

Defenders of Wildlife Share with Wildlife Final Report

December 30, 2020

Project: Aquatic Habitat Connectivity Assessment for the Santa Fe National Forest

Contractor: Defenders of Wildlife; Subcontractor: Cascade Conservation, LLC.

Grantor: State of New Mexico, Department of Game and Fish

Professional Services Contract #20-516-0000-00023

Project Overview

Over the past decade, scientific and advocacy communities have devoted increasing attention and resources toward understanding and protecting landscape connectivity and wildlife corridors for terrestrial species. However, awareness for maintaining connected aquatic and riparian habitats has remained relatively limited. Because of their importance for sustaining a multitude of diverse species, ecologically and geomorphically connected aquatic and riparian habitats have an outsized role in ensuring the long-term persistence of New Mexico's wildlife. Our work over the course of this grant helped identify places where roadway infrastructure is impeding the passage of aquatic and riparian obligate species in the northern Jemez Mountains. [Identifying these restrictive bridges and culverts](#) is the first step needed in order to upgrade this infrastructure to improve connectivity along these vital habitat areas for species that New Mexico has identified as Species of Greatest Conservation Need (SGCN).

Project Summary

A project kick-off meeting was held at the Defenders of Wildlife office in Santa Fe on February 13, 2020. Michael Dax and Bryan Bird (Defenders of Wildlife – DoW), Virginia Seamster (New Mexico Game and Fish - NMDGF), Cecil Rich (U.S. Forest Service - USFS), and Shawn Stone and Rachel More-Hla (Cascade Conservation) attended this initial gathering. This collaborative meeting yielded constructive criticisms that changed the scope of what was initially proposed during the grant application process. Those scope changes are listed below.

The COVID-19 pandemic has altered some expectations for project execution as well, and great care was taken to re-plan according to the best available advice from health organizations. The digital database and digital datasheets (Appendix I; Appendix II) have been developed according to the proposed schedule; equipment for the project was procured, calibrated and field tested; and field protocols have been practiced. Field implementation was planned to begin in early June 2020 but was delayed until July 2020. The Share with Wildlife Coordinator attended a data collection walk-through with Cascade Conservation on June 19, 2020.

[Data collection](#) was performed between July and September of 2020, documenting 99 bridges and culverts. Surveys were performed by Shawn Stone and Tiffany Love-Chezem (Cascade Conservation), with additional volunteer match hours provided by Michael Dax (DoW), and Carol Brown, Doug Whitbeck, and Justin Johnson (public volunteers).

Data were submitted to Rachel More-Hla (Cascade Conservation) at the end of September to begin data management and development of the [Arc StoryMap](#). On October 16, 2020, Shawn Stone and Rachel More-Hla presented a webinar on project methods and preliminary results to an audience of USFS personnel and staff from relevant state agencies. [A recording of this webinar](#) was made available online by Defenders of Wildlife. Viewings of the webinar have led to discussions regarding a future partnership opportunity with the Southeast Aquatic Resources Partnership to contribute data to an effort to document and display results from stream barrier surveys in several western states.

Refining Project Goals and Criteria

Initially, five perennial streams were targeted for this Phase 1 work: Rio de las Vacas, Rio Cebolla, Chihuahueros Creek, Polvadera Creek, and Rio del Oso. After consulting with NMDGF and USFS during the project kickoff meeting in February 2020, this project ended up investigating six perennial streams: Rio de las Vacas, Rio Cebolla, American Creek, San Antonio Creek, East Fork Jemez River, and Rito de las Palomas.

The Wildland Hydrology training that was initially scoped was cancelled due to travel restrictions associated with COVID-19. Funds initially billed to Defenders of Wildlife for course registration and travel plans were reimbursed by Cascade Conservation.

Initially, site conditions to be documented included: georeferenced photographs of the structure; georeferenced photographs of surrounding aquatic and riparian habitat; distance from water surface to the base of the structure and water depth and substrate where water flows out of the structure; cross-sections and longitudinal profiles that evaluate stream depth; active floodplain width; extent of channel incision; stream gradient, categorization of stream habitat (e.g., riffles, runs); percent canopy cover over the stream; dominant species composition, structure, and condition of riparian habitat and other variables related to the structures and wildlife sign.

As a result of consultation with NMDGF and USFS during the February 2020 meeting, this project added the following measurements in the survey protocol:

- culvert shape/size/condition,
- stream substrate
- inlet shape/size/type
- bankfull width
- flood-prone width
- culvert rust line (indication of high water)
- channel gradient
- outlet size/type
- outflow drop height/pool depth
- overhead canopy cover
- water temperature/pH/dissolved oxygen/conductivity

- qualitative ecological ratings (Clarkin et al., 2005).

Because of in-person meeting restrictions associated with COVID-19, the member education day had to be reconfigured. Instead of a volunteer event, DoW hosted the webinar for USFS and state agency personnel. USFS in particular is a target audience for future use of the results and digital datasheet/database generated by this project, thus justifying the substitution of the originally planned outreach event with a webinar.

SCHEDULE OVERVIEW

TASK	% DONE	DUE DATE	DRIVER	NOTES
Develop ArcGIS-compatible geospatial database and digital datasheet	100%	5/31/2020	Grant Deliverable	Digital datasheet completed and available for sharing.
Perform assessments of water-crossing structures	100%	8/31/2020	Grant Deliverable	Field assessments of 99 structures were completed between July and September 2020.
Organize a volunteer education and outreach event to share methods	100%	7/31/2020	Grant Deliverable	Webinar for USFS personnel completed on 10/16/2020.
Collaborate with NMDGF & USFS to share results	100%	10/31/2020	Grant Deliverable	Delivered with StoryMap submittal on 12/31/20.
Ensure survey equipment is disinfected between survey sites	100%	8/31/2020	Wildlife Best Practices	Field protocols are in place and were followed to ensure disinfection at each survey site.
Schedule meeting with Share with Wildlife Coordinator to obtain pictures/info for website article	100%	8/31/2020	Grant Requirement	Field visit with Share with Wildlife Coordinator completed on 6/19/2020.
Submit to DoW an Interim Project Report by 6/22/2020	100%	6/22/2020	Grant Deliverable	Document submitted to DoW on 6/22/2020.
Submit to DoW a Final Project Report by 12/3/2020	100%	12/3/2020	Grant Deliverable	Delayed delivery of 12/8/20.
Acknowledge NMDGF, the Share with Wildlife Program, and State Wildlife Grant T-69-R-1 in any/all	100%	12/31/2020	Grant Requirement	All acknowledgements were made during 10/16/2020 webinar.

presentations or publications associated with this work				
Obtain all appropriate permits	100%	7/1/2020	Regulatory Compliance	Revised Nominal Effects Letter from USFS received 6/16/2020.
Publish Arc StoryMap	100%	12/31/2020	Grant Deliverable	Delivered 12/31/20.

Project Results

Of the 99 culverts assessed, 42 remain in good condition, 32 exist in fair condition, and 16 were determined to be in poor condition. Of those 16 poor culverts, one culvert intersected perennial water and justified immediate management action (Figure 1). Of the remaining 15 poorly rated culverts, seven are completely or almost completely blocked and require servicing to improve hydrologic functioning within the riparian and adjacent habitats. The last eight poorly rated culverts were disconnected from perennial water, and while they could provide habitat to amphibian SGCN, the need to address these culverts is primarily related to managing runoff adjacent to the roads these culverts run underneath (Figure 2).

The StoryMap and database provide greater detail and a visual, georeferenced guide to the project’s final results and include photos of the 99 assessed culverts.



Figure 1 Culvert number 115 on the Rio Cebolla (Photo credit: Cascade Conservation)



Figure 2 Figure 2. Culvert number 48 on the Rio de las Vacas (Photo credit: Cascade Conservation)

The majority of culverts assessed do not require immediate management action. For a pilot project, the results collected were encouraging and provide meaningful, justifiable steps forward for the US Forest Service to act upon to improve habitat connectivity in the riparian corridors in the Jemez Mountains. Ongoing coordination continues with USFS and NMDGF to prioritize the next phase of this project and to ensure that the data generated by this project are useful to all stakeholders involved. Coordination with the Southeast Aquatic Resources Partnership may help to expand this project.


APPENDIX I

MOBILE DATA COLLECTION

ENTRY TYPES:

Hidden Entries:

- GPS point metadata: conversion of point data to Lat/Long, Altitude, Horizontal GPS Accuracy. Collected for all points.
- Intermediate calculations are hidden throughout the form.

GPS Points: push & hold (location averaging) button . This allows multiple point averaging of locations that are within an acceptable accuracy range. This also includes elevation, though it's a hidden field.

Selections: answer can be selected by clicking option once, or un-selected by clicking on option a second time to clear answer.

Selections with Images: click on image to view larger. Use back arrow on top left of image window to go back to selection menu.

Photos: capture photo by selecting camera button in form. If more photos are needed to fully represent structure or stream, take on device and add file names to datasheet in Notes section at end.

METADATA

Culvert Number – Autofill

Date – Autofill

Start Time – Autofill

Crew Names – Text entry; F.LastName, ...

Stream – Autofill

Road Name – Autofill

Watershed – Autofill

STRUCTURE DETAILS

Passable – Yes/No

Terrestrial or Aquatic – Select one (Terrestrial = “No”, Aquatic = “Yes”)

Substrate Present – Yes/No

Culvert Length – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Culvert Shape – Multiple choice selection

Baffles or Weirs – Yes/No

Photo Inside Structure – Capture photo by selecting camera button in form

Photo Above Structure – Capture photo by selecting camera button in form

Structure Condition – Select one

Structure Notes – Text entry

INLET MEASUREMENTS

Inlet Type – Select one

Inlet Apron Length – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Inlet Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Inlet Bankfull Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Inlet Width \geq Bankfull Width? – Yes/No

Inlet Width to Bankfull Width Ratio – Autofill (from Inlet Width and Bankfull Width measurements)

Inlet Height – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Inlet Rust Line – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Culvert Inlet Location – Geopoint

Inlet Altitude – Autofill

Inlet Photo – Capture photo by selecting camera button in form

UPSTREAM CHANNEL MEASUREMENTS

Inlet Gradient Start Point – Geopoint

Inlet Gradient Altitude – Autofill

Distance from inlet – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Upstream Bankfull Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Upstream Flood-prone Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Gradient Start Point – Geopoint

Gradient Altitude – Autofill

Distance from Inlet – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Inlet Gradient – Autofill

OUTLET MEASUREMENTS

Outlet Type – Select one

Perch or Outlet Jump Present? – Yes/No

Outlet Apron Length – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Outlet Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Outlet Bankfull Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Outlet Height – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Outlet Rust Line – Numeric decimal entry; enter in meters to nearest centimeter: 00.01

Outflow Drop Height – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Outflow Pool Depth – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Culvert Outlet Location – Geopoint

Outlet Altitude – Autofill

Outlet Photo – Capture photo by selecting camera button in form

Tailwater Control Photo – Capture photo by selecting camera button in form

DOWNSTREAM CHANNEL MEASUREMENTS

Downstream Bankfull Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Downstream Flood-prone Width – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Channel Gradient End Point – Geopoint

Gradient End Altitude – Autofill

Distance from Outlet – Numeric decimal entry; enter in meters to nearest centimeter: 00.01m

Channel Gradient – Autofill (from Gradient Start and End Points)

HABITAT ASSESSMENT

Percent Cover – Select one

Dominant Stream Substrate – Select one

Temperature – Numeric decimal entry; enter in degrees Celsius: 00.00

pH – Numeric decimal entry; 00.00

Dissolved Oxygen – Numeric decimal entry; enter in milligrams per liter: 00.00

Conductivity – Numeric decimal entry; enter in microSeimens/centimeter: 000.00

Stream Height – Select one

Flow within Structure – Yes/No

River Right Photo – Capture photo by selecting camera button in form

River Right Description – Text entry

River Left Photo – Capture photo by selecting camera button in form

River Left Description – Text entry

ECOLOGICAL RATINGS

Habitat - Rio Grande Chub – Autofill

Habitat - New Mexico Meadow Jumping Mouse (E) – Autofill

Habitat - Rio Grande Sucker – Autofill

Habitat - Boreal Chorus Frog – Autofill

Habitat - Northern Leopard Frog – Autofill

Habitat - Rio Grande Cutthroat Trout – Autofill

Species Count – Numeric integer entry

Species Name – Select one

Conservation Status – Autofill

Extent of Barrier – Select one

Habitat Quantity – Select one

Habitat Quality – Select one

Species Score – Autofill

FINAL SCORE

Total Habitat Score – Autofill

Notes – Text entry

End Time – Autofill

Survey Duration – Autofill

APPENDIX II

PAPER DATASHEET

(used as a backup to digital datasheet – not needed during project execution)

Share with Wildlife 2019				
Paper Data Collection				
Metadata				
Culvert Number				
Date of Survey				
Start Time				
Crew Names				
Stream Name				
Road Name				
Watershed (HUC-12)				
Structure Details				
Structure passable?	Yes	No		
Terrestrial or Aquatic?	Terrestrial	Aquatic		
Substrate present?	Yes	No		
Culvert Length				
Culvert Shape	Circular Ford	Open-bottom Arch Vented Ford	Pipe Arch Bridge	Box Other
Other Shape Description				
Baffles or Weirs Present?	Yes	No		
Photo Inside Structure				
Photo Above Structure				
Structure Condition	Good	Fair	Poor	
Structure Notes				
Inlet Measurements (in meters)				
Inlet Type	Projecting Headwall	Mitered Apron	Wingwall 10-30 Trashrack	Wingwall 30-70 Other
Other Inlet Description				
Inlet apron length				
Inlet width				
Inlet bankfull width				
Inlet width \geq bankfull width?				
Inlet Width to Bankfull Width Ratio				
Inlet height				
Inlet rust line				
Culvert Inlet Location				
Inlet Latitude				
Inlet Longitude				
Inlet Altitude				
Inlet GPS Accuracy				
Inlet Photo				
Upstream Channel Measurements (in meters)				
Inlet Gradient Start Point				
Inlet Gradient Latitude				
Inlet Gradient Longitude				
Inlet Gradient Altitude				
Inlet Gradient GPS Accuracy				
Distance from inlet				
Upstream Bankfull Width				
Upstream Flood-Prone Width				
Channel Gradient Start Point				
Gradient Latitude				
Gradient Longitude				
Gradient Altitude				
Distance from inlet				
Gradient GPS Accuracy				
Inlet Altitude Difference				
AltDiff over Dist				
Inlet Gradient				
Outlet Measurements (in meters)				
Outlet Type	At stream grade Freefall into pool	Freefall onto riprap Outlet apron	Cascade over riprap Other (describe)	
Other outlet description				
Perch or outlet jump present?	Yes	No		
Outlet apron length				
Outlet width				
Outlet bankfull width				
Outlet height				
Outlet rust line				
Outflow drop height				
Outflow pool depth				
Culvert Outlet Location				
Outlet Latitude				
Outlet Longitude				

Outlet Measurements (continue'd)	
Outlet Altitude	
Outlet GPS Accuracy	
Outlet Photo	
Tailwater Control Photo	

Downstream Channel Measurements (in meters)	
Downstream Bankfull Width	
Downstream Flood-Prone Width	
Channel Gradient End Point	
Gradient End Latitude	
Gradient End Longitude	
Gradient End Altitude	
Gradient End GPS Accuracy	
Distance from Outlet	
Channel Altitude Difference	
Channel Gradient Total Distance	
ChAltDiff over Dist	
Channel Gradient	

Habitat Assessment				
<i>Complete in 10 m area below structure.</i>				
Percent Cover	absent: zero cover	sparse: <10%	moderate: 10-40%	
		heavy: 40-75%	very heavy: >75%	
Dominant Stream Substrate	Bedrock - large masses of solid rock	Boulder - > 256mm (10 in)	Cobbles - 64-256mm (2.5-10 in)	Gravel - 2-64mm (0.08-2.5 in)
	Sand - 0.06mm - 2mm (<0.08 in)	Silt and clay - difficult to differentiate individual grains	Organics - muck, organic ooze	Aquatic Macrophytes - rooted aquatic vegetation
Temperature				
pH				
Dissolved Oxygen				
Conductivity				
Stream Height	Standing Water	Intermittent Flow	Base Flow	
	Bankfull	Above Bankfull	Flooding	
Flow within Structure	Yes	No		
River Right Photo				
River Right Description				
River Left Photo				
River Left Description				

Ecological Ratings		
Habitat - Rio Grande Chub	Yes	No
Habitat - New Mexico Meadow Jumping Mouse (E)	Yes	No
Habitat - Rio Grande Sucker	Yes	No
Habitat - Boreal Chorus Frog	Yes	No
Habitat - Northern Leopard Frog	Yes	No
Habitat - Rio Grande Cutthroat Trout	Yes	No
Species Count		

Complete sub-form for each species habitat. Total sub-forms should match Species Count.							
Species Name							
Conservation Status							
Extent of Barrier							
Habitat Quantity							
Habitat Quality							
Species Score							

Final Score	
Total Habitat Score	
Notes	
End Time	
Survey Duration	