
Neotropic Cormorant	*Phalacrocorax brasilianus*	Birds	L	X				X	X	X		X	X	16, 157, 164
Northern Beardless-Tyrannulet	*Camptostoma imberbe ridgwayi*	Birds	L	X	X		X	X		X		X	X	16, 157, 164
Northern Harrier*	*Circus hudsonius*	Birds	D			X	X	X		X		X	X	3, 16, 44, 204
Northern Rough-winged Swallow*	*Stelgidopteryx serripennis*	Birds	D				X			X		X		16
Olive Warbler*	*Peucedramus taeniatus arizonae*	Birds	D				X						X	16
Olive-sided Flycatcher	*Contopus cooperi*	Birds	D	X			X	X		X		X	X	16, 157, 201
Peregrine Falcon	*Falco peregrinus*	Birds	D	X		X		X	X		X	X	X	16, 103, 104, 157, 164, 204, 283
Phainopepla*	*Phainopepla nitens lepida*	Birds	D				X					X	X	16
Pine Grosbeak*	*Pinicola enucleator montana*	Birds	D										X	143
Pine Siskin*	*Spinus pinus*	Birds	D				X					X	X	16, 143
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	F	X	X	X	X	X	X	X	X	X	X	16, 42,97, 98, 99, 100, 101, 129, 157, 215, 226, 237
Piping Plover*	*Charadrius melodus circumcinctus*	Birds	L							X				16
Plumbeous Vireo*	*Vireo plumbeus*	Birds	D				X	X				X	X	16
Prairie Falcon*	*Falco mexicanus*	Birds	D				X	X					X	16
Purple Martin*	*Progne subis*	Birds	D				X					X	X	16
Pygmy Nuthatch	*Sitta pygmaea melanotis*	Birds	D					X		X		X	X	16, 144, 157
Pyrrhuloxia*	*Cardinalis sinuatus sinuatus*	Birds	D								X			15
Red-faced Warbler	*Cardellina rubrifrons*	Birds	D	X	X		X	X	X	X			X	16, 157

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	Birds	L	X	X		X	X		X	X	X		16, 157
Red-naped Sapsucker*	*Sphyrapicus nuchalis*	Birds	D										X	16
Rock Wren*	*Salpinctes obsoletus obsoletus*	Birds	D			X				X		X	X	16
Sage Thrasher*	*Oreoscoptes montanus*	Birds	D	X		X	X			X		X	X	16, 143
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Birds	D		X		X	X		X	X	X	X	16, 157
Savannah Sparrow*	*Passerculus sandwichensis*	Birds	D		X	X	X			X		X	X	16, 143, 277
Scott's Oriole*	*Icterus parisorum*	Birds	D			X	X	X				X		16
Short-eared Owl*	*Asio flammeus flammeus*	Birds	D		X	X		X		X	X	X	X	16, 277
Snowy Plover	*Charadrius nivosus*	Birds	L						X		X		X	157
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	I	X				X	X	X	X	X	X	16, 19, 36, 81, 157, 159, 164
Spotted Sandpiper*	*Actitis macularius*	Birds	D				X	X		X				16
Spotted Towhee*	*Pipilo maculatus*	Birds	D				X			X		X	X	16, 53, 76
Sprague's Pipit	*Anthus spragueii*	Birds	F		X	X	X			X	X	X	X	16, 157, 201, 216, 277
Steller's Jay*	*Cyanocitta stelleri macrolopha*	Birds	D					X				X		16, 129
Thick-billed Kingbird	*Tyrannus crassirostris*	Birds	L	X	X		X	X		X		X	X	16, 157, 164
Thick-billed Longspur	*Rhynchophanes mccownii*	Birds	F		X	X	X			X		X	X	3, 16, 216, 277
Varied Bunting	*Passerina versicolor*	Birds	L	X	X		X	X		X		X	X	16, 157, 164
Verdin*	*Auriparus flaviceps ornatus*	Birds	D	X										15
Vesper Sparrow	*Pooecetes gramineus*	Birds	D		X	X	X			X		X	X	3, 16, 157, 277
Violet-crowned Hummingbird	*Leucolia violiceps ellioti*	Birds	L	X				X		X	X	X	X	134, 157, 164
Violet-green Swallow*	*Tachycineta thalassina lepida*	Birds	D				X			X		X	X	16
Virginia's Warbler	*Leiothlypis virginiae*	Birds	F			X	X	X		X	X	X	X	16, 77, 129, 157, 201
Western Bluebird	*Sialia mexicana bairdi*	Birds	D			X	X			X	X	X	X	3, 16, 157
Western Grebe*	*Aechmophorus occidentalis*	Birds	D				X							147
Western Kingbird*	*Tyrannus verticalis*	Birds	D		X	X	X			X		X	X	3, 16, 277

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Western Meadowlark*	*Sturnella neglecta*	Birds	D	X	X	X	X	X		X	X	X	X	3, 16, 277
Western Sandpiper*	*Calidris mauri*	Birds	L										X	143
Western Wood Pewee*	*Contopus sordidulus*	Birds	D				X					X	X	16, 143
Whiskered Screech-Owl	*Megascops trichopsis asperus*	Birds	F	X					X	X			X	157, 164, 201
White-eared Hummingbird*	*Basilinna leucotis borealis*	Birds	L		X	X	X	X			X	X	X	16, 134, 164
White-tailed Ptarmigan	*Lagopus leucura altipetens*	Birds	F	X	X			X	X	X	X		X	16, 157, 160, 164, 226, 282
White-throated Swift*	*Aeronautes saxatalis saxatalis*	Birds	D									X	X	16
Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	Birds	D	X				X		X		X	X	16, 157
Wilson's Warbler*	*Cardellina pusilla*	Birds	L				X	X		X		X	X	16, 76, 77
Woodhouse's Scrub Jay*	*Aphelocoma woodhouseii*	Birds	I					X		X		X		16
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	F	X	X	X	X	X		X	X	X	X	4, 14, 68, 71, 102, 124, 157, 159, 211, 212, 218, 226, 233, 239, 242, 246, 268, 281, 284
Yellow-billed Cuckoo*	*Coccyzus americanus americanus*	Birds	D		X			X				X	X	16, 226
Yellow-eyed Junco	*Junco phaeonotus palliatus*	Birds	D	X	X			X		X		X	X	16, 157, 164
Yellow-headed Blackbird*	*Xanthocephalus xanthocephalus*	Birds	D	X			X	X		X		X	X	16
Alkali Fairy Shrimp	*Branchinecta mackini*	Crust.	D							X		X		16
Beavertail Fairy Shrimp	*Thamnocephalus platyurus*	Crust.	D							X		X	X	16
BLNWR cryptic species Amphipod	*Gammarus* sp.	Crust.	D							X	X	X		16
Bowman's Fairy Shrimp	*Streptocephalus thomasbowmani*	Crust.	D							X		X		16
Brine Shrimp	*Artemia franciscana*	Crust.	D							X		X		16
Clam Shrimp	*Eulimnadia follisimilis*	Crust.	D							X				16
Colorado Fairy Shrimp	*Branchinecta coloradensis*	Crust.	D							X		X		16
Conchas Crayfish	*Faxonius deanae*	Crust.	D							X	X			157

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Cylindrical Cyst Clam Shrimp	*Eulimnadia cylindrova*	Crust.	D							X		X		16
Desert Fairy Shrimp*	*Streptocephalus dorothae*	Crust.	D							X		X	X	16
Desert Tadpole Shrimp*	*Triops newberryi*	Crust.	D							X		X	X	16
Diversity Clam Shrimp	*Eulimnadia diversa*	Crust.	D							X		X		16
Dumont's Fairy Shrimp	*Streptocephalus henridumontis*	Crust.	D							X		X		16
Fuzzy Cyst Clam Shrimp	*Eulimnadia antlei*	Crust.	D							X		X		16
Great Plains Fairy Shrimp	*Streptocephalus texanus*	Crust.	D							X		X		157
Knobblip Fairy Shrimp	*Eubranchipus bundyi*	Crust.	D							X		X		16
Lynch Tadpole Shrimp	*Lepidurus lemmoni*	Crust.	D							X		X	X	16
Mackin Fairy Shrimp*	*Streptocephalus mackini*	Crust.	D							X		X	X	16
Mexican Beavertail Fairy Shrimp	*Thamnocephalus mexicanus*	Crust.	D							X		X		16
Moore's Fairy Shrimp	*Streptocephalus moorei*	Crust.	D							X	X	X	X	16, 116, 125, 126, 157
Noel's Amphipod	*Gammarus desperatus*	Crust.	F	X						X	X	X	X	117, 152, 157, 164
Packard's Fairy Shrimp	*Branchinecta packardi*	Crust.	D							X		X		16
Playa Clam Shrimp*	*Leptestheria compleximanus*	Crust.	D							X		X	X	16
Scud*	*Hyalella azteca*	Crust.	D									X	X	16
Short Finger Clam Shrimp	*Lynceus brevifrons*	Crust.	D							X		X		16
Sitting Bull Spring cryptic species Amphipod	*Gammarus* sp.	Crust.	D							X			X	16
Socorro Isopod	*Thermosphaeroma thermophilum*	Crust.	F						X	X	X	X	X	16, 157, 164
Southern Plains Crayfish	*Procambarus simulans simulans*	Crust.	D							X	X			157
Sublette's Fairy Shrimp	*Phallocryptis sublettei*	Crust.	D							X		X		16
Texan Clam Shrimp	*Eulimnadia texana*	Crust.	D							X		X		16

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Versatile Fairy Shrimp	*Branchinecta lindahli*	Crust.	D							X		X		16
Arkansas River Shiner	*Notropis girardi*	Fish	F	X	X		X		X	X	X		X	16, 157, 226, 252
Bigscale Logperch	*Percina macrolepida*	Fish	L							X	X		X	16, 157
Blue Sucker	*Cycleptus elongatus*	Fish	F	X		X				X	X	X	X	16, 157, 164
Central Stoneroller*	*Campostoma anomalum*	Fish	L	X				X		X		X	X	16, 194
Chihuahua Chub	*Gila nigrescens*	Fish	F	X	X			X		X	X		X	16, 157, 164, 181, 226
Colorado Pikeminnow	*Ptychocheilus lucius*	Fish	F	X				X		X	X	X	X	16, 96, 157, 164, 226, 256, 258
Desert Sucker	*Catostomus clarkii*	Fish	F	X				X		X	X	X	X	16, 64, 157, 226
Gila Chub	*Gila intermedia*	Fish	F	X	X		X			X	X	X	X	16, 153, 157, 226, 275
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	Fish	L	X	X					X	X		X	16, 64, 157, 164, 226
Gila Trout	*Oncorhynchus gilae*	Fish	F	X	X		X	X	X	X	X	X	X	16, 96, 157, 163, 226, 257
Gray Redhorse	*Moxostoma congestum*	Fish	F	X		X				X	X	X	X	157, 164, 226
Greenthroat Darter	*Etheostoma lepidum*	Fish	I							X	X	X	X	157, 226
Headwater Catfish*	*Ictalurus lupus*	Fish	D	X									X	16, 226
Headwater Chub	*Gila nigra*	Fish	F	X			X	X		X	X	X	X	2, 16, 157, 226
Loach Minnow	*Rhinichthys cobitis*	Fish	F	X	X	X	X			X	X	X	X	96, 157, 164, 226, 239, 244
Longnose Gar*	*Lepisosteus osseus*	Fish	L					X						227
Mexican Tetra	*Astyanax mexicanus*	Fish	I		X					X		X	X	16, 157, 164
Mottled Sculpin*	*Cottus bairdii*	Fish	L										X	226
Pecos Bluntnose Shiner	*Notropis simus pecosensis*	Fish	F	X				X		X	X	X	X	16, 96, 157, 164, 226, 228
Pecos Gambusia	*Gambusia nobilis*	Fish	F	X						X	X		X	157, 223, 224, 226
Pecos Pupfish	*Cyprinodon pecosensis*	Fish	F	X		X		X		X	X	X	X	16, 157, 164, 226
Peppered Chub	*Macrhybopsis tetranema*	Fish	F	X	X	X			X	X	X		X	157, 164, 226, 252, 262
Plains Minnow*	*Hybognathus placitus*	Fish	L	X						X			X	16, 182, 226
Razorback Sucker	*Xyrauchen texanus*	Fish	F	X				X		X	X	X	X	16, 64, 157, 255
Rio Grande Chub	*Gila pandora*	Fish	F	X						X	X	X	X	12, 96, 157, 197, 235, 267

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Rio Grande Cutthroat Trout*	*Oncorhynchus clarkii virginalis*	Fish	F	X	X	X	X	X		X	X	X	X	6, 10, 16, 96, 162, 226, 235, 242, 247
Rio Grande Shiner*	*Notropis jemezanus*	Fish	I	X						X	X		X	16, 96, 226
Rio Grande Silvery Minnow	*Hybognathus amarus*	Fish	I	X						X	X	X	X	16, 96, 155, 157, 226
Rio Grande Sucker	*Catostomus plebeius*	Fish	F	X	X	X				X	X	X	X	12, 16, 157, 226, 235, 267
Roundnose Minnow*	*Dionda episcopa*	Fish	I	X						X				16
Roundtail Chub	*Gila robusta*	Fish	F	X		X	X	X		X	X	X	X	1, 64, 96, 153, 157, 240, 242, 250, 265, 275
Smallmouth Buffalo*	*Ictiobus bubalus*	Fish	I										X	16
Sonora Sucker	*Catostomus insignis*	Fish	F	X						X	X	X	X	16, 64, 157
Southern Redbelly Dace	*Chrosomus erythrogaster*	Fish	L	X				X		X	X	X	X	7, 16, 157
Speckled Chub*	*Macrhybopsis aestivalis*	Fish	I	X						X	X		X	16, 96
Spikedace	*Meda fulgida*	Fish	F	X	X	X	X			X	X	X	X	64, 157, 164, 226, 239, 244
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	L	X	X					X		X	X	16, 157
White Sands Pupfish	*Cyprinodon tularosa*	Fish	F						X	X	X		X	157, 164, 191, 226
Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	Fish	F	X				X		X	X	X	X	66, 157, 164, 226, 239, 242
Alamogordo Window Fly*	*Caenotus inornatus*	Flies	D								X	X		16
Crandall's Hornet Fly*	*Spilomyia crandalli*	Flies	D							X			X	16
Dune Flower-loving Fly*	*Apiocera bilineata*	Flies	D							X				16
Painter's Mydas Fly*	*Rhaphiomidas painteri*	Flies	I	X					X					16
Prairie Bee Fly*	*Poecilognathus scolopax*	Flies	D						X					16
Rio Grande Flower-loving Fly*	*Apiocera hamata*	Flies	D											None available
Small Window Fly*	*Caenotus minutus*	Flies	D								X	X		16
Southwestern Slender Bee Fly*	*Thevenetimyia speciosa*	Flies	D											None available
Yellow-tailed Hornet Fly*	*Spilomyia kahli*	Flies	D											None available

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Allen's Big-eared Bat*	*Idionycteris phyllotis*	Mam.	D		X							X		16, 82
American Beaver*	*Castor canadensis*	Mam.	I	X	X	X	X	X		X	X	X	X	11, 16, 64, 182, 214
American Mink	*Neogale vison*	Mam.	D	X	X			X		X	X			16, 157
American Pika	*Ochotona princeps*	Mam.	L	X	X		X	X		X		X	X	16, 28, 157, 226
Arizona Gray Squirrel*	*Sciurus arizonensis arizonensis*	Mam.	D					X		X				16, 105
Arizona Montane Vole	*Microtus montanus arizonensis*	Mam.	F	X	X			X		X			X	57, 133, 157, 164
Arizona Shrew	*Sorex arizonae*	Mam.	L	X				X		X			X	16, 157, 164
Banner-tailed Kangaroo Rat*	*Dipodomys spectabilis*	Mam.	D					X					X	16, 140, 148, 156, 226, 273
Big Free-tailed Bat*	*Nyctinomops macrotis*	Mam.	D	X						X		X		16, 82
Black-footed Ferret	*Mustela nigripes*	Mam.	F	X				X			X	X		16, 23, 157, 161, 226
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mam.	F	X	X		X	X	X	X	X		X	16, 41, 157, 177
Canada Lynx*	*Lynx canadensis*	Mam.	L	X				X		X	X		X	16, 23, 184, 226
Cave Myotis*	*Myotis velifer*	Mam.	I						X	X	X	X		16, 74, 75, 82, 156
Common Porcupine*	*Erethizon dorsatum*	Mam.	D					X			X	X	X	16
Desert Pocket Gopher*	*Geomys arenarius*	Mam.	D	X	X			X		X			X	16, 41, 157, 177
Eastern Red Bat*	*Lasiurus borealis*	Mam.	D			X	X			X	X	X		5, 8, 16, 82
Ermine Weasel*	*Mustela richardsonii*	Mam.	D		X			X			X		X	23, 58, 60, 93, 156
Fringed Myotis*	*Myotis thysanodes thysanodes*	Mam.	I	X	X				X	X	X	X	X	16, 74, 75, 82
Gray-collared Chipmunk*	*Neotamias cinereicollis cinereicollis*	Mam.	D					X		X				16, 105, 114
Gray-footed Chipmunk*	*Neotamias canipes*	Mam.	D					X		X				16, 209
Gunnison's prairie dog	*Cynomys gunnisoni*	Mam.	F	X				X	X	X	X	X	X	16, 40, 89, 123, 157, 188, 204, 226, 235
Heather Vole*	*Phenacomys intermedius intermedius*	Mam.	D	X	X			X		X			X	16, 56, 156
Hoary Bat*	*Aeorestes cinereus cinereus*	Mam.	D		X	X	X			X	X	X	X	5, 8, 16, 82, 225
Holzner's Cottontail Rabbit*	*Sylvilagus holzneri*	Mam.	D					X		X	X	X	X	16, 156, 237

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Hooded Skunk*	*Mephitis macroura milleri*	Mam.	D					X			X		X	16, 23
Jaguar	*Panthera onca arizonensis*	Mam.	L		X		X	X	X	X			X	23, 157, 187, 275
Least Shrew	*Cryptotis parvus*	Mam.	F	X	X			X		X			X	16, 157, 164
Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	Mam.	F	X		X			X	X	X	X	X	82, 118, 134, 157, 164, 249, 251
Mexican Gray Wolf	*Canis lupus baileyi*	Mam.	I		X		X	X	X	X	X		X	23, 157, 187, 226, 275
Mexican Long-nosed Bat	*Leptonycteris nivalis*	Mam.	F	X					X	X	X	X	X	82, 134, 157, 164, 253
Mexican Long-tongued Bat	*Choeronycteris mexicana*	Mam.	F	X					X	X		X	X	82, 157, 226
New Mexico Jumping Mouse	*Zapus hudsonius luteus (=Zapus luteus luteus)*	Mam.	I	X	X		X	X	X	X	X		X	54, 55, 58, 128, 157, 164, 226, 235, 259
North American River Otter	*Lontra canadensis*	Mam.	F		X			X		X		X	X	16, 37, 157
Northern Pygmy Mouse*	*Baiomys taylori ater*	Mam.	D		X			X		X			X	16, 108
Organ Mountains Colorado Chipmunk	*Neotamias quadrivittatus australis*	Mam.	I	X				X		X	X		X	94, 157, 164, 178, 210, 226
Oscura Mountains Colorado Chipmunk	*Neotamias quadrivittatus oscuraensis*	Mam.	I	X				X		X			X	157, 178, 179, 180, 185, 226
Pacific Marten	*Martes caurina*	Mam.	F	X	X		X	X		X			X	16, 23, 38, 157, 164, 274
Peñasco Least Chipmunk	*Neotamias minimus atristriatus*	Mam.	F	X	X			X	X	X	X		X	95, 135, 136, 157, 164, 195, 226, 254
Pocketed Free-tailed Bat*	*Nyctinomops femorosaccus*	Mam.	D									X		82
Prairie Vole*	*Microtus ochrogaster haydenii*	Mam.	D					X					X	16
Snowshoe Hare*	*Lepus americanus bairdii*	Mam.	D					X		X	X		X	16, 113, 127
Southern Pocket Gopher	*Thomomys umbrinus*	Mam.	D	X				X	X	X		X		16, 157, 164
Southern Red-backed Vole*	*Myodes gapperi*	Mam.	D					X		X			X	16, 111
Southwestern Little Brown Myotis*	*Myotis occultus*	Mam.	D	X	X				X	X	X	X	X	16, 35, 75, 82, 225
Spotted Bat	*Euderma maculatum*	Mam.	D	X	X	X		X	X	X	X	X	X	16, 82, 155, 157, 164, 235

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Thirteen-lined Ground Squirrel*	*Ictidomys tridecemlineatus*	Mam.	D					X			X			16
Tri-colored Bat*	*Perimyotis subflavus*	Mam.	F			X					X	X	X	31, 82, 226, 263
Western Jumping Mouse*	*Zapus princeps princeps*	Mam.	D					X						16
Western Red Bat*	*Lasiurus blossevillii*	Mam.	D				X			X		X	X	16, 82
Western Water Shrew*	*Sorex navigator*	Mam.	D		X					X			X	16, 235
Western Yellow Bat	*Dasypterus xanthinus*	Mam.	D	X	X			X		X		X		5, 16, 82, 157, 164
White-nosed Coati*	*Nasua narica*	Mam.	D	X				X			X			16, 158
White-sided Jackrabbit	*Lepus callotis gaillardi*	Mam.	I	X	X	X	X	X		X			X	16, 157, 164, 275
White-tailed Jackrabbit*	*Lepus townsendii campanius*	Mam.	D	X	X			X				X	X	16, 20
Yellow-bellied Marmot*	*Marmota flaviventris*	Mam.	D					X			X	X	X	16, 59, 148, 156
Yellow-nosed Cotton Rat*	*Sigmodon ochrognathus*	Mam.	D	X	X			X		X				16, 63, 108, 158
Yuma Myotis*	*Myotis yumanensis yumanensis*	Mam.	D		X						X	X	X	16, 75, 82
Alamosa Springsnail	*Pseudotryonia alamosae*	Mol.	F			X		X		X	X	X	X	16, 120, 157
Animas Mountains Holospira Snail	*Holospira animasensis*	Mol.	D			X		X		X			X	16, 151
Animas Peak Woodlandsnail	*Ashmunella animasensis*	Mol.	D			X		X		X			X	16, 151
Animas Talussnail	*Sonorella animasensis*	Mol.	D			X		X		X			X	16, 151
Apache Snaggletooth Snail*	*Gastrocopta cochisensis*	Mol.	D										X	151
Bearded Mountainsnail*	*Oreohelix barbata*	Mol.	D										X	151
Big Hatchet Woodlandsnail*	*Ashmunella mearnsii*	Mol.	D							X			X	16, 151
Bishop Tubeshell Snail*	*Coelostemma pyrgonasta*	Mol.	D										X	151
Black Range Mountainsnail*	*Oreohelix metcalfei*	Mol.	D										X	151
Black Range Mountainsnail*	*Oreohelix metcalfei cuchillensis*	Mol.	D										X	151
Black Range Woodlandsnail*	*Ashmunella cockerelli*	Mol.	D	X				X					X	16, 151

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Burnt Corral Pyrg*	*Pyrgulopsis similis*	Mol.	D		X					X	X			16
Capitan Woodlandsnail*	*Ashmunella pseudodonta*	Mol.	D			X				X			X	151, 237
Chupadera Springsnail	*Pyrgulopsis chupaderae*	Mol.	F		X					X	X	X	X	78, 120, 157, 164
Cockerell Holospira Snail*	*Holospira cockerelli*	Mol.	D										X	151
Cooke's Peak Woodlandsnail	*Ashmunella macromphala*	Mol.	D		X	X		X		X			X	16, 151, 157, 164
Creeping Ancylid Snail	*Ferrissia rivularis*	Mol.	D	X						X	X			157
Cross Holospira Snail	*Holospira crossei*	Mol.	D			X		X		X			X	151, 157
Diablo Mountainsnail*	*Oreohelix houghi*	Mol.	D										X	16
Doña Ana Talussnail	*Sonorella todseni*	Mol.	D	X	X	X		X		X			X	151, 157, 164
Dry Creek Woodlandsnail*	*Ashmunella tetrodon*	Mol.	D	X				X					X	16, 151
Dry Creek Woodlandsnail*	*Ashmunella tetrodon fragilis*	Mol.	D										X	151
False Marsh Slug	*Deroceras heterura*	Mol.	D	X		X		X		X			X	16, 151
Florida Mountain Woodlandsnail*	*Ashmunella walkeri*	Mol.	D										X	16
Franklin Mountain Talussnail*	*Sonorella metcalfi*	Mol.	D										X	151
Franklin Mountain Woodlandsnail*	*Ashmunella pasonis pasonis*	Mol.	D										X	151
Fringed Mountainsnail	*Radiocentrum ferrissi*	Mol.	D		X	X		X		X			X	16, 151
Gila Springsnail	*Pyrgulopsis gilae*	Mol.	I	X	X				X	X	X	X	X	78, 157, 164
Goat Mountain Woodlandsnail*	*Ashmunella harrisi*	Mol.	D										X	151
Guadelupe Woodlandsnail*	*Ashmunella carlsbadensis*	Mol.	D										X	151
Hacheta Grande Woodlandsnail	*Ashmunella hebardi*	Mol.	D		X	X		X		X	X		X	151, 157, 164
Hacheta Mountainsnail*	*Radiocentrum hachetanum*	Mol.	D										X	151
Heart Vertigo Snail*	*Vertigo hinkleyi*	Mol.	D										X	151

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Iron Creek Woodlandsnail*	*Ashmunella mendax*	Mol.	D	X				X					X	16, 151
Jemez Woodlandsnail	*Ashmunella ashmuni*	Mol.	D			X	X	X		X			X	16, 151
Jordan Spring Pyrg*	*Pyrgulopsis marilynae*	Mol.	D		X					X	X			16
Koster's Springsnail	*Juturnia kosteri*	Mol.	F	X		X				X	X	X	X	120, 152, 157, 164
Lake Fingernailclam	*Musculium lacustre*	Mol.	D	X						X	X	X	X	16, 157, 164
Lang Canyon Talussnail	*Sonorella painteri*	Mol.	D			X		X		X			X	16, 151
Lilljeborg's Peaclam	*Pisidium lilljeborgi*	Mol.	D	X							X	X	X	157, 164
Long Fingernailclam	*Musculium transversum*	Mol.	D							X	X	X	X	157, 164
Magdalena Mountainsnail*	*Oreohelix magdalenae*	Mol.	D										X	151
Maple Canyon Woodlandsnail*	*Ashmunella todseni*	Mol.	D										X	151
Metcalf Holospira Snail	*Holospira metcalfi*	Mol.	D			X		X		X			X	16, 151
Mineral Creek Mountainsnail	*Oreohelix pilsbryi*	Mol.	D	X	X	X		X	X	X			X	151, 157, 164
Morgan Creek Mountainsnail*	*Oreohelix swopei*	Mol.	D										X	151
Mount Riley Woodlandsnail*	*Ashmunella rileyensis*	Mol.	D										X	16
Mountainsnail*	*Oreohelix nogalensis*	Mol.	D							X			X	16, 151
Multirib Vallonia Snail*	*Vallonia gracilicosta*	Mol.	D										X	151
New Mexico Hot Springsnail	*Pyrgulopsis thermalis*	Mol.	I	X	X				X	X	X	X		16, 78, 157
New Mexico Ramshorn Snail	*Pecosorbis kansasensis*	Mol.	D	X						X		X	X	16
New Mexico Talussnail (Big Hatchet Mountains, Florida Mountains)	*Sonorella hachitana*	Mol.	D		X	X		X		X			X	151, 157
New Mexico Talussnail (Peloncillo Mountains)	*Sonorella hachitana peloncillensis*	Mol.	D			X		X		X			X	151, 157
Northern Threeband*	*Humboldtiana ultima*	Mol.	D										X	151
Organ Mountain Woodlandsnail*	*Ashmunella organensis*	Mol.	D										X	16

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Ovate Vertigo Snail	*Vertigo ovata*	Mol.	D	X	X	X				X		X	X	16, 151, 157, 164
Paper Pondshell	*Utterbackia imbecillis*	Mol.	D							X	X	X	X	16, 157, 164
Pecos Assiminea	*Assiminea pecos*	Mol.	F	X						X	X	X	X	120, 152, 157, 164
Pecos Springsnail	*Pyrgulopsis pecosensis*	Mol.	F	X	X	X				X	X	X	X	78, 157, 164
Pinos Altos Mountainsnail*	*Oreohelix confragosa*	Mol.	D										X	151
Rocky Mountainsnail*	*Oreohelix strigosa depressa*	Mol.	D										X	151
Roswell Springsnail	*Pyrgulopsis roswellensis*	Mol.	F	X	X					X	X	X	X	78, 120, 152, 157, 164
Ruidoso Snaggletooth Snail	*Gastrocopta ruidosensis*	Mol.	D										X	151
Salinas Peak Woodlandsnail*	*Ashmunella salinasensis*	Mol.	D										X	151
San Augustin Mountainsnail*	*Oreohelix litoralis*	Mol.	D										X	16
Sangre de Cristo Woodlandsnail	*Ashmunella thomsoniana*	Mol.	D	X		X	X	X		X			X	151, 157
Shortneck Snaggletooth Snail	*Gastrocopta dalliana dalliana*	Mol.	D		X	X		X		X			X	151, 157
Silver Creek Woodlandsnail	*Ashmunella binneyi*	Mol.	D	X				X					X	16, 151, 157
Socorro Mountainsnail*	*Oreohelix neomexicana*	Mol.	D										X	151
Socorro Springsnail	*Pyrgulopsis neomexicana*	Mol.	I	X	X			X		X	X	X	X	16, 78, 120, 157, 164
Sonoran Snaggletooth Snail*	*Gastrocopta prototypus*	Mol.	D										X	151
Star Gyro	*Gyraulus crista*	Mol.	D	X						X	X	X	X	157, 164
Subalpine Mountainsnail*	*Oreohelix subrudis*	Mol.	D										X	151
Swamp Fingernailclam	*Musculium partumeium*	Mol.	D							X	X	X	X	157, 164
Texas Hornshell	*Popenaias popeii*	Mol.	F	X	X	X		X		X	X	X	X	22, 155, 157, 164, 239, 242, 248, 279
Tularosa Springsnail	*Juturnia tularosae*	Mol.	D	X						X	X			16
Vallonia Snail	*Vallonia sonorana*	Mol.	D			X		X		X			X	151, 157
Vertigo Snail*	*Vertigo concinnula*	Mol.	D										X	151
Whitewashed Rabdotus Snail*	*Rabdotus dealbatus neomexicanus*	Mol.	D										X	151

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Whitewater Creek Woodlandsnail*	*Ashmunella danielsi*	Mol.	D										X	151
Woodlandsnail	*Ashmunella amblya cornudasensis*	Mol.	D			X		X		X			X	151, 157
Woodlandsnail*	*Ashmunella auriculata*	Mol.	D										X	151
Woodlandsnail*	*Ashmunella kochii*	Mol.	D										X	16, 151
Woodlandsnail*	*Ashmunella rhyssa*	Mol.	D										X	151
Wrinkled Marshsnail	*Stagnicola caperata*	Mol.	D	X	X			X		X		X	X	16, 157
Anicia Checkerspot*	*Euphydryas anicia*	Moths	I								X	X	X	16, 231, 269
Apache Northern Crescent*	*Phyciodes cocyta apache*	Moths	I										X	16
Blanchard's Pelochrista Moth*	*Pelochrista blanchardi*	Moths	D							X	X		X	16, 217
Capulin Mountain Alberta Arctic*	*Oeneis alberta capulinensis*	Moths	I										X	16
Carlsbad Agave-Borer*	*Agathymus neumoegeni carlsbadensis*	Moths	I										X	237
Colorado Melissa Arctic*	*Oeneis melissa lucilla*	Moths	I								X	X	X	24, 231
Colorado Rita Dotted-blue*	*Euphilotes rita coloradensis*	Moths	I								X	X	X	231, 269
Dotted Checkerspot*	*Poladryas minuta*	Moths	D								X	X		231
Lafontaine's Cutworm Moth*	*Euxoa lafontainei*	Moths	I							X				16
Landry's Flower Moth*	*Arotrura landryorum*	Moths	I							X				16
Magdalena Alpine Butterfly*	*Erebia magdalena magdalena*	Moths	I								X	X	X	145, 231
Monarch*	*Danaus plexippus*	Moths	L					X		X	X	X	X	29, 134, 231, 260
Mottled Duskywing*	*Erynnis martialis*	Moths	L								X	X		231
Mountain Checkered-skipper*	*Pyrgus xanthus*	Moths	D							X	X	X		147, 231
New Mexico Desert Blue*	*Euphilotes ellisii anasazi*	Moths	I								X			16
Nokomis Silverspot*	*Speyeria (Argynnis) nokomis*	Moths	I	X	X					X	X	X	X	9, 25, 231

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Nokomis Silverspot*	*Speyeria (Argynnis) nokomis nokomis*	Moths	I	X	X					X	X	X		25, 231, 235, 261
Orange Giant Skipper*	*Agathymus neumoegeni*	Moths	D										X	269
Organ Mountains Poling's Hairstreak*	*Satyrium polingi organensis*	Moths	I					X			X	X	X	16, 27, 231
Pogue's Flower Moth*	*Schinia poguei*	Moths	I							X				16
Questa Skipper*	*Ochlodes yuma anasazi*	Moths	I					X			X	X	X	16, 231
Raton Mesa Boisduval's Blue*	*Icaricia icarioides nigrafem*	Moths	I							X			X	269
Raton Mesa Northwestern Fritillary*	*Argynnis hesperis ratonensis*	Moths	I							X	X	X		231, 269
Raton Mesa Silvery Blue*	*Glaucopsyche lygdamus erico*	Moths	I							X			X	269
Rhena Crossline Skipper*	*Polites origenes rhena*	Moths	L								X	X	X	51, 231
Rhesus Skipper*	*Polites rhesus*	Moths	D								X	X	X	52, 231
Rindge's Emerald Moth*	*Nemoria rindgei*	Moths	I								X	X		16, 205
Rocky Mountain Polixenes Arctic*	*Oeneis polixenes brucei*	Moths	I								X	X	X	231, 269
Sacramento Mountains Borer Moth*	*Papaipema dribi*	Moths	D		X					X	X	X		16
Sacramento Mountains Checkerspot Butterfly*	*Euphydryas anicia cloudcrofti*	Moths	I	X							X	X	X	16, 207, 231, 266
Sacramento Mountains Coral Hairstreak*	*Satyrium titus carrizozo*	Moths	I							X	X	X	X	16, 231
Sacramento Mountains Emerald Moth*	*Nemoria subsequens*	Moths	I								X	X		16
Sacramento Mountains Silvery Blue Butterfly*	*Glaucopsyche lygdamus ruidoso*	Moths	I							X	X	X	X	16, 80, 269
Sacramento Mountains Western Green Hairstreak*	*Callophrys affinis albipalpus*	Moths	I							X	X	X	X	16, 80, 269

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Sacramento Mountains White-lined Hairstreak*	*Callophrys sheridanii sacramento*	Moths	I							X	X	X	X	80, 231, 269
Sacred Boisduval's Blue*	*Icaricia icarioides sacre*	Moths	I							X	X	X	X	80, 231, 269
Sierra Blanca Margined White*	*Pieris marginalis siblanca*	Moths	I									X	X	16
Snow's Lustrous Copper*	*Lycaena cupreus snowi*	Moths	I								X	X	X	199, 231
Socorro Chryxus Arctic*	*Oeneis chryxus socorro*	Moths	I										X	16
Southwestern Brown Moth*	*Plagiomimicus astigmatosum*	Moths	D		X					X	X		X	16
Sunrise Skipper*	*Adopaeoides prittwitzi*	Moths	I							X	X	X	X	9, 231
Ursine Giant Skipper*	*Megathymus ursus ursus*	Moths	D											None available
West Coast Lady*	*Vanessa annabella*	Moths	L								X	X		231
Western Hobomok Skipper*	*Lon hobomok wetona*	Moths	I							X	X	X	X	231, 269
White Sands Cutworm Moth*	*Protogygia whitesandsensis*	Moths	I							X				16
White Sands Dune Moth*	*Areniscythris whitesands*	Moths	I							X				16
White Sands Owlet Moth*	*Aleptina arenaria*	Moths	I							X				16
White Sands Twirler Moth*	*Chionodes bustosorum*	Moths	I							X				16
White Sands Yinyang Moth*	*Cochylis yinyangana*	Moths	I							X				16
Wiest's Sphinx Moth*	*Euproserpinus wiesti*	Moths	D								X	X	X	17, 149, 202, 229, 231
Yuma Skipper*	*Ochlodes yuma yuma*	Moths	D								X	X	X	26, 231
Zuni Flower Moth*	*Schinia zuni*	Moths	D								X	X		16
Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	Rept.	D				X	X	X	X	X			16, 157
Arizona Black Rattlesnake	*Crotalus cerberus*	Rept.	I		X		X	X		X	X		X	33, 34, 176
Banded Rock Rattlesnake*	*Crotalus lepidus klauberi*	Rept.	I	X	X	X	X	X					X	84, 155
Big Bend Slider	*Trachemys gaigeae*	Rept.	F					X	X	X	X		X	73, 157, 220
Bleached Earless Lizard*	*Holbrookia maculata ruthveni*	Rept.	D										X	213
Bolson's Tortoise*	*Gopherus flavomarginatus*	Rept.	L		X			X						16, 226

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Dunes Sagebrush Lizard	*Sceloporus arenicolus*	Rept.	F	X	X	X	X		X	X		X	X	16, 30, 48, 79, 155, 157, 164, 213, 226, 270
Giant Spotted Whiptail	*Aspidoscelis stictogramma*	Rept.	D	X	X			X		X				157, 164, 226
Gila Monster	*Heloderma suspectum*	Rept.	D		X		X	X	X	X			X	65, 155, 157, 164, 183, 275
Gray-banded Kingsnake	*Lampropeltis alterna*	Rept.	D		X		X	X						157, 164, 275
Gray-checkered Whiptail	*Aspidoscelis dixoni*	Rept.	D	X	X	X	X	X				X	X	16, 157, 164, 226
Green Rat Snake	*Senticolis triaspis intermedia*	Rept.	D		X		X	X		X				157, 164, 275
Knobloch's Mountain Kingsnake*	*Lampropeltis knoblochi*	Rept.	L		X		X	X		X			X	87
Little White Whiptail*	*Aspidoscelis arizonae gypsi*	Rept.	D		X				X					72
Madrean Mountain Spiny Lizard*	*Sceloporus jarrovii jarrovii*	Rept.	L	X		X							X	13, 16, 121, 122, 158, 213
Midland Smooth Softshell Turtle*	*Apalone mutica mutica*	Rept.	D						X	X		X		137
Mojave Rattlesnake*	*Crotalus scutulatus scutulatus*	Rept.	D		X		X	X						16, 139
Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	Rept.	D	X	X	X	X	X					X	84, 155, 157, 275
Mountain Skink	*Plestiodon callicephalus*	Rept.	D	X				X		X				16, 157, 158
Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	Rept.	L	X	X		X	X	X	X	X	X	X	2, 16, 86, 157, 245, 275
New Mexico Ridge-nosed Rattlesnake	*Crotalus willardi obscurus*	Rept.	F	X	X	X	X	X	X	X	X		X	16, 85, 155, 157, 158, 164, 275
North American Racer*	*Coluber constrictor*	Rept.	D		X		X					X	X	16, 186
Northern Mexican Gartersnake	*Thamnophis eques megalops*	Rept.	L	X	X		X	X	X	X	X	X	X	2, 16, 36, 107, 157, 164, 226, 242, 245
Ornate Box Turtle*	*Terrapene ornata*	Rept.	I		X		X	X		X	X		X	16, 21, 91, 183, 196, 226
Plains Gartersnake*	*Thamnophis radix*	Rept.	D				X			X				16
Pyro Mountain Kingsnake*	*Lampropeltis pyromelana*	Rept.	L		X		X	X		X	X		X	16, 88
Slevin's Bunchgrass Lizard	*Sceloporus slevini*	Rept.	L	X	X			X		X			X	157, 164, 213

Common Name[67]	Scientific Name	Taxon[68]	Category[69]	Dev	Agr	Ene	Tra	Bio	Hum	Nat	Inv	Pol	Cli	References
Smooth Greensnake*	*Opheodrys vernalis blanchardi*	Rept.	D				X	X		X		X		16
Sonoran Lyresnake*	*Trimorphodon lambda*	Rept.	D				X							115
Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	Rept.	I	X				X		X	X	X	X	16, 157, 158, 193, 219
Texas Lyresnake*	*Trimorphodon vilkinsonii*	Rept.	D				X							67
Texas Spotted Whiptail*	*Aspidoscelis gularis gularis*	Rept.	D											None available
Trans-Pecos Rat Snake*	*Bogertophis subocularis subocularis*	Rept.	D				X							16
Western Blind Snake*	*Rena humilis segregus*	Rept.	D				X					X	X	16, 271
Western Massasauga	*Sistrurus tergeminus*	Rept.	I		X		X	X				X	X	83, 157, 208
Western Painted Turtle*	*Chrysemys picta bellii*	Rept.	D							X			X	16
Western River Cooter	*Pseudemys gorzugi*	Rept.	F	X				X	X	X		X	X	46, 130, 131, 132, 157, 164, 221, 226
Yaqui Black-headed Snake*	*Tantilla yaquia*	Rept.	D			X	X			X	X		X	16, 200
Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	Rept.	D				X	X	X	X	X		X	16, 157, 164

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APPENDIX F: CLIMATE CHANGE VULNERABILITY INDEX ANALYSIS RESULTS FOR VERTEBRATE SPECIES OF GREATEST CONSERVATION NEED

This Appendix presents results of a climate change vulnerability assessment performed by staff at the Natural Resources Institute at Texas A & M University for the 295 vertebrate Species of Greatest Conservation Need identified in the 2025 State Wildlife Action Plan for New Mexico. RCP = Representative Concentration Pathway. Full results are described in NRI (2025).[70] Please see Literature Cited section that follows this table for complete information about numbered references.

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Arizona Toad	*Anaxyrus microscaphus microscaphus*	Amphibians	Moderately High	Moderately Vulnerable	Highly Vulnerable	163, 363, 652, 704, 807, 808, 810, 1076
Arizona Treefrog	*Dryophytes wrightorum*	Amphibians	Moderately High	Moderately Vulnerable	Moderately Vulnerable	4, 346, 363, 519, 649
Barking Frog	*Craugastor augusti latrans*	Amphibians	Moderately High	Moderately Vulnerable	Extremely Vulnerable	235, 333, 363, 519, 560, 763, 809
Blanchard's Cricket Frog	*Acris blanchardi*	Amphibians	Moderately High	Less Vulnerable	Moderately Vulnerable	235, 365, 387, 363, 383, 441, 519, 710, 775
Boreal Chorus Frog	*Pseudacris maculata*	Amphibians	Moderately High	Less Vulnerable	Moderately Vulnerable	14, 363, 519, 574, 600, 880, 941, 1075, 1076
Boreal Toad	*Anaxyrus boreas boreas*	Amphibians	Moderately Low	Moderately Vulnerable	Extremely Vulnerable	141, 162, 284, 363, 385, 637, 658, 662, 710, 746, 790, 967
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	Amphibians	Moderately Low	Highly Vulnerable	Highly Vulnerable	163, 235, 326, 363, 462, 463, 466, 652, 742, 878, 906, 995, 1010, 1086
Jemez Mountains Salamander	*Plethodon neomexicanus*	Amphibians	Moderately High	Highly Vulnerable	Highly Vulnerable	214, 215, 217, 218, 235, 363, 507, 519, 592, 648, 666,766, 1015
Lowland Leopard Frog	*Lithobates yavapaiensis*	Amphibians	Low	Moderately Vulnerable	Extremely Vulnerable	163, 196, 363, 461, 464, 466, 519, 637, 704, 710, 835, 847
Northern Leopard Frog	*Lithobates pipiens*	Amphibians	Moderately Low	Moderately Vulnerable	Moderately Vulnerable	2, 4, 146, 163, 280, 284, 329, 363, 464, 1075, 1076
Plains Leopard Frog	*Lithobates blairi*	Amphibians	High	Less Vulnerable	Less Vulnerable	4, 163, 196, 329, 355, 363, 383, 464, 519, 693, 745
Rio Grande Leopard Frog	*Lithobates berlandieri*	Amphibians	Moderately High	Less Vulnerable	Less Vulnerable	329, 363, 466, 519, 652, 710
Sacramento Mountain Salamander	*Aneides hardii*	Amphibians	Low	Highly Vulnerable	Highly Vulnerable	194, 195, 232, 363, 546, 637, 645, 658, 781, 1087, 1104
Sonoran Desert Toad	*Incilius alvarius*	Amphibians	Moderately Low	Moderately Vulnerable	Moderately Vulnerable	363, 485, 519, 637, 641, 637, 643, 890, 912

[70] The full citation for NRI (2025) is: [NRI] Natural Resources Institute. 2025. Climate change vulnerability assessment for Species of Greatest Conservation Need in New Mexico, version 1.0. Texas A & M Natural Resources Institute, College Station, Texas, USA. <https://bison-m.org/Documents/50715_TAMU_NRI_2025_CCVI_FinalReport_v3.pdf>.

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Western Narrow-mouthed Toad	*Gastrophryne olivacea*	Amphibians	Moderately Low	Moderately Vulnerable	Extremely Vulnerable	363, 383, 519, 637, 643, 906, 907
Abert's Towhee	*Melozone aberti aberti*	Birds	High	Less Vulnerable	Less Vulnerable	236, 283, 637, 643, 652, 662, 871, 1105
American Bittern	*Botaurus lentiginosus*	Birds	High	Less Vulnerable	Less Vulnerable	4, 284, 439, 652, 1105
American Dipper	*Cinclus mexicanus unicolor*	Birds	High	Less Vulnerable	Less Vulnerable	78, 236, 389, 439, 802, 883, 938, 1105
American Kestrel	*Falco sparverius sparverius*	Birds	High	Less Vulnerable	Less Vulnerable	45, 236, 327, 712, 802, 869
American Pipit	*Anthus rubescens*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	45, 93, 439, 802, 1105
American Tree Sparrow	*Spizelloides arborea ochracea*	Birds	High	Less Vulnerable	Less Vulnerable	58, 197, 332, 481, 802, 931, 934, 1105
Aplomado Falcon	*Falco femoarlis septentrionalis*	Birds	Moderately High	Moderately Vulnerable	Highly Vulnerable	405, 640, 641, 652, 662, 1105, 1106
Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	381, 615, 639, 641, 643, 652, 662, 732, 802, 1103, 1105
Arizona Woodpecker	*Dryobates arizonae*	Birds	High	Less Vulnerable	Less Vulnerable	93, 236, 641, 802, 1105
Baird's Sparrow	*Centronyx bairdii*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	260, 366, 381, 629, 637, 802, 879, 1106
Bald Eagle	*Haliaeetus leucocephalus*	Birds	High	Less Vulnerable	Less Vulnerable	2, 197, 368, 405, 641, 643, 650, 951, 1105
Band-tailed Pigeon	*Patagioenas fasciata*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	103, 457,637, 802, 825, 1105
Bank Swallow	*Riparia riparia riparia*	Birds	Moderately High	Less Vulnerable	Moderately Vulnerable	260, 327, 381, 627, 934, 1105
Bell's Vireo	*Vireo belli*	Birds	High	Less Vulnerable	Less Vulnerable	52, 381, 643, 649, 652, 715, 1105
Bendire's Thrasher	*Toxostoma bendirei*	Birds	High	Less Vulnerable	Less Vulnerable	236, 237, 629, 748, 802, 819
Bewick's Wren	*Thryomanes bewickii*	Birds	High	Less Vulnerable	Less Vulnerable	78, 236, 327, 748, 802, 842, 851, 865
Black Rosy-finch	*Leucosticte atrata*	Birds	Moderately High	Moderately Vulnerable	Highly Vulnerable	81, 411, 439, 539, 629, 802, 967
Black Swift	*Cypseloides niger*	Birds	Moderately High	Highly Vulnerable	Highly Vulnerable	381, 437, 447, 511, 538, 629, 641, 802, 955, 1105
Black-billed Magpie	*Pica hudsonia*	Birds	High	Less Vulnerable	Less Vulnerable	4, 236, 263, 380, 830, 944, 1105
Black-chinned Sparrow	*Spizella atrogularis evura*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	236, 629, 802, 933, 1086
Black-headed Grosbeak	*Pheucticus melanocephalus*	Birds	High	Less Vulnerable	Less Vulnerable	80, 94, 236, 260, 297, 682, 758, 802, 830, 942, 1105
Black-throated Gray Warbler	*Setophaga nigrescens*	Birds	High	Less Vulnerable	Less Vulnerable	39, 251, 260, 353, 381, 802, 833
Black-throated Sparrow	*Amphispiza bilineata*	Birds	High	Less Vulnerable	Less Vulnerable	9, 236, 399, 478, 802, 1070

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Boreal Owl	*Aegolius funereus*	Birds	Moderately Low	Highly Vulnerable	Extremely Vulnerable	274, 284, 407, 516, 545, 550, 662, 813, 884, 1099, 1105
Brewer's Sparrow	*Spizella breweri*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	9, 92, 97, 399, 439, 748, 802, 804, 846, 883, 969, 1103, 1106
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	Birds	High	Less Vulnerable	Less Vulnerable	44, 236, 637, 641, 643, 647, 802
Broad-tailed Hummingbird	*Selasphorus platycercus platycercus*	Birds	High	Less Vulnerable	Less Vulnerable	37, 136, 236, 589, 732, 802, 966
Brown Pelican	*Pelecanus occidentalis carolinensis*	Birds	High	Less Vulnerable	Less Vulnerable	16, 17, 425, 437, 637, 643, 644, 1002, 1105
Brown-capped Rosy Finch	*Leucosticte australis*	Birds	Moderately Low	Highly Vulnerable	Highly Vulnerable	411, 539, 629, 802, 814, 1041, 1088
Buff-breasted Flycatcher	*Empidonax fulvifrons pygmaeus*	Birds	High	Less Vulnerable	Less Vulnerable	100, 236, 439, 860
Bullock's Oriole	*Icterus bullockii*	Birds	High	Less Vulnerable	Less Vulnerable	294, 748, 802, 857
Burrowing Owl	*Athene cunicularia hyupgaea*	Birds	High	Less Vulnerable	Moderately Vulnerable	74, 260, 476, 508, 647, 652, 802, 934, 937, 1105, 1115
Cactus Wren	*Campylorhyncus brunneicapillus couesi*	Birds	High	Less Vulnerable	Less Vulnerable	54, 236, 439, 652, 748, 802, 1106
Canyon Towhee	*Melozone fusca*	Birds	High	Less Vulnerable	Less Vulnerable	81, 236, 480, 748, 830, 1105
Canyon Wren	*Catherpes mexicanus conspersus*	Birds	High	Less Vulnerable	Less Vulnerable	78, 236, 491, 732, 839
Cassin's Finch	*Haemorhous cassinii*	Birds	Moderately High	Moderately Vulnerable	Highly Vulnerable	81, 410, 439, 652, 748, 802, 823, 824
Cassin's Kingbird	*Tyrannus vociferans vociferans*	Birds	High	Less Vulnerable	Less Vulnerable	437, 748, 802, 829, 950
Cassin's Sparrow	*Peucaea cassinii*	Birds	High	Less Vulnerable	Less Vulnerable	97, 381, 506, 615, 748, 1106
Chestnut-collared Longspur	*Calcarius ornatus*	Birds	High	Moderately Vulnerable	Highly Vulnerable	97, 249, 381, 392, 417, 615, 629, 802, 833, 879, 1105, 1106
Chihuahuan Meadowlark	*Sturnella lilianae*	Birds	High	Less Vulnerable	Less Vulnerable	9, 93, 159, 260, 381, 615, 748, 802, 1106
Chihuahuan Raven	*Corvus cryptoleucus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 254, 649, 748
Chipping Sparrow	*Spizella passerina arizonae*	Birds	High	Less Vulnerable	Less Vulnerable	236, 297, 353, 564, 597, 668, 748, 830, 1103
Clark's Grebe	*Aechmorphorus clarkii*	Birds	High	Less Vulnerable	Less Vulnerable	4, 284, 629, 652, 801, 1105
Clark's Nutcracker	*Nucifraga columbiana*	Birds	Moderately High	Moderately Vulnerable	Highly Vulnerable	39, 239, 381, 473, 557, 652, 801, 1105, 1106, 1067, 1068
Cliff Swallow	*Petrochelidon pyrrhonota*	Birds	High	Less Vulnerable	Less Vulnerable	110, 113, 236, 260, 327, 381, 748, 802, 1103
Common Black Hawk	*Buteogallus anthracinus anthracinus*	Birds	Moderately Low	Highly Vulnerable	Highly Vulnerable	439, 637, 641, 643, 673, 677, 818, 867, 871
Common Ground Dove	*Columbina passerina pallescense*	Birds	High	Less Vulnerable	Less Vulnerable	640, 643, 652, 662, 1195

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Common Nighthawk	*Chordeiles minor*	Birds	High	Less Vulnerable	Less Vulnerable	9, 45, 381, 439, 801, 842, 1105
Costa's Hummingbird	*Calypte costae*	Birds	High	Less Vulnerable	Less Vulnerable	435, 495, 643, 652, 662, 802, 966
Eastern Bluebird	*Sialis sialis*	Birds	High	Less Vulnerable	Less Vulnerable	9, 241, 327, 381, 437, 580, 802, 899, 965, 1105
Elegant Trogon	*Trogon elegans conescense*	Birds	Moderately High	Less Vulnerable	Moderately Vulnerable	93, 641, 643, 649, 652, 662, 802
Elf Owl	*Micrathene whitneyi whitneyi*	Birds	Moderately High	Less Vulnerable	Less Vulnerable	236, 382, 413, 414, 439, 851, 1086, 1105
Evening Grosbeak	*Coccothraustes vespertinus*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	81, 98, 236, 381, 629, 652, 802, 848, 1105, 1106, 1113
Ferruginous Hawk	*Buteo regalis*	Birds	High	Less Vulnerable	Less Vulnerable	4, 9, 236, 284, 400, 353, 876, 1105, 1106
Field Sparrow	*Spizella pusilla arenacea*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	21, 142, 437, 439, 590, 802, 1105
Flammulated Owl	*Psilocops flammeolus*	Birds	High	Less Vulnerable	Less Vulnerable	399, 403, 410, 439, 472, 541, 577, 777
Gila Woodpecker	*Melanerpes uropygialis uropygialis*	Birds	Moderately High	Less Vulnerable	Moderately Vulnerable	637, 641, 643, 654, 802, 923
Golden Eagle	*Aquila chrysaetos canadensis*	Birds	High	Less Vulnerable	Less Vulnerable	236, 277, 335, 439, 515, 527, 650, 675, 802, 875, 881, 1105
Grace's Warbler	*Setophaga graciae*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	222, 236, 267, 381, 482, 621, 652, 802, 1105
Grasshopper Sparrow	*Ammodramus savannarum perpallidus*	Birds	Moderately High	Moderately Vulnerable	Highly Vulnerable	381, 437, 439, 590, 615, 639, 652, 662, 732, 802, 1105
Gray Vireo	*Vireo vicinior*	Birds	Moderately High	Less Vulnerable	Moderately Vulnerable	53, 79, 288, 325, 353, 399, 637, 662, 802
Gray-crowned Rosy Finch	*Leucosticte tephorcotis*	Birds	Moderately High	Moderately Vulnerable	Highly Vulnerable	81, 360, 381, 411, 479, 539, 965, 1088, 1105
Greater Pewee	*Contopus pertinax pallidiventris*	Birds	High	Less Vulnerable	Less Vulnerable	197, 236, 381, 437, 652, 732, 801, 802, 1103, 1105
Greater Yellowlegs	*Tringa melanoleuca*	Birds	High	Less Vulnerable	Less Vulnerable	45, 437, 732, 1105
Green-tailed Towhee	*Pipilo chlorurus*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	72, 96, 236, 243, 381, 439, 802, 1105, 1106
Harris's Hawk	*Parabuteo unicinctus harrisi*	Birds	High	Less Vulnerable	Less Vulnerable	63, 229, 253, 437, 439, 712, 1105
Horned Lark	*Eremophila alpestris*	Birds	High	Less Vulnerable	Less Vulnerable	9, 97, 172, 177, 236, 238, 381, 437, 802, 1005, 1106
Juniper Titmouse	*Baeolophus ridgwayi*	Birds	Moderately High	Less Vulnerable	Less Vulnerable	170, 353, 652, 802, 1105
Killdeer	*Charadrius vociferus vociferus*	Birds	High	Less Vulnerable	Less Vulnerable	45, 97, 264, 437, 522, 776, 834, 857, 1105
Lapland Longspur	*Calcarius lapponicus alascensis*	Birds	Moderately High	Moderately Vulnerable	Moderately Vulnerable	219, 381, 437, 802, 1105
Lark Bunting	*Calamospiza melanocorys*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	260, 284, 381, 439, 615, 732, 802, 1105, 1106

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Lark Sparrow	*Chondestes grammacus strigatus*	Birds	High	Less Vulnerable	Less Vulnerable	9, 260, 381, 419, 437, 497, 667, 703, 802, 1103, 1105, 1106
Lazuli Bunting	*Passerina amoena*	Birds	High	Less Vulnerable	Less Vulnerable	236, 282, 439, 652, 802, 1105
Least Tern	*Sternula antillarum athalassos*	Birds	Moderately Low	Highly Vulnerable	Highly Vulnerable	124, 373, 566, 640, 641, 652, 662, 732, 984, 997, 1005, 1045, 1105, 1106
Lesser Prairie Chicken	*Tympanuchus pallidicinctus*	Birds	Low	Highly Vulnerable	Highly Vulnerable	34, 99, 351, 376, 439, 474, 629, 802, 827, 930, 984, 997, 1005, 1045, 1105, 1106
Lewis's Woodpecker	*Melanerpes lewisi*	Birds	Moderately High	Less Vulnerable	Moderately Vulnerable	75, 95, 439, 572, 815, 652, 802, 940, 955, 1105
Loggerhead Shrike	*Lanius ludovicianus*	Birds	High	Less Vulnerable	Less Vulnerable	19, 130, 132, 236, 284, 381, 439, 518, 590, 748, 802, 1106, 1117
Long-billed Curlew	*Numenius americanus americanus*	Birds	Moderately High	Less Vulnerable	Moderately Vulnerable	153, 179, 278, 260, 284, 505, 578, 615, 652, 697, 744, 1105, 1106
Long-billed Dowitcher	*Limnodromus scolopaceus*	Birds	High	Less Vulnerable	Less Vulnerable	45, 197, 435, 629, 1105
Long-eared Owl	*Asio otus*	Birds	Moderately High	Less Vulnerable	Less Vulnerable	121, 236, 264, 439, 496, 565, 568, 802, 1105
Lucifer's Hummingbird	*Calothorax lucifer*	Birds	High	Less Vulnerable	Less Vulnerable	584, 637, 644, 652, 662, 966
Lucy's Warbler	*Leiothlypis luciae*	Birds	High	Less Vulnerable	Less Vulnerable	9, 236, 381, 641, 652, 662, 802, 851, 1105
Mexican Chickadee	*Poecile sclateri eidos*	Birds	High	Less Vulnerable	Less Vulnerable	93, 439, 653, 802, 851
Mexican Spotted Owl	*Strix occidentalis lucida*	Birds	Moderately Low	Highly Vulnerable	Highly Vulnerable	55, 149, 369, 371, 410, 652, 805, 967, 981, 1097
Mexican Whip-poor-will	*Anostomus arizonae arizonae*	Birds	High	Less Vulnerable	Less Vulnerable	236, 381, 439, 540, 652, 802
Mountain Bluebird	*Sialia currucoides*	Birds	High	Less Vulnerable	Less Vulnerable	353, 381, 448, 617, 652, 802, 1095, 1105
Mountain Chickadee	*Poecile gambeli gambeli*	Birds	High	Less Vulnerable	Less Vulnerable	236, 300, 381, 439, 802, 822, 883, 925, 1105
Mountain Plover	*Charadrius montanus*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	510, 532, 615, 629, 641, 652, 732, 955, 1004, 1105, 1106
Neotropic Cormorant	*Nannopterum brasilianum*	Birds	Moderately High	Less Vulnerable	Less Vulnerable	439, 637, 643, 652, 662, 1105
Northern Beardless-Tyrannulet	*Campostoma omberbe ridgwayi*	Birds	High	Less Vulnerable	Less Vulnerable	381, 439, 641, 643, 652, 662, 1105
Northern Harrier	*Circus hudsonius*	Birds	High	Less Vulnerable	Less Vulnerable	9, 97, 236, 284, 381, 415, 437, 439, 520, 802, 1105, 1106
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Birds	High	Less Vulnerable	Less Vulnerable	260, 327, 381, 394, 437, 934, 1105
Olive Warbler	*Peucedramus taeniatus arizonae*	Birds	High	Less Vulnerable	Less Vulnerable	381, 437, 439, 934, 1105
Olive-sided Flycatcher	*Contopus cooperi*	Birds	High	Less Vulnerable	Less Vulnerable	11, 12, 39, 284, 381, 437, 438, 652, 802, 927, 1072, 1105
Peregrine Falcon	*Falco peregrinus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 405, 483, 637, 642, 652, 672, 674, 802, 967, 1064

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Phainopepla	*Phainopepla nitens lepida*	Birds	High	Less Vulnerable	Less Vulnerable	197, 236, 327, 381, 439, 805, 1105
Pine Grosbeak	*Pinicola enucleator montana*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	236, 437, 439, 802, 1105
Pine Siskin	*Spinus pinus*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	381, 439, 802, 965, 1105
Pinyon Jay	*Gymnorhinus cyanocephalus*	Birds	Moderately Low	Moderately Vulnerable	Highly Vulnerable	231, 236, 353, 475, 477, 557, 652, 802, 927, 1070
Piping Plover	*Charadrius melodus circumcinctus*	Birds	Moderately High	Moderately Vulnerable	Moderately Vulnerable	101, 124, 425, 437, 637, 718, 719, 1105
Plumbeous Vireo	*Vireo plumbeus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 325, 571, 802, 883, 924, 1105
Prairie Falcon	*Falco mexicanus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 238, 402, 422, 802, 892, 965
Purple Martin	*Progne subis*	Birds	Moderately High	Moderately Vulnerable	Moderately Vulnerable	111, 236, 260, 284, 381, 802, 1105
Pygmy Nuthatch	*Sitta pygmaea melanotis*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	236, 301, 381, 437, 669, 802, 851, 922, 925, 1070, 1105
Pyrrhuloxia	*Cardinalis sinuatus sinuatus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 742, 802, 949, 965
Red-faced Warbler	*Cardellina rubrifrons*	Birds	High	Less Vulnerable	Less Vulnerable	268, 570, 652, 802, 1103
Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	Birds	High	Less Vulnerable	Less Vulnerable	303, 437, 451, 652, 802, 860
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	220, 236, 259, 778, 802, 860, 965, 1081, 1103, 1113
Rock Wren	*Salpinctes obsoletus obsoletus*	Birds	High	Less Vulnerable	Less Vulnerable	71, 78, 381, 439, 549, 748, 802, 934, 965, 1089, 1106
Sage Thrasher	*Oreoscoptes montanus*	Birds	High	Less Vulnerable	Less Vulnerable	104, 260, 399, 779, 802, 1070, 1106
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Birds	High	Less Vulnerable	Less Vulnerable	177, 236, 381, 399, 404, 652, 748, 802, 860, 883, 965, 1103
Savannah Sparrow	*Passerculus sandwichensis*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	260, 381, 439, 615, 732, 802, 1105, 1106
Scott's Oriole	*Icterus parisorum*	Birds	High	Less Vulnerable	Less Vulnerable	236, 353, 381, 517, 748, 802, 1103
Short-eared Owl	*Asio flammeus flammeus*	Birds	High	Less Vulnerable	Less Vulnerable	97, 173, 200, 615, 802, 955, 1064, 1103, 1106
Snowy Plover	*Charadrius nivosus*	Birds	High	Less Vulnerable	Less Vulnerable	284, 425, 439, 652, 694, 695, 696, 728, 802, 860, 976
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Birds	Moderately High	Moderately Vulnerable	Moderately Vulnerable	4, 7, 108, 199, 326, 425, 439, 480, 509, 637, 652, 662, 802, 980, 1103
Spotted Sandpiper	*Actitis macularius*	Birds	High	Less Vulnerable	Less Vulnerable	236, 393, 437, 680, 826, 1105
Spotted Towhee	*Pipilo maculatus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 297, 327, 401, 748, 758, 802, 1103, 1113
Sprague's Pipit	*Anthus spragueii*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	381, 629, 652, 802, 879, 1103, 1105

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Steller's Jay	*Cyanocitta stelleri macrolopha*	Birds	High	Less Vulnerable	Less Vulnerable	77, 351, 361, 381, 438, 557, 778
Thick-billed Kingbird	*Tyrannus crassirostris*	Birds	High	Less Vulnerable	Less Vulnerable	3, 260, 637, 641, 652, 802
Thick-billed Longspur	*Rhynchophanes mccownii*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	236, 260, 629, 802, 832, 879, 1041, 1106, 1110
Varied Bunting	*Passerina versicolor*	Birds	High	Less Vulnerable	Less Vulnerable	236, 282, 439, 637, 641, 643, 652, 660, 802, 903, 1041
Verdin	*Auriparus flaviceps ornatus*	Birds	High	Less Vulnerable	Less Vulnerable	45, 236, 802, 1105
Vesper Sparrow	*Pooecetes gramineus*	Birds	High	Less Vulnerable	Less Vulnerable	9, 260, 439, 652, 748, 802
Violet-crowned Hummingbird	*Leucolia violiceps ellioti*	Birds	High	Less Vulnerable	Less Vulnerable	404, 583, 637, 641, 643, 662, 802
Violet-green Swallow	*Tachycineta thalassina lepida*	Birds	High	Less Vulnerable	Less Vulnerable	236, 381, 564, 748, 802, 829, 883, 1103
Virginia's Warbler	*Leiothlypis virginiae*	Birds	High	Less Vulnerable	Less Vulnerable	236, 353, 651, 652, 802, 831, 934, 1103, 1105
Western Bluebird	*Sialia mexicana bairdi*	Birds	High	Less Vulnerable	Less Vulnerable	9, 236, 353, 381, 617, 652, 1105
Western Grebe	*Aechmophorus occidentalis*	Birds	High	Less Vulnerable	Less Vulnerable	73, 197, 470, 934, 802, 1041, 1105
Western Kingbird	*Tyrannus verticalus*	Birds	High	Less Vulnerable	Less Vulnerable	40, 76, 439, 676, 726, 802, 828, 871, 934, 9631103, 1106
Western Meadowlark	*Sturnella neglecta*	Birds	High	Less Vulnerable	Less Vulnerable	9, 260, 748, 802, 840, 1106
Western Sandpiper	*Calidris mauri*	Birds	High	Moderately Vulnerable	Moderately Vulnerable	45, 299, 437, 439, 1105
Western Wood-Pewee	*Contopus sordidulus*	Birds	High	Less Vulnerable	Less Vulnerable	76, 153, 260, 439, 440, 802, 822, 857, 934
Whiskered Screech-Owl	*Megascops trichopsis asperus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 641, 643, 652, 802, 851
White-eared Hummingbird	*Basilinna leucotis borealis*	Birds	High	Less Vulnerable	Less Vulnerable	584, 637, 643, 662, 802
White-tailed Ptarmigan	*Lagopus leucura altipetens*	Birds	Moderately High	Highly Vulnerable	Highly Vulnerable	104, 105, 637, 652, 654, 821
White-throated Swift	*Aeronautes saxatalis saxatalis*	Birds	High	Less Vulnerable	Less Vulnerable	45, 236, 802, 936, 962
Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	Birds	High	Less Vulnerable	Less Vulnerable	75, 205, 372, 437, 439, 652, 1070, 1105
Wilson's Warbler	*Cardellina pusilla*	Birds	High	Less Vulnerable	Less Vulnerable	22, 236, 401, 802, 893, 934, 963, 967
Woodhouse's Scrub Jay	*Aphelocoma woodhouseii*	Birds	High	Less Vulnerable	Less Vulnerable	158, 236, 277, 297, 353, 748
Yellow-billed Cuckoo	*Coccyzus americanus americanus*	Birds	Moderately Low	Moderately Vulnerable	Extremely Vulnerable	153, 284, 436, 802, 1103
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Birds	Moderately Low	Moderately Vulnerable	Extremely Vulnerable	2, 284, 398, 436, 618, 654, 802, 886, 1003, 1018

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Yellow-eyed Junco	*Junco phaeonotus palliatus*	Birds	High	Less Vulnerable	Less Vulnerable	236, 637, 652, 913, 914
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Birds	High	Less Vulnerable	Less Vulnerable	45, 236, 287, 381, 748, 802, 948
Arkansas River Shiner	*Notropis girardi*	Fish	Low	Highly Vulnerable	Highly Vulnerable	49, 89,637, 687, 688, 911, 985, 993, 1030, 1056,
Bigscale Logperch	*Percina macrolepida*	Fish	High	Less Vulnerable	Less Vulnerable	120, 148, 206, 331, 534, 628, 652, 662, 699, 861, 911
Blue Sucker	*Cycleptus elongatus*	Fish	Moderately High	Moderately Vulnerable	Moderately Vulnerable	127, 458, 82, 137, 637, 662, 729, 861, 911, 977, 978
Central Stoneroller	*Campostoma anomalum*	Fish	High	Less Vulnerable	Less Vulnerable	424, 460, 576, 585, 665, 699, 861, 911
Chihuahua Chub	*Gila nigrescens*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	604, 606, 662, 699, 750, 755, 911, 971, 1051
Colorado Pikeminnow	*Ptychocheilus lucius*	Fish	Moderately Low	Highly Vulnerable	Highly Vulnerable	239, 637, 911, 968, 979, 1011, 1048, 1057
Desert Sucker	*Catostomus clarkii*	Fish	Moderately High	Highly Vulnerable	Extremely Vulnerable	230, 548, 606, 609, 614, 652, 679, 699, 861, 863, 911, 935
Gila Chub	*Gila intermedia*	Fish	Low	Highly Vulnerable	Highly Vulnerable	367, 453, 601, 605, 620, 623, 630, 632, 646, 658, 699, 717, 765, 783, 789, 853, 994, 1024, 1026, 1028, 1046, 1071, 1093
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	405, 409, 453, 534, 608, 609, 613, 861, 911, 968, 1035, 1092
Gila Trout	*Oncorhynchus gilae*	Fish	Low	Highly Vulnerable	Highly Vulnerable	114, 240, 326, 619, 751, 755, 991, 1036, 1050, 1069, 1111
Gray Redhorse	*Moxostoma congestum*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	201, 444, 459, 630, 637, 663, 755, 861, 911
Greenthroat Darter	*Etheostoma lepidum*	Fish	Moderately Low	Extremely Vulnerable	Extremely Vulnerable	223, 643, 698, 699, 861, 911, 935
Headwater Catfish	*Ictalurus lupus*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	257, 391, 446, 501, 502, 544, 699, 736, 861, 911
Headwater Chub	*Gila nigra*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	7, 85, 86, 147, 453, 611, 620, 634, 646, 665, 699, 700, 702, 765, 787, 789, 853, 1013, 1073
Loach Minnow	*Rhinichthys cobitis*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	620, 752, 754, 765, 784, 853, 911, 973, 1012, 1053
Longnose Gar	*Lepisosteus osseus*	Fish	High	Less Vulnerable	Less Vulnerable	60, 109, 135, 191, 581, 699, 765, 853, 911
Mexican Tetra	*Astyanax mexicanus*	Fish	Moderately High	Less Vulnerable	Moderately Vulnerable	606, 630, 633, 702, 713, 755, 765, 794, 853, 911
Mottled Sculpin	*Cottus bairdii*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	49, 60, 246, 326, 449, 534, 596, 630, 699, 722, 740, 852, 911, 1078, 1120
Pecos Bluntnose Shiner	*Notropis simus pecosensis*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	26, 87, 156, 298, 326, 336, 396, 683, 684, 738, 911, 961, 974, 1006, 1027, 1037
Pecos Gambusia	*Gambusia nobilis*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	62, 255, 256, 326, 443, 445, 534, 699, 918, 1029
Pecos Pupfish	*Cyprinodon pecosensis*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	266, 326, 630, 642, 911, 986, 987, 1001, 1032, 1034

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Peppered Chub	*Macrhybopsis tetranema*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	184, 188, 262, 551, 1030, 1032, 1034, 1044
Plains Minnow	*Hybognathus placitus*	Fish	Moderately Low	Moderately Vulnerable	Highly Vulnerable	188, 207, 537, 630, 687, 699, 772, 836, 911, 1030, 1100, 1109, 1112
Razorback Sucker	*Xyrauchen texanus*	Fish	Moderately High	Less Vulnerable	Moderately Vulnerable	567, 630, 699, 773, 975, 979, 989, 1034, 1043
Rio Grande Chub	*Gila pandora*	Fish	Moderately High	Less Vulnerable	Moderately Vulnerable	69, 90, 133, 630, 737, 764, 844, 1059, 1061, 1062
Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	Fish	Low	Extremely Vulnerable	Extremely Vulnerable	13, 67, 68, 133, 334, 390, 644, 786, 911, 988, 1020, 1023, 1047, 1119, 1121
Rio Grande Shiner	*Notropis jemezanus*	Fish	Moderately Low	Moderately Vulnerable	Extremely Vulnerable	154, 250, 412, 421, 529,534, 630, 685, 699, 911, 960, 1040, 1101
Rio Grande Silvery Minnow	*Hybognathus amarus*	Fish	Low	Highly Vulnerable	Highly Vulnerable	10, 24, 25, 88, 258, 450, 536, 630, 637, 662, 665, 687, 690, 729, 911, 990, 996, 998, 1007, 1058
Rio Grande Sucker	*Catostomus plebeius*	Fish	Low	Highly Vulnerable	Highly Vulnerable	36, 47, 134, 204, 453, 534, 606, 630, 699, 774, 780, 872, 911, 957, 1059, 1060, 1062
Roundnose Minnow	*Dionda episcopa*	Fish	Moderately High	Moderately Vulnerable	Moderately Vulnerable	699, 739, 844, 911
Roundtail Chub	*Gila robusta*	Fish	Moderately High	Less Vulnerable	Moderately Vulnerable	86, 91, 143, 152, 275, 442, 453, 591, 602, 612, 630, 635, 665, 701, 765, 853, 911, 1049, 1073
Smallmouth Buffalo	*Ictiobus bubalus*	Fish	High	Less Vulnerable	Less Vulnerable	60, 134, 221, 468, 575, 699, 911, 1099
Sonora Sucker	*Catostomus insignis*	Fish	High	Less Vulnerable	Less Vulnerable	6, 178, 350, 530, 534, 606, 652, 785, 788, 911, 1013
Southern Redbelly Dace	*Chrosomus erythrogaster*	Fish	Moderately Low	Moderately Vulnerable	Moderately Vulnerable	35, 362, 410, 534, 637, 652, 662, 699, 755, 911
Speckled Chub	*Macrhybopsis aestivallis*	Fish	Moderately High	Less Vulnerable	Moderately Vulnerable	48, 97, 207, 262, 637, 685, 730, 889, 911
Spikedace	*Meda fulgida*	Fish	Low	Highly Vulnerable	Highly Vulnerable	609, 610, 716, 753, 755, 911, 972, 999, 1012, 1013
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	High	Less Vulnerable	Less Vulnerable	637, 641, 643, 658, 699, 911
White Sands Pupfish	*Cyprinodon tularosa*	Fish	Moderately Low	Moderately Vulnerable	Highly Vulnerable	5, 51, 144, 469, 569, 603, 641, 643, 699, 733, 734, 792, 793, 898, 916
Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	Fish	Low	Moderately Vulnerable	Extremely Vulnerable	352, 458, 637, 641, 749, 755, 756, 888, 911, 946, 999, 1009, 1016, 1017, 1039
Allen's Big-eared Bat	*Idionycteris phyllotis*	Mammals	Moderately High	Less Vulnerable	Less Vulnerable	1, 117, 168, 423, 426, 488, 760, 761, 762, 929
American Beaver	*Castor canadensis*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	286, 473, 500, 504, 553, 650, 654, 742, 868, 1115
American Mink	*Neogale vison*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	277, 292, 441, 640, 721
American Pika	*Ochotona princeps*	Mammals	Moderately Low	Moderately Vulnerable	Highly Vulnerable	30, 65, 150, 292, 410, 471, 552, 598, 599, 720, 870
Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	Mammals	High	Less Vulnerable	Less Vulnerable	210, 211, 319, 423, 473
Arizona Montane Vole	*Microtus montanus arizonensis*	Mammals	Moderately High	Moderately Vulnerable	Moderately Vulnerable	312, 630, 637, 652, 662

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Arizona Shrew	*Sorex arizonae*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	2, 4, 637, 837, 843
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	Mammals	Moderately Low	Moderately Vulnerable	Highly Vulnerable	131, 198, 473, 488, 627, 649, 1066, 1083
Big Free-tailed Bat	*Nyctinomops macrotis*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	192, 305, 423, 426, 488, 760, 761, 762, 929
Black-footed Ferret	*Mustela nigripes*	Mammals	Low	Extremely Vulnerable	Extremely Vulnerable	286, 306, 324, 441, 473, 486, 659, 660
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	Moderately High	Moderately Vulnerable	Moderately Vulnerable	157, 176, 177, 284, 285, 286, 423, 441, 607, 652, 843, 992
Canada Lynx	*Lynx canadensis*	Mammals	Moderately Low	Highly Vulnerable	Highly Vulnerable	171, 289, 324, 473, 514, 638, 714, 856, 882, 951, 967, 983, 1000, 1020
Cave Myotis	*Myotis velifer*	Mammals	Moderately High	Less Vulnerable	Less Vulnerable	20, 286, 292, 423, 426, 488, 512, 563, 760, 761, 762, 928
Common Porcupine	*Erethizon dorsatum*	Mammals	High	Less Vulnerable	Less Vulnerable	23, 286, 292, 327, 543, 920
Desert Pocket Gopher	*Geomys arenarius*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	46, 227, 245, 286, 374, 375, 473, 671, 691, 1002
Eastern Red Bat	*Lasiurus borealis*	Mammals	High	Less Vulnerable	Less Vulnerable	32, 265, 428, 488, 515, 678, 760, 761, 762, 928, 929, 1008, 1108
Ermine Weasel	*Mustela richardsonii*	Mammals	High	Less Vulnerable	Less Vulnerable	276, 285, 307, 473, 320, 321, 864
Fringed Myotis	*Myotis thysanodes thysanodes*	Mammals	High	Less Vulnerable	Less Vulnerable	168, 190, 284, 397, 426, 488, 664, 760, 761, 762, 947, 964
Gray-collared Chipmunk	*Neotamias cinereicollis cinereicollis*	Mammals	High	Less Vulnerable	Less Vulnerable	102, 307, 378, 420, 484, 525
Gray-footed Chipmunk	*Neotamias canipes*	Mammals	High	Less Vulnerable	Less Vulnerable	84, 307, 839
Gunnison's Prairie Dog	*Cynomys gunnisoni*	Mammals	Moderately High	Moderately Vulnerable	Extremely Vulnerable	176, 212, 213, 284, 286, 305, 328, 423, 533, 735, 768, 769, 806, 817, 843
Heather Vole	*Phenacomys intermedius intermedius*	Mammals	High	Less Vulnerable	Less Vulnerable	286, 307, 651
Hoary Bat	*Aeorestes cinereus cinereus*	Mammals	High	Moderately Vulnerable	Moderately Vulnerable	32, 41, 168, 292, 426, 488, 515, 760, 761, 762, 838, 928
Holzner's Cottontail Rabbit	*Sylvilagus holzneri*	Mammals	High	Less Vulnerable	Less Vulnerable	277, 286, 305, 349, 969, 1063
Hooded Skunk	*Mephitis macroura milleri*	Mammals	High	Less Vulnerable	Less Vulnerable	171, 190, 263, 286, 473
Jaguar	*Panthera onca arizonensis*	Mammals	High	Less Vulnerable	Less Vulnerable	33, 112, 171, 356, 513, 640, 652, 727, 759, 970, 982
Least Shrew	*Cryptotis parvus*	Mammals	High	Less Vulnerable	Moderately Vulnerable	637, 643, 837, 843, 858
Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	38, 181, 284, 423, 426, 488, 515, 531, 643, 689, 760, 761, 762, 876, 1025, 1031
Mexican Gray Wolf	*Canis lupus baileyi*	Mammals	Moderately Low	Moderately Vulnerable	Extremely Vulnerable	2, 408, 593, 652, 1014, 1054, 1087
Mexican Long-nosed Bat	*Leptonycteris nivalis*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	15, 27, 426, 488, 639, 643, 652, 760, 761, 762, 838, 1032

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Mexican Long-tongued Bat	*Choeronycteris mexicana*	Mammals	Moderately Low	Highly Vulnerable	Highly Vulnerable	209, 426, 488, 622, 652, 760, 761, 762, 947
New Mexico Jumping Mouse	*Zapus hudsonius luteus (=Zapus luteus luteus)*	Mammals	Moderately Low	Moderately Vulnerable	Extremely Vulnerable	284, 308, 309, 310, 326, 398, 423, 1014, 1022, 1038, 1096, 1114
North American River Otter	*Lontra canadensis*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	9, 187, 202, 203, 247, 324, 626, 652
Northern Pygmy Mouse	*Baiomys taylori ater*	Mammals	High	Less Vulnerable	Less Vulnerable	160, 273, 286, 342, 406, 423, 493, 503, 555
Organ Mountains Colorado Chipmunk	*Neotamias quadrivittatus australis*	Mammals	Moderately Low	Highly Vulnerable	Highly Vulnerable	84, 312, 313, 455, 637, 849, 850, 915
Oscura Mountains Colorado Chipmunk	*Neotamias quadrivittatus oscuraensis*	Mammals	Moderately Low	Moderately Vulnerable	Highly Vulnerable	84, 637, 643, 724, 757, 849, 850, 915
Pacific Marten	*Martes caurina*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	286, 292, 542, 643, 662, 905, 1084
Peñasco Least Chipmunk	*Neotamias minimus atristriatus*	Mammals	Moderately Low	Extremely Vulnerable	Extremely Vulnerable	315, 218, 323, 357, 454, 586, 587, 588, 652, 757, 1033, 1042
Pocketed Free-tailed Bat	*Nyctinomops femorosaccus*	Mammals	High	Less Vulnerable	Less Vulnerable	307, 423, 426, 488, 760, 761, 762, 947
Prairie Vole	*Microtus ochrogaster haydenii*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	228, 304, 307, 347, 348, 404, 473, 582, 692, 885, 897
Snowshoe Hare	*Lepus americanus bairdii*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	128, 285, 317, 523, 556, 862, 1122
Southern Pocket Gopher	*Thomomys umbrinus*	Mammals	High	Less Vulnerable	Less Vulnerable	41, 190, 286, 423, 435, 473, 573, 637, 662, 671
Southern Red-backed Vole	*Myodes gapperi*	Mammals	High	Less Vulnerable	Less Vulnerable	70, 304, 354, 370, 473, 487, 499, 521, 594, 595
Southwestern Little Brown Myotis	*Myotis occultus*	Mammals	High	Less Vulnerable	Less Vulnerable	151, 169, 286, 426, 488, 760, 761, 762, 777, 928
Spotted Bat	*Euderma maculatum*	Mammals	High	Less Vulnerable	Less Vulnerable	286, 305, 337, 338, 426, 488, 760, 761, 762, 967
Thirteen-lined Ground Squirrel	*Ictidomys tridecemlineatus*	Mammals	High	Less Vulnerable	Less Vulnerable	292, 434, 493, 579, 795, 904
Tricolored Bat	*Perimyotis subflavus*	Mammals	Moderately High	Highly Vulnerable	Highly Vulnerable	43, 155, 330, 343, 426, 488, 515, 524, 760, 761, 762, 1008, 1065, 1098
Western Jumping Mouse	*Zapus princeps princeps*	Mammals	High	Less Vulnerable	Less Vulnerable	116, 164, 175, 286, 309, 473, 896
Western Red Bat	*Lasiurus blossevillii*	Mammals	High	Less Vulnerable	Less Vulnerable	190, 286, 340, 426, 488, 760, 761, 762
Western Water Shrew	*Sorex navigator*	Mammals	Moderately High	Moderately Vulnerable	Moderately Vulnerable	186, 286, 322, 423, 837, 967
Western Yellow Bat	*Dasypterus xanthinus*	Mammals	Moderately High	Less Vulnerable	Moderately Vulnerable	32, 190, 286, 307, 423, 426, 488, 515, 643, 662, 760, 761, 762, 929, 1118
White-nosed Coati	*Nasua narica*	Mammals	High	Less Vulnerable	Less Vulnerable	316, 395, 441, 498, 657
White-sided Jackrabbit	*Lepus callotis gaillardi*	Mammals	High	Less Vulnerable	Less Vulnerable	61, 64, 115, 326, 637, 643, 643, 652, 662, 943
White-tailed Jackrabbit	*Lepus townsendii campanius*	Mammals	High	Less Vulnerable	Less Vulnerable	113, 115, 118, 252, 281, 286, 324, 791, 967

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
Yellow-bellied Marmot	*Marmota flaviventris*	Mammals	Moderately High	Less Vulnerable	Less Vulnerable	28, 29, 31, 286, 302, 314, 370, 388
Yellow-nosed Cotton Rat	*Sigmodon ochrognathus*	Mammals	High	Less Vulnerable	Less Vulnerable	138, 190, 227, 339, 341, 493
Yuma Myotis	*Myotis yumanensis yumanensis*	Mammals	High	Less Vulnerable	Less Vulnerable	43, 106, 104, 168, 286, 426, 488, 760, 761, 762, 952, 954
Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	Reptiles	High	Less Vulnerable	Less Vulnerable	57, 270, 363, 637, 641, 652, 803
Arizona Black Rattlesnake	*Crotalus cerberus*	Reptiles	High	Less Vulnerable	Less Vulnerable	166, 167, 244, 363, 399, 670, 1070
Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	Reptiles	High	Less Vulnerable	Less Vulnerable	399, 430, 649
Big Bend Slider	*Trachemys gaigeae*	Reptiles	Moderately High	Moderately Vulnerable	Moderately Vulnerable	295, 327, 333, 686, 909, 910
Bleached Earless Lizard	*Holbrookia maculata ruthveni*	Reptiles	Moderately Low	Moderately Vulnerable	Moderately Vulnerable	66, 344, 345, 379, 383, 561, 854, 866
Bolson's Tortoise	*Gopherus flavomarginatus*	Reptiles	Low	Extremely Vulnerable	Extremely Vulnerable	56, 129, 624, 625, 945, 953, 958, 959, 1055
Dunes Sagebrush Lizard	*Sceloporus arenicolus*	Reptiles	Moderately Low	Moderately Vulnerable	Highly Vulnerable	234, 235, 279, 293, 418, 637, 649, 655, 708, 812, 816, 855, 859, 866, 874, 1004, 1079
Giant Spotted Whiptail	*Aspidoscelis stictogramma*	Reptiles	Moderately Low	Moderately Vulnerable	Highly Vulnerable	44, 107, 235, 637, 642, 643, 649, 652, 710, 797, 866, 891
Gila Monster	*Heloderma suspectum*	Reptiles	High	Less Vulnerable	Less Vulnerable	139, 360, 399, 485, 637, 643, 649, 656, 1087
Gray-banded Kingsnake	*Lampropeltis alterna*	Reptiles	High	Less Vulnerable	Less Vulnerable	235, 363, 377, 641, 652, 709, 891, 932, 1094
Gray-checkered Whiptail	*Aspidoscelis dixoni*	Reptiles	Moderately Low	Moderately Vulnerable	Highly Vulnerable	6, 180, 193, 208, 235, 637, 652, 662, 705, 706, 866, 890, 1077
Green Rat Snake	*Senticolis triaspis intermedia*	Reptiles	High	Less Vulnerable	Less Vulnerable	66, 235, 652,662, 890, 891
Knobloch's Mountain Kingsnake	*Lampropeltis knoblochi*	Reptiles	High	Less Vulnerable	Less Vulnerable	122, 363, 428, 452, 891
Little White Whiptail	*Aspidoscelis arizonae gypsi*	Reptiles	High	Less Vulnerable	Less Vulnerable	125, 235, 242, 261, 386, 561, 890, 1116
Madrean Mountain Spiny Lizard	*Sceloporus jarrovii jarrovii*	Reptiles	Moderately High	Less Vulnerable	Moderately Vulnerable	59, 358, 547, 630, 866, 891
Midland Smooth Softshell Turtle	*Apalone mutica mutica*	Reptiles	Moderately Low	Moderately Vulnerable	Moderately Vulnerable	24, 183, 333, 441, 710, 771, 890
Mojave Rattlesnake	*Crotalus scutulatus scutulatus*	Reptiles	High	Less Vulnerable	Less Vulnerable	139, 235, 269, 363, 616, 649, 723, 747
Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	Reptiles	High	Less Vulnerable	Less Vulnerable	139, 363, 399, 430, 641, 643, 649, 921, 932
Mountain Skink	*Plestiodon callicephalus*	Reptiles	High	Less Vulnerable	Less Vulnerable	235, 290, 291, 637, 641, 890, 926
Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	Reptiles	High	Less Vulnerable	Less Vulnerable	165, 235, 280, 357, 363, 465, 631, 637, 641, 643, 890, 1019
New Mexico Ridge-nosed Rattlesnake	*Crotalus willardi obscurus*	Reptiles	High	Less Vulnerable	Less Vulnerable	50, 140, 225, 226, 431, 432, 433, 637, 643, 649, 707

Common Name	Scientific Name	Family	Adaptive Capacity	RCP 4.5 Score	RCP 8.5 Score	Literature
North American Racer	*Coluber constrictor*	Reptiles	High	Less Vulnerable	Less Vulnerable	118,119, 183, 235, 327, 363, 383, 725, 798, 919, 932
Northern Mexican Gartersnake	*Thamnophis eques megalops*	Reptiles	Moderately Low	Extremely Vulnerable	Extremely Vulnerable	3, 363, 554, 562, 637, 643, 662, 799, 939, 1003, 1021
Ornate Box Turtle	*Terrapene ornata*	Reptiles	Moderately Low	Highly Vulnerable	Extremely Vulnerable	333, 363, 399, 410, 535, 710, 770, 894, 1082
Plains Gartersnake	*Thamnophis radix*	Reptiles	High	Less Vulnerable	Less Vulnerable	235, 363, 383, 887, 890, 1074
Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	Reptiles	High	Less Vulnerable	Less Vulnerable	54, 122, 235, 359, 429, 631, 891, 956
Slevin's Bunchgrass Lizard	*Sceloporus slevini*	Reptiles	Moderately High	Moderately Vulnerable	Moderately Vulnerable	42, 261, 326, 636, 637, 641, 642, 643, 652, 681, 866, 873, 891, 1085
Smooth Greensnake	*Opheodrys vernalis blanchardi*	Reptiles	High	Less Vulnerable	Less Vulnerable	145, 182, 185, 189, 284, 296, 363, 384, 410, 494, 741, 895
Sonoran Lyresnake	*Trimorphodon lambda*	Reptiles	High	Less Vulnerable	Less Vulnerable	54, 107, 235, 270, 63, 526, 891, 932
Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	Reptiles	Moderately High	Less Vulnerable	Moderately Vulnerable	234, 248, 271, 364, 630, 782, 890, 901, 902
Texas Lyresnake	*Trimorphodon vilkinsonii*	Reptiles	High	Less Vulnerable	Less Vulnerable	107, 235, 363, 528, 711, 841, 932
Texas Spotted Whiptail	*Aspidoscelis gularis gularis*	Reptiles	High	Less Vulnerable	Less Vulnerable	18, 83, 126, 261, 285, 333, 710, 711, 866
Trans-Pecos Rat Snake	*Bogertophis subocularis subocularis*	Reptiles	High	Less Vulnerable	Less Vulnerable	54, 185, 235, 363, 710, 747, 890, 932, 1094
Western Blind Snake	*Rena humilis segregus*	Reptiles	High	Less Vulnerable	Less Vulnerable	54, 235, 891, 1080, 1094
Western Massasauga	*Sistrurus tergeminus*	Reptiles	High	Less Vulnerable	Less Vulnerable	2, 174, 284, 427, 649, 723, 800, 811
Western Painted Turtle	*Chrysemys picta bellii*	Reptiles	High	Less Vulnerable	Less Vulnerable	161, 235, 327, 333, 379, 383, 416, 650, 771
Western River Cooter	*Pseudemys gorzugi*	Reptiles	Moderately High	Moderately Vulnerable	Highly Vulnerable	154, 466, 558, 559, 637, 731, 820, 917
Yaqui Black-headed Snake	*Tantilla yaquia*	Reptiles	High	Less Vulnerable	Less Vulnerable	235, 641, 796, 891
Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	Reptiles	High	Less Vulnerable	Less Vulnerable	164, 235, 637, 643, 932

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APPENDIX G: SPECIES OF GREATEST CONSERVATION NEED IN 30 CONSERVATION OPPORTUNITY AREAS (COAS) IN NEW MEXICO

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
Apache Box	Amph.	Arizona Toad	*Anaxyrus microscaphus microscaphus*	I		
	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Lowland Leopard Frog	*Lithobates yavapaiensis*	L		E
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elegant Trogon	*Trogon elegans canescens*	L		E
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		

[71] Amph. = Amphibians, Crust. = Crustaceans, Mam. = Mammals, Mol. = Molluscs, Moths = Moths and Butterflies, Rept. = Reptiles.
[72] Category abbreviations are: D = Data Needs Species, F = Current Focal Species, I = Conservation Impact Species, L = Limited Conservation Opportunity Species.
[73] Federal and state status abbreviations are: E = Endangered, T = Threatened

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*	L		T
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Lucifer Hummingbird	*Calothorax lucifer*	L		T
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Fish	Desert Sucker	*Catostomus clarkii*	F		
	Fish	Sonora Sucker	*Catostomus insignis*	F		
	Fish	Spikedace	*Meda fulgida*	F	E	E
	Mam.	Jaguar	*Panthera onca arizonensis*	L	E	
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Rept.	Arizona Black Rattlesnake	*Crotalus cerberus*	I		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
Big Hatchet Mountains	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Lowland Leopard Frog	*Lithobates yavapaiensis*	L		E
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*	D		E
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Costa's Hummingbird	*Calypte costae*	L		T
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Mam.	Jaguar	*Panthera onca arizonensis*	D	E	
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	Mexican Long-nosed Bat	*Leptonycteris nivalis*	F	E	E
	Mam.	Mexican Long-tongued Bat	*Choeronycteris mexicana*	F		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Western Yellow Bat	*Dasypterus xanthinus*	D		T
	Mol.	Big Hatchet Woodlandsnail	*Ashmunella mearnsii*	D		
	Mol.	Cross Holospira Snail	*Holospira crossei*	D		
	Mol.	Fringed Mountainsnail	*Radiocentrum ferrissi*	D		
	Mol.	Hacheta Grande Woodlandsnail	*Ashmunella hebardi*	D		T
	Mol.	Hacheta Mountainsnail	*Radiocentrum hachetanum*	D		
	Mol.	Multirib Vallonia Snail	*Vallonia gracilicosta*	D		
	Mol.	Shortneck Snaggletooth Snail	*Gastrocopta dalliana dalliana*	D		T
	Mol.	Vallonia Snail	*Vallonia sonorana*	D		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
	Rept.	Mountain Skink	*Plestiodon callicephalus*	D		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	New Mexico Ridge-nosed Rattlesnake	*Crotalus willardi obscurus*	F	T	E
	Rept.	Slevin's Bunchgrass Lizard	*Sceloporus slevini*	L		T
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
Black Range Mountains	Amph.	Arizona Toad	*Anaxyrus microscaphus microscaphus*	I		
	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Band-tailed Pigeon	*Patagioenas fasciata*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Common Black Hawk	*Buteogallus anthracinus anthracinus*	D		T
	Birds	Common Ground Dove	*Columbina passerina pallescens*	L		E
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*	L		T
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	D	T	
	Fish	Chihuahua Chub	*Gila nigrescens*	F	T	E
	Fish	Desert Sucker	*Catostomus clarkii*	F		
	Fish	Gila Chub	*Gila intermedia*	F	E	E
	Fish	Gila Trout	*Oncorhynchus gilae*	F	T	T
	Fish	Headwater Chub	*Gila nigra*	F		E
	Fish	Loach Minnow	*Rhinichthys cobitis*	F	E	E
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	F		
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Fish	Roundtail Chub	*Gila robusta*	F		E
	Fish	Sonora Sucker	*Catostomus insignis*	F		
	Fish	Spikedace	*Meda fulgida*	F	E	E
	Mam.	Allen's Big-eared Bat	*Idionycteris phyllotis*	D		
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		
	Mam.	Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	D		
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Hooded Skunk	*Mephitis macroura milleri*	D		
	Mam.	Jaguar	*Panthera onca arizonensis*	L	E	
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Yuma Myotis	*Myotis yumanensis yumanensis*	D		
	Mol.	Black Range Mountainsnail	*Oreohelix metcalfei*	D		
	Mol.	Black Range Woodlandsnail	*Ashmunella cockerelli*	D		
	Mol.	Burnt Corral Pyrg	*Pyrgulopsis similis*	D		
	Mol.	Dry Creek Woodlandsnail	*Ashmunella tetrodon*	D		
	Mol.	Iron Creek Woodlandsnail	*Ashmunella mendax*	D		
	Mol.	Mineral Creek Mountainsnail	*Oreohelix pilsbryi*	D		T
	Mol.	Silver Creek Woodlandsnail	*Ashmunella binneyi*	D		
	Rept.	Arizona Black Rattlesnake	*Crotalus cerberus*	I		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	L	T	E
	Rept.	Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	L		
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
Bootheel	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Lowland Leopard Frog	*Lithobates yavapaiensis*	L		E
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Amph.	Sonoran Desert Toad	*Incilius alvarius*	D		T
	Amph.	Western Narrow-mouthed Toad	*Gastrophryne olivacea*	L		E
	Bees	Half-scarlet Fairy Bee	*Perdita semicrocea*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Bees	Sweat Bee	*Conanthalictus conanthi*	D		
	Birds	Aplomado Falcon	*Falco femoralis septentrionalis*	L	E	E
	Birds	Arizona Grasshopper Sparrow	*Ammodramus savannarum ammolegus*	D		E
	Birds	Baird's Sparrow	*Centronyx bairdii*	F		T
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Broad-billed Hummingbird	*Cynanthus latirostris magicus*	L		T
	Birds	Burrowing Owl	*Athene cunicularia hypugaea*	I		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Common Ground Dove	*Columbina passerina pallescens*	L		E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Costa's Hummingbird	*Calypte costae*	L		T
	Birds	Elegant Trogon	*Trogon elegans canescens*	L		E
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*	L		T
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Lucifer Hummingbird	*Calothorax lucifer*	L		T
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Chickadee	*Poecile sclateri eidos*	L		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Northern Beardless-Tyrannulet	*Camptostoma imberbe ridgwayi*	L		E
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Sprague's Pipit	*Anthus spragueii*	F		
	Birds	Thick-billed Kingbird	*Tyrannus crassirostris*	L		E
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Varied Bunting	*Passerina versicolor*	L		T
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Violet-crowned Hummingbird	*Leucolia violiceps ellioti*	L		T
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	White-eared Hummingbird	*Basilinna leucotis borealis*	L		T
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Birds	Yellow-eyed Junco	*Junco phaeonotus palliatus*	D		T
	Mam.	Arizona Shrew	*Sorex arizonae*	L		E
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Eastern Red Bat	*Lasiurus borealis*	D		
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		
	Mam.	Hooded Skunk	*Mephitis macroura milleri*	D		
	Mam.	Jaguar	*Panthera onca arizonensis*	D	E	
	Mam.	Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	F	E	T
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	Mexican Long-nosed Bat	*Leptonycteris nivalis*	F	E	E
	Mam.	Mexican Long-tongued Bat	*Choeronycteris mexicana*	F		
	Mam.	Northern Pygmy Mouse	*Baiomys taylori ater*	D		
	Mam.	Pocketed Free-tailed Bat	*Nyctinomops femorosaccus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Western Red Bat	*Lasiurus blossevillii*	D		
	Mam.	Western Yellow Bat	*Dasypterus xanthinus*	D		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	White-nosed Coati	*Nasua narica*	D		
	Mam.	White-sided Jackrabbit	*Lepus callotis gaillardi*	I		T
	Mam.	Yellow-nosed Cotton Rat	*Sigmodon ochrognathus*	D		
	Mol.	Animas Peak Woodlandsnail	*Ashmunella animasensis*	D		
	Mol.	Animas Talussnail	*Sonorella animasensis*	D		
	Mol.	Apache Snaggletooth Snail	*Gastrocopta cochisensis*	D		
	Mol.	Heart Vertigo Snail	*Vertigo hinkleyi*	D		
	Mol.	Shortneck Snaggletooth Snail	*Gastrocopta dalliana dalliana*	D		T
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Giant Spotted Whiptail	*Aspidoscelis stictogramma*	D		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
	Rept.	Green Rat Snake	*Senticolis triaspis intermedia*	D		T
	Rept.	Knobloch's Mountain Kingsnake	*Lampropeltis knoblochi*	L		
	Rept.	Mountain Skink	*Plestiodon callicephalus*	D		T
	Rept.	New Mexico Ridge-nosed Rattlesnake	*Crotalus willardi obscurus*	F	T	E
	Rept.	Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	L		
	Rept.	Slevin's Bunchgrass Lizard	*Sceloporus slevini*	L		T
	Rept.	Sonoran Lyresnake	*Trimorphodon lambda*	D		
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
Conchas Reservoir	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D		
	Fish	Arkansas River Shiner	*Notropis girardi*	F	T	E
	Fish	Plains Minnow	*Hybognathus placitus*	L		
	Mam.	Least Shrew	*Cryptotis parvus*	F		T
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Eagle Nest Lake	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Brown-capped Rosy-Finch	*Leucosticte australis*	F		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Ferruginous Hawk	*Buteo regalis*	D		
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
Guadalupe Mountains	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Amph.	Rio Grande Leopard Frog	*Lithobates berlandieri*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Varied Bunting	*Passerina versicolor*	L		T
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D		
	Fish	Pecos Gambusia	*Gambusia nobilis*	F	E	E
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		
	Mam.	Gray-footed Chipmunk	*Neotamias canipes*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mol.	Guadelupe Woodlandsnail	*Ashmunella carlsbadensis*	D		
	Mol.	Northern Threeband	*Humboldtiana ultima*	D		
	Moths	Rindge's Emerald Moth	*Nemoria rindgei*	I		
	Moths	Sacramento Mountains Emerald Moth	*Nemoria subsequens*	I		
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gray-banded Kingsnake	*Lampropeltis alterna*	D		E
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	D		T

COA	Taxon[71]	Common Name	Scientific Name	Category[72]	Federal Status[73]	State Status
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Western River Cooter	*Pseudemys gorzugi*	F		T
Jemez Mountains	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Boreal Toad	*Anaxyrus boreas boreas*	F		E
	Amph.	Jemez Mountains Salamander	*Plethodon neomexicanus*	F	E	E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Bees	Southern Plains Bumble Bee	*Bombus fraternus*	D		
	Bees	Western Bumble Bee	*Bombus occidentalis*	D		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Band-tailed Pigeon	*Patagioenas fasciata*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black Swift	*Cypseloides niger*	L		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Boreal Owl	*Aegolius funereus*	L		T
	Birds	Brown Pelican	*Pelecanus occidentalis carolinensis*	L		E
	Birds	Brown-capped Rosy-Finch	*Leucosticte australis*	F		
	Birds	Burrowing Owl	*Athene cunicularia hypugaea*	I		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		

COA	Taxon[71]	Common Name	Scientific Name	Category[72]	Federal Status[73]	State Status
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Ferruginous Hawk	*Buteo regalis*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Bluebird	*Sialia currucoides*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Northern Beardless-Tyrannulet	*Camptostoma imberbe ridgwayi*	L		E
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Peregrine Falcon	*Falco peregrinus*	D		T
	Birds	Pine Grosbeak	*Pinicola enucleator montana*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		

COA	Taxon[71]	Common Name	Scientific Name	Category[72]	Federal Status[73]	State Status
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus caurinus*	L		
	Birds	Sage Thrasher	*Oreoscoptes montanus*	D		
	Birds	Sagebrush Sparrow	*Artemisiospiza nevadensis*	D		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Crust.	Scud	*Hyalella azteca*	D		
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	F		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Mam.	American Pika	*Ochotona princeps*	L		
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		

COA	Taxon 71	Common Name	Scientific Name	Category 72	Federal Status[73]	State Status
	Mam.	New Mexico Jumping Mouse	*Zapus hudsonius luteus* (=*Zapus luteus luteus*)	I	E	E
	Mam.	Pacific Marten	*Martes caurina*	F		T
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Western Water Shrew	*Sorex navigator*	D		
	Mol.	Jemez Woodlandsnail	*Ashmunella ashmuni*	D		
	Mol.	Wrinkled Marshsnail	*Stagnicola caperata*	D		E
	Moths	Monarch	*Danaus plexippus*	L		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Smooth Greensnake	*Opheodrys vernalis blanchardi*	D		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Lower Gila River	Amph.	Arizona Toad	*Anaxyrus microscaphus microscaphus*	I		
	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Lowland Leopard Frog	*Lithobates yavapaiensis*	L		E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Abert's Towhee	*Melozone aberti aberti*	L		T
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Band-tailed Pigeon	*Patagioenas fasciata*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Brown Pelican	*Pelecanus occidentalis carolinensis*	L		E
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Black Hawk	*Buteogallus anthracinus anthracinus*	D		T
	Birds	Common Ground Dove	*Columbina passerina pallescens*	L		E
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elegant Trogon	*Trogon elegans canescens*	L		E
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Ferruginous Hawk	*Buteo regalis*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*	L		T
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Lucifer Hummingbird	*Calothorax lucifer*	L		T
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Neotropic Cormorant	*Phalacrocorax brasilianus*	L		T
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		
	Birds	Sage Thrasher	*Oreoscoptes montanus*	D		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Fish	Desert Sucker	*Catostomus clarkii*	F		
	Fish	Gila Chub	*Gila intermedia*	F	E	E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Fish	Gila Trout	*Oncorhynchus gilae*	F	T	T
	Fish	Headwater Catfish	*Ictalurus lupus*	D		
	Fish	Loach Minnow	*Rhinichthys cobitis*	F	E	E
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Fish	Roundtail Chub	*Gila robusta*	F		E
	Fish	Sonora Sucker	*Catostomus insignis*	F		
	Fish	Spikedace	*Meda fulgida*	F	E	E
	Mam.	Allen's Big-eared Bat	*Idionycteris phyllotis*	D		
	Mam.	Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	D		
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Eastern Red Bat	*Lasiurus borealis*	D		
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		
	Mam.	Hooded Skunk	*Mephitis macroura milleri*	D		
	Mam.	Jaguar	*Panthera onca arizonensis*	L	E	
	Mam.	Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	F	E	T
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	Northern Pygmy Mouse	*Baiomys taylori ater*	D		
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Western Red Bat	*Lasiurus blossevillii*	D		
	Mam.	White-nosed Coati	*Nasua narica*	D		
	Mam.	Yellow-nosed Cotton Rat	*Sigmodon ochrognathus*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	Yuma Myotis	*Myotis yumanensis yumanensis*	D		
	Rept.	Arizona Black Rattlesnake	*Crotalus cerberus*	I		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
	Rept.	Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	L	T	E
	Rept.	Northern Mexican Gartersnake	*Thamnophis eques megalops*	L	T	E
	Rept.	Slevin's Bunchgrass Lizard	*Sceloporus slevini*	L		T
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
Lower Pecos and Black Rivers	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Amph.	Rio Grande Leopard Frog	*Lithobates berlandieri*	I		
	Bees	Austin’s Fairy Bee	*Perdita austini*	D		
	Bees	Cockerell's Bumble Bee	*Bombus cockerelli*	I		
	Bees	Southern Plains Bumble Bee	*Bombus fraternus*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Harris's Hawk	*Parabuteo unicinctus harrisi*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Piping Plover	*Charadrius melodus circumcinctus*	L	T	T
	Birds	Snowy Plover	*Charadrius nivosus*	L		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Varied Bunting	*Passerina versicolor*	L		T
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D		
	Fish	Arkansas River Shiner	*Notropis girardi*	F	T	E
	Fish	Bigscale Logperch	*Percina macrolepida*	L		T
	Fish	Blue Sucker	*Cycleptus elongatus*	F		E
	Fish	Gray Redhorse	*Moxostoma congestum*	F		E
	Fish	Greenthroat Darter	*Etheostoma lepidum*	I		T
	Fish	Headwater Catfish	*Ictalurus lupus*	D		
	Fish	Longnose Gar	*Lepisosteus osseus*	L		
	Fish	Mexican Tetra	*Astyanax mexicanus*	I		T
	Fish	Pecos Bluntnose Shiner	*Notropis simus pecosensis*	F	T	E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Fish	Pecos Gambusia	*Gambusia nobilis*	F	E	E
	Fish	Pecos Pupfish	*Cyprinodon pecosensis*	F		T
	Fish	Plains Minnow	*Hybognathus placitus*	L		
	Fish	Rio Grande Shiner	*Notropis jemezanus*	I		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Roundnose Minnow	*Dionda episcopa*	I		
	Fish	Smallmouth Buffalo	*Ictiobus bubalus*	I		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Least Shrew	*Cryptotis parvus*	F		T
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mol.	Guadelupe Woodlandsnail	*Ashmunella carlsbadensis*	D		
	Mol.	Long Fingernailclam	*Musculium transversum*	D		T
	Mol.	Ovate Vertigo Snail	*Vertigo ovata*	D		T
	Mol.	Pecos Springsnail	*Pyrgulopsis pecosensis*	F		T
	Mol.	Texas Hornshell	*Popenaias popeii*	F		E
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Gray-banded Kingsnake	*Lampropeltis alterna*	D		E
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	D		T
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Western River Cooter	*Pseudemys gorzugi*	F		T
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
Lower Rio Grande	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Sage Thrasher	*Oreoscoptes montanus*	D		
	Birds	Snowy Plover	*Charadrius nivosus*	L		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Fish	Mexican Tetra	*Astyanax mexicanus*	I		T
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Shiner	*Notropis jemezanus*	I		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Smallmouth Buffalo	*Ictiobus bubalus*	I		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mol.	Ovate Vertigo Snail	*Vertigo ovata*	D		T
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Lower Rio Grande - Caballo Reservoir	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		

COA	Taxon[71]	Common Name	Scientific Name	Category[72]	Federal Status[73]	State Status
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Neotropic Cormorant	*Phalacrocorax brasilianus*	L		T
	Birds	Peregrine Falcon	*Falco peregrinus*	D		T
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Snowy Plover	*Charadrius nivosus*	L		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Fish	Gray Redhorse	*Moxostoma congestum*	F		E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mol.	Ovate Vertigo Snail	*Vertigo ovata*	D		T
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Big Bend Slider	*Trachemys gaigeae*	F		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Middle Pecos River	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Amph.	Rio Grande Leopard Frog	*Lithobates berlandieri*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Brown Pelican	*Pelecanus occidentalis carolinensis*	L		E
	Birds	Burrowing Owl	*Athene cunicularia hypugaea*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Least Tern	*Sternula antillarum athalassos*	L	E	E
	Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*	F	E	
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Piping Plover	*Charadrius melodus circumcinctus*	L	T	T
	Birds	Snowy Plover	*Charadrius nivosus*	L		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D		
	Crust.	Noel's Amphipod	*Gammarus desperatus*	F	E	E
	Fish	Arkansas River Shiner	*Notropis girardi*	F	T	E
	Fish	Bigscale Logperch	*Percina macrolepida*	L		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Fish	Gray Redhorse	*Moxostoma congestum*	F		E
	Fish	Greenthroat Darter	*Etheostoma lepidum*	I		T
	Fish	Headwater Catfish	*Ictalurus lupus*	D		
	Fish	Longnose Gar	*Lepisosteus osseus*	L		
	Fish	Mexican Tetra	*Astyanax mexicanus*	I		T
	Fish	Pecos Bluntnose Shiner	*Notropis simus pecosensis*	F	T	E
	Fish	Pecos Gambusia	*Gambusia nobilis*	F	E	E
	Fish	Pecos Pupfish	*Cyprinodon pecosensis*	F		T
	Fish	Plains Minnow	*Hybognathus placitus*	L		
	Fish	Rio Grande Shiner	*Notropis jemezanus*	I		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Roundnose Minnow	*Dionda episcopa*	I		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Fish	Suckermouth Minnow	*Phenacobius mirabilis*	L		T
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Least Shrew	*Cryptotis parvus*	F		T
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mol.	Koster's Springsnail	*Juturnia kosteri*	F	E	E
	Mol.	Pecos Assiminea	*Assiminea pecos*	F	E	E
	Mol.	Roswell Springsnail	*Pyrgulopsis roswellensis*	F	E	E
	Mol.	Texas Hornshell	*Popenaias popeii*	F	E	E
	Mol.	Wrinkled Marshsnail	*Stagnicola caperata*	D		E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Western River Cooter	*Pseudemys gorzugi*	F		T
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Middle Rio Grande	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Austin’s Fairy Bee	*Perdita austini*	D		
	Bees	Half-scarlet Fairy Bee	*Perdita semicrocea*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Bees	Watson’s Mason Bee	*Osmia watsoni*	D		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Neotropic Cormorant	*Phalacrocorax brasilianus*	L		T
	Birds	Peregrine Falcon	*Falco peregrinus*	D		T
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Piping Plover	*Charadrius melodus circumcinctus*	L	T	T
	Birds	Snowy Plover	*Charadrius nivosus*	L		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Fish	Bigscale Logperch	*Percina macrolepida*	L		T
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Shiner	*Notropis jemezanus*	I		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Smallmouth Buffalo	*Ictiobus bubalus*	I		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Mam.	Eastern Red Bat	*Lasiurus borealis*	D		
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	New Mexico Jumping Mouse	*Zapus hudsonius luteus* (= *Zapus luteus luteus*)	I	E	E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	White-nosed Coati	*Nasua narica*	D		
	Mam.	Yuma Myotis	*Myotis yumanensis yumanensis*	D		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Big Bend Slider	*Trachemys gaigeae*	F		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Middle San Juan River	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Boreal Toad	*Anaxyrus boreas boreas*	F		E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Fish	Colorado Pikeminnow	*Ptychocheilus lucius*	F	E	E
	Fish	Mottled Sculpin	*Cottus bairdii*	L		
	Fish	Razorback Sucker	*Xyrauchen texanus*	F	E	
	Fish	Roundtail Chub	*Gila robusta*	F		E
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
Mimbres River	Amph.	Arizona Toad	*Anaxyrus microscaphus microscaphus*	I		
	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Mimbres Miner Bee	*Andrena mimbresensis*	D		
	Bees	Neff’s Miner Bee	*Andrena neffi*	D		
	Bees	Volger’s Mining Bee	*Andrena vogleri*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Common Black Hawk	*Buteogallus anthracinus anthracinus*	D		T
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*	L		T
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Crust.	Scud	*Hyalella azteca*	D		
	Fish	Chihuahua Chub	*Gila nigrescens*	F	T	E
	Fish	Desert Sucker	*Catostomus clarkii*	F		
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Mam.	Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	D		
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		
	Mam.	Jaguar	*Panthera onca arizonensis*	L	E	
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	Northern Pygmy Mouse	*Baiomys taylori ater*	D		
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Western Red Bat	*Lasiurus blossevillii*	D		
	Rept.	Arizona Black Rattlesnake	*Crotalus cerberus*	I		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	L		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
Northern Sacramento and Capitan Mountains	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Amph.	Sacramento Mountain Salamander	*Aneides hardii*	I		T
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Broad-billed Hummingbird	*Cynanthus latirostris magicus*	L		T
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Snowy Plover	*Charadrius nivosus*	L		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Gray-footed Chipmunk	*Neotamias canipes*	D		
	Mam.	Peñasco Least Chipmunk	*Neotamias minimus atristriatus*	F	E	E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mol.	Mountainsnail	*Oreohelix nogalensis*	D		
	Moths	Apache Northern Crescent	*Phyciodes cocyta apache*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Moths	Sacramento Mountains Silvery Blue Butterfly	*Glaucopsyche lygdamus ruidoso*	I		
	Moths	Sacramento Mountains Western Green Hairstreak	*Callophrys affinis albipalpus*	I		
	Moths	Sacramento Mountains White-lined Hairstreak	*Callophrys sheridanii sacramento*	I		
	Moths	Sacred Boisduval's Blue	*Icaricia icarioides sacre*	I		
	Moths	Sierra Blanca Margined White	*Pieris marginalis siblanca*	I		
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	D		T
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Western River Cooter	*Pseudemys gorzugi*	F		T
Organ Mountains	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Broad-billed Hummingbird	*Cynanthus latirostris magicus*	L		T
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Common Ground Dove	*Columbina passerina pallescens*	L		E
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Peregrine Falcon	*Falco peregrinus*	D		T
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		
	Mam.	Organ Mountains Colorado Chipmunk	*Neotamias quadrivittatus australis*	I		T
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Yuma Myotis	*Myotis yumanensis yumanensis*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mol.	Franklin Mountain Talussnail	*Sonorella metcalfi*	D		
	Mol.	Maple Canyon Woodlandsnail	*Ashmunella todseni*	D		
	Mol.	Organ Mountain Woodlandsnail	*Ashmunella organensis*	D		
	Mol.	Woodlandsnail	*Ashmunella auriculata*	D		
	Moths	Orange Giant Skipper	*Agathymus neumoegeni neumoegeni*	D		
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
Pecos River Headwaters	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D		
	Fish	Bigscale Logperch	*Percina macrolepida*	L		T
	Fish	Central Stoneroller	*Campostoma anomalum*	L		
	Fish	Mexican Tetra	*Astyanax mexicanus*	I		T
	Fish	Pecos Bluntnose Shiner	*Notropis simus pecosensis*	F	T	E
	Fish	Plains Minnow	*Hybognathus placitus*	L		
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Shiner	*Notropis jemezanus*	I		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Roundnose Minnow	*Dionda episcopa*	I		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Fish	Suckermouth Minnow	*Phenacobius mirabilis*	L		T
	Mam.	Least Shrew	*Cryptotis parvus*	F		T
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Pecos River - Lake Sumner	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Bare Fairy Bee	*Perdita aperta*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bell's Vireo	*Vireo bellii*	F		T
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D		
	Fish	Arkansas River Shiner	*Notropis girardi*	F	T	E
	Fish	Bigscale Logperch	*Percina macrolepida*	L		T
	Fish	Central Stoneroller	*Campostoma anomalum*	L		
	Fish	Headwater Catfish	*Ictalurus lupus*	D		
	Fish	Mexican Tetra	*Astyanax mexicanus*	I		T
	Fish	Pecos Bluntnose Shiner	*Notropis simus pecosensis*	F	T	E
	Fish	Pecos Gambusia	*Gambusia nobilis*	F	E	E
	Fish	Plains Minnow	*Hybognathus placitus*	L		
	Fish	Rio Grande Shiner	*Notropis jemezanus*	I		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Roundnose Minnow	*Dionda episcopa*	I		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Fish	Suckermouth Minnow	*Phenacobius mirabilis*	L		T
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		
	Mam.	Least Shrew	*Cryptotis parvus*	F		T
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Western River Cooter	*Pseudemys gorzugi*	F		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Rio Chama	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Boreal Toad	*Anaxyrus boreas boreas*	F		E
	Amph.	Jemez Mountains Salamander	*Plethodon neomexicanus*	F	E	E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Band-tailed Pigeon	*Patagioenas fasciata*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Brown-capped Rosy-Finch	*Leucosticte australis*	F		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Peregrine Falcon	*Falco peregrinus*	D		T
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Sage Thrasher	*Oreoscoptes montanus*	D		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Crust.	Scud	*Hyalella azteca*	D		
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	F		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	New Mexico Jumping Mouse	*Zapus hudsonius luteus* (= *Zapus luteus luteus*)	I	E	E
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Moths	Monarch	*Danaus plexippus*	L		
	Moths	Zuni Flower Moth	*Schinia zuni*	D		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Rio Puerco	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Jemez Mountains Salamander	*Plethodon neomexicanus*	F	E	E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Cassin's Sparrow	*Peucaea cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Fish	Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	F		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
San Francisco River	Amph.	Arizona Toad	*Anaxyrus microscaphus microscaphus*	I		
	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Lowland Leopard Frog	*Lithobates yavapaiensis*	L		E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Bees	Western Bumble Bee	*Bombus occidentalis*	D		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Black Hawk	*Buteogallus anthracinus anthracinus*	D		T
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elegant Trogon	*Trogon elegans canescens*	L		E
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Ferruginous Hawk	*Buteo regalis*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*	L		T
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		
	Birds	Sage Thrasher	*Oreoscoptes montanus*	D		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Fish	Desert Sucker	*Catostomus clarkii*	F		
	Fish	Gila Chub	*Gila intermedia*	F	E	E
	Fish	Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	L	E	T
	Fish	Gila Trout	*Oncorhynchus gilae*	F	T	T
	Fish	Loach Minnow	*Rhinichthys cobitis*	F	E	E
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Fish	Roundtail Chub	*Gila robusta*	F		E
	Fish	Sonora Sucker	*Catostomus insignis*	F		
	Fish	Spikedace	*Meda fulgida*	F	E	E
	Mam.	Allen's Big-eared Bat	*Idionycteris phyllotis*	D		
	Mam.	Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	D		
	Mam.	Arizona Montane Vole	*Microtus montanus arizonensis*	F		E
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Black-footed Ferret	*Mustela nigripes*	F	E	
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Eastern Red Bat	*Lasiurus borealis*	D		
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Jaguar	*Panthera onca arizonensis*	L	E	

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	New Mexico Jumping Mouse	*Zapus hudsonius luteus* (= *Zapus luteus luteus*)	I	E	E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Western Red Bat	*Lasiurus blossevillii*	D		
	Mol.	Black Range Woodlandsnail	*Ashmunella cockerelli*	D		
	Mol.	Whitewater Creek Woodlandsnail	*Ashmunella danielsi*	D		
	Rept.	Arizona Black Rattlesnake	*Crotalus cerberus*	I		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
	Rept.	Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	L	T	E
	Rept.	Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	L		
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
San Mateo Mountains	Amph.	Arizona Toad	*Anaxyrus microscaphus microscaphus*	I		
	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		

COA	Taxon[71]	Common Name	Scientific Name	Category[72]	Federal Status[73]	State Status
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Mam.	Allen's Big-eared Bat	*Idionycteris phyllotis*	D		
	Mam.	Cave Myotis	*Myotis velifer*	I		
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	Yuma Myotis	*Myotis yumanensis yumanensis*	D		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
Santa Fe River	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Burrowing Owl	*Athene cunicularia hypugaea*	I		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	White-tailed Jackrabbit	*Lepus townsendii campanius*	D		
	Moths	Monarch	*Danaus plexippus*	L		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
Southern Sacramento Mountains	Amph.	Barking Frog	*Craugastor augusti latrans*	L		
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Amph.	Sacramento Mountain Salamander	*Aneides hardii*	I		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Bees	Cockerell's Bumble Bee	*Bombus cockerelli*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Band-tailed Pigeon	*Patagioenas fasciata*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Snowy Plover	*Charadrius nivosus*	L		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Gray-footed Chipmunk	*Neotamias canipes*	D		
	Mam.	New Mexico Jumping Mouse	*Zapus hudsonius luteus* (= *Zapus luteus luteus*)	I	E	E
	Mam.	Peñasco Least Chipmunk	*Neotamias minimus atristriatus*	F	E	E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Moths	Apache Northern Crescent	*Phyciodes cocyta apache*	I		
	Moths	Rindge's Emerald Moth	*Nemoria rindgei*	I		
	Moths	Sacramento Mountains Checkerspot Butterfly	*Euphydryas anicia cloudcrofti*	I	E	
	Moths	Sacramento Mountains Emerald Moth	*Nemoria subsequens*	I		
	Moths	Sacramento Mountains Western Green Hairstreak	*Callophrys affinis albipalpus*	I		
	Moths	Sacramento Mountains White-lined Hairstreak	*Callophrys sheridanii sacramento*	I		
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Mottled Rock Rattlesnake	*Crotalus lepidus lepidus*	D		T
	Rept.	Western River Cooter	*Pseudemys gorzugi*	F		T
Upper Gila River	Amph.	Arizona Toad	*Anaxyrus microscaphus microscaphus*	I		
	Amph.	Arizona Treefrog	*Dryophytes wrightorum*	D		
	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Chiricahua Leopard Frog	*Lithobates chiricahuensis*	F	T	
	Amph.	Lowland Leopard Frog	*Lithobates yavapaiensis*	L		E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Band-tailed Pigeon	*Patagioenas fasciata*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-chinned Sparrow	*Spizella atrogularis evura*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Black Hawk	*Buteogallus anthracinus anthracinus*	D		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Elegant Trogon	*Trogon elegans canescens*	L		E
	Birds	Elf Owl	*Micrathene whitneyi whitneyi*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Gila Woodpecker	*Melanerpes uropygialis uropygialis*	L		T
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Lucifer Hummingbird	*Calothorax lucifer*	L		T
	Birds	Lucy's Warbler	*Leiothlypis luciae*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Red-faced Warbler	*Cardellina rubrifrons*	D		
	Birds	Thick-billed Longspur	*Rhynchophanes mccownii*	F		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D	T	
	Fish	Desert Sucker	*Catostomus clarkii*	F		
	Fish	Gila Chub	*Gila intermedia*	F	E	E
	Fish	Gila Trout	*Oncorhynchus gilae*	F	T	T
	Fish	Headwater Catfish	*Ictalurus lupus*	D		
	Fish	Headwater Chub	*Gila nigra*	F		E
	Fish	Loach Minnow	*Rhinichthys cobitis*	F	E	E
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Fish	Roundtail Chub	*Gila robusta*	F		E
	Fish	Sonora Sucker	*Catostomus insignis*	F		
	Fish	Spikedace	*Meda fulgida*	F	E	E
	Flies	Crandall's Hornet Fly	*Spilomyia crandalli*	D		
	Flies	Southwestern Slender Bee Fly	*Thevenetimyia speciosa*	D		
	Flies	Yellow-tailed Hornet Fly	*Spilomyia kahli*	D		
	Mam.	Allen's Big-eared Bat	*Idionycteris phyllotis*	D		
	Mam.	Arizona Gray Squirrel	*Sciurus arizonensis arizonensis*	D		
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Black-footed Ferret	*Mustela nigripes*	F	E	

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	Fringed Myotis	*Myotis thysanodes thysanodes*	I		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Hooded Skunk	*Mephitis macroura milleri*	D		
	Mam.	Jaguar	*Panthera onca arizonensis*	L	E	
	Mam.	Lesser Long-nosed Bat	*Leptonycteris yerbabuenae*	F	E	T
	Mam.	Mexican Gray Wolf	*Canis lupus baileyi*	I	E	E
	Mam.	Southwestern Little Brown Myotis	*Myotis occultus*	D		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mam.	White-nosed Coati	*Nasua narica*	D		
	Mol.	Bearded Mountainsnail	*Oreohelix barbata*	D		
	Mol.	Burnt Corral Pyrg	*Pyrgulopsis similis*	D		
	Mol.	Gila Springsnail	*Pyrgulopsis gilae*	I		
	Mol.	Jordan Spring Pyrg	*Pyrgulopsis marilynae*	D		
	Mol.	New Mexico Hot Springsnail	*Pyrgulopsis thermalis*	I		T
	Moths	Orange Giant Skipper	*Agathymus neumoegeni neumoegeni*	D		
	Moths	Zuni Flower Moth	*Schinia zuni*	D		
	Rept.	Arizona Black Rattlesnake	*Crotalus cerberus*	I		
	Rept.	Banded Rock Rattlesnake	*Crotalus lepidus klauberi*	I		
	Rept.	Gila Monster	*Heloderma suspectum*	D		E
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Narrow-headed Gartersnake	*Thamnophis rufipunctatus*	L	T	E
	Rept.	Pyro Mountain Kingsnake	*Lampropeltis pyromelana*	L		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Rept.	Slevin's Bunchgrass Lizard	*Sceloporus slevini*	L		T
	Rept.	Sonoran Mud Turtle	*Kinosternon sonoriense sonoriense*	I		
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
Upper Rio Grande	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		
	Amph.	Jemez Mountains Salamander	*Plethodon neomexicanus*	F	E	E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Bees	Southern Plains Bumble Bee	*Bombus fraternus*	D		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Band-tailed Pigeon	*Patagioenas fasciata*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Bendire's Thrasher	*Toxostoma bendirei*	F		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Chestnut-collared Longspur	*Calcarius ornatus*	F		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Clark's Nutcracker	*Nucifraga columbiana*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Lewis's Woodpecker	*Melanerpes lewis*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Northern Beardless-Tyrannulet	*Camptostoma imberbe ridgwayi*	L		E
	Birds	Olive-sided Flycatcher	*Contopus cooperi*	D		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Sage Thrasher	*Oreoscoptes montanus*	D		
	Birds	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	I	E	E
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Birds	Williamson's Sapsucker	*Sphyrapicus thyroideus nataliae*	D		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	F	T	
	Fish	Rio Grande Chub	*Gila pandora*	F		
	Fish	Rio Grande Cutthroat Trout	*Oncorhynchus clarkii virginalis*	F		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Fish	Rio Grande Shiner	*Notropis jemezanus*	I		
	Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	I	E	E
	Fish	Rio Grande Sucker	*Catostomus plebeius*	F		
	Fish	Speckled Chub	*Macrhybopsis aestivalis*	I		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	New Mexico Jumping Mouse	*Zapus hudsonius luteus* (= *Zapus luteus luteus*)	I	E	E
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Mol.	Jemez Woodlandsnail	*Ashmunella ashmuni*	D		
	Moths	Monarch	*Danaus plexippus*	L		
	Moths	Sacramento Mountains Borer Moth	*Papaipema dribi*	D		
	Rept.	Gray-checkered Whiptail	*Aspidoscelis dixoni*	D		E
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		
	Rept.	Yellow-bellied Watersnake	*Nerodia erythrogaster transversa*	D		E
Upper San Juan River	Amph.	Boreal Toad	*Anaxyrus boreas boreas*	F		E
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Birds	Bald Eagle	*Haliaeetus leucocephalus*	D		T
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Brown-capped Rosy-Finch	*Leucosticte australis*	F		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Flammulated Owl	*Psiloscops flammeolus*	D		
	Birds	Golden Eagle	*Aquila chrysaetos canadensis*	D		
	Birds	Grace's Warbler	*Setophaga graciae*	I		
	Birds	Gray Vireo	*Vireo vicinior*	I		T
	Birds	Juniper Titmouse	*Baeolophus ridgwayi*	I		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Mexican Spotted Owl	*Strix occidentalis lucida*	I	T	
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Pygmy Nuthatch	*Sitta pygmaea melanotis*	D		
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Western Bluebird	*Sialia mexicana bairdi*	D		
	Fish	Colorado Pikeminnow	*Ptychocheilus lucius*	F	E	E
	Fish	Mottled Sculpin	*Cottus bairdii*	L		
	Fish	Roundtail Chub	*Gila robusta*	F		E
	Mam.	Big Free-tailed Bat	*Nyctinomops macrotis*	D		
	Mam.	Gunnison's prairie dog	*Cynomys gunnisoni*	F		
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
Vermejo River	Amph.	Boreal Chorus Frog	*Pseudacris maculata*	I		

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Amph.	Northern Leopard Frog	*Lithobates pipiens*	I		
	Amph.	Plains Leopard Frog	*Lithobates blairi*	I		
	Bees	Morrison's Bumble Bee	*Bombus morrisoni*	D		
	Birds	Bank Swallow	*Riparia riparia riparia*	D		
	Birds	Black-throated Gray Warbler	*Setophaga nigrescens*	D		
	Birds	Burrowing Owl	*Athene cunicularia hypugaea*	I		
	Birds	Cassin's Finch	*Haemorhous cassinii*	D		
	Birds	Clark's Grebe	*Aechmophorus clarkii*	D		
	Birds	Common Nighthawk	*Chordeiles minor*	D		
	Birds	Evening Grosbeak	*Coccothraustes vespertinus*	D		
	Birds	Loggerhead Shrike	*Lanius ludovicianus*	D		
	Birds	Long-billed Curlew	*Numenius americanus americanus*	D		
	Birds	Mountain Plover	*Charadrius montanus*	F		
	Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	F		
	Birds	Piping Plover	*Charadrius melodus circumcinctus*	L	T	T
	Birds	Vesper Sparrow	*Pooecetes gramineus*	D		
	Birds	Virginia's Warbler	*Leiothlypis virginiae*	F		
	Birds	Yellow-billed Cuckoo	*Coccyzus americanus americanus*	D		
	Fish	Plains Minnow	*Hybognathus placitus*	L		
	Mam.	Black-tailed Prairie Dog	*Cynomys ludovicianus*	F		
	Mam.	Least Shrew	*Cryptotis parvus*	F		T

COA	Taxon [71]	Common Name	Scientific Name	Category [72]	Federal Status[73]	State Status
	Mam.	Spotted Bat	*Euderma maculatum*	D		T
	Rept.	Arid Land Ribbonsnake	*Thamnophis proximus diabolicus*	D		T
	Rept.	Western Massasauga	*Sistrurus tergeminus*	I		

APPENDIX H: GLOSSARY OF TERMS USED IN THE STATE WILDLIFE ACTION PLAN

Abiotic resource use- The use of non-living natural resources (e.g., hard-rock mining).

Adaptive management- A natural-resources management process under which planning, implementation, monitoring, research, evaluation, and incorporation of new information are combined into a management approach that: (1) is based on scientific findings and the needs of society; (2) treats management actions as experiments; (3) acknowledges the complexity of natural systems and scientific uncertainty; and (4) uses new information resulting from scientific findings and implemented management actions to modify future management methods and policy.

Adit- Horizontal or nearly horizontal passage driven from the earth's surface into the side of a ridge or mountain for access to, ventilation of, or water removal from a mine.

Alien species- Species that are not native to the ecosystem.

Amphibian- Any cold-blooded vertebrate of the class Amphibia, which is comprised of frogs and toads, newts and salamanders, and caecilians. Larvae are typically aquatic and breathe by gills. Adults are typically semiterrestrial and breathe by lungs and through their moist, glandular skin.

Argillic- Of or relating to clay or clay minerals.

Aridity- Characterized by very dry conditions, insufficient rainfall, and a lack of vegetation.

Arroyo- A dry creek, streambed, or gulch that temporarily or seasonally fills and flows after sufficient rain; also called a wash. Flash floods are common in arroyos following thunderstorms.

Arthropod- An invertebrate animal having an exoskeleton (external skeleton), a segmented body, and jointed appendages (paired appendages). Arthropods form the phylum Arthropoda, which includes the insects, arachnids, myriapods, and crustaceans.

Avifauna- The birds of a specific region or time period.

Bajada- Consists of a series of coalescing alluvial fans along a mountain front. These fan-shaped deposits form as a result of the deposition of sediment within a stream onto flat land at the base of a mountain.

Biodiversity- A contraction of the words "biological" and "diversity". Generally refers to the variety and variability of life on earth, including genetic variation, ecosystem variation, or species variation (number of species) within a specific region.

Biomass- The total mass of living material within a given unit of area.

Biota Information System of New Mexico (BISON-M)- A natural history database containing information to over 6,000 species that are either confirmed as occurring in New Mexico or possibly occur in New Mexico and some species found in Arizona. <http://bison-m.org>.

Bird- An endothermic (warm-blooded) vertebrate characterized by feathers; toothless, beaked jaws; the laying of hard-shelled eggs; a high metabolic rate; a four-chambered heart; and a lightweight but strong skeleton.

Bosque- The forested area on either side of a watercourse, typically in the American southwest.

Brackish- Water that has more salinity than fresh water, but not as much as seawater.

Caliche- A layer of soil in which the soil particles have been cemented together by lime (calcium carbonate [$CaCO_3$]).

Carrying capacity- Maximum number of individuals that a given environment can support without detrimental effects.

Channelization- Mechanical redirecting of a streambed into more or less a straight line.

Chaparral- A hardy, fire-prone plant community characterized by evergreen shrubs.

Cienega- A freshwater or alkaline wet meadow with a shallow gradient and permanently saturated soils in an otherwise arid landscape. Occurs where the geomorphology forces water to the surface.

Climate analog- Sites with a contemporary climate similar to the future climate at a target location (Richardson et al. 2024).

Closed basin- A geographic area where all surface waters drain into a basin with no outlet.

Conservation Reserve Program (CRP)- A federal program that pays a yearly rental payment in exchange for farmers removing environmentally sensitive land from agricultural production and planting vegetation that will improve environmental health and quality.

Consumptive biological resource use- The use of living natural resources (e.g., hunting, fishing, logging).

Crustacean- Any species of the class Crustacea, which includes lobsters, crabs, shrimp, and barnacles. Characteristically aquatic species having a segmented body, a chitinous exoskeleton (external skeleton), and paired, jointed limbs.

Deflation- Erosion by wind of loose material from flat areas of dry sediments.

Desertification- The process by which fertile land becomes desert, typically driven by drought, deforestation, or inappropriate agriculture.

Desiccation- A state of extreme dryness (desiccated), or the process of extreme drying (desiccation).

Ecological sustainability- A human system of natural resource use that can be maintained into the future. The long-term maintenance of ecosystem functions, processes, and services over time.

Ecosystem- A biological community plus all of the abiotic factors influencing that community.

Endangered species- Species of plant or animal of concern that is in danger of becoming extinct.

Endemic- Native to or confined to a certain region. For this document, the term specifically refers to taxa that are geographically limited to New Mexico.

Entisol- Soil of recent origin, developed in unconsolidated parent material, usually with only an A horizon (topsoil, rich in organic matter). Any soil not otherwise categorized is classified as an entisol.

Ephemeral- Channel or basin which carries water only during, and immediately after, periods of rainfall or snowmelt.

Exotic species- Species that are not native to the ecosystem and are introduced from elsewhere.

Extinct- No longer existing or living.

Fire weather- Types of weather that create favorable conditions for the start and spread of wildfires, including low relative humidity, strong surface wind, unstable air, and drought.

Fish- Any of a large group of cold-blooded, aquatic vertebrates having jaws, gills, usually fins, and a skin covered in scales.

Flow regime- The flow of a moving body of water (i.e., river or stream) over time and space.

Forb- Non-woody flowering plant that is not a grass, sedge, or rush (*Juncus* spp.).

Geographic Information System (GIS)- A digital tool used to visualize spatial data and create maps.

Gleying- Soil forming process that occurs in waterlogged, anaerobic conditions when iron compounds are reduced and either removed from the soil or segregated out as mottles (spots, specks) or concretions (hard and compact mass) in the soil.

Graminoid- Herbaceous (non-woody) plant with hollow, jointed stems and narrow, long-bladed leaves commonly known as a grass.

Habitat- An area inhabited by a particular organism and bounded in space and time by where the organism can find food, shelter, and reproductive opportunities.

Hectare- A metric unit of area equal to 10,000 m^2 (2.5 acres).

Herbivore- Plant-eating animal.

Herpetofauna- The amphibians and reptiles of a specific region or time period.

Hybridization- The act of mating between different species or varieties of animals or plants, which produces hybrids (mixtures of two species or varieties).

Hydroriparian- Associated with a perennial water source or a hydric riparian zone, where the soil is permanently or seasonally saturated by water and typical vegetation either must be or typically is associated with wetlands.

Intermittent- Irregular; as pertains to mapped waterways, indicates the stream contains water for extended periods only at certain times of the year (e.g., after snowmelt; https://www.srca.nm.gov/parts/title20/20.006.0004.html).

Inundation- Flooding, by the rise and spread of water, of a land surface that is not normally submerged.

Invasive species- An exotic species whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

Invertebrate- Animal that does not possess or develop a spinal column. Includes insects and crustaceans.

Keystone species- Species that are of demonstrable importance for ecosystem function (Cottee-Jones and Whittaker 2012). These species may contribute more to the conservation of biological diversity, through their impacts on other species, than expected based on their relative abundance, and their removal is likely to lead to a reduction in species diversity or change in community structure or dynamics.

Macrogroup- A particular classification of vegetation from the United States (US) National Vegetation Classification System database. This classification is based on dominant and diagnostic growth forms and species composition similarity.

Mammal- A warm-blooded vertebrate animal of the class Mammalia that is distinguished by the possession of hair or fur, the secretion of milk by females for the nourishment of their young, and (typically) the birth of live young.

Marsh- A type of wetland containing grasses, rushes (*Juncus* spp.), reeds, cattails (*Typha* spp.), sedges, and other herbaceous plants in shallow water.

Microplastic- Small pieces of plastic (e.g., less than 5 mm [0.2 in] long) in the environment resulting from the disposal and breakdown of consumer products and industrial waste.

Mollisol- Prairie or grassland soil that has a dark-colored surface horizon. Highly fertile and rich in chemical "bases" such as calcium and magnesium.

Mollusc- An invertebrate of the large Mollusca phylum that includes snails, slugs, mussels, and octopuses. Characterized by a soft, unsegmented body; live in aquatic or damp habitats; and most species have an external calcareous (containing calcium carbonate [$CaCO_3$]) shell.

Montane- Of, growing in, or inhabiting mountains.

Native species- Originating and adapting in a certain place or region; indigenous.

Neotropical migrant- A bird that breeds in Canada and the US during the summer and spends the winter in Mexico, Central America, South America, or the Caribbean islands.

Non-native species- Species that are not native to the ecosystem and are introduced from elsewhere.

Obligate- Plants or animals able to exist or survive only in a particular environment or by assuming a particular role.

Perennial- Body of water that contains water at all times except during extreme drought.

Per- and polyfluoroalkyl substances (PFAS)- Group of synthetic chemical compounds that have multiple fluorine atoms attached to an alkyl (type of hydrocarbon) chain; also known as "forever chemicals". These chemicals are typically used to help products resist heat, stains, and water and have been linked to harmful health effects in humans and wildlife (Witt et al. 2024).

Physiology- Branch of biology that deals with the normal functions of living organisms and their parts; the way in which a living organism or body part functions.

Playa- A desert basin with no outlet that periodically fills with water to form a temporary lake.

Prescribed burning- Planned burning carried out by land-management agencies under specific weather conditions to remove excess plant material and replicate natural fire regimes.

Recruitment- Reinforcement of a population of a species with new members through reproduction or immigration.

Reptile- A cold-blooded vertebrate of the Reptilia class that includes snakes, lizards, crocodiles, turtles, and tortoises. They are characterized by having a dry, scaly skin and, typically, by laying soft-shelled eggs on land.

Riparian habitat- Transitional, semiterrestrial areas regularly influenced by fresh water, usually extending from the edges of water bodies to the edges of upland communities.

Savanna- Grassland habitat with widely spaced trees or shrubs.

Seep- A generally small area where water rises slowly to the ground surface, typically without a well-defined point of origin.

Spring- The location where an underground source of water emerges from the ground, generally from a single point of origin.

Steppe- A semi-arid grassland that occurs in temperate climates.

Talus slope- Slope formed by an accumulation of broken rock debris, as at the base of a cliff or other high place.

Taxa- Taxonomic categories or groups, such as a phylum, class, order, family, genus, or species.

Threatened species- Species of plant or animal of concern that is likely to become Endangered.

Vertebrate- Animal that has a spinal column.

Watershed- Topographically delineated area drained by a stream system; also known as a catchment or basin. In other words, the total land area above some point on a stream or river from which water drains past that point.

Wildland-urban interface (WUI)- Zone of contact between human development and undeveloped, forested habitats.

Xeric- As used in this document, habitats and plants found in arid regions that lack humidity and water.

New Mexico Department of Game and Fish
1 Wildlife Way, Santa Fe, New Mexico 87507

(505) 476-8000
https://wildlife.dgf.nm.gov