

Oil and Gas Development Guidelines

Conserving New Mexico's Wildlife Habitat and Wildlife



New Mexico Department of Game and Fish

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Oil and Gas Development Guidelines

Conserving New Mexico's Wildlife Habitats and Wildlife

The purpose of this publication is to provide a set of guidelines that are broadly useful to guide oil and gas development statewide. It is intended for the information and discretionary use of regulatory agencies and concerned citizens as well as industry. Oil and gas development can have negative impacts on native wildlife and habitat, primarily through fragmentation and degradation of habitat. These guidelines are intended to promote attention to conserving wildlife and habitat while continuing to develop energy resources.

Various combinations of land and mineral ownership, lease status, and land use present different possibilities and constraints for conservation planning. The recommendations are intended to be site and situation specific, implemented where they will be effective and technically and economically feasible. Numbers in parentheses refer to documents listed in Appendix E, References. Most of the documents are available online; URL addresses are provided for readers seeking additional detail on specific topics.

Targeted mitigation has the potential to conserve and restore wildlife and habitat. However, recommendations alone, no matter how sensible, will not benefit wildlife resources on the ground if there is insufficient commitment to implement such practices. We encourage industry to recognize and proactively plan and fund the full direct and administrative cost of developing, producing, abandoning, and reclaiming facilities that disrupt wildlife habitats and movements. Further, we will strive for cooperative endeavors to work with industry to most efficiently and cost effectively implement the practices described herein. Such cooperative actions will promote incentives to treat the land with regard for its natural values and will encourage realistic efforts to monitor implementation and effectiveness of mitigation measures.



Otero Mesa: Oil and gas reserves underlie relatively undisturbed wildlife habitat and coexisting rangeland with vast supplies of underground fresh water

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Background

Economic Values

According to the 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (30), these forms of recreation made more than \$1 billion in direct contribution to New Mexico's economy in that year. The survey indicates that 314,000 anglers spent \$176 million in New Mexico on trip and equipment costs, 130,000 hunters spent \$153 million, and 671,000 wildlife watchers spent \$558 million. Another \$138 million was spent on licenses, contributions, land ownership and leasing, and other items and services. Nationally, the annual value of wildlife activities stayed fairly constant from 1991 through 2006, the most recent year for which data are available. State by state data for 2006 will be published in November 2007. These activities support at least 17,000 jobs in New Mexico.

In addition to economic activity generated directly by consumptive and appreciative uses, conservation of species and habitat can yield indirect economic benefit. Examples of indirect benefit from natural ecosystems include pollination services from birds, bats and insects; pest insect predation by birds and bats; flood control and range productivity; and scientific and educational values. Augmentation of property

value from proximity to desirable scenic or recreational open space, which often includes a wildlife component, is also classified as an indirect economic benefit. Many people attribute importance to non-use benefits of a cultural, spiritual, historic, or esthetic nature. Economic techniques exist to assign dollar value to indirect and non-use benefits, although such valuation has not been estimated for New Mexico (8).

New Mexico has been a major producer of oil and gas since they were first discovered here in the 1920s. Direct revenues to the state from the oil and gas industry in 2006 were approximately \$2.5 billion, in the form of taxes, royalties, and lease payments. These payments fluctuate with petroleum prices. In recent years, they have contributed from 10% to 25% of the state's General Fund revenue. Royalties earned by the oil, gas and mineral industries comprise 95% of the revenue deposited into the Land Grant Permanent Fund, which supports education in New Mexico. The industry employs 23,000 temporary or permanent New Mexico residents, generally at wages higher than the average income for the state.



Anglers spent \$176 million in 2001

Bird watchers contribute to New Mexico's economy



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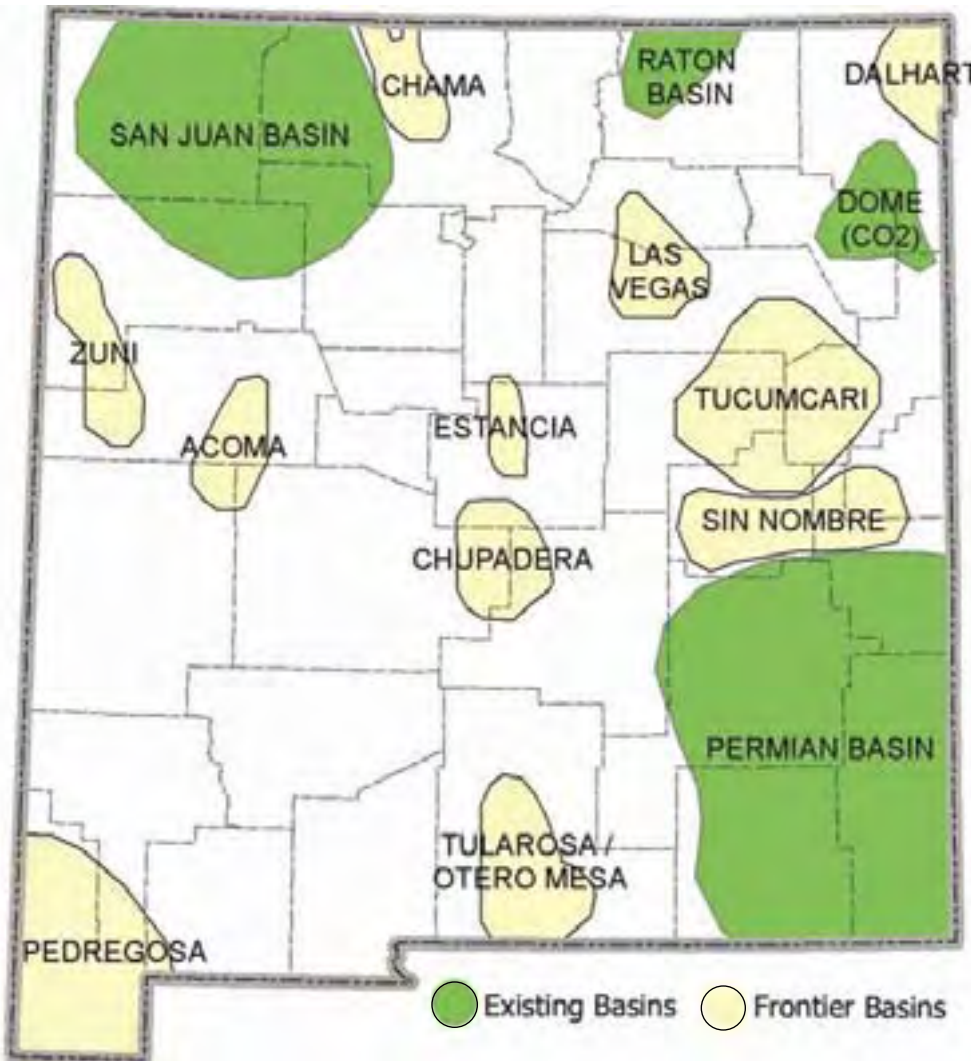
Conservation Context

New Mexico has 2 producing basins of national significance. The San Juan Basin in the northwest corner of the state produces mostly natural gas, with the primary product being coalbed methane. The Permian Basin in the southeast corner of the state produces both gas and liquid oil. These basins have been in operation for more than 80 years and development continues at a robust pace. A smaller production area, the Raton Basin, is

other indications include the Tularosa/Otero Mesa, Sin Nombre, and Tucumcari basins. However, it is unknown what amount of the resource is economically extractable. The other basins shown on the accompanying map are considered to have low or moderate potential for development. The Pedregosa, Las Vegas, and Chama basins are internally very complex. Therefore any productive oil or gas fields in these basins will probably be of limited areal extent. Significant exploration is currently occurring in the Sin Nombre and Tucumcari basins.

Other areas of the state, which have experienced little exploration to date, such as the Galisteo and Albuquerque basins, may prove to be productive in the future.

In 2006, the New Mexico Department of Game & Fish (NMDGF), with assistance of about 170 cooperators, prepared the Comprehensive Wildlife Conservation Strategy (CWCS) for New Mexico (16). The CWCS is intended as a guiding document and should be consulted when considering adoption of broad-scale plans or policies which may affect conservation of the state's biodiversity. The Strategy focuses on Species of Greatest Conservation Need (SGCN), key wildlife habitats essential to sustain the SGCN, and overcoming the challenges affecting the conservation of



Existing and frontier oil and gas development basins active in the northeast.

Frontier basins are presently nonproductive and poorly explored regions, having geologic characteristics in common with producing basins, where research has been initiated. Frontier basins with particularly high oil and gas potential, based on source material, geologic structure, or

both. The desired outcome is that New Mexico's key habitats persist in the condition, connectivity, and quantity necessary to sustain viable and resilient populations of resident SGCN, and host a variety of land uses with reduced resource use conflicts.

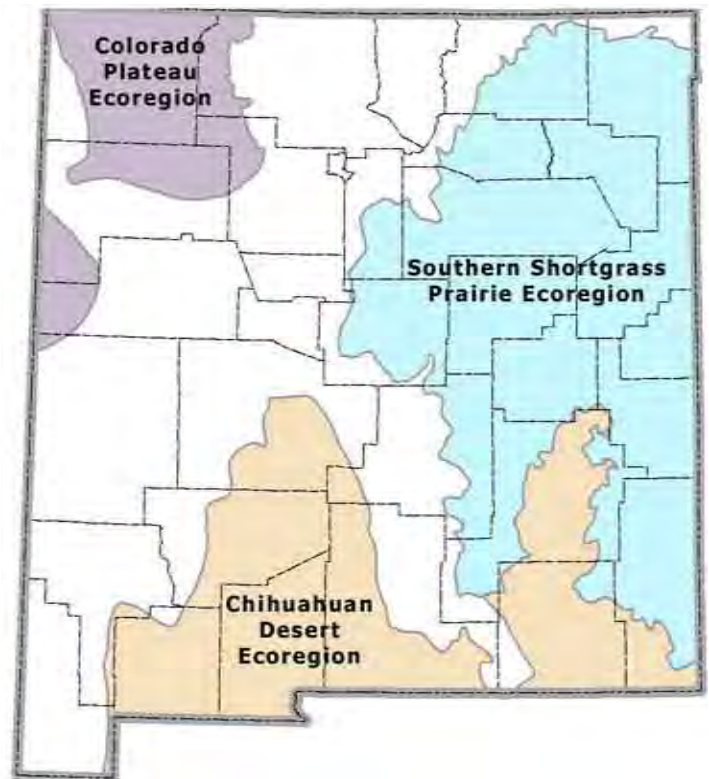
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An ecoregion is defined as a relatively large area of land or water which contains characteristic and geographically distinct assemblages of natural communities and species. Specific land covers within each ecoregion that were determined to be ecologically significant in New Mexico were identified as CWCS “key habitats”. Lists of SGCN associated with the key habitats most affected by oil and gas development are shown in Appendix A.

The San Juan Basin is within the Colorado Plateau Ecoregion. The single key habitat is the Inter-mountain Basins Big Sagebrush Shrubland. The vegetation composition of this habitat has been severely modified and fragmented over time and continues to be altered by energy development, grazing, and invasive species. A total of 15 SGCN are associated with the Inter-mountain Basins Big Sagebrush Shrubland.

The Permian Basin is within the Southern Shortgrass Prairie and Chihuahuan Desert ecoregions. Four frontier basins – Tucumcari, Sin Nombre, Las Vegas, and Estancia – are also in the Southern Short-grass Prairie ecoregion. Key habitats within the Southern Shortgrass Prairie are the Western Great Plains Sandhill Sagebrush Shrubland and the Western Great Plains Shortgrass Prairie. The Western Great Plains Sandhill Sagebrush Shrubland is a mosaic of hummock and coppice dunes dominated by sand sage and/or shinnery oak. This habitat occurs over 900 square miles of Chavez, Eddy, Lea, and Roosevelt Counties and does not occur elsewhere in New Mexico. The Western Great Plains Shortgrass Prairie evolved with frequent vegetative disturbance from grazing by American bison and other herbivores, drought, fire, and storms. Prairie dogs, and the ground disturbance which resulted from their burrowing, were a vital component of this habitat. These natural disturbance factors served to alter vegetation, create open habitat, and modify soil, nutrient, and energy cycles. The plants and animals that evolved here were well adapted to those cycles and the variance of frequency, type, and level of disturbance created a vast mosaic of biodiversity. There are 29 SGCN identified associated with the 2 key habitats of the Southern Shortgrass Prairie Ecoregion.

Key habitats in the Chihuahuan Desert ecoregion include the Chihuahuan Semi-desert Grassland and the Western Great Plains Sandhill Sagebrush Shrubland. There are 59 SGCN associated with the key habitats in this ecoregion. The Tularosa/Otero Mesa frontier basin is within the Chihuahuan Desert Ecoregion.



Key ecoregions affected by oil and gas development

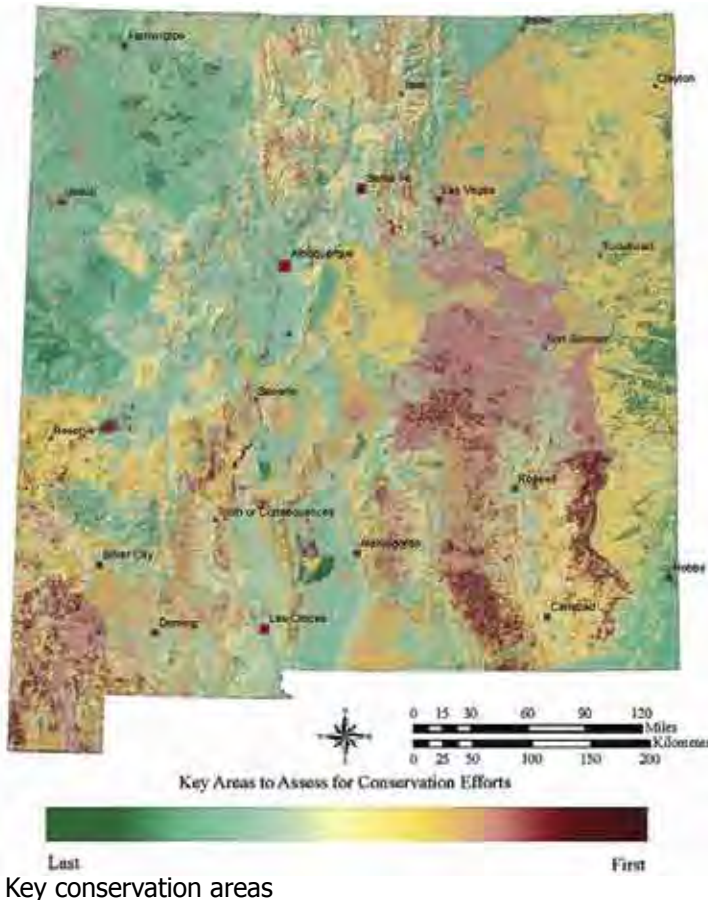
The majority of the Pedregosa Basin is found within the Apache Highlands Ecoregion in far southwest New Mexico. Key habitats include the Chihuahuan Desert Grassland, Madrean Encinal, and Madrean Pine-Oak Forest and Woodland. Approximately 102 SGCN, excluding arthropods other than crustaceans, occur in the key habitats of this ecoregion. A small portion of the Pedregosa Basin lies within the Chihuahuan Desert Ecoregion.

The Raton and other frontier production basins of New Mexico are located within other New Mexico ecoregions. The Raton basin does not contain significant portions of any CWCS key terrestrial habitats.

In addition to terrestrial habitats, oil and gas development has the potential to affect statewide

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key aquatic habitats. These aquatic habitats are perennial large reservoir and 1st through 5th order streams, perennial tanks and man-made catchments, as well as geographically isolated wetlands. The CWCS includes lists of Species of Greatest Conservation Need for aquatic habitats by watershed.



Geographically Isolated Wetlands refers to ephemeral natural catchments, marsh/cienegas, and ephemeral 1st and 2nd order streams. (These may include both “jurisdictional” and “non-jurisdictional” wetlands as defined by the US Army Corps of Engineers). Wetlands that can be considered “geographically isolated” represent a considerable amount of the United States’ ecological diversity and provide habitat for a considerable portion of the nation’s flora and fauna. These habitats are even more important in the arid and semi-arid southwest. Significant loss of isolated wetland habitats could seriously affect opportunities for the survival and recovery of many rare or endangered species that depend

on them. New Mexico has 34 SGCN associated with geographically isolated wetland habitat.

The Key Conservation Areas map on the left illustrates key areas for focusing biodiversity conservation efforts as identified in the CWCS. The map was derived using 4 criteria: key habitats, SGCN presence, analysis of factors that influence habitats, and land status estimates. Assessment of influences primarily considered factors that are harmful to wildlife at certain levels of use or extent; it is the manner in which a human activity or practice is conducted that determines its effects on wildlife populations. Land status estimates pertain to management plans, allowed uses, and level of protection from conversion of natural land cover.

“Potential Effects of Climate Change in New Mexico” (26), a state interagency study, projects that “Climate change and global warming are expected to impact the distribution and biological characteristics of plants and animals, and affect individuals, species, populations, and ecosystems . . . “. Of particular concern for wildlife conservation are the predicted loss of alpine and subalpine high elevation habitat, and reduced instream flow due to higher evaporation rates.

Executive Order 05-033 (27), signed by Governor Bill Richardson on June 5, 2005, established the New Mexico Climate Change Advisory Group (CCAG), a stakeholder group coordinated through the New Mexico Environment Department (NMED). CCAG’s Final Report (11) found that oil and gas extraction, transport, and processing contributes an estimated 23% of greenhouse gas (GHG) emissions in the state. Emissions occur primarily via operational fuel use, release of coalbed carbon dioxide, and the venting and leakage of methane. CCAG policy recommendations specific to the oil and gas industry include detailed technical and economic feasibility studies of the capture and use or sequestration of carbon dioxide; methane loss reduction through the US Environmental Protection Agency Energy Star program; and improved compressor efficiency.

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Legal Framework

When a parcel of land is under lease, the lease holder has a contractual right to develop the mineral estate. Constraints consistent with lease rights may be imposed. In addition to compliance with non-discretionary environmental law, constraints may result from lease stipulations, the surface management agency or owner's review, and environmental analysis of the proposed operations, Notices to Lessees, Onshore Orders, or regulations. The most restrictive lease stipulation is no surface occupancy. An Application for Permission to Drill (APD) must be submitted for each proposed well. Mitigations can be attached as approval conditions for individual projects.

While a lease has geographic boundaries, it does not necessarily mean that the surface owner is also the mineral owner. The situation where different entities own the surface and mineral rights is known as "split estate". Sixty percent of the oil and gas production in New Mexico is federal mineral. The Bureau of Land Management (BLM) enforces national laws and regulations as they apply to actions taken on Federal minerals, regardless of surface ownership. Each BLM State Office is required to hold lease sales (auctions) at least quarterly if lands are available for competitive leasing. BLM issues leases for a primary term of 10 years, and must extend a lease as long as oil and gas is being produced in paying quantities, or where drilling operations are being diligently pursued.

Where mineral ownership is federal, the APD will be reviewed by BLM for approval, modification, or denial. An overview of required and recommended oilfield practices on federal land is available in the BLM Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, commonly known as the Gold Book (29). If the well is on state or fee minerals, the APD will be reviewed by the New Mexico Oil Conservation Division (OCD).

Public and state agency involvement in federal agency decisions takes place through the National Environmental Policy Act (NEPA) process. That process provides the opportunity

to supply information and recommendations for inclusion in impact statements, environmental assessments, and land use planning documents. NEPA public input procedure is still followed for planning purposes. However, the 2005 Energy Policy Act created categorical exemptions from environmental assessment for most individual oil and gas development projects, although biological and cultural clearances are still conducted. In February 2007, the Western Governors' Association (WGA) passed Policy Resolution 07-01 (37), urging Congress to remove the categorical exclusion for NEPA reviews of exploration or development of oil and gas in wildlife migration corridors and crucial wildlife habitat on federal lands. To date, Congress has not taken such action. NMDGF is an active participant in efforts by WGA and the Association of Fish and Wildlife Agencies to identify specific recommended locations for implementing the WGA resolution.

The State Land Office (SLO) manages 13 million mineral acres, of which 3 million acres currently are leased for oil and gas. The mission statement of the SLO Oil, Gas, and Minerals Division is to "Optimize revenues while protecting our heritage and our future". There is no public participation process for oil and gas planning, leasing, or project design for these lands. The lease forms and surface protection requirements are specified by state law. The Commissioner of State Lands may withdraw certain tracts from leasing based on their "special" status in regard to resource values other than recoverable minerals.

Appendix B presents a more detailed description of federal and state law and regulation as it applies to oil and gas operations. Adequate follow-up monitoring and enforcement of environmental stipulations is essential to assure their effectiveness.

General Statewide Recommendations

Habitat Loss, Degradation, and Fragmentation

Habitat loss is the direct conversion of surface area to uses not compatible with the needs of wildlife. Habitat degradation is the diminishment of habitat value or functionality. When considering widespread activities such as oilfield development, direct habitat loss has less impact than habitat degradation through fragmentation and loss of connectivity. Habitat fragmentation is the division of contiguous or

Fragmentation is generally quantified in environmental planning documents using a metric of number of point features (wellpads) or miles of linear features (roads, pipeline) per square mile. Sometimes the density of features is considered on a watershed level. Another useful index for some species is the number of undisturbed core areas of a given acreage, or percentage of area remaining a given distance



Oil and gas development roads can cause significant habitat loss and fragmentation

homogeneous blocks of wildlife habitat into smaller areas separated by physical or other barriers. Causes of habitat fragmentation are not limited to oil and gas development, but also include other cumulative disturbances such as highways, urbanization, and agriculture. Oilfield features that contribute to habitat fragmentation include roads, pipelines, powerlines, wellpads, and other industrial developments such as compressors or pump stations.

Habitat fragmentation has been associated in some cases with loss of genetic diversity. Fragmentation may also lead to population declines in species that are sensitive to human noise and activity or otherwise dependent on large blocks of habitat. Other detrimental community and population-level effects may occur.

from any road or wellpad. Magnitude of fragmentation effects vary depending on the type of disturbance and the species under consideration. A roadbed directly removes about 2 acres of habitat per mile of 16-foot wide road ($16 \text{ ft width} \times 5280 \text{ ft/mi} = 84,480 \text{ sf} = 1.94 \text{ acres}$). In a study conducted in southern Utah, the average width of roadside edges with an increased richness and cover of exotic (non-native) species was approximately 6 meters (20 feet) on each side of graded dirt roads (5). At high levels of development, zones of disturbance around individual features will begin to overlap. It is also important to consider the specific location and arrangement of disturbance or barriers in relation to habitat function and use.

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When wildlife are displaced due to habitat loss and fragmentation, it moves into areas of lower habitat value or quality, and/or areas which are already occupied at their carrying capacity. Thus overall carrying capacity is reduced at the population level. Habitat fragmentation by roads also increases accidental road kill and access opportunities for poachers. The NMDGF Habitat Handbook background paper "Habitat Fragmentation and the Effects of Roads on Habitat and Wildlife" (13) presents more information on this topic, including a research literature review.

Certain unique areas may have a level of wildlife and other values (cultural, recreational, water quality, etc.) that justifies complete protection by withholding leasing altogether. For example, the Valle Vidal unit of Carson National Forest has been administratively withdrawn from oil and gas leasing by act of Congress.

Pursuant to requirements of the Energy Policy Act of 2005, the federal Department of Energy is in the process of designating energy corridors. Energy corridors may accommodate multiple pipelines (such as for oil, gas, or hydrogen), electricity transmission lines, and related infrastructure. This effort could benefit fish and wildlife by concentrating future disturbance in limited pre-defined locations. However large corridors also have the potential to increase fragmentation effects by forming more complete barriers to animal movement. For this reason, energy corridors must be very carefully sited and should avoid to the extent feasible the following sensitive locations: state and federal areas designated for management as wilderness, wildlife refuges, parks and recreation areas, BLM Areas of Critical Environmental Concern, Inventoried Roadless Areas over 5,000 acres, major bird and mammal migration corridors, and rare and critically important habitat areas in New Mexico such as wetlands, playas, riparian areas, and big game critical winter and breeding areas.

Habitat Loss and Fragmentation - Recommended Mitigations

- Limit the total area of disturbed ground, number of wellpads, and, especially, the linear distance of roads per section. In the absence of lease stipulations, consolidate infrastructure to the extent feasible.
- Limit the number of wellpads under simultaneous active development.
- Maintain existing large blocks of undeveloped habitat, especially roadless areas.
- Use plans of development, master drilling plans and unitization agreements, as appropriate, for multiple facilities in each leasehold or watershed. Additional discussion of these planning tools can be found in the Western Governors' Association Coal Bed Methane Best Practices: A Handbook (36).
- Develop a mitigation plan for projects that will result in habitat loss or significant degradation of habitat values. The degree of mitigation should correspond to the quantity, value and scarcity of the habitat at risk. BLM Instruction Memorandum No. 2005-069 (31) establishes a policy authorizing the use of off-site compensatory mitigation.
- Minimize the construction of new roads; require closure and reclamation of obsolete roads.
- Install housing around noisy equipment that may cause disturbance to sensitive wildlife.
- Directionally drill boreholes to petroleum-bearing formations from less sensitive surface locations where technically and economically feasible. Co-locate drill holes from a single pad to multiple formations where feasible.
- Monitor wellheads using solar powered automated systems to reduce the number of wellsite visits needed (otherwise typically 1 per day).
- Pipe produced water to a central collector location for reinjection to reduce water truck travel (otherwise typically 1 visit per site per day).
- Bury pipeline along existing or planned road corridors to minimize additional surface disturbance. Follow practices described in the NMDGF Habitat Handbook Trenching Guideline (13).
- Avoid, minimize, or mitigate development in less abundant habitat types that may contribute disproportionately to regional biodiversity. Examples of special habitats include riparian zones or rimrock outcrops.
- Conduct pre-development surveys of plants and animals (including reptiles, small mammals and invertebrates, as well as fish, large mammals and birds), to establish baseline reference data for future comparison.

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Erosion and Water Quality

Road-building and clearing of wellpads may lead to erosion of sediment into watercourses, thus impairing fish spawning substrate and other aquatic wildlife habitat. Roadbeds also capture surface runoff, potentially causing reduced infiltration, a lower water table, and lower rangeland productivity. Surface clearing and compaction, and the concentration of stormwater flow energy along roadbeds, can accelerate soil loss and down-cutting of ephemeral channels. Soil survey information can be helpful when evaluating specific sites for erosion hazard.

Seismic exploration and pipeline corridors are linear developments which can have similar impacts as roads, particularly when rights-of-way become informal public roads. However, the impacts from pipelines are generally less severe than those of roads because the rights-of-way are revegetated within a shorter time frame.

The 2005 Energy Policy Act exempts most oilfield construction from stormwater sediment control requirements of the Clean Water Act. However, the state may enforce any violation of state water quality standards. Installation of pipeline river crossings may temporarily increase turbidity and reduce water quality in the construction area.

Runoff from construction worksites, access routes, staging areas, and unprotected fills could

further degrade water quality. Changes in flow caused by de-watering of the construction sites and excavation could cause direct mortality to fish and aquatic invertebrates, disrupt fish spawning, and cause mortality of incubating eggs downstream of construction sites. These impacts can

be minimized during site-specific project design, and must comply with all Clean Water Act Section 404 permitting and Section 401 certification requirements, and state water quality standards.

OCD mandates that no pits may be located below the ordinary high water mark of any watercourse, lake bed, sinkhole, or playa lake, or in any wetland.



Reclamation and restoration are related but different processes. Reclamation means returning a site to approximate original contour, and establishing a desired plant community. Restoration is a return to natural or near-natural ecosystem function. Reclamation of arid-land plant communities can be a difficult endeavor. A long-term reduction of vegetative cover and productivity should be expected in many cases.

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Erosion and Water Quality - Recommended Mitigations

- Prevent unauthorized travel on seismic and pipeline corridors.
- Implement and maintain erosion control measures suitable to site conditions and consistent with generally accepted engineering design criteria and manufacturer specifications, during and after construction activities.
- Close drilling pits in a manner that will not result in salt contamination of near-surface soil.
- Enforce and monitor revegetation requirements. Include standards for reclamation schedule and success monitoring. Continue to monitor and treat until success standards are achieved.
- Wellpad construction disturbs a larger footprint of ground than is needed for production operations. Recontour and revegetate unused disturbed ground around wellpads and above buried pipeline soon after completion of the well.
- If produced water meets the New Mexico Water Quality Control Commission surface water standards, consider using it for irrigation of reclaimed areas until vegetation is established. Recent research on various saline water treatment technologies shows promise of economic feasibility. Follow safe and legal practices for disposal of brine side-product from reverse osmosis or other purification process.
- Fencing may sometimes be appropriate to protect areas under reclamation. Follow practices described in the NMDGF Habitat Handbook Fencing Guideline (13).
- Properly align roads, on moderate grades with a side slope, and ensure adequate drainage. Drainage considerations include proper sizing, frequency, and placement of culverts.
- Maintain a vegetated buffer zone along watercourses, including ephemeral arroyos, sufficient to minimize headcutting and sediment delivery.
- Construct road and pipeline crossings perpendicular to wetland/riparian areas, including ephemeral channels. Minimize the duration of construction and concentrate activity during dry conditions. Reshape disturbed channels to their approximate original configuration.
- Avoid or minimize loss of riparian habitat at crossings. Employ silt curtains, dikes, coffer dams, or other suitable erosion control measures. Replace lost riparian woody vegetation at a ratio of 2 acres for each acre lost, and 10 saplings for each mature tree lost .
- Amend surfaces with gravel, sand, stone, cinders, or other available material for dirt roads that must be placed on soils susceptible to ruts, or on steeper grades. Limit travel during periods when the ground is wet.
- Speed limits can reduce airborne dust, but require a diligent enforcement effort on low-volume oilfield roads.

Physical and Chemical Hazards

Open pits, ponds, and lagoons have the potential to contain wastewater with salts and brines, organic chemicals, petroleum hydrocarbons, surfactants, or other substances which may pose a risk to migratory birds and other wildlife. These materials can be hazardous to wildlife through ingestion, loss of insulation due to oiled fur or feathers, or contamination of embryos through the eggshell. Even ponds or tanks containing clean water can be a physical trapping hazard for large and small

animals, especially if the sides are steep and/or lined with a slippery material.

OCD Rules require that all pits and ponds (other than drilling and workover pits), and tanks greater than 16 feet diameter, be netted or otherwise rendered non-hazardous to migratory birds. BLM requires netting or cover on all pits (other than drilling and workover pits) and tanks, of any size, containing liquid in the San Juan Basin. Although drilling pits are small and temporary, the simultaneous presence of large numbers of open pits on the landscape presents a potentially significant cumulative hazard to wildlife (34).

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Hydrogen sulfide (H_2S) is an odorous but invisible gas which is toxic to inhale. Where H_2S is associated with the formation being drilled, monitoring and control measures to minimize emissions are required by regulations of the OCD and NMED Air Quality Bureau. However, most of the required mitigation measures pertain to signage and alarm or alert systems, and are thus of limited value to protect wildlife.

An excellent example of cooperation between the oil and gas industry, government agencies, and concerned citizens is BLM Notice to Lessees Number 93-2, which requires capping of open exhaust stacks with screen cones to exclude native birds and bats. This straightforward solution implemented on all federal oil and gas facilities in the San Juan and Permian Basins has eliminated what was formerly a serious threat to birds and bats that flew down the stacks and became trapped. The State Land Office does not have a prohibition on open stacks.



Physical and Chemical Hazards - Recommended Mitigations

- Avoid grubbing or clearing stands of woody species or other vegetated areas, or conduct pre-construction nest surveys, during the migratory bird nesting season (March through August).
- Follow recommendations from the OCD manual Pollution Prevention Best Management Practices and the Pollution Prevention Pocket Guide (**18**).
- Use closed-loop drilling systems which do not involve open pits.
- Cover or net pits and tanks to exclude flying wildlife. The US Fish & Wildlife Service provides technical guidance (**35**) for pit netting design. Netting for smaller, temporary ponds may be constructed using less durable materials and methods.
- Provide escape ramps, rafts, or ladders, depending on configuration, in clean water containments where trapping hazard may exist. Escape mechanisms should be designed for effectiveness at any reasonably anticipated water level.
- Exclude wildlife from potentially hazardous long-term impoundments. Fences intended to exclude wildlife should be chain link or welded wire at least 8 feet high and wrapped at the bottom with finer mesh material to exclude small animals. Fences intended to exclude livestock and/or the public should be constructed to minimize potential injury to wildlife (see NMDGF Habitat Handbook Fencing Guideline (**13**)).
- Follow best management practices from the NMDGF Habitat Handbook Trenching Guideline (**13**) during pipeline burial to prevent wildlife mortalities from entrapment. Reptiles, amphibians, and small mammals are particularly vulnerable.
- Evaluate the need for additional H_2S mitigation where special status species may be affected.

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Noxious, Non-native, and Undesirable Plants

Weedy plant species spread along linear corridors of disturbance such as roads and pipelines, with detrimental effects to native plants and animals as well as livestock. In addition to displacing native species and disrupting locally adapted natural processes, non-native invaders can bring “unseen impacts” such as non-native bacteria, viruses, insect pests, and/or chemical defense compounds with toxic and/or allergenic properties. Non-native plant species, such as yellow sweetclover and smooth brome, are sometimes included in seed mixes sown on newly disturbed roadsides and pipelines.

The New Mexico Department of Agriculture publishes a list of noxious weed species (**12**) and an identification booklet. County and federal agencies may have their own lists of invasive species for specific geographic areas. Federal agencies have management responsibility to prevent the spread of noxious weeds.

Invasive plants infest an abandoned roadbed



Undesirable Plants - Recommended Mitigations

- Assign responsibility for weed surveillance and control by the project proponent to combat invasive species problems which result from their activities.
- Wash and/or treat drill rigs and other portable equipment which may carry soil between deployments. Wash oilfield service pickup trucks daily and after visits to areas of known weed infestation.
- Specify only native species in certified weed-free revegetation seed mixes.



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Impacts on Recreation

Recreation and tourism are major economic activities in New Mexico. Too much noise near a good fishing hole, a reduction in numbers of an interesting bird species, or excessive weedy plants such as thistles and tumbleweeds, may lead to reduced satisfaction with the outdoor experience among fishermen, hunters, hikers, nature photographers, and bird watchers. Reduced recreational use of an area, due to lower wildlife populations from habitat loss or degradation, may result in a loss of economic activity for the local community.

Winter hiking in the Valle Vidal



Impacts on Recreation - Recommended Mitigations

- Partner with resource agencies and local user groups to identify existing and potential outdoor recreation activities in areas of production and development.
- Locate above-ground facilities for the smallest visual evidence. Paint an appropriate color (darker colors are usually less evident on the landscape). Use low-profile tanks to avoid breaking the visual horizon. Leave a screen of trees around wellpads in forest or wooded areas.
- Use on-site mitigations such as noise reduction or barriers. Place seasonal restrictions on construction activities and/or wellpad density limits in areas with high visitor use, developed facilities or exceptional recreational value.
- Provide off-site mitigations such as trail relocation, repair, and enhancement.

Scaled Quail



Hunting quail in the Permian Basin

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Specific Recommendations

Big Game

Statewide, adverse effects to large mammals may include lower carrying capacity through direct and indirect habitat loss, disruption of migration routes, or disturbance or loss of critical winter range or birthing habitat. Part of the San Juan Basin oilfield is located on important winter habitat for elk and mule deer.

Increased open road density can result in vehicle avoidance reactions, illegal take, and road kills. Effective habitat diminishment due to elk avoidance of human activity may extend for 0.25 miles around each wellpad and along both sides of each road. A study of mule deer on the Pinedale, Wyoming, gas field, located in critical winter range, has documented 46% population decline after 4 years of development (resulting in surface wellpad densities of 4 to 16 per section), compared to no significant change on the control area (24). Shifts to previously low usage areas occurred even though drilling was largely confined to non-winter months. Preliminary results from a 5-year study of pronghorn in the same region indicate reduced usage and abandonment of small habitat parcels, and avoidance of areas of highly concentrated oilfield development (3).

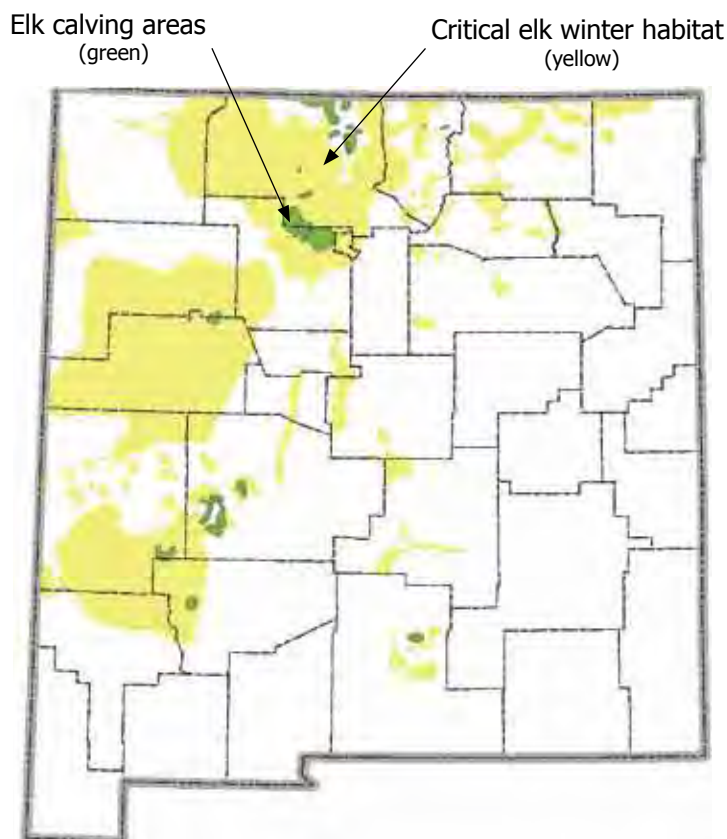
A more comprehensive discussion of this subject is available in the NMDGF Habitat Handbook 2006 Mule Deer Habitat Guideline (13) (This document is specific to the Southwest Deserts Ecoregion. A complementary document specific to the Colorado Plateau is in progress).



Elk cow and calf

Big Game - Recommended Mitigations

- Implement seasonal restrictions on important wintering or fawning areas.
- Don't construct long-term facilities in wildlife migration routes. Implement seasonal restrictions on activities in migration routes.
- Move projects to avoid locally important cover types.
- Locate drill pads, roads, and facilities below ridgelines or behind topographic feature to minimize visual and auditory effects.
- Gate single-purpose roads, and close/reclaim all unnecessary roads.
- Design reclamation plantings using locally appropriate native species suitable for big game browse.
- Institute a corporate-funded reward program for information leading to conviction of poachers, especially on winter range.
- Forbid carrying or transporting firearms by oilfield service personnel while on the job.



Critical elk winter habitat and calving areas

Conserving New Mexico's Wildlife Habitats and Wildlife

Raptors

Land use planners and project proponents statewide must avoid the direct or incidental take of raptors, their nests, or eggs, as prohibited under parts of the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Endangered Species Act. Certain life history characteristics, including typically long life spans, slow reproductive rates, and specific habitat requirements for nesting and foraging, make raptor populations particularly vulnerable to disturbances and may retard recovery of some populations. Raptors may temporarily or permanently abandon their roosting area or nests in response to disturbance. Ferruginous hawks and golden eagles are especially sensitive to human activity.



Swainson's hawk

Project proponents, property owners, and land managers can use a 4-step process to avoid negative effects on raptors. **First**, determine the potential species present in the project area, based on species range and habitat type. **Second**, prioritize species by listed status, sensitivity to disturbance, population trends, or other criteria. **Third**, conduct field surveys to determine presence/absence/status of priority

raptor species or their nests. **Fourth**, implement protective measures. Some resources are available to help determine appropriate measures. The USFWS Utah Field Office has developed a set of recommended practices, including species- and season-specific buffer distances, which is being adapted for use throughout the west (23). The Navajo Nation Natural Heritage Program publishes a set of recommendations based on raptor usage patterns specific to the Four Corners region (10).

Another option is to conduct broad-scale comprehensive surveys for species of concern, thus reducing the need for project-specific reconnaissance. For example, the State Land Office has aerially surveyed the entire eastern edge of New Mexico for golden eagle nests, to assist in evaluating potential wind farm locations. Similarly, Navajo Nation Fish and Wildlife has extensive knowledge of golden eagle and ferruginous hawk nest locations, and has mapped a coverage of intersecting buffer zones where restrictions apply.

Birds of prey frequently use power lines and support structures for perching and nesting. These raptors can be injured or electrocuted while using power lines. Standard techniques have been developed to prevent raptor collisions and electrocution at electric transmission and distribution lines.

Raptors - Recommended Mitigations

- Survey any suitable habitat (cliffs, large trees, snags) within 1 mile of a proposed project site. Contact NMDGF Conservation Services Division for guidance on baseline wildlife survey techniques.
- Determine appropriate buffer zones, and/or seasonal limitations on construction activity, based on the species involved, time and intensity of the proposed project, and site-specific characteristics of habitat and topography.
- Construct or retrofit oilfield power lines and poles following the Avian Power Line Interaction Committee (APLIC) guidance documents Suggested Practices for Avian Protection on Power Lines (2) and Mitigating Bird Collisions with Power Lines (1).

Oil and Gas Development Guidelines

Lesser Prairie-Chicken



The lesser prairie-chicken (LPC) is a grouse native to west Texas, eastern New Mexico, and portions of Colorado, Kansas, and Oklahoma. It is a candidate for Threatened listing under the federal Endangered Species Act and is considered a species of concern by NMDGF. Currently the LPC is absent or near absent from 56% of its historical range in the state. The LPC is subject to natural fluctuations in population and range occupancy, largely in response to rainfall patterns.

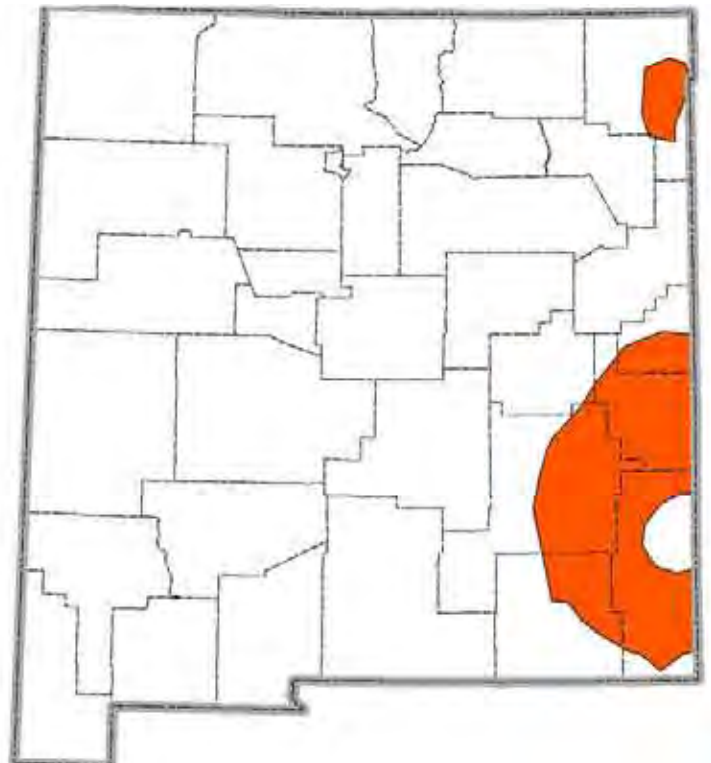
LPCs depend on mixed grass-dwarf shrub vegetation found on sandy soils, a form of the Western Great Plains Sandhill Sagebrush Shrubland habitat type. In southeastern New Mexico, LPCs use mixed stands of tall grass with shinnery oak and/or sand sagebrush. In northeast New Mexico, they historically inhabited sand sagebrush rangelands. In addition to energy development, threats to LPC conservation include intensive grazing, fencing, shrub control, and the conversion of native rangeland to irrigated agriculture.

Male LPCs start to congregate on traditional booming grounds, known as leks, in February. Booming usually starts in early March, with peak booming period around the first part of April. Females attend leks typically from late March to May and the nesting phase extends through May and early June. Nests are located an average of 2 miles from the lek site. High reproductive potential (10-14 eggs per clutch)

is offset by high nest failure and mortality of chicks and adults. Predation by mammals, birds, and reptiles is the biggest mortality factor. Populations are sustained by each year's percentage of successful nests and surviving chicks. Ultimately the survival of populations depends on the presence of large, interconnected areas containing a high percentage of usable habitat.

Recent research has documented LPC avoidance of the vicinity of man-made structures (21, 22). This avoidance reaction may reduce connectivity between subpopulations, as well as effectively eliminate otherwise suitable lekking, nesting, and brood-raising habitat.

A stakeholder group, including NMDGF as well as other state and federal agencies, ranchers, industry and conservation interests, negotiated a strategy for LPC management acceptable to all parties (19). BLM has proposed a set of special regulations based on the working group recommendations (32).



Current lesser prairie chicken range

Conserving New Mexico's Wildlife Habitats and Wildlife

Until a decision is reached on new regulations, interim management regulations include:

- Deferral of new federal leasing in the Roswell core management area, on NMDGF Prairie Chicken Areas, and within 1.5 miles of known leks,
- A development plan required for existing leases,
- Seasonal restrictions from March 15 to June 15; timing restrictions from 3:00 am to 9:00 am within the seasonal restriction period,
- Noise limits,
- No new drilling within 200 meters of known leks.

The State Land Office has temporarily withdrawn 109,000 acres from leasing within 1.5 miles of known active leks. NMDGF supports the BLM interim regulations, and recommends additional conservation measures.



Remote sensing gas line eliminates powerlines and traffic to the site

Male prairie chickens sparring on a lek



Lesser Prairie-Chicken - Additional Recommended Mitigations

- Extend the seasonal restriction from February 15 through June 30. This period encompasses the entire breeding season from the start of lek activity through brood rearing and the initiation of second nesting.
- Bury powerlines where feasible. Remove obsolete powerlines.
- Design revegetation plans in potentially suitable habitat to meet LPC requirements. Consider site reclamation successful only when LPC nesting and brood-rearing habitat needs are achieved.

Oil and Gas Development Guidelines

Sand Dune Lizard



The sand dune lizard (SDL) is a small, terrestrial lizard restricted to sand dune formations vegetated by shinnery oak, a form of the Western Great Plain Sandhill Sagebrush Shrubland habitat type. It is listed as Endangered by the state of New Mexico, and is a candidate for federal listing as Endangered.

The SDL occurs only within a small area of shinnery oak habitat in parts of southeast New Mexico and adjacent Texas. In New Mexico, the species is known to exist as fragmented populations within an area of about 900 sq. mi. in parts of Chaves, Eddy, Lea, and Roosevelt counties. However, within this area the potential and occupied habitat consists of only 655 square miles. SDLs are found throughout oil and gas fields, but overall population levels are 31 to 52% lower in oil and gas fields

compared to undeveloped areas (20). Other conservation threats include shrub removal and off-road vehicle activity.

Sand dune lizards hibernate during colder temperatures (October - April). During hibernation or seasons of inactivity, they are immobile and unable to move about and escape. Seismic exploration in occupied habitat during these periods of inactivity could result in direct killing of individual lizards. Direct kills also could occur during summer months when they are laying eggs in underground nests that could be crushed.

The working group recommendations and BLM interim management described for LPC also address conservation of the SDL (ranges of the 2 species overlap). Interim management applicable to SDL includes deferral of new leasing

Sand dune lizard range



in occupied or suitable habitat; a plan of development for existing leases; and, no surface disturbance in occupied habitat or within 100 meters of associated suitable habitat. NMDGF supports the BLM interim regulations, with the following recommendations for additional conservation measures.

Sand Dune Lizard - Recommended Mitigations

- Limit oil/gas well density to less than 13 wellpads per square mile in suitable habitat.
- Stack sand removed during pad construction on one side of the pad to be used later during site reclamation. Clean abandoned well pads and the caliche roads that serve these wells of caliche, rake, and reclaim with native sand.
- Do not reseed abandoned well pads, pipeline corridors and out-of-service roads in dunal areas.
- Reclaim to a rolling topography.
- Don't use seismic "thumper trucks" in occupied and adjacent suitable habitat during hibernation or nesting season.

Conserving New Mexico's Wildlife Habitats and Wildlife

Geographically Isolated, Spring-Fed Wetlands

Bitter Lake National Wildlife Refuge (NWR), near Roswell, is a geographically isolated spring-fed wetland system that is the only remaining occupied location in New Mexico for 4 federally endangered invertebrates. These invertebrates occur at sinkholes, springs, and associated spring runs and wetland habitats on the refuge. Bitter Lake NWR also provides habitat for the federally endangered Interior Least Tern, and 5 state threatened species listed under the New Mexico Wildlife Conservation Act (Pecos pupfish, greenthroat darter, Mexican tetra, arid land ribbon snake, and least shrew).

Isolated spring wetlands are vulnerable to lowered water tables that can result from changes in groundwater flow or loss of artesian pressure. Leaking wells, produced water in unlined pits, leaky valves, or pipeline and tanker spills can affect springwater with sulfide, chloride, or hydrocarbon contamination. Pollutants could enter underground aquifers that contribute to spring flow or contaminate springs from point source



Bitter Lake NWR and Texas hornshell range

leaks on the surface. Oil and gas development is not the only threat. Other cumulative sources include mining, spring development, dairy farms, urban discharge and illegal dumping

The BLM administers a habitat protection zone (HPZ) within the 500-year source water capture zone for the refuge. All oil and gas activities within the primary area of the HPZ must incorporate groundwater protection features including steel tanks instead of earthen pits and a stringent casing protocol.



Texas hornshell

The Texas hornshell, which is state endangered and a candidate for federal listing, occupies a limited stretch

of the Black River, a tributary to the Pecos River. It is a filter feeder which requires clean flowing fresh water. The Black River population is 1 of only 2 known populations in the United States. Like Bitter Lake, the Black River is a spring-fed system with extensive groundwater connectivity. Primary threats to this species are the construction of impoundments, groundwater depletion, and surface and ground water contamination. Long-distance transport of petroleum-derived hydrocarbon and sulfide contaminants has been documented in the karst, evaporite rock of the Black River valley. Several low-water crossings span the Black River. Transit of heavy trucks carrying petroleum-derived products could result in surface water contamination from leakage or accidents.

Geographically Isolated Spring-Fed Wetlands - Recommended Mitigations

- Implement strict groundwater protection features on oil wells within the 500-year source water capture zone for Bitter Lake where surface and mineral rights are controlled by entities other than BLM.
- Implement similar protective features on oil wells that could affect water quantity or quality along the Texas hornshell occupied stretch of the Black River.
- Develop and implement a set of best management practices on a watershed scale to protect the river, riparian corridor, and groundwater aquifer of the Black River.

Oil and Gas Development Guidelines

Research Is Needed

Biological systems are exceedingly complex. There can be serious cascading ecological consequences when these systems are disturbed. Poorly understood connections may lead to unanticipated effects. Little baseline data are available with which comparisons can later be made in the attempt to document changes, or lack thereof, due to oil and gas development. In the face of scientific uncertainty, decisions must be based on the available information and best professional judgement. In cases where serious adverse consequences may reasonably be expected, it is prudent to follow a precautionary principal.

We do not yet know the effects of the current level of habitat fragmentation. For example, the association of nest predation and parasitism with habitat fragmentation is dependent on the type of fragmentation and the landscape context at different scales (28). Study of existing highly fragmented landscapes is likely to yield information that can reduce adverse effects in areas currently in earlier stages of development.

Existing regulation of wellhead and compressor station noise levels is designed to protect human noise receptors. Little definitive work has been done on the effects of noise on wildlife.

Wild mammals and birds respond to noise disturbance with short-term avoidance behavior, however many studies have shown they become habituated. Possible negative impacts include interference with songbird or lekking bird (grouse) communication in the breeding/nesting season, and altered predator/prey dynamics. Mammals habituated to traffic may be more vulnerable to road kill.

Suggested Research Topics

- Monitor the effects of disturbance as development proceeds and throughout the productive life of the oilfield. Practice adaptive management as previously unknown effects are documented.
- Identify appropriate scales of reference for cumulative effects analysis.
- Determine species-specific effects of fragmentation on habitat utilization.
- Conduct test plot studies to develop more effective revegetation practices. Variables might include slope, aspect, soil preparation, soil amendments, irrigation, and seed mix composition.
- Research the effects of the frequencies, intensity and duration of oilfield-associated and other noise on wildlife behavior and physiology.
- Study effects on hydrogeology, including the surface expression of springs and wetlands, from coal seam dewatering, groundwater depletion or pressure changes due to drilling.



Conserving New Mexico's Wildlife Habitats and Wildlife

Appendix A

New Mexico Species of Greatest Conservation Need Chihuahuan Desert Ecoregion

Common Name	Chihuahuan Semi-Desert Grasslands	Western Great Plains Sandhill Sagebrush Shrubland
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Birds

Bald Eagle	X	
Northern Harrier	X	
Ferruginous Hawk	X	X
Golden Eagle	X	
Aplomado Falcon	X	
Lesser Prairie-Chicken		X
Montezuma Quail	X	
Scaled Quail	X	
Sandhill Crane	X	
Mourning Dove	X	X
Common Ground-Dove	X	
Burrowing Owl	X	X
Loggerhead Shrike	X	X
Gray Vireo	X	
Sage Thrasher	X	
Bendire's Thrasher	X	
Sprague's Pipit	X	
Botteri's Sparrow	X	
Baird's Sparrow	X	
Grasshopper Sparrow	X	
Varied Bunting	X	
Hooded Oriole	X	

Mammals

Mexican Long-Tongued Bat	X	
Lesser Long-Nosed Bat	X	
Arizona Myotis Bat	X	
Pocketed Free-Tailed Bat	X	
White-sided Jack Rabbit	X	
Black-tailed Prairie Dog	X	X
Northern Pygmy Mouse	X	
Yellow-Nosed Cotton Rat	X	
Mexican Gray Wolf	X	
Swift Fox	X	X
Mule Deer	X	X
Coues' White-Tailed Deer	X	
Desert Bighorn Sheep	X	



Oil production within sandhill sagebrush shrubland

Oil and Gas Development Guidelines

New Mexico Species of Greatest Conservation Need Chihuahuan Desert Ecoregion *continued*

Common Name	Chihuahuan Semi-Desert Grasslands	Western Great Plains Sandhill Sagebrush Shrubland
<i>Amphibians</i>		
Great Plains Narrowmouth Toad	X	
Tiger Salamander	X	X
<i>Reptiles</i>		
Ornate Box Turtle	X	
Collared Lizard	X	X
Sand Dune Lizard		X
Bunch Grass Lizard		X
Texas Banded Gecko		X
Gray-Checkered Whiptail	X	
Gray-Banded Kingsnake	X	
Milk Snake	X	X
Western Diamondback Rattlesnake	X	X
Desert Massasauga	X	X
<i>Molluscs</i>		
New Mexico Ramshorn Snail	X	
Three-Toothed Column Snail	X	
Distorted Metastoma Snail	X	
Whitewashed Radabotus Snail	X	
Woodlandsnail	X	
Organ Mountain Talussnail	X	
Franklin Mountain Talussnail	X	
Dona Ana Talussnail	X	
San Luis Mountains Talussnail	X	
Northern Treeband Snail	X	

Chihuahuan semi-desert grasslands



Oil and Gas Development Guidelines

New Mexico Species of Greatest Conservation Need Southern Shortgrass Prairie Ecoregion *continued*

Common Name	Western Great Plains Sandhill Sagebrush	Western Great Plains Shortgrass Prairie Shrubland
<i>Birds continued</i>		
Ferruginous Hawk	X	X
Lesser Prairie-Chicken	X	X
Mourning Dove	X	X
Burrowing Owl	X	X
Loggerhead Shrike	X	X
<i>Mammals</i>		
Least Shrew		X
Arizona Myotis Bat		X
Prairie Vole		X
Black-Tailed Prairie Dog	X	X
Swift Fox	X	X
Mule Deer	X	X
<i>Amphibians</i>		
Western Chorus Frog		X
Plains Leopard Frog		X
Tiger Salamander	X	X
<i>Reptiles</i>		
Ornate Box Turtle	X	X
Collared Lizard	X	X
Sand Dune Lizard		X
Milk Snake	X	X
Western Diamondback Rattlesnake	X	X
Desert Massasauga	X	X

Western Shortgrass Prairie



New Mexico Species of Greatest Conservation Need Perennial Tank Habitats and Ephemeral Aquatic Habitats

Common Name	Perennial Habitat	Ephemeral Habitats			
	Tank	1st and 2 nd Order Stream	Marsh/ Cienega	Man-made Catchments	Natural Catchments
Birds					
American Bittern			X		X
Common Black-Hawk	X		X		
Sandhill Crane					X
Northern Pintail	X		X	X	X
Bald Eagle	X		X	X	X
Peregrine Falcon			X		
Southwestern Willow Flycatcher			X		
Eared Grebe	X				X
Northern Harrier			X		
White-Faced Ibis	X		X	X	X
Wilson's Phalarope	X		X	X	X
Interior Least Tern	X				
Mammals					
Allen's Big-Eared Bat	X				
Pocketed Free-Tailed Bat	X				
Western Red Bat	X				
Spotted Bat	X				
NM Meadow Jumping Mouse			X		
Desert Bighorn Sheep	X		X	X	X
Prairie Vole			X		
Amphibian					
Western Chorus Frog	X	X	X	X	X
Chiricahua Leopard Frog	X		X	X	X
Lowland Leopard Frog		X			
Northern Leopard Frog	X		X	X	X
Plains Leopard Frog	X			X	X
Rio Grande Leopard Frog	X				
Tiger Salamander	X		X	X	X
Arizona Toad		X		X	X
Colorado River Toad				X	X
Great Plains Narrowmouth Toad				X	X

Oil and Gas Development Guidelines

New Mexico Species of Greatest Conservation Need Perennial Tank Habitats and Ephemeral Aquatic Habitats *continued*

Common Name	Perennial Habitat	Ephemeral Habitats			
	Tank	1st and 2 nd Order Stream	Marsh/ Cienega	Man-made Catchments	Natural Catchments
Reptiles					
Arid Land Ribbon Snake	X	X	X		X
Western Painted Turtle	X				
Big Bend Slider	X				
Mexican Garter Snake				X	
Sonoran Mud Turtle	X		X	X	X



Riparian Habitat

Ephemeral Tank



Appendix B

Environmental Laws and Regulations

Federal Laws and Regulations

Federal oil and gas development in New Mexico is regulated by the Bureau of Land Management (BLM), as surface administrator and trustee of the Federal Mineral Estate. Other federal agencies, such as the Forest Service (USFS), may also be involved as surface administrators. The Mineral Leasing Act of 1920, Federal Land Policy and Management Act of 1976, the Energy Policy Act of 2005, and the revised Onshore Order No. 1 (43 CFR Part 3160 and 36 CFR Part 228) are the main federal laws and regulations that direct development of federal oil and gas.

The USFS authorizes and controls all activities concerned with surface operations on lands the agency administers. The BLM issues the lease, in accordance with USFS specifications and stipulations. The USFS manages the surface, which includes wildlife and fish protection measures. Regulations affecting development on National Forests can be found under 36 CFR 228 subpart e, at the National Minerals and Geology internet site http://www.fs.fed.us/geology/mgm_leasable.html/.

The U.S. Fish and Wildlife Service (USFWS) administers a number of laws designed to protect particular species of wildlife, including the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA), and the Bald and Golden Eagle Protection Act. The purposes of the ESA include providing a means whereby the ecosystem upon which endangered and threatened species depend may be conserved, and to providing a program for the conservation of such species. Section 7 requires federal agencies to consult with USFWS prior to engaging in any action which may adversely affect a listed species. Some listed species in New Mexico have designated Critical Habitat, where additional restrictions on land use may be applied. The MBTA makes it unlawful to hunt, take, capture, kill, possess, import or export any migratory birds. Contact

USFWS for more information and/or technical assistance before conducting activities which may affect species protected by these laws.

The objective of the Clean Water Act (CWA) (33 USC 1252, *et. seq.*) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The CWA specifies 2 permitting programs: one to regulate point source discharges (Section 402) and another to regulate dredge and fill activities (Section 404). The CWA also specifies a voluntary program for reducing the impacts from dispersed sources (nonpoint sources) of pollutants to waters. Some oil and gas development activities are covered by the point source permitting program. EPA Region 6 manages the point source permitting program for New Mexico facilities. The 2005 Energy Policy Act exempts most oilfield construction from stormwater permit requirements of the Clean Water Act.

As a result of a 2001 Supreme Court decision, *Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers*, 2001, some wetlands and other waters that are considered "geographically isolated" from navigable waters no longer fall under the jurisdiction of the Clean Water Act. Although an unknown but potentially significant number and acreage of these isolated wetlands may lose protection under the Clean Water Act, some may continue to receive protection through other regulatory or voluntary incentive mechanisms.

Activities related to oil and gas development may require Section 404 permitting coverage from the U.S. Army Corps of Engineers (USACE) if there are discharges to jurisdictional waters. If the activities are authorized by a Section 404 permit, then a Section 401 Water Quality Certification is required. The activity may be covered under a general nationwide permit (NWP). The USACE has issued close to 50 NWPs. Authorization is subject to meeting the conditions within the NWP, regional conditions developed by the USACE District overseeing New

Oil and Gas Development Guidelines

Mexico, and the Section 401 Water Quality Certification. More information on Section 404, Section 401 and applications may be viewed at the USACE Albuquerque District Regulatory web site at: <http://www.spa.usace.army.mil/reg/default.asp/>.

State Laws and Regulations

In New Mexico, certification for NWP's can be issued, denied, waived, or conditioned by the appropriate water quality certification authority for the project area (NMED, tribal government, or EPA Region 6 where appropriate). In 2007, NMED denied Section 401 certification of discharges to intermittent, perennial, and wetland surface water and Outstanding National Resource Waters (ONRW) that are regulated by Nationwide Permits. In accordance with General Condition 21 of the Nationwide Permits, a project-specific Section 401 Water Quality Certification must be obtained (see 33 CFR 330.4(c)) to discharge dredge or fill material to any intermittent, perennial, and wetland surface waters and to any ONRW prior to construction.

NMED requires a complete joint USACE - NMED application and USACE permit verification prior to commencing the water quality certification review. For discharges regulated by NWP's to ephemeral surface waters, NMED issued a conditional Section 401 Water Quality Certification.

The certification contains numerous conditions that may be viewed at: <http://www.nmenv.state.nm.us/SWQB/WPS/NMEDSection401WQCEphemeralBlanketNWP2007.pdf/>. EPA Region 6 certifies projects on tribal lands in New Mexico where the tribe does not have water quality certifying authority.

The New Mexico Water Quality Act (74-6 NMSA) authorizes the Water Quality Control Commission (WQCC) to approve rules to protect water quality of the waters of the state. Surface water quality standards (20.6.4 NMAC) include requirements to protect all classified waters and unclassified ephemeral, intermittent, or perennial waters. Ground water quality protection requirements (20.6.2 NMAC) protect ground water quality and related wildlife impacts from discharges to the grounds surface, pits, lagoons, or other surface features. As a constituent agency



Conserving New Mexico's Wildlife Habitats and Wildlife

of the WQCC, the state Energy, Minerals and Natural Resources Department, Oil Conservation Division (OCD) is empowered to prevent or abate water pollution resulting from exploration, development, production, or storage of crude oil or natural gas, the treatment of natural gas or the refinement of crude oil, including administering the WQA.

The primary responsibility of OCD is regulation of oil and gas well spacing to protect correlative rights. OCD also enforces some environmental rules. OCD regulations can be found under Title 29 Chapter 15 of the New Mexico Code of Regulations. Recently passed rules include expanded general enforcement powers, new requirements for oilfield pits, prohibition of pits in the Otero Mesa area, and operation of surface waste management facilities.

The executive at the State Land Office (SLO) is the Commissioner of Public Lands, an elected official of the executive branch. At the time of statehood the federal government and New Mexico entered into the Enabling Act which is the principal document that governs the SLO's management of trust lands. In addition, trust lands are governed by Chapter 19 of NMSA 1978. The primary purpose of state trust land is to generate income which is used to support the public institutions designated as beneficiaries. Oil and gas leasing and operations on state trust land are governed by 19-10-1, *et seq.* NMSA 1978. The statutory leases contained in 19-10-4.1 *et seq.* NMSA 1978 are the primary documents addressing specific oil and gas operations on state trust land. More information is available by viewing the SLO Oil and Gas Manual at: <http://www.nmstatelands.org/PDFs/OandG/New-Manual.pdf/>.

The New Mexico Wildlife Conservation Act (WCA, NMSA 17-2-37) authorizes the NMDGF to create a list of endangered or threatened wildlife within the state, and to take steps to protect and restore populations of species on the list. Actions causing the death of a state endangered animal are in violation

of the WCA. In addition, USFWS and NMDGF maintain lists of species considered to be particularly sensitive or at risk. State and federal listed species in the major oil producing regions of New Mexico are shown in Appendix C (not all of these species have suitable habitat in oil and gas development areas). Project proponents and/or land managing agencies should contact NMDGF and the USFWS for current Wildlife of Concern lists (available by county) and consult appropriate state and federal wildlife agencies when planning and implementing oil and gas activities. In addition to endangered species, songbirds, raptors, and horned lizards are protected by state law.

In 2007, the legislature passed, and Governor Richardson signed, the Surface Owner Protection Act. Under the Act, surface owners who don't own the mineral rights below their property must be notified 30 days prior to beginning any drilling-related activity. Surface owners must receive a description of proposed oil and gas operations so they can evaluate the potential impacts to their property. Oil and gas operators must compensate landowners for the use of their property, and pay for any damages caused by activities like drilling and road building. The Act also requires oil and gas operators to reclaim surface disturbance when they are done.

On surface owned or controlled by the State Game Commission, NMDGF generally has the same rights as any surface owner involved in oil and gas development. On these lands, it is the stated policy of the Commission to prohibit uses that are incompatible with providing quality habitat for wildlife.



Oil and Gas Development Guidelines

Appendix C

NEW MEXICO WILDLIFE OF CONCERN

For complete up-dated information on federal-listed species, including plants, see the US Fish & Wildlife Service NM Ecological Services Field Office web site at <http://www.fws.gov/ifw2es/NewMexico/SBC.cfm/>. For information on state-listed plants, contact the New Mexico Energy, Minerals and Natural Resources Department, Division of Forestry, or go to <http://nmrareplants.unm.edu/>. If your project is on Bureau of Land Management, contact the local BLM Field Office for information on species of particular concern. If your project is on a National Forest, contact the Forest Supervisor's office for species information.

San Juan Basin Counties

Common Name	Scientific Name	NMDGF	USFWS	Critical Habitat
Red Fox	<i>Vulpes vulpes</i>	s		
Ringtail	<i>Bassariscus astutus</i>	s		
American Marten	<i>Martes americana origenes</i>	T		
Black-footed Ferret	<i>Mustela nigripes</i>	E		
Western Spotted Skunk	<i>Spilogale gracilis</i>	s		
Goat Peak Pika	<i>Ochotona princeps nigrescens</i>	s	SOC	
White-tailed Jack Rabbit	<i>Lepus townsendii campanius</i>	s		
Yellow-bellied Marmot	<i>Marmota flaviventris</i>	s		
Gunnison's Prairie Dog	<i>Cynomys gunnisoni</i>	s		
Heather Vole	<i>Phenacomys intermedius intermedius</i>	s		
New Mexican Jumping Mouse	<i>Zapus hudsonius luteus</i>	E	SOC	
Western Small-footed Myotis Bat	<i>Myotis ciliolabrum melanorhinus</i>	s		
Yuma Myotis Bat	<i>Myotis yumanensis yumanensis</i>	s		
Little Brown Myotis Bat	<i>Myotis lucifugus carissima</i>	s		
Occult Little Brown Myotis Bat	<i>Myotis lucifugus occultus</i>	s		
Long-legged Myotis Bat	<i>Myotis volans interior</i>	s		
Fringed Myotis Bat	<i>Myotis thysanodes thysanodes</i>	s		
Long-eared Myotis Bat	<i>Myotis evotis evotis</i>	s		
Spotted Bat	<i>Euderma maculatum</i>	T		
Pale Townsend's Big-eared Bat	<i>Corynorhinus townsendii pallescens</i>	s	SOC	
Big Free-tailed Bat	<i>Nyctinomops macrotis</i>	s		
Brown Pelican	<i>Pelecanus occidentalis</i>	E		
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>	T		
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	T	
Northern Goshawk	<i>Accipiter gentilis</i>	s	SOC	
Common Black-Hawk	<i>Buteogallus anthracinus</i>	T	SOC	
Peregrine Falcon	<i>Falco peregrinus</i>	T	SOC	
White-tailed Ptarmigan	<i>Lagopus leucurus</i>	E		
Mountain Plover	<i>Charadrius montanus</i>	s	SOC	
Least Tern	<i>Sterna antillarum</i>	E	E	
Black Tern	<i>Chlidonias niger surinamensis</i>		SOC	
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	s	C	
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	s	T	Y
Boreal Owl	<i>Aegolius funereus</i>	T		
Burrowing Owl	<i>Athene cunicularia</i>		SOC	

Conserving New Mexico's Wildlife Habitats and Wildlife

New Mexico Wildlife of Concern

San Juan Basin Counties *continued*

Common Name	Scientific Name	NMGF	USFWS	Critical Habitat
Black Swift	<i>Cypseloides niger</i>	s		
Broad-billed Hummingbird	<i>Cynanthus latirostris</i>	T		
Costa's Hummingbird	<i>Calypte costae</i>	T		
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E	E	Y
Loggerhead Shrike	<i>Lanius ludovicianus</i>	s		
Gray Vireo	<i>Vireo vicinior</i>	T		
Baird's Sparrow	<i>Ammodramus bairdii</i>	T	SOC	
Rio Grande Cutthroat Trout	<i>Oncorhynchus clarki</i>	s	SOC	
Rio Grande Chub	<i>Gila pandora</i>	s		
Roundtail Chub	<i>Gila robusta</i>	E	SOC	
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	E	E	Y
Zuni Bluehead Sucker	<i>Catostomus discobolus yarrowi</i>	E	C	
Razorback Sucker	<i>Xyrauchen texanus</i>	s	E	Y
Jemez Mountains Salamander	<i>Plethodon neomexicanus</i>	E	SOC	
Western Boreal Toad	<i>Bufo boreas boreas</i>	E	SOC	
Southwestern Fence Lizard	<i>Sceloporus cowlesi</i>	s		
Socorro Mountainsnail	<i>Oreohelix neomexicana</i>	s		

Permian Basin Counties

Common Name	Scientific Name	NMDGF	USFWS	Critical Habitat
Sandhill White-tailed Deer	<i>Odocoileus virginianus texana</i>	s		
Red Fox	<i>Vulpes vulpes</i>	s		
Swift Fox	<i>Vulpes velox velox</i>	s	SOC	
Ringtail	<i>Bassariscus astutus</i>	s		
Black-footed Ferret	<i>Mustela nigripes</i>	E		
Western Spotted Skunk	<i>Spilogale gracilis</i>	s		
Common Hog-nosed Skunk	<i>Conepatus leuconotus</i>	s		
Pecos River Muskrat	<i>Ondatra zibethicus ripensis</i>	s	SOC	
Least Shrew	<i>Cryptotis parva</i>	T		
Western Small-footed Myotis Bat	<i>Myotis ciliolabrum melanorhinus</i>	s		
Yuma Myotis Bat	<i>Myotis yumanensis yumanensis</i>	s		
Cave Myotis Bat	<i>Myotis velifer</i>	s		
Long-legged Myotis Bat	<i>Myotis volans interior</i>	s		
Fringed Myotis Bat	<i>Myotis thysanodes thysanodes</i>	s		
Long-eared Myotis Bat	<i>Myotis evotis evotis</i>	s		
Eastern Red Bat	<i>Lasiurus borealis</i>	s		
Pale Townsend's Big-eared Bat	<i>Corynorhinus townsendii pallescens</i>	s	SOC	
Big Free-tailed Bat	<i>Nyctinomops macrotis</i>	s		
Black-tailed Prairie Dog	<i>Cynomys ludovicianus ludovicianus</i>	s	SOC	
Guadalupe Pocket Gopher	<i>Thomomys bottae guadalupensis</i>	s	SOC	
Nelson's Pocket Mouse	<i>Chaetodipus nelsoni canescens</i>	s		

s = sensitive T = Threatened E = Endangered SOC = Species of Concern C = Candidate Y = Yes

Oil and Gas Development Guidelines

Permian Basin Counties *continued*

Common Name	Scientific Name	NMDGF	USFWS	Critical Habitat
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	T	
Northern Goshawk	<i>Accipiter gentilis</i>	s	SOC	
Common Black-Hawk	<i>Buteogallus anthracinus</i>	T	SOC	
Applomado Falcon	<i>Falco femoralis</i>	E	Exp	
Peregrine Falcon	<i>Falco peregrinus</i>	T	SOC	
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	s	C	
Piping Plover	<i>Charadrius melodus circumcinctus</i>	T	T	
Mountain Plover	<i>Charadrius montanus</i>	s	SOC	
Least Tern	<i>Sterna antillarum</i>	E	E	
Black Tern	<i>Chlidonias niger surinamensis</i>		SOC	
Common Ground-Dove	<i>Columbina passerina</i>	E		
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	s	SOC	
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	s	T	Y
Burrowing Owl	<i>Athene cunicularia</i>		SOC	
Broad-billed Hummingbird	<i>Cynanthus latirostris</i>	T		
Lucifer Hummingbird	<i>Calothorax lucifer</i>	T		
Northern Beardless-Tyrannulet	<i>Camptostoma imberbe</i>	E		
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E	E	Y
Thick-billed Kingbird	<i>Tyrannus crassirostris</i>	E		
Loggerhead Shrike	<i>Lanius ludovicianus</i>	s		
Bell's Vireo	<i>Vireo bellii</i>	T	SOC	
Gray Vireo	<i>Vireo vicinior</i>	T		
Baird's Sparrow	<i>Ammodramus bairdii</i>	T	SOC	
Varied Bunting	<i>Passerina versicolor</i>	T		
Brown Pelican	<i>Pelecanus occidentalis</i>	E		
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>	T		
Mexican Tetra	<i>Astyanax mexicanus</i>	T		
Rio Grande Chub	<i>Gila pandora</i>	s		
Rio Grande Shiner	<i>Notropis jemezianus</i>	s	SOC	
Pecos Bluntnose Shiner	<i>Notropis simus pecosensis</i>	E	T	Y
Suckermouth Minnow	<i>Phenacobius mirabilis</i>	T		
Blue Sucker	<i>Cycleptus elongatus</i>	E	SOC	
Gray Redhorse	<i>Moxostoma congestum</i>	T	SOC	
Headwater Catfish	<i>Ictalurus lupus</i>	s	SOC	
Pecos Pupfish	<i>Cyprinodon pecosensis</i>	T	SOC	
Pecos Gambusia	<i>Gambusia nobilis</i>	E	E	
Greenthroat Darter	<i>Etheostoma lepidum</i>	T	SOC	
Bigscale Logperch	<i>Percina macrolepida</i> (Native pop.)	T		
Western River Cooter	<i>Pseudemys gorzugi</i>	T		
Sand Dune Lizard	<i>Sceloporus arenicolus</i>	E	C	
Gray-banded Kingsnake	<i>Lampropeltis alterna</i>	E		
Blotched Water Snake	<i>Nerodia erythrogaster transversa</i>	E		
Arid Land Ribbon Snake	<i>Thamnophis proximus diabolicus</i>	T		

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Permian Basin Counties *continued*

Common Name	Scientific Name	NMDGF	USFWS	Critical Habitat
Mottled Rock Rattlesnake	<i>Crotalus lepidus lepidus</i>	T		
Texas Hornshell	<i>Popenaias popeii</i>	E	C	
Pecos Springsnail	<i>Pyrgulopsis pecosensis</i>	T	SOC	
Roswell Springsnail	<i>Pyrgulopsis roswellensis</i>	E	E	
Koster's Springsnail	<i>Juturnia kosteri</i>	E	E	
Pecos Assiminea Snail	<i>Assiminea pecos</i>	E	E	
Ovate Vertigo Snail	<i>Vertigo ovata</i>	T	SOC	
Noel's Amphipod	<i>Gammarus desperatus</i>	E	E	
Desert Viceroy Butterfly	<i>Limenitis archippus obsoleta</i>		SOC	

s = sensitive T = Threatened E = Endangered SOC = Species of Concern C = Candidate Y = Yes

Loggerhead Shrike



Oil and Gas Development Guidelines

Appendix D

Agency and Public Review

The following organizations contributed comments and information which were considered in preparation of this guideline:

Albuquerque Wildlife Federation
Center for Biological Diversity
Conservation Voters New Mexico
Devon Energy Corporation
Forest Guardians
Independent Petroleum Association of New Mexico
Lower Rio Grande Back Country Horsemen
Marbob Energy Corporation
Middle Rio Grande Back Country Horsemen
Oil and Gas Accountability Project
National Wildlife Federation
New Mexico Audubon Council
New Mexico Bureau of Geology and Mineral Resources
New Mexico Energy, Minerals and Natural Resources Department – Oil Conservation Division
New Mexico Environment Department – Surface Water Quality Bureau
New Mexico Oil and Gas Association
New Mexico State Land Office
New Mexico Wilderness Alliance
New Mexico Wildlife Federation
Republicans for Environmental Protection – New Mexico Chapter
San Juan Citizens Alliance
Sierra Club – Southern Group of the Rio Grande Chapter
Sky Island Alliance
Southwest Consolidated Sportsmen
Southwest Environmental Law Center
The Wilderness Society
Trout Unlimited – New Mexico Council
US Forest Service – R3 Regional Office
US Bureau of Land Management – Farmington Field Office
US Fish and Wildlife Service – New Mexico Ecological Services Field Office
Vermejo Park Ranch
Western Environmental Law Center

Appendix E

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