Draft Wildlife and Wildlife Habitat Restoration Plan and Environmental Assessment for the Chino, Cobre, and Tyrone Mine Facilities

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Contents

Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
BCE	Before the Common Era
BLM	Bureau of Land Management
CE	Common Era
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CWA	Clean Water Act
DOI	U.S. Department of the Interior
EA	Environmental Assessment
ESA	Endangered Species Act of 1973
FMI	Freeport-McMoRan Copper & Gold Inc.
GRIP	Gila Resources Information Project
NAWCA	North American Wetland Conservation Act
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NHPA	National Historic Preservation Act
NMDGF	New Mexico Department of Game and Fish
NMLC	New Mexico Land Conservancy
NRCS	Natural Resources Conservation Service
NRDAR	Natural Resource Damage Assessment and Restoration
ONRT	New Mexico Office of Natural Resources Trustee
RFP	Request for Proposal
RP	Restoration Plan
SGCN	Species of Greatest Conservation Need
T&E	threatened and endangered
TNC	The Nature Conservancy
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

Executive Summary

The New Mexico Office of Natural Resources Trustee and the U.S. Fish and Wildlife Service (collectively, the "Trustees") have engaged in a cooperative Natural Resource Damage Assessment and Restoration (NRDAR) process for the Freeport-McMoRan Copper & Gold Inc. and its associated companies (FMI) mine sites near Silver City, New Mexico. Wildlife and wildlife habitat resources have been injured by hazardous substances released from three copper mining facilities owned by FMI. The mines include:

- **Chino Mine:** Located approximately 19 kilometers (12 miles) east of Silver City, New Mexico, this mine is east of the Continental Divide in the Mimbres River Watershed. Open-pit mining began in 1910. The mine was temporarily closed in January 2002 but has since reopened.

- **Tyrone Mine:** Located approximately 16 kilometers (10 miles) southwest of Silver City, New Mexico, this open-pit mine straddles the Continental Divide and the Mimbres and Gila River basins. Turquoise, copper, and fluorspar were mined in the area from the late 1870s through the early 1900s. Open-pit copper mining began in 1967. Since 1992, the mine has been solely a copper leaching operation.

- **Cobre Mine[1]:** Located approximately 5 kilometers (3 miles) north of Hanover, New Mexico, this is the smallest of the three mine sites. It is east of the Continental Divide in the Mimbres River Watershed, and has a long history of iron ore production. Commercial copper production by underground methods began in 1858; underground copper mining ended in 1971. The mine was closed from 1982 to 1993 due to low copper prices, and went on standby status in 1999.

The Trustees undertook a wildlife assessment for these three mines in which they assessed and quantified injuries to terrestrial resources, wildlife, and wildlife habitat resources, and successfully brought claims against FMI for terrestrial and wildlife damages. FMI paid $5.5 million and transferred 289 hectares (714 acres) of grassland to the City of Rocks State Park to settle allegations that the company injured terrestrial and wildlife resources as a result of discharges of hazardous substances from the Chino, Tyrone, and Cobre mines.

The Trustees view the transfer of land to New Mexico State Parks as compensation for injuries to terrestrial resources. Thus this Draft Restoration Plan and Environmental Assessment (Draft RP/EA) for the Chino, Tyrone, and Cobre mine facilities, prepared by the Trustees,

1. The Cobre Mine is also known as the Continental Mine.

evaluates proposed restoration projects and determines which of these projects would best compensate the public for injuries to wildlife and wildlife habitat resources that resulted from the release of hazardous substances from the three mines. The Trustees solicited a broad range of potential restoration projects from local, state, and federal agencies; nonprofit organizations; stakeholder groups; and private citizens. The Trustees identified 21 potential restoration projects.

These projects were evaluated using screening and evaluation criteria developed by the Trustees that are consistent with federal regulations. To be considered for further evaluation, a project had to meet the following criteria:

- Is technically and administratively feasible
- Benefits wildlife or wildlife habitat affected by hazardous substance releases at the Chino, Tyrone, or Cobre mines
- Provides an overall net environmental benefit
- Complies with applicable and relevant federal, state, local, and tribal laws and regulations
- Is subject to Trustee management, control, and monitoring.

Projects that passed the screening criteria were assessed using the following set of evaluation criteria, which were designed to evaluate which projects best provided compensation for injured wildlife and wildlife habitat resources:

- Is likely to directly benefit birds that were affected by hazardous substance releases at the Chino, Tyrone, or Cobre mines
- Has a high potential for long-term success
- Has a low risk of failure
- Has feasible and cost-effective provisions for operations, maintenance, and monitoring
- Needs NRDAR funding
- Is located close to where the injuries occurred at the Chino, Tyrone, or Cobre mines
- Is cost-effective compared with other projects that provide similar benefits
- Is likely to benefit multiple wildlife resources and services

- Is consistent with regional planning and federal and state policies
- Is likely to provide benefits quickly after project implementation
- Allows for appropriate public access
- Leverages funding to enable projects to be larger or more comprehensive in scope.

After conducting the screening and evaluation process, the Trustees developed a preferred restoration alternative, which included all of the proposed projects that met the screening criteria. However, the funding available to the Trustees is insufficient to fund all of the proposed projects within the preferred alternative. Thus the Trustees have proposed three priority tiers for funding. These tiers are based on how well each project met the Trustee evaluation criteria and the total costs of different combinations of projects.

- Tier 1 proposed projects ranked highest in the project evaluation and have top priority for funding. These projects represent a diverse, regional portfolio of wildlife and wildlife habitat restoration projects that would effectively compensate the public for the loss of wildlife, especially birds, and the loss of wildlife habitat that resulted from releases of hazardous substances at the Sites.
- Tier 2 proposed projects ranked the next highest in the project evaluation and will be funded by the Trustees with funding that remains after the Tier 1 projects have been completed.
- Tier 3 proposed projects met Trustee criteria; however, they scored lower than projects in Tier 2. These projects may receive funding if there are funds available after Tiers 1 and 2 projects are completed.

Table S.1 shows the wildlife and wildlife habitat restoration projects and the proposed funding tiers.

The Trustees are seeking public input and comment on this Draft RP/EA, as well as new project ideas. All comments and project ideas will be considered by the Trustees prior to revising and publishing the Final RP/EA.

Table S.1. Restoration alternatives by proposed funding tier (projects listed alphabetically by tier)

Project title	Project category	Brief project description
Tier 1		
Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration	Watershed habitat restoration	Repair severe erosion damage to the Burro Cienaga, improve water quality and storage, and restore critical habitat for plants and animals.
Double E Ranch Habitat Protection and Improvement	Habitat protection and improvement	Protect native riparian habitat along Bear Creek through the purchase and conservation of the Double E Ranch.
Mimbres River Watershed Wildlife and Habitat Restoration	Riparian habitat restoration	Restore and improve riparian and wetland habitats and modify at least one stock pond.
Redrock Property Habitat Protection and Improvement	Habitat protection and improvement	Protect and restore native riparian habitat along the Gila River through the purchase and conservation of the Redrock property's native riparian habitat along the Gila River.
Tier 2		
Burro Cienaga Stream Stabilization Restoration	Watershed habitat restoration	Repair erosion damage throughout the Burro Cienaga Watershed through stream stabilization projects.
Davis Property Habitat Protection and Improvement	Habitat protection and improvement	Protect and restore native riparian habitat along the Gila River through the purchase and conservation of the Davis property.
Porter Property Habitat Protection and Improvement	Habitat protection and improvement	Protect and restore native riparian habitat along the Gila River through the purchase and conservation of the Porter property.
River Ranch Habitat Protection and Improvement	Habitat protection and improvement	Protect and restore native riparian habitat along the Mimbres River through the purchase and conservation of the River Ranch property.
Upper Bear Creek Habitat Protection and Improvement	Habitat protection and improvement	Protect native riparian habitat along Bear Creek through the purchase and conservation of the Bear Creek Ranch.

Table S.1. Restoration alternatives by proposed funding tier (projects listed alphabetically by tier) (cont.)

Project title	Project category	Brief project description
Tier 3		
Burro Cienaga Grassland Restoration	Grassland habitat restoration	Increase continuous grass cover through prescribed burnings and herbicide treatments in the Burro Cienaga.
Burro Cienaga Pinyon and Juniper Restoration	Grassland habitat restoration	Eliminate invasive pinion and juniper from the Burro Cienaga.
Burro Cienaga Stock Pond Restoration	Watershed habitat restoration	Maintain and reconstruct stock ponds and tanks in the Burro Cienaga.
Grassland Restoration through Aerial Treatment of Mesquite	Grassland habitat restoration	Increase grass cover through aerial treatments of mesquite on Chihuahuan Desert grassland and shrubland.
Meadow Creek Restoration	Riparian habitat restoration	Restore a portion of Meadow Creek, a tributary of the Gila River.
Migratory Bird Grassland Restoration	Grassland habitat restoration	Increase grass cover through aerial treatments of creosote or mesquite on the Bureau of Land Management priority watersheds.
Swan Pond Habitat Restoration	Riparian habitat restoration	Convert Swan Pond from a cattail monoculture to a diverse wetland habitat.
York Canyon Rehabilitation	Riparian habitat restoration	Levee setback and associated restoration along the San Francisco River.

1. Introduction

This Draft Restoration Plan and Environmental Assessment (Draft RP/EA) presents proposed restoration actions to benefit wildlife and wildlife habitat in the general vicinity of Silver City, New Mexico. The projects are intended to compensate the public for the injuries to wildlife, particularly birds, and wildlife habitat resources that occurred when hazardous substances,[1] including copper and other heavy metals, were released from three copper mining facilities owned by Freeport-McMoRan Copper & Gold Inc. (FMI)[2] in Grant County, New Mexico. The mines include:

- Chino Mine – located approximately 19 kilometers (12 miles) east of Silver City
- Tyrone Mine – located approximately 16 kilometers (10 miles) southwest of Silver City
- Cobre[3] Mine – located approximately 5 kilometers (3 miles) north of Hanover.

These facilities are referred to as "the Sites" throughout this plan. Their locations are shown in Chapter 2 (Figure 2.1).

The New Mexico Office of Natural Resources Trustee (ONRT) and the U.S. Fish and Wildlife Service (USFWS; collectively, the "Trustees") identified the proposed restoration actions described in this RP/EA through discussions with local, state, and federal agencies; nonprofit organizations; stakeholder groups; and private citizens. These projects are being proposed as offsets for injuries to natural resources identified during the NRDAR process undertaken by FMI and the Trustees pursuant to CERCLA (42 USC § 9601 et seq.). Under CERCLA, as part of the overall NRDAR process, the Trustees are responsible for selecting and implementing appropriate restoration projects to compensate the public for natural resource injuries. These restoration projects will be paid for with funds received from FMI through the settlement. A copy of the settlement consent decree can be found at http://www.onrt.state.nm.us/documents/ConsentDecreesignedbyJudge2-21-2012FMIWildlife.pdf.

1. The term "hazardous substance" refers to a hazardous substance as defined in Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), federal Natural Resource Damage Assessment and Restoration (NRDAR) regulations 43 CFR § 11.14(u). This includes hazardous substances designated or listed by Sections 311(b)(2)(A) and 307(a) of the Federal Water Pollution Control Act (i.e., the Clean Water Act, or CWA), by Section 102 of CERCLA, by Section 3001 of the Solid Waste Disposal Act (i.e., the Resource Conservation and Recovery Act), and Section 112 of the Clean Air Act.

2. FMI is used in this document to collectively refer to any or all of the following entities: Freeport-McMoRan Corporation, Freeport-McMoRan Chino Mines Company, Freeport-McMoRan Tyrone Inc., Freeport-McMoRan Tyrone Mining LLC, and Freeport-McMoRan Cobre Mining Company.

3. The Cobre Mine is also known as the Continental Mine.

The purpose of this Draft RP/EA is to inform the public about the wildlife and wildlife habitat resources that were injured by releases of hazardous substances at and from the Sites and to present proposed restoration projects that would compensate the public for these injuries. This document describes the types of actions, anticipated benefits, and potential impacts associated with the specific actions. Detailed project designs and costs will be developed for restoration projects that have been selected for funding prior to implementation.

This introductory chapter explains the responsibility and legal authority of the Trustees to develop this plan, summarizes the settlement that occurred between FMI and the Trustees, and describes the role of public involvement in developing this Draft RP/EA.

1.1 Trustee Responsibilities under CERCLA and the National Environmental Policy Act

The Trustees' authority to pursue NRDAR claims at the FMI sites is identified in the New Mexico Natural Resources Trustee Act [NMSA 1978, §§ 75-7-1 et seq.] and in the following federal statutes:

- CERCLA, as amended [42 USC § 9601 et seq.]
- CWA [33 USC §1251 et seq.].

Under these authorities, the Trustees are responsible for assessing natural resource damages and identifying compensatory restoration projects.

The purpose of this Draft RP/EA is to inform and solicit comments from members of the public on the restoration actions proposed to compensate for wildlife and wildlife habitat injuries and associated lost services resulting from the release of hazardous substances at and from the Sites. This document serves as an EA pursuant to the National Environmental Policy Act (NEPA) [42 USC 4321 et seq.] and the regulations guiding its implementation at 40 CFR 1500 et seq. This plan describes the purpose and need for the proposed restoration actions; the restoration alternatives considered, including a no-action alternative; and the potential individual and cumulative impacts of restoration actions on the quality of the physical, biological, and cultural environment.

This document also serves as a Draft RP for implementing the selected restoration alternative, pursuant to NRDAR regulations (43 CFR Part 11) issued by the U.S. Department of the Interior (DOI). Under the regulations, the alternatives selected in the RP should ensure that damages recovered from the responsible parties are used to undertake feasible, safe, and cost-effective projects that address injured natural resources; consider actual and anticipated conditions; and are consistent with applicable laws and policies. The Draft RP should ultimately identify the

proposed alternatives and describe how settlement monies received will be spent to achieve restoration goals.

1.2 Summary of Wildlife and Terrestrial Natural Resource Damage Settlement for FMI Mines

As part of the Trustees' NRDAR responsibilities, the Trustees assessed and quantified injuries to terrestrial resources, wildlife, and wildlife habitat associated with the Sites, and successfully brought claims against FMI for these injuries. The Trustees and FMI reached a natural resource damage settlement for land and wildlife resources in the amount of $5.5 million and for the transfer of approximately 289 hectares (714 acres) of grasslands owned by FMI to the City of Rocks State Park.

The Trustees view the transfer of land to New Mexico State Parks for permanent protection and management as compensation for injuries to terrestrial resources, as well as unique habitat protection. Thus the restoration actions considered in this Draft RP/EA will focus on benefiting wildlife, particularly birds, and wildlife habitat. Hazardous substances released from the mines impacted diverse wildlife, including birds, mammals, and reptiles/amphibians, as well as their habitats. Affected birds include water birds and non-water birds, both resident and migratory.

Before this land and wildlife settlement, FMI and ONRT reached a settlement for damages to groundwater resources in the amount of $13 million. ONRT identified and evaluated proposed groundwater restoration projects that were presented to the public in both draft and final groundwater restoration plans. A diverse, regional portfolio of groundwater restoration projects was selected that would yield maximum benefits to regional groundwater resources and that is consistent with current approaches to regional water planning in the area. For additional information, see the final groundwater restoration plan at http://onrt.nmenv.state.nm.us/documents/Final.Groundwater.Restoration.Plan.Chino.Cobre.Tyrone_1.4.2012.pdf.

1.3 Public Involvement

During the development of this Draft RP/EA, the Trustees held an informal public meeting in Silver City, New Mexico on May 30, 2012 to inform the public about the restoration planning process and request that information about potential restoration projects be forwarded to the Trustees for consideration. The Trustees also contacted relevant agencies, organizations, and stakeholder groups to learn more about potential restoration project opportunities.

Public review of the proposed restoration actions presented in this Draft RP/EA is an integral part of the restoration planning process. The Trustees seek public comment on the projects being proposed to restore injured wildlife and wildlife habitat resources. This Draft RP/EA will be available for public comment for 45 days. The Trustees will consider comments received during the public comment period before developing the Final RP/EA. In addition, the Trustees will consider additional project ideas submitted in writing to ONRT during this timeframe. The Final RP/EA will include a summary of comments received and Trustee responses to those comments.

Written comments should be provided to:

Ms. Rebecca de Neri Zagal
New Mexico Office of Natural Resources Trustee
4910-A Alameda Boulevard NE
Albuquerque, NM 87113

Comments can also be submitted via email to: nmenv-onrtinfo@state.nm.us.

1.4 Responsible Party Involvement

The assessment process for the Sites was conducted as a cooperative assessment with FMI, through which the Trustees coordinated with responsible parties while undertaking the NRDAR. Cooperative assessments (such as this one) can increase the cost-effectiveness of the process by facilitating the sharing of information and avoiding the duplication of study efforts. Input from FMI was sought and considered throughout the assessment process.

FMI chose not to participate in the restoration planning and implementation process. The Trustees have the final authority to make determinations regarding restoration actions for wildlife and wildlife habitat resources.

1.5 Administrative Record

The administrative record contains the official documents pertaining to the NRDAR activities at and in the area of the Sites. The administrative record for the NRDAR case is housed at ONRT.

1.6 Document Organization

The remainder of this document is organized as follows. Chapter 2 describes the purpose and need for restoration, including an overview of injuries to wildlife and wildlife habitat in the area of the Sites. Chapter 3 describes the process used to evaluate proposed restoration projects.

Chapter 4 describes the proposed restoration alternative and the projects that make up this alternative; it also describes the no-action alternative. Chapter 5 describes the affected environment. Chapter 6 presents the environmental and socioeconomic impacts of the proposed restoration alternatives. Chapter 7 provides a list of agencies, organizations, and parties consulted during preparation of this document. The appendix contains a complete project list of the wildlife and wildlife habitat restoration projects identified by the Trustees.

2. Purpose and Need for Restoration

This chapter describes the purpose and need for restoration to address injuries to natural resources resulting from the releases of hazardous substances at and from the Sites. It also provides an overview of the mine sites, summarizes the natural resource injuries resulting from the release of hazardous substances at and from these Sites, and describes the need for restoration under CERCLA.

2.1 Overview of the Sites

The Sites, located in southwestern New Mexico, are open-pit and underground copper and iron mining, extraction, and processing facilities owned and operated by FMI (Figure 2.1). A brief description and map of each mine facility (i.e., the Chino, Tyrone, and Cobre mines) is provided below. A more detailed description of the mine facilities and their mining history can be found in Section 2 of the final groundwater restoration plan available at http://onrt.nmenv.state.nm.us/documents/Final.Groundwater.Restoration.Plan.Chino.Cobre.Tyrone_1.4.2012.pdf.

Chino Mine

The Chino Mine site is located approximately 19 kilometers (12 miles) east of Silver City in Grant County, New Mexico. It includes the Santa Rita pit; the Groundhog Mine; the former Hurley smelter; and associated stockpile areas and tailings impoundments, including the historical tailings impoundments known as Lake One and Axiflo Lake (Figure 2.2). The largest drainage at the Chino Mine is Whitewater Creek; Hanover Creek and Lampbright Draw (not shown) are other important drainages. Surface drainage from the Chino Mine drains into the Mimbres River Watershed (MFG, 2003; Golder Associates, 2008).

Tyrone Mine

The Tyrone Mine is located approximately 16 kilometers (10 miles) southwest of Silver City, New Mexico, in southwestern Grant County. This site includes several open-pit areas, leach stockpiles, waste stockpiles, tailings impoundments, and other mine processing facilities (Figure 2.3). The largest drainage at the Tyrone Mine is Mangas Creek; Brick Kiln Gulch, Oak Grove Creek, and Deadman Canyon are other important drainages. Surface drainage from the Tyrone Mine drains into the Gila and Mimbres River watersheds (Daniel B. Stephens & Associates, 1999, 2004).

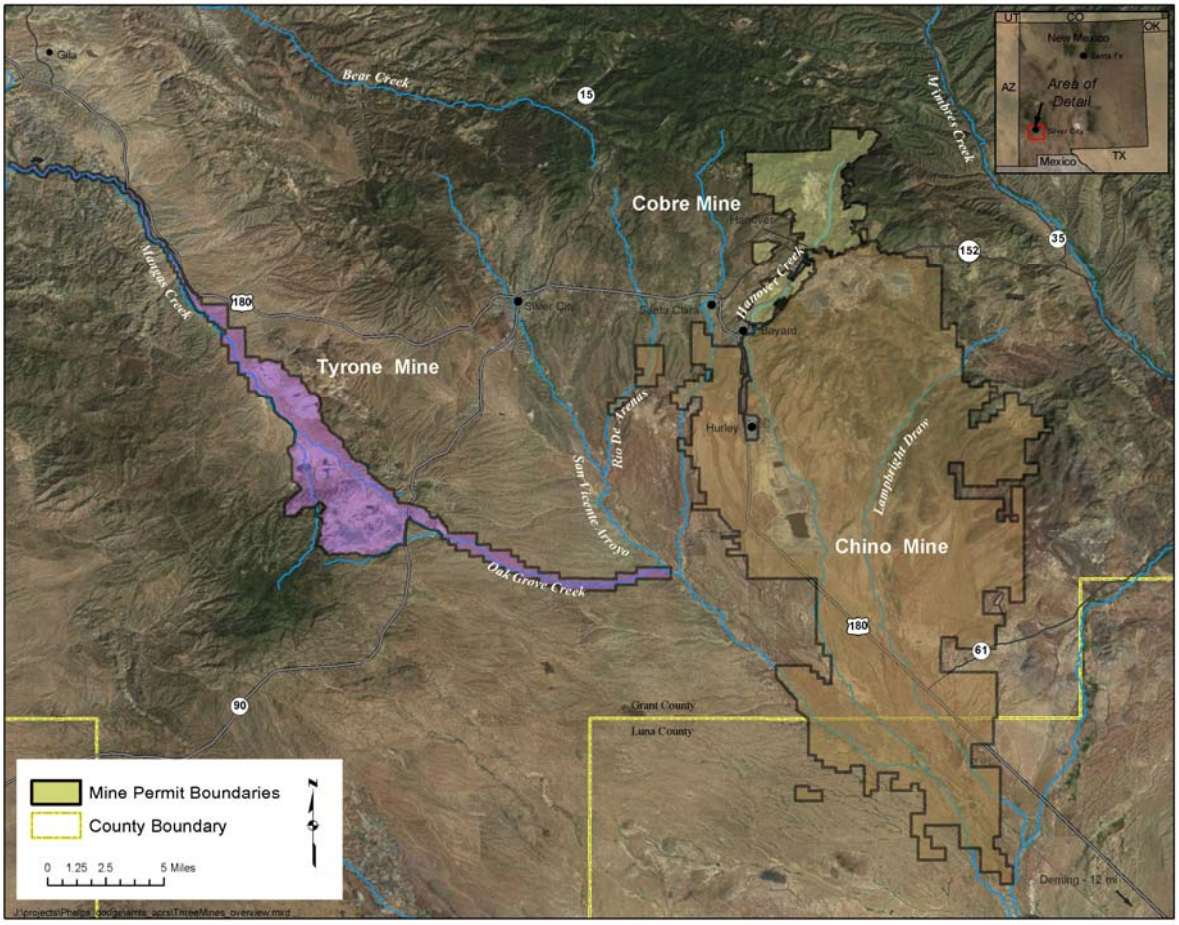


Figure 2.1. Overview map of the Chino, Tyrone, and Cobre mines.

Cobre Mine

The Cobre Mine is located approximately 5 kilometers (3 miles) north of Hanover, New Mexico, in Grant County. The site includes the Continental pit, underground mine workings, waste rock disposal facilities, low- and high-grade ore stockpiles, and tailings impoundments (M3 Engineering & Technology, 2001; Telesto Solutions, 2005) (Figure 2.4). Major drainages at the Cobre Mine are Buckhorn Gulch and Hanover Creek. Surface drainage from the Cobre Mine drains into the Mimbres River Watershed.

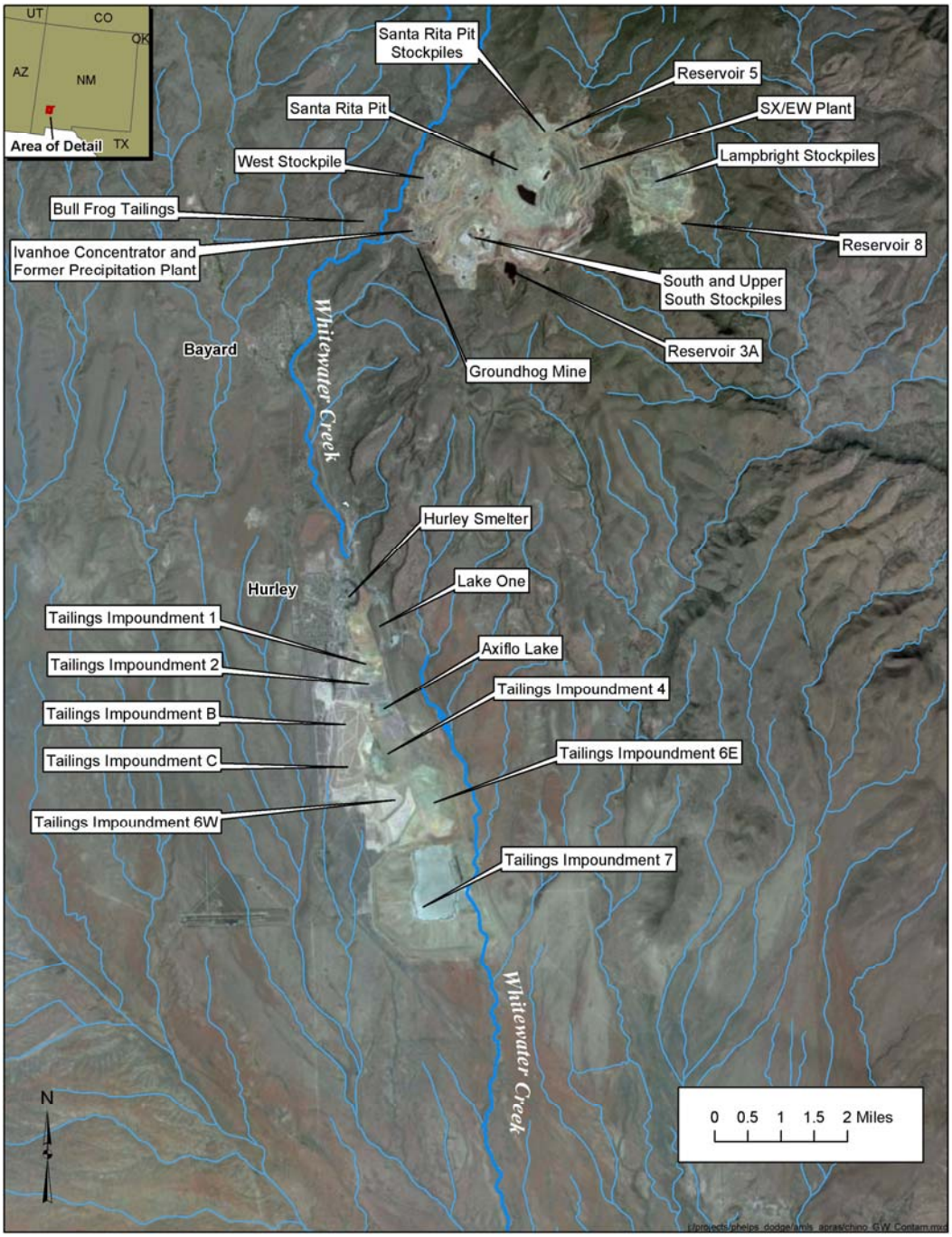


Figure 2.2. Hydrologic features and mine facilities at the Chino Mine.

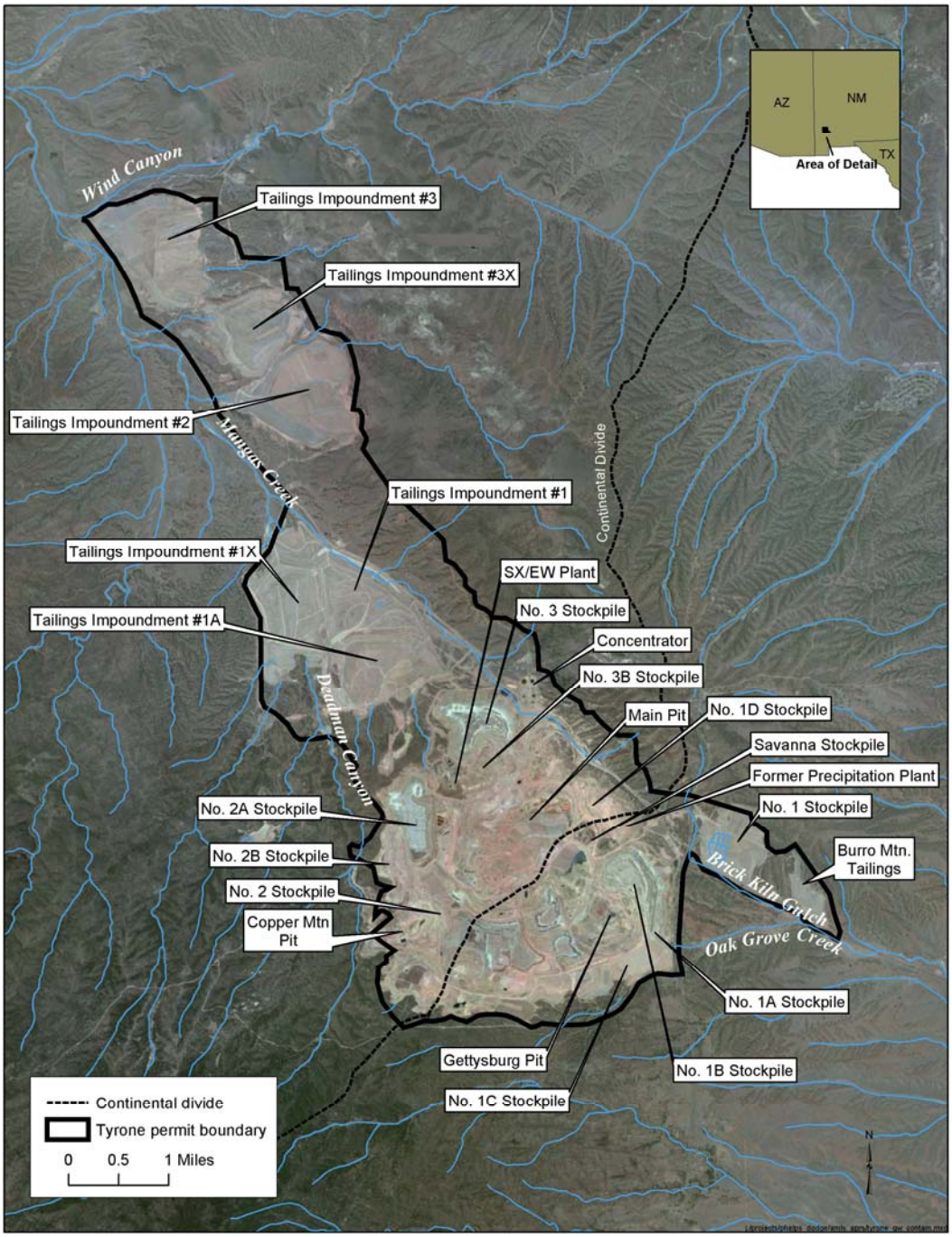


Figure 2.3. Hydrologic features and mine facilities at the Tyrone Mine.

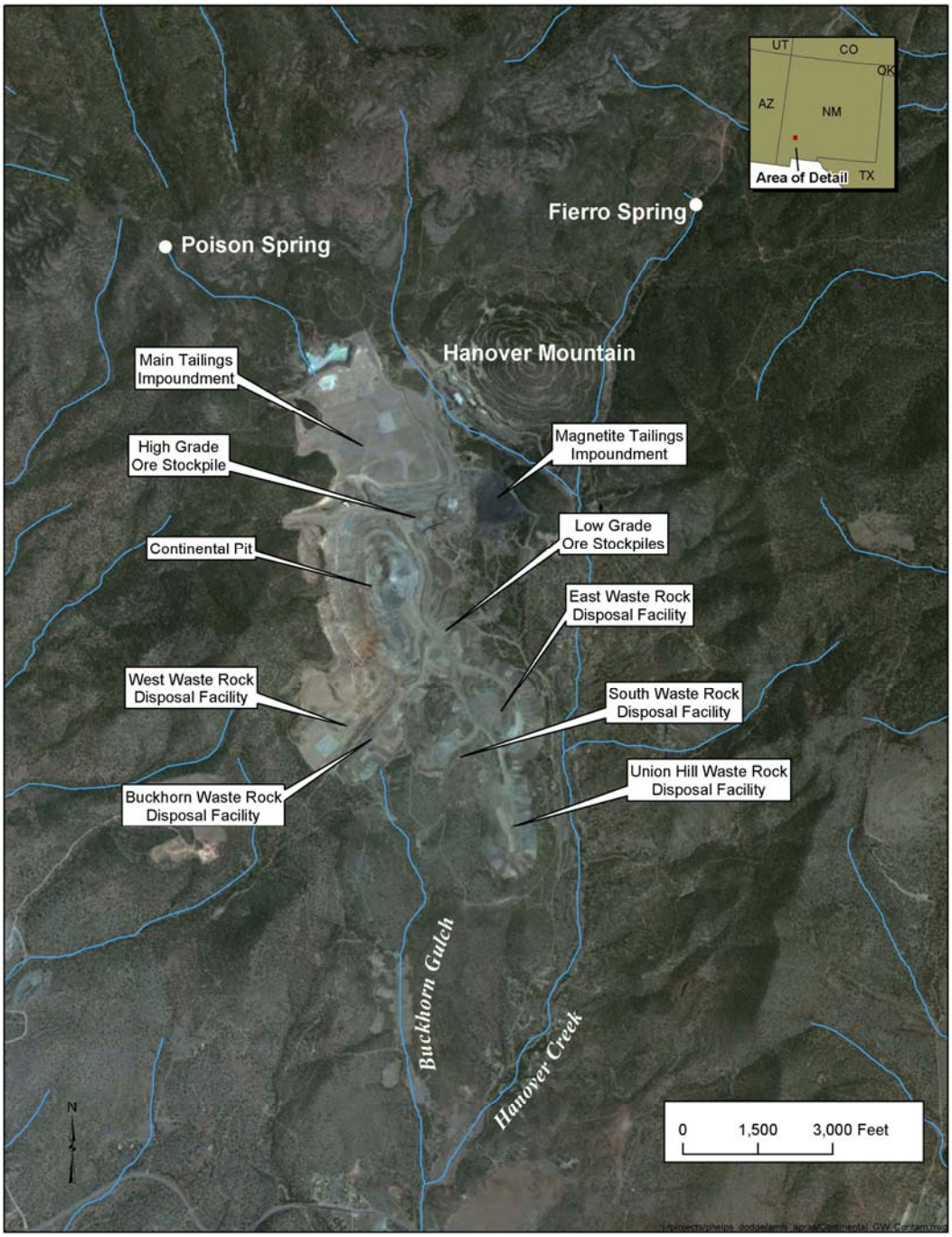


Figure 2.4. Hydrologic features and mine facilities at the Cobre Mine.

2.2 Summary of Natural Resource Injuries

This section includes an overview of sources of hazardous substances at the Sites; pathways to natural resources; and injuries to terrestrial resources, surface water resources, and wildlife resulting from hazardous substance releases. Surface water resources are considered here in the context of their role in providing wildlife habitat.

2.2.1 Sources of hazardous substances and pathways to natural resources

Hazardous substances released at the Sites include sulfuric acid and metals/metalloids, including arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, and zinc. The primary sources of hazardous substances at the Sites include:

- Mine wastes, including tailings, waste rock, and spent ore leach piles
- Ore and leach stockpiles
- Mine waters, including pregnant leach solution, raffinate, tailings supernatant water, seepage from wastes and mined materials, and stormwater that contacts mine wastes.

Hazardous substances from these and other sources at the Sites were transported to natural resources through a variety of pathways, including but not limited to:

- **Aerial transport.** For example, windblown tailings and hazardous substances released by the Hurley smelter were transported through the atmosphere, and then deposited on surrounding habitat.

- **Pipeline breaches and other spills that deposited hazardous substances into waterways.** For example, tailings spills and process water spills released hazardous substances into drainages at the Sites.

- **Direct contact of biota with hazardous substances.** For example, birds and wildlife came into contact with leach solutions in open channels and ponds, as well as with high concentrations of metals and acidic water found in tailings impoundments.

- **Contaminated groundwater contacting geologic resources (including soil) or surface water (including sediment).** For example, contaminated groundwater, including seeps and springs, “daylighted” at the Sites and exposed surrounding geologic resources or surface water to hazardous substances.

Two site-specific examples of contaminant pathways that led to the widespread exposure of natural resources at the Sites include:

1. **Exposure of biota to contaminants in tailings areas**

   All three mine sites have tailings in unlined impoundments. Before the tailings impoundments at the Sites were remediated, they were a key pathway between hazardous substance releases and biota. Tailings impoundments frequently had ponded water on the top, either from water that was pumped with the tailings or from precipitation. The ponded water contained hazardous substances, with concentrations increasing during the summer months as water evaporated and thunderstorms created newly ponded water in areas where metal-sulfate salts had formed on or near the surface. In the arid environment of the Sites, waterfowl and other biota were attracted to the ponded water on the tailings, where they were exposed to high concentrations of hazardous substances through direct contact or ingestion.

2. **Riparian habitat resources exposed to hazardous substances in stockpiles, waste rock, or process material**

   Riparian habitat resources have been exposed to hazardous substances through numerous pathways at the Sites, including process water leaks and spills; tailings spills; dryfall from smelter emissions; windblown materials; runoff, infiltration, or percolation from tailings and waste stockpiles; and transport through erosional processes. Whitewater Creek and Mangas Creek are two important waterways at the Chino and Tyrone mines, respectively, where the riparian and associated streambed habitats have been exposed to hazardous substances from multiple sources. Those sources include direct inputs of contaminated water from the mines, tailings pond breaches during high-volume storm events, and deposition or spills of tailings directly into the streambed areas.

2.2.2 Injuries to terrestrial resources

Terrestrial resources, including soils and vegetation, at the Sites and in surrounding areas were injured by exposure to hazardous substances released from the Sites. For example, surface soils at sampling locations downwind from the Hurley smelter near the Chino Mine had high metals concentrations and low pH, resulting in toxicity to vegetation in controlled tests. Food-chain modeling also indicated that there was the potential for injury to small ground-feeding birds at the Chino Mine due to exposure to copper, lead, and zinc via the food chain. Small mammals at the Chino Mine were also observed to have increased liver and kidney abnormalities compared to animals in reference areas, which is consistent with toxicity from metals exposure (MFG, 2003).

2.2.3 Injuries to surface water resources and associated wildlife habitat

Surface water resources and the wildlife habitat associated with these resources at the Sites and in drainages downstream from them were injured by exposure to hazardous substances released from the Sites. These resources include ephemeral ponds that form on or near tailings piles, mine-related process waters, and natural surface water bodies such as seeps, streams, and ponds. Each of these surface water resources provides habitat or is a drinking water source for wildlife, particularly migrating waterfowl.

Injuries to surface water resources, including sediments, were assessed by comparing concentrations of hazardous substances in surface water to water quality standards and toxicity thresholds for amphibians and other biota. Cadmium, copper, lead, and zinc exceeded water quality standards and toxicity thresholds for amphibians in certain sampling locations and time periods at the Sites. In addition, food-chain modeling showed that there was a potential for injury to amphibians based on exposure to cadmium, copper, lead, or zinc in Whitewater Creek or Bayard Canyon at the Chino Mine site (MFG, 2003).

2.2.4 Injuries to birds and wildlife

Ponds, streams, and other areas of open water are an important resource for wildlife, particularly for migrating waterfowl and other resident and terrestrial birds that seek open water for resting and drinking. This is especially true in southern New Mexico, which has a dry, desert environment, where open water is infrequent. The contaminated open water at the Sites, including ponded water on or near tailings piles, acidic leach solutions in open channels, and other mine-related process water, caused birds and wildlife to die after they came into contact with it. Much of the dead wildlife observed consisted of migratory water birds that had been seeking water. Resident terrestrial birds were also found dead under similar conditions. Some surviving wildlife, including migratory birds, resident birds, amphibians, small mammals, and reptiles, were injured at the Sites, mostly through direct contact with contaminated water that had high concentrations of metals and was highly acidic.

From September to November 2000, 177 dead migratory birds were found near tailings ponds at the Tyrone Mine. In September 2000, after the discovery of bird carcasses, the mine initiated a bird hazing program, whose objective was to discourage birds from landing or staying on tailings ponds (Stratus Consulting, 2003). Although the program was unsuccessful at deterring all birds, the remediation of tailings piles has ended these injuries because there are no longer open sources of water in contact with the tailings.

As part of the NRDAR assessment activities, estimates of bird injuries at the Tyrone and Chino mine sites were developed that included the number of birds killed from exposure to contaminated waters at the Sites, as well as the number of years of “lost bird life” associated with

the premature mortalities. The Trustees used various sources of information to estimate the approximate number of birds exposed to hazardous substances at the Sites and the likely injuries to these birds. For example, they reviewed observations made by bird hazers[1] at the Tyrone site from 2000 to 2005 regarding the number and types of birds trying to land on the tailings ponds; they also reviewed information about migratory bird counts to understand more about the populations of birds that could have been exposed. They also estimated the level of bird mortality and sublethal injuries that likely occurred at the ponds based on the assumed length of time that birds were exposed to hazardous substances and the toxicity of the waters at different ponds. Finally, the Trustees estimated the years of "lost bird life" due to the premature mortalities of injured birds, based on information on typical bird lifespans and annual mortality rates.

2.3 Need for Restoration under CERCLA

The objective of the NRDAR process is to compensate the public, through environmental restoration, for natural resources and the services provided by these resources that have been injured, destroyed, or lost as a result of the release of hazardous substances into the environment. As described above, injuries to wildlife and wildlife habitat at the Sites require restoration. The amount, or "scale," of restoration required to compensate for these losses depends on the spatial extent, nature, severity, and duration of both losses from injuries and gains from restoration.

Given the injuries to wildlife and wildlife habitat described above, the Trustees and FMI jointly reached a natural resource damage settlement for grasslands and wetlands wildlife resources in the amount of $5.5 million, and for terrestrial resources, the transfer of 289 hectares (714 acres) of grasslands owned by FMI to the City of Rocks State Park (see Section 1.2). The Trustees determined that the restoration that could be accomplished with this sum of money would be sufficient to compensate for the estimated level of injury to wildlife and wildlife habitat at the Sites. Settlement funds for NRDAR resource restoration can only be used to restore, rehabilitate, replace, or acquire the equivalent of these injured natural resources and the services provided by them.

This Draft RP/EA has been developed to evaluate and select restoration projects designed to compensate the public for injuries that have occurred to wildlife and wildlife habitat resources at the Sites. Selected restoration projects will be implemented over a period of time, depending on the project type. Because the Sites are still considered active mining operations, the Trustees have chosen to focus on restoration alternatives that will benefit wildlife resources outside the footprint of the Sites.

1. The presence and use of bird hazers is in itself notable for these sites. The hazers' objective was to keep birds from landing on, or minimize the time exposed to, the waters in these ponds. This is a clear recognition of the ponds' potential to injure birds following exposure.

3. Restoration Project Evaluation

The Trustees' goal under this NRDAR is to compensate the public for the loss of wildlife, especially birds, and the loss of wildlife habitat that resulted from releases of hazardous substances at and from the Sites. According to the NRDAR regulations developed for CERCLA (43 CFR § 11.82(a)), the Trustees are required to develop restoration alternatives that either (1) restore or rehabilitate injured natural resources to a condition in which they can provide the level of services available at baseline (conditions that would have occurred but for the release of hazardous substances), or (2) replace or acquire equivalent natural resources capable of providing such services.

The Trustees propose to fund a diverse portfolio of wildlife-focused restoration projects that would provide the maximum benefit to regional wildlife resources; this includes a mix of projects that focus on wildlife habitat protection and wildlife habitat restoration. Because migratory birds and waterfowl have been identified as the primary wildlife resource injured (Chapter 2), preferred projects will benefit migratory birds and waterfowl habitat, or protect land that provides riparian habitat that benefits these bird species. This is consistent with current approaches to regional planning in the area and will meet the Trustees' goal of replacing or acquiring natural resources that are equivalent to those lost.

The Trustees based their process for evaluating restoration projects on the guidance for restoration project selection provided by the NRDAR regulations developed for CERCLA (43 CFR § 11.82). First, the Trustees developed criteria for screening and evaluating proposed restoration projects (Section 3.1), and then they applied these criteria to proposed restoration projects to develop a preferred restoration alternative and place projects into priority tiers for funding (Section 3.2).

3.1 Screening and Evaluation Criteria for Proposed Restoration Projects

The Trustees developed screening and evaluation criteria to be used in evaluating proposed restoration projects. The criteria reflect not only the guidance for restoration project selection provided by the NRDAR regulations developed for CERCLA (43 CFR § 11.82), but also the guidance for restoration project selection in the regulations developed by the National Oceanic and Atmospheric Administration for restoration planning under the Oil Pollution Act (15 CFR § 990.54).

3.1.1 Screening criteria

The Trustees used screening criteria (see Table 3.1) to determine whether the proposed projects met minimum standards of acceptability. To be deemed acceptable, a project must comply with all of these criteria. If any project did not meet the screening criteria, it was not given further consideration by the Trustees. Table 3.1 lists both the screening criteria and explanations of how the Trustees interpreted and applied the criteria.

Table 3.1. Screening criteria for proposed restoration projects

Screening criteria	Explanation
Be technically and administratively feasible	Proposed projects must be able to be implemented using reliable technical approaches and by entities with the capacity to effectively complete and manage the project.
Benefit wildlife or wildlife habitat affected by hazardous substance releases at and from the Sites	Proposed projects must restore, rehabilitate, replace, or acquire wildlife or wildlife habitat, particularly birds or bird habitat, that were injured by the release of hazardous substances at and from the Sites.
Provide an overall net environmental benefit	Proposed projects must provide a net gain in environmental services. For example, a project that is solely a research study would not meet this criterion.
Comply with applicable and relevant federal, state, local, and tribal laws and regulations	Proposed projects must be legal, likely to receive required permits, and must consider public health, welfare, and the environment.
Be subject to a reasonable degree of Trustee management, control, and monitoring	Proposed projects must be managed, controlled, and monitored in a way that is consistent with Trustee restoration goals and subject to a reasonable degree of Trustee oversight.

3.1.2 Evaluation criteria

The Trustees applied evaluation criteria to each of the potential restoration projects that successfully passed the project screening process. These criteria were grouped into three categories (high-priority, medium-priority, or low-priority) according to their importance to the Trustees. Ratings were weighted more heavily for high-priority criteria and less heavily for low-priority criteria. Proposed projects were evaluated for each criterion and assigned a rating of below average, average, or above average. A list of evaluation criteria is provided in Table 3.2, together with an explanation of how the Trustees interpreted and applied the criteria.

Table 3.2. Evaluation criteria for proposed restoration projects

Evaluation criteria	Explanation
High-priority criteria	
Is likely to directly benefit birds that were affected by hazardous substance releases at and from the Sites	Birds have been identified as the primary wildlife resource injured. Proposed projects that directly benefit birds will be evaluated more favorably. Factors to be considered include how the proposed project will benefit birds, particularly migratory birds and waterfowl, and whether the project specifically improves high-priority bird habitats, such as riparian and floodplain habitats.
Has a high potential for long-term success	Proposed projects that use proven technologies and have mechanisms in place to ensure long-term success will be evaluated more favorably. Factors to be considered include whether the project includes provisions for land protection, such as a conservation easement or management by a public agency or conservation organization, whether the proposed restoration technique is appropriate for the project, whether these preservation mechanisms or restoration techniques have been used before with success, and whether the entity proposing to implement the project has the capacity to undertake it.
Has a low risk of failure	Proposed projects that have addressed and limited potential risks will be evaluated more favorably. Factors to be considered include all potential risks that may be faced during project implementation, such as the need for long-term protection, the need for high-quality management by a public entity or nongovernmental organization (NGO), the need to coordinate with multiple outside parties, the need for regulatory permits, the complexity of design and engineering, and potential public support.
Has feasible and cost-effective provisions for operations, maintenance, and monitoring	Proposed projects that have sufficient provisions or less need for operations, maintenance, and monitoring will be evaluated more favorably. Factors to be considered include whether operations, maintenance, and monitoring costs are reasonable and cost-effective given the project's scope; whether funding is sufficient to support operations, maintenance, and monitoring activities over an appropriate timeframe; and whether the proposed duration of operations, maintenance, and monitoring activities is appropriate.
Need for NRDAR funding	Projects that will not be implemented unless they receive funding from the NRDAR settlement will be evaluated more favorably. Factors to be considered for land conservation projects include whether NRDAR settlement funding will prevent land development and habitat degradation that is otherwise at a high risk of occurring. A secondary priority will be projects for which NRDAR funding would enable earlier implementation.

Table 3.2. Evaluation criteria for proposed restoration projects (cont.)

Evaluation criteria	Explanation
Medium-priority criteria	
Is located close to where the injuries occurred at the Sites	Proposed projects that are located in areas that have a positive impact on wildlife injured at the Sites (e.g., projects that are in the same migratory flyway) will be evaluated more favorably. A secondary geographic priority will be projects located within the Mimbres or Gila watersheds, which are the watersheds where the injuries occurred.
Is cost-effective compared with other projects that provide similar benefits	Proposed projects that are more cost-effective relative to other projects that provide similar benefits will be evaluated more favorably. Factors to be considered include the estimated costs of a proposed project compared to the likely benefits to wildlife and wildlife habitat, especially birds.
Is likely to benefit multiple wildlife resources and services	Proposed projects that provide multiple benefits will be evaluated more favorably. Factors to be considered include the rarity or uniqueness of wildlife species that benefit from the project; the extent to which proposed projects directly benefit multiple wildlife resources; and the extent to which projects provide additional services that indirectly benefit wildlife, such as improvements in water quality, biodiversity, and open space.
Is consistent with regional planning and federal and state policies	Proposed projects that are consistent with regional planning, federal and state policies, or conservation organization priorities will be evaluated more favorably. Factors to be considered include consistency with federal and state regional planning documents, policies, and strategies; and consistency with national, state, and regional conservation priorities. For example, projects that increase or improve habitat that is contiguous with other protected areas will be evaluated more favorably. Similarly, project sites that have been identified by a public agency or conservation organization as priority sites for wetland or riparian habitat and bird management will be evaluated more favorably.
Low-priority criteria	
Is likely to provide benefits quickly after project implementation	Proposed projects that provide benefits sooner will be evaluated more favorably. Factors to be considered include how quickly after project implementation the benefits to birds are realized.
Allows for appropriate public access	Proposed projects that allow regular public access will be evaluated more favorably than projects that allow occasional public access or that do not allow public access. Factors to be considered include the level and timing of access the public will have to the protected or restored project site.
Leverages funding to enable projects to be larger or more comprehensive in scope.	Proposed projects that leverage funding from other sources will be evaluated more favorably. Although matching funds are not required for a project to be eligible for NRDAR funding, the Trustees encourage proposals that leverage additional funding and in-kind services because it expands the scope of projects and benefits supported with NRDAR funds.

3.2 Development of a Preferred Restoration Alternative and Priority Tiers for Funding

After conducting the screening and evaluation process, the Trustees developed a preferred restoration alternative that included all of the proposed projects that met the screening criteria. However, the funding available to the Trustees is insufficient to fund all of the proposed projects within the preferred alternative. Thus the Trustees have proposed three priority tiers for funding. Projects in the first tier will have top priority for funding; the Trustees have sufficient funding available to fund all Tier 1 projects. Projects in Tier 2 may receive funding if funds are available after implementing all Tier 1 projects. Third-tier projects may receive funding if there are funds available after the all projects in Tiers 1 and 2 are completed; however, the Trustees anticipate that all funding will be spent completing projects in the first two tiers.

The Trustees placed projects into the three funding priority tiers based on how well each project met the Trustee evaluation criteria, and based on the total cost of different combinations of projects. For example, if two projects that received top evaluations would cumulatively exceed the funding available, then the Trustees could place only one of those projects into the top funding tier. The tiers reflect the Trustees' best effort to select the combination of projects that will most effectively compensate the public for the loss of wildlife, especially birds, and the loss of wildlife habitat that resulted from releases of hazardous substances at and from the Sites.

4. Wildlife and Wildlife Habitat Restoration Alternatives

This chapter describes two potential restoration alternatives: a no-action alternative (as required under NEPA) (Section 4.1), and the Trustees' proposed restoration alternative (Sections 4.2–4.5) consisting of a suite of restoration projects that cumulatively aim to compensate for injuries to wildlife and wildlife habitat resources that occurred when hazardous substances were released from the Sites. Potential projects were identified through outreach to local, state, and federal agencies; nonprofit organizations; stakeholder groups; and private citizens (see Chapter 7 for a list of contacts). Through these efforts, the Trustees identified 21 potential restoration projects (see the appendix for the full list).

Potential restoration projects were evaluated against the screening criteria described in Section 3.1.1 to determine whether each project met minimum standards of acceptability. Projects that did not meet these standards were not evaluated further. This group of four restoration projects, which were considered but not recommended for inclusion as part of the proposed alternative, is discussed in Section 4.6. Projects that met the screening criteria were evaluated using the evaluation criteria described in Section 3.1.2. Based on the results of the evaluation, projects were placed into one of the three priority tiers for funding. Projects in the first tier will have top priority for funding.

4.1 No-action/Natural Recovery Alternative

Evaluation of a no-action alternative is required under NEPA [40 CFR § 1502.14(d)]. The selection of this alternative by the Trustees would mean that no actions would be taken by the Trustees to restore injured wildlife and wildlife habitat resources, and that the public would not receive compensation for losses that occurred in the past or are ongoing. This alternative may be used as a benchmark to evaluate the comparative benefit of other actions. Because no action is taken, this alternative also has no cost.

4.2 Summary of Proposed Restoration Alternative

The proposed alternative is the one that the Trustees believe would best compensate the public for injuries to wildlife and wildlife habitat resources resulting from releases of hazardous substances at and from the Sites. This alternative consists of a suite of habitat protection and habitat restoration projects that benefit wildlife.

The preferred restoration alternative includes all the proposed projects that met the screening criteria. The Trustees appreciate that they received many well developed and suitable project proposals from project proponents. However, settlement funding is insufficient to fund all of the proposed projects within the preferred alternative. Therefore, the Trustees grouped projects in the preferred restoration alternative into three priority tiers for funding. These tiers are based on how well each project met the Trustee evaluation criteria and the total costs of different combinations of projects. For instance, if two projects that received high scores would cumulatively exceed the available funding, the Trustees could place only one of the projects into the top funding tier. The tiers reflect the Trustees' best effort to select the combination of projects that will most effectively compensate the public for the loss of wildlife, especially birds, and the loss of wildlife habitat that resulted from releases of hazardous substances at and from the Sites.

Projects in the first tier will have top priority for funding; the Trustees have sufficient funding available to fund all Tier 1 projects. The Trustees may choose not to fund a Tier 1 project, however, if the final budget significantly exceeds current budget estimates or if impediments to implementation develop. If the Trustees have funding available after Tier 1 is complete, then Tier 2 projects will be eligible for funding. The priorities for funding within Tier 2 will be decided by the Trustees at that time based on the amount of funding available and the current status of Tier 2 projects. The Trustees anticipate waiting to fund second-tier projects until they have greater certainty regarding costs for the first-tier projects. Third-tier projects may receive funding if there are funds available after all projects in Tiers 1 and 2 are completed; however, the Trustees anticipate that all funding will be spent completing projects in the first two tiers.

The Trustees will work closely with project proponents (beginning with the Tier 1 projects) as they develop more detailed project implementation plans and budgets to ensure that the suite of projects remain cost-effective. Project proponents are listed in the appendix.

The Trustees expect to use a variety of different mechanisms for project implementation, and will select the mechanism most appropriate for each project. The following mechanisms may be used for project implementation:

- Cooperative agreement that would be executed between a federal agency and the designated implementing partner. Projects proposed for this funding mechanism are those that can only be successfully completed by the entity already associated with the project.

- Request for Proposals (RFPs) issued by a state agency. An RFP is a competitive process that is open to all qualified bidders. The Trustees will establish the selection criteria for evaluating all proposals that are submitted in response to the RFPs. The selection of a contractor would result in a professional services contract.

- Interagency service agreement executed by a state agency.
- Interagency or intra-agency agreement between federal agencies.

A summary of the projects included in the proposed alternative is provided in Table 4.1. The table provides the name of each project, the primary project category to which it belongs, and the relative project cost. Projects are arranged alphabetically within tiers, and the estimated cost of all the projects in each of the three tiers is included in the table. Specific costs for individual projects are not provided in the Draft RP due to concerns that this information could negatively impact negotiations for land protection. Figure 4.1 provides a map of restoration project locations for projects in the proposed alternative. The map shows approximate locations for projects for which specific locations have not yet been selected (e.g., Projects 4.3.3 and 4.5.6).

Descriptions of each of the projects in the proposed restoration alternative, divided into the three tiers, are provided in Sections 4.3–4.5. For each project, there is a brief description of the project and location, an explanation of the expected benefits from the project and the timeframe of those benefits, an overview of maintenance and monitoring requirements for the project so that the Trustees can determine if the desired benefits are being achieved and take corrective actions if necessary, and an explanation of how the project was evaluated by the Trustees. Following the proposed alternative, a description is provided of the projects that were not recommended for funding (Section 4.6).

4.3 Tier 1 Proposed Restoration Projects

The projects proposed for Tier 1 represents a diverse, regional portfolio of wildlife and wildlife habitat restoration projects that focus on birds and will provide the maximum benefit to regional wildlife resources. The four projects in this tier – two habitat protection and improvement projects and two restoration projects – were ranked highly by the Trustees using the evaluation criteria.

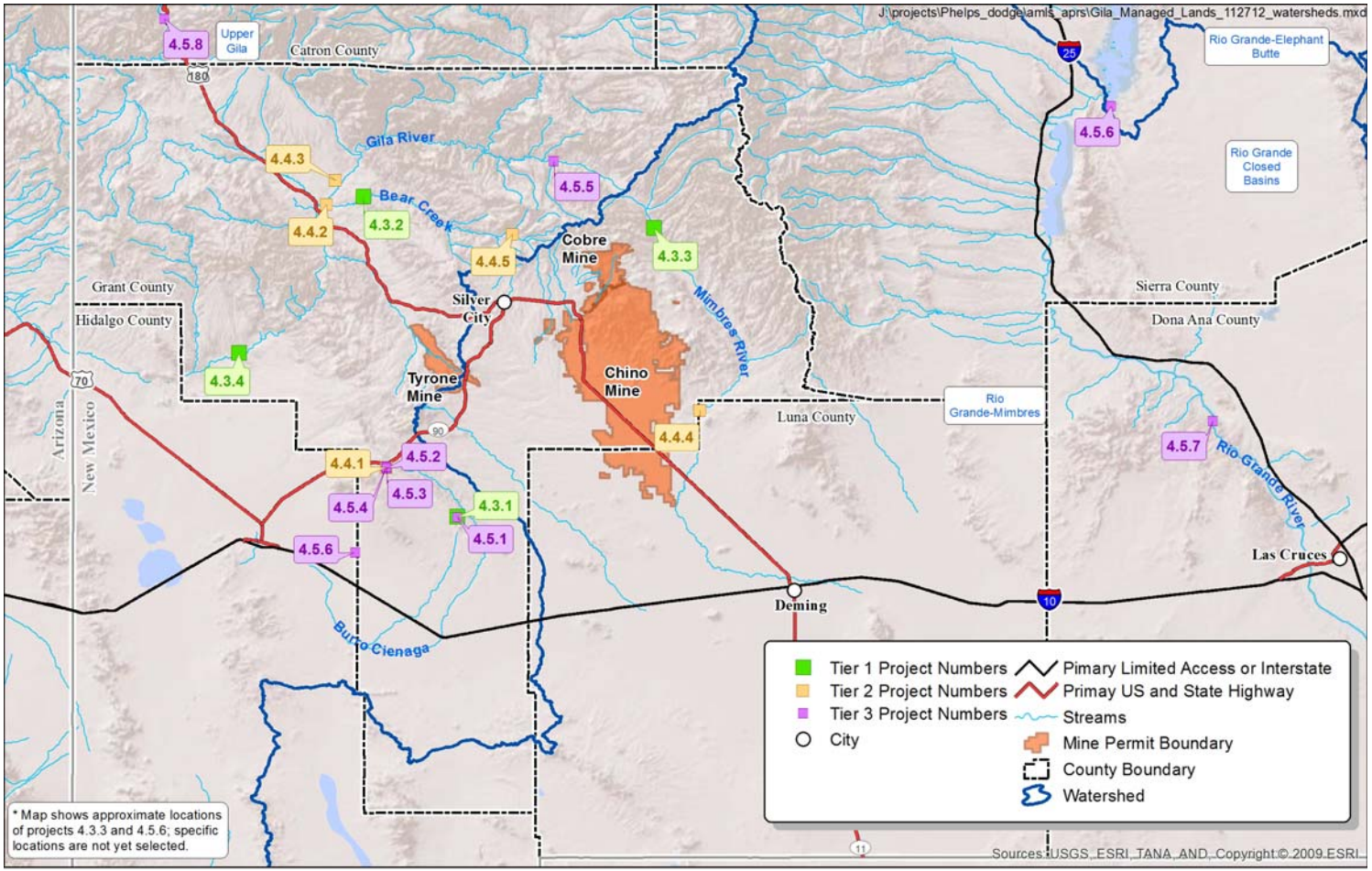
This combination of projects will effectively compensate the public for the loss of wildlife, especially birds, and the loss of wildlife habitat that resulted from releases of hazardous substances at the Sites (e.g., Stratus Consulting, 2003). These projects significantly benefit wildlife, especially birds affected by hazardous substance releases at and from the Sites. They also have a high potential for long-term success, largely due to the strong land protection mechanisms associated with each project.

The Trustees estimate that the group of Tier 1 projects will cost approximately $4,360,000. Details for each of the Tier 1 projects are described below, in alphabetical order.

Table 4.1. Summary of projects in the proposed alternative (projects listed alphabetically within tiers)

Project name	Project category	Relative project cost[a]
Tier 1		
Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration	Watershed habitat restoration	$
Double E Ranch Habitat Protection and Improvement	Habitat protection and improvement	$$$
Mimbres River Watershed Wildlife and Habitat Restoration	Riparian habitat restoration	$
Redrock Property Habitat Protection and Improvement	Habitat protection and improvement	$$
Approximate cost estimate for Tier 1		***$4,360,000***
Tier 2		
Burro Cienaga Stream Stabilization Restoration	Watershed habitat restoration	$
Davis Property Habitat Protection and Improvement	Habitat protection and improvement	$$$
Porter Property Habitat Protection and Improvement	Habitat protection and improvement	$$
River Ranch Habitat Protection and Improvement	Habitat protection and improvement	$$$
Upper Bear Creek Habitat Protection and Improvement	Habitat protection and improvement	$ to $$$
Approximate cost estimate for Tier 2		***$4,720,000–5,410,000***
Tier 3		
Burro Cienaga Grassland Restoration	Grassland habitat restoration	$
Burro Cienaga Pinyon and Juniper Restoration	Grassland habitat restoration	$
Burro Cienaga Stock Pond Restoration	Watershed habitat restoration	$
Grassland Restoration through Aerial Treatment of Mesquite	Grassland habitat restoration	$
Meadow Creek Restoration	Riparian habitat restoration	$$$
Migratory Bird Grassland Restoration	Grassland habitat restoration	$$
Swan Pond Habitat Restoration	Riparian habitat restoration	$$
York Canyon Rehabilitation	Riparian habitat restoration	$
Approximate cost estimate for Tier 3		***$3,680,000***

a. Projects associated with the $ symbol are low-cost projects below $500,000; projects associated with $$ symbol are medium-cost projects between $500,000 and $1,000,000; and projects associated with the $$$ symbol are high-cost projects over $1,000,000.



4.3.1 Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration
4.3.2 Double E Ranch Habitat Protection and Improvement
4.3.3 Mimbres River Watershed Wildlife and Habitat Restoration*
4.3.4 Redrock Property Habitat Protection and Improvement
4.4.1 Burro Cienaga Stream Stabilization Restoration
4.4.2 Davis Property Habitat Protection and Improvement
4.4.3 Porter Property Habitat Protection and Improvement
4.4.4 River Ranch Habitat Protection and Improvement
4.4.5 Upper Bear Creek Habitat Protection and Improvement
4.5.1 Burro Cienaga Grassland Restoration
4.5.2 Burro Cienaga Pinyon and Juniper Restoration
4.5.3 Burro Cienaga Stock Pond Restoration
4.5.4 Grassland Restoration through Aerial Treatment of Mesquite
4.5.5 Meadow Creek Restoration
4.5.6 Migratory Bird Grassland Restoration*
4.5.7 Swan Pond Habitat Restoration
4.5.8 York Canyon Rehabilitation

Figure 4.1. Map of proposed restoration projects.

4.3.1 Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration

This project will continue ongoing restoration along a 14-kilometer (8.6-mile) reach of the Burro Cienaga located on the Pitchfork Ranch.

Project description

The Pitchfork Ranch encompasses 2,088 hectares (5,160 acres) of deeded land that is bisected, north to south, by a 14-kilometer (8.6-mile) reach of the Burro Cienaga, which flows from the Big Burro Mountains of the Gila National Forest, eventually entering into a playa east of Lordsburg. The Burro Cienaga is located in the Animas Valley Watershed that has several unique habitats but few surface waters. The cienaga is a unique southwestern desert wetland (Hendrickson and Minckley, 1984; Minckley et al., In press) and an important stopover point for migratory birds in this dry landscape.

The upper 5 kilometers (3 miles) of the cienaga are perennial and the lower 9 kilometers (5.6 miles) are intermittent, with subsurface water throughout the year. The owners of the Pitchfork Ranch adopted a Restoration Management Plan in 2005 that focused on (1) retaining and storing water, and (2) improving important habitat for birds, wildlife, and a small herd of cattle. The previous restoration work that focused on erosion control appears to be successfully raising groundwater levels, thus allowing for natural revegetation along the cienaga. This project will continue the ongoing habitat restoration through the installation of erosion control structures in two canyons and 25 side channels in the floodplain, and the creation of terraces and up-slopes along the sides of the cienaga. The objective of the restoration work is to raise the groundwater table (by stopping erosive down-cutting of the stream channel) and thereby maintain the cienaga as a perennial wetland, which provides key habitat for birds and other wildlife.

The proponents of this project are the owners of the Pitchfork Ranch, who have successfully implemented previous restoration projects along the cienaga. This project is a continuation of previous restoration and maintenance projects on the Pitchfork Ranch. However, there is no current funding available, outside of the NRDAR settlement, to undertake the restoration work described here. NRDAR funding from the wildlife settlement provides an opportunity to restore cienaga and floodplain habitats that are vital to birds and other wildlife species.

The property also contains a cultural site, which contains archaeological remnants of Archaic people, who lived along the cienaga more than 13,000 years ago, and the Mimbres people, who populated the area by 750 Common Era (CE). A small amount of the funding for this project is proposed for stabilizing 2.3 hectares (5.8 acres) of the severely incised Mimbres archaeological site by installing smaller erosion control structures; these actions would simultaneously provide benefits to wildlife and wildlife habitat in this location.

Project location

The project is located on the Pitchfork Ranch in the Animas Valley Watershed, which is approximately 40 kilometers (25 miles) southwest of Silver City on the southeastern corner of the Burro Mountains. This is in the watershed adjacent to where the injury occurred. This project is located approximately 45 kilometers (28 miles) from the Chino Mine, 31 kilometers (19 miles) from the Tyrone Mine, and 51 kilometers (32 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

The wildlife and wildlife habitat benefits stem from restoring and protecting the Pitchfork Ranch's Burro Cienaga. The cienaga provides surface water that is important to birds and other wildlife, including a number of federally and state-listed species such as the bald eagle (*Haliaeetus leucocephalus*), southwestern willow flycatcher (*Empidonax traillii extimus*), Bell's vireo (*Vireo bellii*), Chiricahua leopard frog (*Lithobates chiricahuensis*), and Gila topminnow (*Poeciliopsis occidentalis*). More than 50 bird species have been recorded on the Pitchfork Ranch, with many nesting near or on the ranch, such as the scaled quail (*Callipepla squamata*), vermilion flycatcher (*Pyrocephalus rubinus*), and Cassin's kingbird (*Tyrannus vociferans*). Other bird species wintering on the ranch or in its vicinity are the northern harrier (*Circus cyaneus*), long-eared owl (*Asio otus*), and red-naped sapsucker (*Sphyrapicus nuchalis*). Restoration actions will provide long-term benefits to habitat by reducing erosion and improving wetland functions. Although some habitat benefits will begin immediately after project implementation, full restoration of the cienaga to the desired hydrologic and vegetated condition will take some time.

In addition to the ecological benefits, this project would also benefit the public, who are allowed to access the ranch for birding and educational purposes. In the past, the ranch has hosted various groups for birding, bird surveys, and plant inventories. Universities and organizations (e.g., Audubon New Mexico) have used the Pitchfork Ranch as an outdoor classroom for scientific and archeological research, as well as birding. In the future, the public will be able to access the restoration area on a limited basis.

Overview of maintenance and monitoring

This project will be completed over three years. The owners of the Pitchfork Ranch have committed to spending $15,000 annually on maintenance, and have received some funding awards to pay for maintenance on the property. Monitoring on the property has been accomplished historically with photographs. Seventeen photo-monitoring points have been established on the ranch, and photographs have been taken at these sites each year since 2005 on the same date. This practice is conducted and funded by the property owners, so no settlement funding will be necessary for this effort.

Trustee evaluation

The Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration project is proposed as a Tier 1 project. The project has a strong nexus to the bird and wildlife injury at the Sites because of its significant benefits to riparian and wetland habitats along a 14-kilometer (8.6-mile) reach of the Burro Cienaga, a unique habitat and an important stopover point for migratory birds and wildlife that may have been affected by hazardous substance releases at and from the Sites.

Specifically, this project received above-average ratings for three high-priority evaluation criteria: "high potential for long-term success," "low risk of failure," and "likely to benefit birds." This project has a high likelihood of success and a low risk of failure because (1) there is a long history of implementing restoration plans on this ranch, (2) the ranch is protected by a highly restrictive conservation easement held by the New Mexico Land Conservancy (NMLC), and (3) the property owners intend to bequeath the land to a nonprofit organization that will continue to manage the property for wildlife benefits. In addition, photograph monitoring that has been conducted on the ranch since 2005 confirms the benefits of previous restoration projects that are similar to the ones proposed here.

This project also received above-average ratings for two medium-priority evaluation criteria: "likely to benefit multiple wildlife resources and services" and "cost-effective compared to other projects that provide similar benefits." As described above, the project will improve habitat, benefiting multiple resident and migratory bird species (some of which are federally and state-listed species) and other wildlife. The project was also evaluated as very cost-effective when compared to other watershed restoration projects, considering both the estimated cost of the project and the area that would benefit from the treatments.

This project received average ratings for all the other evaluation criteria; it did not receive any below-average ratings. This project and the Mimbres River Watershed Wildlife and Habitat Restoration project (see Project 4.3.3) were the two projects in the habitat restoration category that were evaluated most favorably.

4.3.2 Double E Ranch Habitat Protection and Improvement

The purpose of this project is to permanently protect and improve valuable wildlife habitat on the Double E Ranch.

Project description

The Double E Ranch located in Grant County, New Mexico comprises 2,509 hectares (6,200 acres) of deeded land that lies adjacent to the Gila National Forest and to land managed

by the Bureau of Land Management (BLM); 1,477 hectares (3,650 acres) of BLM grazing leases; 1,010 hectares (2,495 acres) of state grazing leases; and 4,452 hectares (11,000 acres) of U.S. Forest Service (USFS) leases. The property also includes the rights to 13,260 cubic meters (10.75 acre-feet) of surface water in Bear Creek, a perennial stream that runs through the property before it joins the Gila River. This project would include the purchase of the Double E Ranch with the objective of protecting and restoring riparian habitat along Bear Creek and maintaining perennial flow. The project proponent is the Gila Resources Information Project (GRIP); the Trust for Public Land would work closely with GRIP to acquire this property for long-term stewardship by the BLM.

Approximately 5 kilometers (3 miles) of Bear Creek run through the Double E Ranch. Riparian habitat on the ranch is dominated by a rare, mature Fremont cottonwood (*Populus fremontii*) and Arizona sycamore (*Platanus wrightii*) community that provides habitat for migratory birds. However, the riparian habitat lacks younger age-classes and understory vegetation. In addition to having a high-quality riparian habitat, this portion of Bear Creek is designated by the USFWS as critical habitat for the endangered loach minnow (*Tiaroga cobitis*), and may also provide habitat for the threatened Chiricahua leopard frog. The ranch surrounds the 599-hectare (1,480-acre) BLM Bear Creek Area of Critical Environmental Concern (ACEC), which is managed for the high conservation value of its riparian and aquatic habitats (BLM, 1993). Restoration actions would include installing fencing to limit grazing and off-road vehicle use in the riparian areas, allowing riparian vegetation to reestablish naturally.

The ranch owners have had the ranch on the market for several years, and several 14-hectare (35-acre) parcels have already been sold, including one sale completed in the summer of 2012. Thus there is an immediate development threat on the ranch. Currently, the property is not subject to a conservation easement or other provision that could be used to encourage or require a buyer to manage the ranch for conservation and wildlife benefits. If the property is not protected, it may be subdivided, and grazing and water use could continue or increase, leading to further degradation of the valuable riparian and aquatic habitats. Purchasing the property would add to the amount of protected land in this key habitat area and would support BLM and USFWS management goals for critical habitat.

Project location

The property is located along the southwestern edge of Gila National Forest, approximately 6 kilometers (4 miles) east of Gila, New Mexico. This project is located approximately 51 kilometers (32 miles) from the Chino Mine, 35 kilometers (22 miles) from the Tyrone Mine, and 43 kilometers (27 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

Wildlife and wildlife habitat would benefit from protecting and restoring the high-quality riparian habitat along Bear Creek on the property. Riparian habitat is critical for hundreds of migrating birds that visit the area, including the federally endangered southwestern willow flycatcher and the candidate species yellow-billed cuckoo (*Coccyzus americanus*). Bear Creek has been designated as critical habitat for the loach minnow by the USFWS (USFWS, 2012). Conserving Bear Creek may also provide habitat for the threatened Chiricahua leopard frog. Wildlife benefits would be achieved through preventing degradation and fragmentation of habitat on the Double E Ranch. The owners are actively selling portions of the ranch to other private owners, which may lead to the degradation or loss of riparian habitat on the property. Preserving the habitat under BLM management would maintain Bear Creek in its free-flowing state.

Protecting and restoring riparian areas is also expected to improve water quality and provide improved or increased access for wildlife to riparian habitat. Robust riparian vegetation and hydrologically connected floodplains can increase shading and reduce stream velocities, which in turn can help reduce erosion and decrease water temperatures, all of which may help support and sustain native riparian, wetland, and aquatic species (Beschta, 1997; Tabacchi et al., 1998).

Acquisition of the Double E Ranch would also benefit the public, as it would connect USFS land to BLM and state lands, providing contiguous public access to Hell's Half Acre (a popular recreational area) and Bear Creek. In addition, this project would conserve historically important cultural resources from the Pithouse and Classic Mimbres periods (Russell, 1992).

Overview of maintenance and monitoring

Maintenance and monitoring efforts would include managing grazing and water use to benefit riparian restoration and support wildlife populations. The primary restoration action would be to install fencing in the riparian area to reduce grazing impacts and allow riparian vegetation to become reestablished. Maintenance and monitoring would focus on ensuring the effectiveness and integrity of the fencing. The property is expected to be incorporated into BLM's management plan.

Trustee evaluation

The protection and improvement of the Double E Ranch is proposed as a Tier 1 project. The project has a strong nexus to the bird and wildlife injury at the Sites because of its significant benefits to riparian habitat along Bear Creek, a tributary to the Gila River that provides important riparian and upland habitats for migratory and resident birds and wildlife that may have been affected by hazardous substance releases at and from the Sites.

Specifically, this project received above-average ratings for all five high-priority evaluation criteria: "high potential for long-term success," "low risk of failure," "likely to benefit birds," "provisions for operation, maintenance, and monitoring are feasible and cost-effective," and "need for NRDAR funding for project implementation." The protection and improvement of the Double E Ranch has a high likelihood of success and a low risk of failure because the BLM is expected to manage the land to benefit wildlife and wildlife habitat. Fencing around riparian areas will also protect wildlife and wildlife habitat and contribute to the long-term success of the project.

There is an immediate development threat on the ranch, and if the property is not purchased for conservation purposes, it may be subdivided, and heavy grazing and excessive off-road vehicle use could lead to further degradation of the valuable riparian and aquatic habitats. As described above, the protection and improvement of riparian habitat within the Double E Ranch will benefit many resident and migratory bird species, some of which are federally and state-listed species. Maintenance and monitoring for the project would be ongoing by the BLM, which is already maintaining adjacent land. Finally, protection and improvement of this property will not move forward without NRDAR funding. There are no other provisions in place to protect the habitat (e.g., there is no existing conservation easement) and the federal government has no other funding opportunities to complete the purchase.

This project received above-average ratings for three medium-priority evaluation criteria: "located close to where the injuries occurred," "consistent with regional planning and federal and state policies," and "likely to benefit multiple wildlife resources and services." The project is located in the Gila Watershed, within approximately 35 kilometers (22 miles) of the Tyrone Mine. This project is consistent with regional planning. The property surrounds the BLM Bear Creek ACEC, which is managed for its high conservation value of its riparian habitat. In addition, a portion of the property is designated as critical habitat for the federally listed loach minnow (USFWS, 2012). Protecting this property will assist regional planning efforts in conserving and improving riparian habitat for critical wildlife species, including birds, along Bear Creek. As described above, the project will protect and improve riparian habitat that benefits multiple resident and migratory bird species and other wildlife.

The project received above-average ratings for two lower-priority criteria: "likelihood to provide benefits rapidly after project implementation" and "allows for appropriate public access." The benefits of protecting and improving this property will begin to be realized immediately after project implementation, when the ranch is permanently protected and the riparian area is fenced. However, some of the wildlife habitat benefits from riparian restoration will take some time to be realized. The project will also provide improved opportunities for public access to existing popular recreation areas as described above.

This project received an average rating for "leverages funding to enable projects to be larger and more comprehensive in scope" and a below-average rating for "cost-effective compared to other projects that provide similar benefits." Due to the large amount of land associated with the property, this project is very cost-effective when compared to other land protection and improvement projects on a total acreage basis. However, if cost-effectiveness is calculated solely for riparian habitat, then this project is not considered as cost-effective as other similar projects.

Overall, this project was evaluated very favorably within the habitat protection and improvement category. The Trustees felt that it represents a unique opportunity to benefit birds and wildlife because of the large land area it protects, including 4.8 kilometers (3 miles) of perennial stream, 38 hectares (94 acres) of riparian habitat, and 9,395 hectares (23,215 acres) of upland habitat.

4.3.3 Mimbres River Watershed Wildlife and Habitat Restoration

This project aims to restore and improve riparian and wetland habitats and modify at least one stock pond for wildlife and wildlife habitat at several locations within the Mimbres Watershed.

Project description

This project is a collaboration of several public and private landowners working together to restore riparian and wetland habitats throughout the Mimbres Watershed. The project proponent is Bat Conservation International, and partners include The Nature Conservancy (TNC), USFS, and several private landowners. Headwaters of the Mimbres River are in the Black Range in the Gila National Forest (NMDGF, 2006). Downstream, much of the river is in private lands where gravel mining and water diversions affect the river and its riparian habitat. Below the confluence with Bear Canyon, the Mimbres River passes into the Chihuahua Desert zone, where it becomes intermittent but remains a major water resource in this area. Much of the historical riparian and wetland habitats along the Mimbres River has been converted to agricultural lands.

Two types of projects will be completed: riparian restoration and stock pond restoration. Riparian restoration actions will include removing invasive plants [e.g., juniper (*Juniperus* spp.), tree-of-heaven (*Ailanthus altissima*), and Siberian elm (*Ulmus pumila*)], and stabilizing and restoring eroding riverbanks using local materials (e.g., boulders and large woody debris) by creating natural river features, planting native vegetation along the riverbanks (e.g., willows and cottonwoods), and installing fencing to protect the restored areas. This restoration work is expected to create a complex wetland pool and riparian habitat for wildlife, including migratory and resident shorebirds and waterfowl, as well as species of concern, such as the Chihuahua chub (*Gila nigrescens*). The stock pond restoration project will transform a large old stock pond that no longer holds water into a surface water wetland pond. Clay soils at the bottom of the old stock pond will be compacted to improve water holding, and a compacted clay filled trench will be built to prevent losses under the existing dam. The slope of the stock pond will be lessened to

create a natural appearance and large wood debris and native plants will be added to increase wildlife habitat. The current fencing around the pond will be modified to restrict livestock access to a single point at the pond, and allow 90% of the pond to be accessible to wildlife, including migratory waterfowl, shorebirds, and others. In addition, the stock pond could be used as a reintroduction site for the Chiricahua leopard frog.

Project location

The project is located at several sites in the Mimbres Watershed, which is in Grant, Luna, Sierra, and Dona Ana counties. This project is located approximately 23 kilometers (14 miles) from the Chino Mine, 45 kilometers (28 miles) from the Tyrone Mine, and 14 kilometers (9 miles) from the Cobre Mine.

In upper portions of the Mimbres Watershed, riparian restoration will occur in the Gila National Forest and on the Headwaters Ranch, where TNC holds grazing allotments. Along the main channel of the Mimbres River, riparian restoration will take place on the Mimbres River Preserve and the Lower Mimbres River Preserve, both of which are owned by TNC. In the lower portions of the Mimbres Watershed, restoration and conversion of an old stock pond to wetland habitat will be completed on private land.

Expected benefits and timeframe of benefits

The two restoration actions in this project are expected to restore a 10-kilometer (6-mile) stretch of the Mimbres River and up to 243 hectares (600 acres) of riparian and wetlands habitat. The restoration is located in the Mimbres Watershed, which is where the Chino and Cobre mines are located. The Mimbres River Watershed Wildlife and Habitat Restoration project will improve water quality and availability, and increase areas of pooled water that may be used by bats and other wildlife in the Mimbres Watershed.

This watershed has a high diversity of native fauna, including the southwestern willow flycatcher, yellow-billed cuckoo, Abert's towhee (*Melozone aberti*), Gila woodpecker (*Melanerpes uropygialis)*, Chihuahua chub, and Chiricahua leopard frog. Bats, one of the species targeted by this project, require pooled water for survival because they must drink while in flight; increased pooled-water wetland habitat along the Mimbres River will benefit these bat species. The benefits of this project will begin to be realized immediately; however, benefits from the restoration of the hydrologic condition and revegetation will take some time to be realized.

The public would also benefit from the project through enhanced access to wildlife viewing areas and environmental engagement and education.

Overview of maintenance and monitoring

Monitoring and maintenance will be performed by the project proponents for two years following restoration. Additional maintenance needed once the project is implemented will be the responsibility of the specific landowners (i.e., USFS, TNC, and private landowners). TNC has an active management and monitoring plan for their properties (i.e., Mimbres River Preserve and the Lower Mimbres River Preserve) and the land leased from the USFS. The private landowners are long-term residents who have a history of implementing restoration projects on his land. They are committed to providing for maintenance needs associated with the project on this property through in-kind services or donations.

Trustee evaluation

The Mimbres River Watershed Wildlife and Habitat Restoration project is proposed as a Tier 1 project. The project has a strong nexus to the bird and wildlife injury at the Sites because of its significant benefits to riparian habitat in the Mimbres River. The Mimbres Watershed is where most of the injuries to birds and wildlife occurred.

Specifically, this project received above-average ratings for four high-priority evaluation criteria: "high potential for long-term success," "likely to benefit birds," "provisions for operation, maintenance, and monitoring are feasible and cost-effective," and "need for NRDAR funding for project implementation." This project is likely to succeed because the project partners (i.e., TNC, USFS, and several private landowners) have a history of implementing restoration projects in the Mimbres Watershed. TNC has managed two preserves in the area (the Mimbres River Preserve and the Lower Mimbres River Preserve) since 1994. As described above, the project will restore a large area of riparian and wetland habitats that directly benefit birds, including migratory waterfowl and shorebirds. Also, lands owned and operated by the USFS and TNC have long-term land protection mechanisms that guarantee the long-term maintenance of the restoration actions. In addition, private landowners will be required to have long-term protection mechanisms on their properties – either a conservation easement or contracts for at least a 10-year operations and maintenance commitment, before the project commences. Maintenance and monitoring would be ongoing and these costs would be assumed by project partners (i.e., USFS, TNC, and private landowners). Finally, this project is unlikely to proceed without Trustee support. If this project is not implemented, the upper and lower Mimbres River will continue to erode and non-native species will continue to expand along the river's corridor. This will negatively affect migratory and resident birds and other aquatic and terrestrial wildlife.

This project received above-average ratings for three medium-priority evaluation criteria: "located close to where the injuries occurred," "likely to benefit multiple wildlife resources and services," and "cost-effective compared to other projects that provide similar benefits." The project is located in the Mimbres Watershed, within approximately 19 kilometers (11.5 miles) of

the Chino and Cobre mines. This is the same watershed where birds and wildlife were affected by hazardous substance releases at and from the Sites. This project will benefit multiple wildlife resources and services because it includes restoration of both riparian and ponded water habitats. This project also is considered very cost-effective when compared to other riparian habitat restoration projects.

This project received average ratings for all other evaluation criteria; it did not receive any below-average ratings. This project and the Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration project (see Project 4.3.1) were the two projects in the habitat restoration category that were evaluated most favorably.

4.3.4 Redrock Property Habitat Protection and Improvement

This project aims to protect and restore native riparian habitat along the Gila River through the purchase and conservation of private lands. Projects 4.4.2 and 4.4.3 have similar objectives but target different parcels of land along the Gila River.

Project description

This project would support the protection and improvement of 53 hectares (130 acres) of private land along the Gila River in Redrock, New Mexico. The upper Gila River is one of the Southwest's only free-flowing rivers, and its natural flow regime supports an exceptional array of biological diversity, both on land and in water. This project would include the purchase of the riparian portion of a larger parcel of privately owned land. The upland portion, which includes a home, would remain in private ownership. Either the BLM or TNC would take over ownership and stewardship of the acquired property. After purchase, the riparian area would be fenced to prevent unmanaged grazing and off-road vehicle use, while allowing riparian vegetation to become reestablished naturally. TNC has found that this "passive restoration" approach is a cost-effective strategy for developing the types of complex, multi-aged stands of riparian vegetation that best support riparian-dependent species. Where necessary, non-native species [e.g., salt cedar (*Tamarix* spp.) or Siberian elm] will be removed.

Project location

The project is located at the end of the Game Department Road in Redrock, New Mexico, approximately 40 kilometers (25 miles) west of Silver City, Grant County. It directly adjoins property currently managed by the New Mexico Department of Game and Fish (NMDGF), which is using the land to support the restoration of bighorn sheep (*Ovis canadensis*) in the area, and is near BLM land. This project is located approximately 64 kilometers (40 miles) from the Chino Mine, 34 kilometers (21 miles) from the Tyrone Mine, and 61 kilometers (38 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

The project is expected to have multiple benefits for wildlife and people. High-quality habitat in the Gila River supports a wide array of wildlife, including multiple threatened or endangered aquatic or riparian obligate species. There are 15 state-listed threatened and endangered (T&E) species that could benefit from improved habitat in the Gila River, including the southwestern willow flycatcher, Bell's vireo, Gila chub (*Gila intermedia*), lowland leopard frog (*Lithobates yavapaiensis*), and Mexican garter snake (*Thamnophis eques*). The Gila Watershed provides important riparian habitat for migratory birds and supports high avian diversity (Hubbard, 1977; Baltosser, 1986), including Species of Greatest Conservation Need (SGCN; NMDFG, 2006). Passive restoration planned for this project would reestablish native vegetation and encourage the reestablishment of natural floodplain hydrodynamics. Both terrestrial and aquatic species are likely to benefit from the enhanced, complex habitat provided through such restoration.

Local communities could also benefit from the project. Specifically, local hikers and bird watchers would enjoy increased access to natural areas near the river.

Overview of maintenance and monitoring

Given the focus on passive restoration, which primarily relies upon natural ecosystem dynamics to drive the recovery of diverse native habitat, ongoing maintenance is expected to be minimal. Fences will be repaired and nonnative plants will be removed as needed, but the effort expended on these activities is expected to be small. Monitoring will focus on tracking the effectiveness of fences in excluding cattle and off-road vehicles and the progression of natural recovery. Before installing fences, baseline data will be collected, including aerial photographs and floodplain surveys, as well as data on surface water and groundwater characteristics, avian community composition and abundance, and vegetation composition and structure. Analysis of aerial photographs will be used to evaluate vegetative change over time.

Trustee evaluation

The protection and improvement of the Redrock property is proposed as a Tier 1 project. The project has a strong nexus to the bird and wildlife injury at the Sites because of its significant benefits to riparian habitat along the Gila River, a free-flowing river that supports riparian habitat for migratory and resident birds and wildlife that may have been affected by hazardous substance releases at and from the Sites.

Similar to the Double E Ranch project, this project received above-average ratings for all five high-priority evaluation criteria: "high potential for long-term success," "low risk of failure," "likely to benefit birds," "provisions for operation, maintenance, and monitoring are feasible and cost-effective," and "need for NRDAR funding for project implementation." Protection and

improvement of the Redrock property has a high likelihood of success and a low risk of failure because an established NGO or the federal government will hold the title to the land and manage it to benefit wildlife and wildlife habitat. In addition, long-term stewardship is included in the project scope.

As described above, protection and improvement of riparian habitat on the Redrock property will benefit many resident and migratory bird species, some of which are federally and state-listed species. Maintenance, monitoring, and management of the property are included in the project budget and would be conducted by the new landowner. Finally, the protection and improvement of this property will not move forward without NRDAR funding. There are no other provisions in place to protect the habitat (e.g., there is no existing conservation easement).

This project received above-average ratings for three medium-priority evaluation criteria: "consistent with regional planning and federal and state policies," "likely to benefit multiple wildlife resources and services," and "cost-effective compared to other projects that provide similar benefits." This project is also consistent with regional planning. The property adjoins the NMDGF property and is near BLM land; BLM has expressed strong interest in the property as it is adjacent to the Gila Middle Box ACEC. In addition, of the three habitat protection and improvement projects submitted by TNC (see Projects 4.4.2 and 4.4.3), TNC has identified this project as its top priority because of the significant amount of riparian habitat that can be protected and restored with the purchase of this land parcel. Protecting this property will assist regional planning efforts in conserving and improving riparian habitat for critical wildlife species, including birds, along the Gila River. As described above, the project will protect and improve riparian habitat that benefits multiple resident and migratory bird species and other wildlife. Finally, this project is considered very cost-effective with regard to riparian habitat when compared with similar habitat protection and improvement projects. It protects and improves a large area of riparian habitat (53 hectares, or 130 acres) that directly benefits birds and multiple wildlife resources and services.

This project also received above-average ratings for two lower-priority criteria: "likelihood to provide benefits rapidly after project implementation" and "allows for appropriate public access." The benefits of the habitat protection and fencing of riparian areas will be felt immediately; benefits from passive restoration will take some time to be realized. The project would also provide public access to the Gila River at the lower end of the Gila Middle Box.

This project received average ratings for all other evaluation criteria; it did not receive any below-average ratings. It was a highly-rated project in the habitat protection and improvement category with a relatively low cost that fit into Tier 1.

4.4 Tier 2 Proposed Restoration Projects

Projects proposed as second-tier projects meet the restoration criteria but were scored lower than projects of similar cost in Tier 1 based on the application of the screening and evaluation criteria. The priorities for funding within Tier 2 will be decided by the Trustees based on funding availability and project status, after the Tier 1 projects have been implemented. The Trustees do not yet know which, if any, Tier 2 projects may be funded.

Tier 2 includes four habitat protection and improvement projects and one watershed habitat restoration project. These projects benefit wildlife, especially migratory and resident birds, and most of these projects have a high potential for long-term success and a low risk of failure due to strong land protection mechanisms associated with each project.

The Trustees estimate that the group of Tier 2 projects will cost between $4,720,000 and $5,410,000, although it is unlikely that this amount of funding will be available for Tier 2 projects. Details for each of the Tier 2 projects are described below, in alphabetical order.

4.4.1 Burro Cienaga Stream Stabilization Restoration

This project aims to restore riparian and wetland habitats throughout the Burro Cienaga Watershed through stream stabilization projects.

Project description

The Upper Burro Cienaga Watershed Association – a group of five private ranches and the Gila National Forest – is working to restore habitat and hydrologic functions in the watershed. This project aims to further improve the watershed function through the construction of earthen erosion control structures located in actively eroding head cuts and gullies at various locations throughout the watershed. At some locations, the existing stream banks will be reshaped, stream banks will be armored with local rock, and native vegetation will be planted along restored bank areas. This project includes sites on land owned by all project partners, i.e., AT Cross Ranch, C Bar Ranch, M-N Ranch, Prevost Ranch, Thorne Ranch, and the Gila National Forest.

Project location

The project is located on public and private lands in the Upper Burro Cienaga Watershed, which is approximately 40 kilometers (25 miles) southwest of Silver City on the southeastern corner of the Burro Mountains. This project is located approximately 47 kilometers (29 miles) from the Chino Mine, 23 kilometers (14 miles) from the Tyrone Mine, and 51 kilometers (32 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

Like the Pitchfork Ranch's Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration project (see Project 4.3.1), the wildlife and wildlife habitat benefits from this project stem from restoring the Burro Cienaga. In the dry Chihuahua Desert, the Burro Cienaga provides surface water that is used by birds and other wildlife, including federally and state-listed species such as the bald eagle, the southwestern willow flycatcher, Bell's vireo, Chiricahua leopard frog, and Gila topminnow. Installing erosion control structures and restoring riparian and wetland habitats will provide long-term benefits to habitats. Although the habitat benefits will begin immediately, improvements to hydrologic function (i.e., raising of the groundwater table) and natural revegetation will take some time.

Overview of maintenance and monitoring

Specific monitoring tasks are included as part of the project, including monitoring acres of restored riparian habitat and acres of surface water available to wildlife. Over the long-term, monitoring will be the responsibility of the private and public landowners within the watershed. In addition, a steering committee has been developed to oversee the implementation and monitoring of the Watershed Restoration Action Plan. This steering committee is also monitoring watershed improvement and wetland/riparian reclamation success through transect surveys of planted vegetation, photograph monitoring, noxious weed surveys, stream temperature monitoring, and qualitative evaluation of sediment movement.

Trustee evaluation

The Burro Cienaga Stream Stabilization Restoration project is proposed as a Tier 2 project. The project has a strong nexus to the NRDAR injury because of its benefits to riparian habitat along the Burro Cienaga, an important habitat resource for migratory and resident birds and wildlife that may have been affected by hazardous substance releases at and from the mine sites. This project received a very similar evaluation as Project 4.3.1, which also proposes restoration to the Burro Cienaga. This project was placed into Tier 2 because the private properties within this project do not have long-term land protections (e.g., conservation easements). Thus, this project received average ratings for two high-priority evaluation criteria: "high potential for long-term success" and "low risk of failure" because the long-term protection of the restoration actions is not guaranteed.

4.4.2 Davis Property Habitat Protection and Improvement

This project aims to protect and restore native riparian habitat along the Gila River through the purchase and conservation of private lands. Projects 4.3.4 (Redrock Property Habitat Protection and Improvement) and 4.4.3 (Porter Property Habitat Protection and Improvement) are also located along the Gila River and have similar objectives, but target different parcels of land.

Project description

This project, proposed by TNC, would support the purchase and protection of 40.5 hectares (100 acres) of private land and associated water rights at the confluence of Bear Creek and the Gila River. Of this area, 36 hectares (89 acres) include potential riparian habitat. The land is currently agricultural, with a small area of riparian habitat along the Gila River. The property lies entirely in the former floodplain of the Gila River, and a levee currently stands between Bear Creek and the property and between the Gila River and the property. Bear Creek in this reach is intermittent, while the Gila River flows year-round. The highest value for wildlife would be to restore the majority of the property to wetland habitat (i.e., shallow seasonal and permanent ponds with rushes, sedges, and other wetland vegetation) with associated semi-riparian native vegetation [e.g., Arizona walnut (*Juglans major*), hackberry (*Celtis* spp.), Arizona or velvet ash (*Fraxinus velutina*)]. Like Projects 4.3.4 and 4.4.3, the main focus of this project would be passive restoration of wetland and riparian habitats, which would be achieved primarily through fencing and allowing native vegetation to regrow. If the property is purchased, TNC would apply for North American Wetlands Conservation Act (NAWCA) funds to create wetlands in the agricultural area using existing water rights associated with the property. The grant funds from this NRDAR project would be used to meet the required 50% match for the NAWCA grant. TNC has successfully created wetland habitat on a similar property near the Davis and Porter parcels (i.e., the Gila Riparian Preserve), also along the Gila River.

Project location

The project is located in the heart of the Gila Basin at the confluence of the Gila River and Bear Creek, approximately 1.6 kilometers (1 mile) southwest of Gila and 35 kilometers (22 miles) northwest of Silver City, New Mexico. This project is located approximately 55 kilometers (34 miles) from the Chino Mine, 37 kilometers (23 miles) from the Tyrone Mine, and 48 kilometers (30 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

The benefits of this project are expected to be similar to those of Projects 4.3.4 and 4.4.3. Specifically, birds and wildlife will benefit from increases in riparian habitat extent, diversity, and quality. Increased riparian vegetation also is expected to benefit aquatic resources by

increasing shading of surface water and decreasing water velocities, which improve water quality by reducing water temperature and decreasing erosion (Beschta, 1997; Tabacchi, et al., 1998). Water rights could potentially be used to maintain a wet river channel during the irrigation season.

The Cliff-Gila Valley has the largest southwestern willow flycatcher population (Durst et al., 2008) and is a breeding location for the candidate species, yellow-billed cuckoo. Protection of this property would increase protected habitat for the southwestern willow flycatcher, as well as the loach minnow and spikedace (*Meda fulgida*). As with Project 4.4.3, local hikers and bird watchers visit TNC's Gila Riparian Preserve regularly, and would enjoy additional access to natural areas near the river.

Overview of maintenance and monitoring

The maintenance and monitoring associated with this project would be similar to those described for Projects 4.3.4 and 4.4.3. The project would be incorporated into TNC's existing monitoring framework. Fencing would be monitored and maintained and non-native species would occasionally be removed. Baseline and monitoring data would be collected regarding vegetation composition and structure, water quality, and wildlife composition and abundance. TNC would also conduct annual surveys for the southwestern willow flycatcher.

Trustee evaluation

The protection and improvement of the Davis property is proposed as a Tier 2 project. This project protects and improves a large area of riparian habitat (36 hectares, or 89 acres) at the confluence of Bear Creek and the Gila River. Overall, this project was evaluated very favorably within the habitat protection and improvement category; however, the expected cost of the project was too high to fit into Tier 1.

Similar to the Double E Ranch and Redrock projects, this project received above-average ratings for all five high-priority evaluation criteria: "high potential for long-term success," "low risk of failure," "likely to benefit birds," "provisions for operation, maintenance, and monitoring are feasible and cost-effective," and "need for NRDAR funding for project implementation." Protection and improvement of the Davis property has a high likelihood of success and a low risk of failure because an established NGO (TNC) will hold the title to the land and manage it to benefit wildlife and wildlife habitat. As described above, protection and improvement of riparian habitat on the Davis property will benefit many resident and migratory bird species, some of which are federally and state-listed species. This project includes sufficient monitoring and maintenance; these costs will be assumed by the project proponent and have been included in the project proposal's budget. If this property is not purchased with NRDAR settlement funding, it may remain in high water-use agricultural practices (i.e., alfalfa fields) that provide lesser

benefits for birds and wildlife, or there could be subdivision and residential development that further reduce the wildlife value. There are no other provisions in place to protect the habitat (i.e., there is no existing conservation easement).

This project received above-average ratings for one medium-priority criteria: "likely to benefit multiple resources and services." The project protects and improves a large area of riparian habitat (36 hectares, or 89 acres) that directly benefits birds and multiple wildlife resources and services. However, this project protects fewer hectares of riparian habitat than the Tier 1 habitat protection and improvement projects (see Projects 4.3.2 and 4.3.4). Additional wildlife habitat benefits could be realized from converting the agricultural fields to wetlands. Although the scope of work does not include this wetland conversion, this project plans to use settlement funding to leverage a NAWCA grant to convert the property's field to wetlands.

This project received above-average ratings for two lower-priority criteria: "likely to provide benefits rapidly after project implementation" and "allows for appropriate public access." The benefits of protecting and improving this property will be felt immediately after project implementation, when the ranch is permanently protected and the riparian area is fenced. Benefits from the conversion of agricultural fields to wetlands will depend on additional funding and, once implemented, these benefits will take many years to be realized. The project will also provide improved opportunities for public access for bird watching and other recreational activities.

This project received average ratings for all other evaluation criteria; it did not receive any below-average ratings. Overall, this project was evaluated very favorably within the habitat protection and improvement category; however, its cost was too high to fit into Tier 1.

4.4.3 Porter Property Habitat Protection and Improvement

This project aims to protect and restore native riparian habitat along the Gila River through the purchase and conservation of private lands. Projects 4.3.4 (Redrock Property Habitat Protection and Improvement) and 4.4.2 (Davis Property Habitat Protection and Improvement) have similar objectives, but are targeted on different parcels of land.

Project description

This project, proposed by TNC, would support purchasing 25.5 hectares (63 acres) of land and associated water rights on the east side of the Gila River, approximately one mile north of Gila, New Mexico. The land consists of high-quality riparian habitat and an adjacent agricultural field that lies in the former floodplain of the river. If the property is purchased, TNC would apply for funds through the NAWAC. As with Project 4.4.2, the grant funds from this NRDAR project would be used to meet the required 50% match for the NAWAC grant, thus significantly

leveraging the initial investment. Multiple sites on the property provide appropriate habitat for such restoration, including the lower terrace of the agricultural field and a portion of the property that is intersected by the Gila Farm ditch. If other funding is unavailable, the existing alfalfa fields would be converted to native grasses. TNC has successfully created wetland habitat on a similar property near the Davis and Porter parcels (i.e., the Gila Riparian Preserve), also along the Gila River.

Project location

The parcel of land to be purchased lies one mile north of Gila on the east side of the Gila River and approximately 35 kilometers (22 miles) northwest of Silver City, New Mexico. This project is located approximately 56 kilometers (35 miles) from the Chino Mine, 40 kilometers (25 miles) from the Tyrone Mine, and 48 kilometers (30 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

The benefits of this project are expected to be similar to that of Projects 4.3.4 and 4.4.2. Specifically, birds and wildlife will benefit from increases in riparian habitat extent, diversity, and quality. Increased riparian vegetation also is expected to benefit aquatic resources by increasing shading of surface water and decreasing water velocities, which improve water quality by reducing water temperature and decreasing erosion (Beschta, 1997; Tabacchi et al., 1998).

As with Project 4.4.2, protection of the Porter property would increase protected habitat for the southwestern willow flycatcher, loach minnow, and spikedace. Local birders and hikers will also benefit from increased access to natural areas near the river.

Overview of maintenance and monitoring

The maintenance and monitoring associated with this project would be similar to those described for Projects 4.3.4 and 4.4.2. The project would be incorporated into TNC's existing monitoring framework. Fencing would be monitored and maintained and non-native species would occasionally be removed. Baseline vegetation, water, and wildlife surveys would be conducted, as would aerial photography. TNC would also conduct annual surveys for the southwestern willow flycatcher. Changes in vegetation and wildlife would be documented periodically as restoration proceeds. If the additional wetland restoration is completed with other funding, more maintenance and monitoring would be required, which would be supported through other funding sources.

Trustee evaluation

The protection and improvement of the Porter property is proposed as a Tier 2 project. Its evaluation is very similar to the Davis project (Project 4.4.2). The Porter property protects and

improves a large area of riparian habitat (25.5 hectares, or 63 acres) that directly benefits birds and multiple wildlife resources and services. Overall, this project was evaluated very favorably within the habitat protection and improvement category; however, the expected cost of the project was too high to fit into Tier 1.

Similar to the Double E Ranch Habitat Protection and Improvement (Project 4.3.2), Redrock (Project 4.3.4), and Davis (Project 4.4.2) properties, the Porter property received above-average ratings for all five high-priority evaluation criteria: "high potential for long-term success," "low risk of failure," "likely to benefit birds," "provisions for operation, maintenance, and monitoring are feasible and cost-effective," and "need for NRDAR funding for project implementation." The protection and improvement of the Porter property has a high likelihood of success and a low risk of failure because an established NGO (TNC) will hold the title to the land and manage it to benefit wildlife and wildlife habitat. As described above, the protection and improvement of riparian habitat on the Porter property will benefit many resident and migratory bird species, some of which are federally and state-listed species. This project includes sufficient monitoring and maintenance; these costs will be assumed by the project proponent and have been included in the project proposal's budget. If this property is not purchased with settlement funding, it may remain in high water-use agricultural practices (i.e., alfalfa fields) that provide little benefit for birds and wildlife. There are no other provisions in place to protect the habitat (i.e., there is no existing conservation easement).

This project received above-average ratings for one medium-priority criteria: "likely to benefit multiple resources and services." The project protects and improves a large area of riparian habitat (25.5 hectares, or 63 acres) that directly benefits birds and multiple wildlife resources and services. However, this project protects fewer hectares of riparian habitat than the Tier 1 habitat protection and improvement projects (see Projects 4.3.2 and 4.3.4) or the Davis property (see Project 4.4.2). Additional wildlife habitat benefits will be realized from converting the agricultural fields to wetlands. Although the scope of work does not include this wetland conversion, the project proponent plans to use NRDAR funding to leverage additional funding to convert the property's field to wetlands.

This project received above-average ratings for two lower-priority criteria: "likely to provide benefits rapidly after project implementation" and "allows for appropriate public access." The benefits of protecting and improving this property will be felt immediately after project implementation, when the ranch is permanently protected and the riparian area is fenced. Benefits from conversion of agricultural fields to wetlands will depend on additional funding and, once implemented, these benefits will take many years to be realized. The project will also provide improved opportunities for public access for bird watching and other recreational activities.

This project received average ratings for all other evaluation criteria; it did not receive any below-average ratings.

4.4.4 River Ranch Land Habitat Protection and Improvement

This project aims to protect valuable wildlife habitat and allow for effective management through the acquisition, restoration, and management of the River Ranch.

Project description

This project, proposed by NMLC, would protect, restore, and manage habitat on the River Ranch. The River Ranch comprises 409 hectares (1,010 acres) of deeded land, along with 1,182 hectares (2,920 acres) of federal and leased land, and water rights. Approximately 3 kilometers (2 miles) of the Mimbres River transect the property; this is the lowest reach of the river that still flows perennially. The river corridor and floodplain on the ranch are wide, and riparian and floodplain areas cover a large area of the property. Based on the National Wetlands Inventory map, riparian and wetland habitats comprise approximately 60 hectares (147 acres) of the property. Habitat on the property includes riparian gallery forests, irrigated pastureland, Sacaton grasslands, and upland Chihuahua desert scrubland. Almost all of the leased lands associated with the ranch are upland Chihuahuan desert scrubland and grasslands. The property also contains a 10-acre cultural site (the Pruitt Site), which contains archaeological remnants of the pre-Columbian Mimbres community of "Old Town."[1]

Since 2009, the owners of the River Ranch have been working with NMLC to help conserve key wildlife habitat on the property. In 2011, the New Mexico Forestry Division used state funding to purchase a conservation easement for the entire property, which is held by NMLC. New Mexico State Parks had planned to purchase the property after the easement was obtained, and a $550,000 federal Land and Water Conservation Fund grant was secured for that purpose. New Mexico State Parks has been facing budget cuts, however, and is concerned about their ability to staff and manage the property in the absence of additional funding; thus, acquisition of this property by New Mexico State Parks has not moved forward. Funding for this project would help with (1) property acquisition, (2) habitat restoration, (3) property and habitat management, and (4) conservation easement stewardship. Restoration activities supported through NRDAR funding would include restoration planning, fencing, cottonwood and willow plantings, building and irrigation diversion structures, and restoration of an arroyo.

1. The archaeological site was donated to the Archaeological Conservancy by the landowners, and is not accessible to the general public. It is fenced off and used solely for research and educational purposes. The archeological site will not be affected by this project.

The project could be carried out via four possible acquisition, ownership, and management scenarios: (1) acquisition, ownership, and management by NMDGF; (2) acquisition, ownership, and management by NMDGF, with recreational management support from New Mexico State Parks; (3) acquisition, ownership, and management by New Mexico State Parks; or (4) acquisition and interim ownership and management by NMLC until the property can be conveyed to a suitable public agency or conservation buyer. For a state agency to hold the property, long-term maintenance and management costs would need to be provided in full. The costs of these four options are very similar. Public access to the property would be available under each of these scenarios, but the specifics will likely differ depending on ownership and management goals.

Project location

The River Ranch is located on New Mexico State Highway 61, approximately 56 kilometers (35 miles) southeast of Silver City and 48 kilometers (30 miles) northwest of Deming in Grant and Luna counties, New Mexico. The property is also just east of the City of Rocks State Park and southeast of the Chino Mine Permit Area. This project site is approximately 21 kilometers (13 miles) from the Chino Mine, 45 kilometers (28 miles) from the Tyrone Mine, and 31 kilometers (19 miles) from the Cobre Mine. The project is located in the Mimbres Watershed, where most of the injuries to birds and wildlife occurred.

Expected benefits and timeframe of benefits

Protecting and improving riparian habitat on the River Ranch will benefit birds and wildlife, water resources, and local communities. In the Comprehensive Wildlife Conservation Strategy for New Mexico, two habitat types found on River Ranch are noted as containing a high diversity and abundance of SGCN (NMDGF, 2006). Sixty-seven species of birds have been documented as inhabiting the riparian forest and woodlands of the River Ranch during the breeding season. Of those species, six are SGCN. Notable bird SGCN documented during the 2000 nesting-season survey on the River Ranch include the yellow-billed cuckoo, a federal candidate species, and Bell's vireo, which is state-listed as threatened under the New Mexico Wildlife Conservation Act.

While the property is currently protected under a conservation easement from division and development, it may be sold to a private party who wishes to manage the land for livestock production. Purchase and restoration of the property through this project would actively improve riparian habitat, benefiting a multitude of riparian-dependent species in the area. Increased riparian vegetation (with associated woody debris such as logs, sticks, and other wood that falls into streams and rivers) is also likely to improve local water quality through increased shading and slower water velocities, which reduce water temperature and erosion. The public would also

benefit from the project through enhanced access to wildlife viewing and environmental education.

Overview of maintenance and monitoring

Maintenance and monitoring activities would depend on the ultimate owner and manager of the land. Restoration plans are in the conceptual stage, and thus detailed activities that would be required for maintenance and monitoring are not yet clear. However, activities may include monitoring and documenting changes in vegetation composition and structure, avian and aquatic community structure and abundance, and invasive species abundance, as well as monitoring water quality. Fences installed to control grazing in the riparian areas will need to be monitored and maintained to ensure their effectiveness, and active invasive species management may be required.

Trustee evaluation

The protection and improvement of River Ranch is proposed as a Tier 2 project. The project has a strong nexus to the NRDAR injury because of its benefits to riparian habitat along the Mimbres River. Overall, this project was evaluated very favorably within the habitat protection and improvement category; however, the expected cost of the project was too high to fit into Tier 1.

This project received above-average ratings for four high-priority evaluation criteria: “high potential for long-term success,” “low risk of failure,” “likely to benefit birds,” and “provisions for operation, maintenance, and monitoring are feasible and cost-effective.” This project has a high likelihood of success and a low risk of failure because an established NGO or a state agency will hold the title to the land. This property also has a conservation easement in place that limits the potential for development and provides wildlife and wildlife habitat benefits into the future. This project includes sufficient monitoring and maintenance; these costs have been included in the project proposal’s budget. There is some uncertainty regarding project costs for operations and maintenance, however, because plans for ownership are not yet final.

This project received above-average ratings for two medium-priority criteria: “located close to where the injuries occurred” and “likely to benefit multiple resources and services.” This project is located in the Mimbres Watershed, within approximately 26 kilometers (16 miles) of the Cobre and Chino mines. The project protects and improves a large area of riparian habitat (60 hectares, or 147 acres) that directly benefits birds and multiple wildlife resources and services.

This project received above-average ratings for all three lower-priority criteria: “likely to provide benefits rapidly after project implementation,” “allows for appropriate public access,” and “leverages funding.” The benefits of protecting and improving this property will be felt

immediately after project implementation, when the ranch is permanently protected. Benefits associated with riparian restoration will take some time to be realized. The project will provide improved opportunities for public access for bird watching and other recreational activities. There is the opportunity for this project to leverage other funding available for the purchase of the ranch.

This project received a below-average rating for "cost-effective compared to other projects that provide similar benefits." Due to the large amount of land associated with the property, this project is very cost-effective when compared to other land protection and improvement projects on a total acreage basis. However, if cost-effectiveness is calculated solely for riparian habitat, then this project is not considered as cost-effective as other similar projects. In addition, the degree of benefits associated with this project is smaller than other proposed habitat protection and improvement projects, because many of the benefits of land protection are already provided by the conservation easement that is in place on the property.

4.4.5 Upper Bear Creek Habitat Protection and Improvement

This project aims to protect valuable wildlife habitat and allow for its effective management through the acquisition and management of the Upper Bear Creek property.

Project description

The Upper Bear Creek property is currently owned by Bear Creek Ranch, LLC. It is located on a tributary of the upper Gila River, and is one of the largest private inholdings within the Gila National Forest. The property comprises approximately 89 hectares (220 acres), which includes Bear Creek, a perennial interrupted stream. The property also includes the Ben Lilly Pond, which is approximately 0.4 hectares (1 acre) and supports waterfowl, fish, and other wildlife. If purchased, ownership of the property would be transferred to the federal government and incorporated into the Gila National Forest. The project proponent is the U.S. Department of Agriculture Forest Service – Gila National Forest.

Project location

The property is located approximately 3 kilometers (2 miles) northwest of the community of Pinos Altos, New Mexico. This project is located approximately 27 kilometers (17 miles) from the Chino Mine, 29 kilometers (18 miles) from the Tyrone Mine, and 18 kilometers (11 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

Protecting and restoring the high-quality riparian habitat along Bear Creek and the Ben Lilly Pond would benefit birds and wildlife. Riparian habitat in these locations is critical for hundreds of migrating birds that visit the area. Ben Lilly Pond provides habitat for waterfowl that include mallards (*Anas platyrhynchos*), coots (*Fulica* spp.), great blue herons (*Ardea herodias*), gadwalls (*Anas strepera*), and other species. Birds and wildlife would benefit from this project through the prevention of habitat degradation on the Upper Bear Creek property. This property has road access, and there have been some inquiries about the possibility of widening the access road to the property for potential buyers. As such, there is some development pressure, which could include eventual subdivision and residential development. Protection of the property, however, would protect it from future development. Because the property would be incorporated into the Gila National Forest, the USFS would provide long-term stewardship, ensuring that the benefits of this project to wildlife and wildlife habitat would continue in perpetuity.

Overview of maintenance and monitoring

The USFS would assume all monitoring and maintenance activities for the property as part of their Gila National Forest management operations. Specific monitoring actions have not been identified. The property would be managed to benefit wildlife and wildlife habitat.

Trustee evaluation

The protection and improvement of the Upper Bear Creek property is proposed as a Tier 2 project. This project protects and improves riparian habitat along Bear Creek (11.7 hectares, or 28.8 acres) that directly benefits birds and wildlife resources and services. Protection of this property primarily eliminates a forest inholding, reducing fragmentation of the forest. This project was evaluated favorably within the habitat protection and improvement category; however, the expected cost of the project was too high to fit into Tier 1.

The Upper Bear Creek property received above-average ratings for three high-priority evaluation criteria: “high potential for long-term success,” “provisions for operation, maintenance, and monitoring are feasible and cost-effective,” and “need for NRDAR funding for project implementation.” The protection and improvement of the Upper Bear Creek property has a high likelihood of success because the federal government will hold the title to the land and manage it as part of the Gila National Forest. This project includes sufficient monitoring and maintenance; the Gila National Forest will assume these costs. Finally, protection of this property will not move forward without NRDAR funding. There are no other provisions in place to protect the habitat (e.g., there is no existing conservation easement) and the federal government has no other funding opportunities to complete the purchase. In addition, there is some risk of development if this property is not purchased with settlement funding.

This project received an average rating for one high-priority evaluation criteria: "low risk of failure." There is some uncertainty in the cost of purchasing this property and the nature of the water rights associated with the property's Ben Lilly Pond. If this project is selected for funding, the Trustees will work closely with project proponents to ensure a reasonable and cost-effective purchase price of the Upper Bear Creek property. Moreover, the Trustees will work closely with project proponents and the Office of the State Engineer to ensure that water rights are attached to the pond.

This project received above-average ratings for two medium-priority criteria: "located close to where the injuries occurred" and "consistent with regional planning." This project is located in the Gila Watershed, within approximately 18 kilometers (11 miles) of the Cobre Mine and 29 kilometers (18 miles) of the Tyrone Mine. As an inholding, this property is a high priority for protection and integration into the Gila National Forest. This project received a below-average rating for one medium-priority criterion: "likely to benefit multiple wildlife resources and services." Compared to other proposed projects, protection of the Upper Bear Creek property would be less likely to benefit unique wildlife resources or services.

This project received above-average ratings for two lower-priority criteria: "likely to provide benefits rapidly after project implementation" and "allows for appropriate public access." The benefits of protecting this property will be felt immediately after project implementation, when the property is permanently protected and incorporated into the Gila National Forest. The project will also provide improved opportunities for public access in the Gila National Forest.

Overall, this project was evaluated slightly less favorably within the habitat protection and improvement category compared to the other Tier 1 and Tier 2 habitat protection and improvement projects.

4.5 Tier 3 Proposed Restoration Projects

Projects in the third tier meet Trustee screening criteria; however, they were scored lower than projects in the first and second tiers. Third-tier projects may receive funding if there are funds available after the projects in Tiers 1 and 2 are completed.

4.5.1 Burro Cienaga Grassland Restoration

The goal of this project is to increase continuous grass cover in the Burro Cienaga through prescribed burning and herbicide treatments that will reduce mesquite (*Prosopis* spp.) and benefit grassland-dependent birds and wildlife and wildlife habitat.

Project description

Chihuahuan Desert grasslands have undergone a dramatic vegetation change due to encroachment by shrubs and loss of perennial grass cover. The Burro Cienaga has been identified as a priority borderlands grassland landscape, where restoring intact grasslands and recovering grassland-dependent wildlife has a high probability of success (Bodner et al., In press). This grassland restoration project, proposed by TNC, AT Cross Ranch, and Pitchfork Ranch, will increase continuous grass cover on more than 2,185 hectares (5,400 acres) of land, and link high-quality grassland patches with restored patches, resulting in more than 20,234 hectares (50,000 acres) of grassland habitat in the Burro Cienaga. Restoration actions will include prescribed burning and herbicide treatments that reduce the density and cover of mesquite and other shrubs and increase perennial grass cover.

Areas for treatment will be targeted (1) where mesquite canopy cover is low and perennial grasses persist, and (2) adjacent to high-quality, open grassland patches so that restoration has the "multiplicative" effect of increasing the contiguous areas of open grassland, which in turn helps to maintain grasslands by reducing opportunities for mesquite invasion. Herbicide treatment will be used to initiate restoration in areas where mesquite shrubs are too large to treat effectively with only prescribed burning. Restored areas will be maintained through prescribed burning. This project is expected to (1) eradicate mesquite within the first year after treatment, (2) increase herbaceous and perennial grass canopy cover within two growing seasons after treatment, and (3) increase perennial grass recruitment when climate conditions are suitable.

Project location

This project is located in the Burro Cienaga Watershed, which is approximately 40 kilometers (25 miles) southwest of Silver City on the southeastern corner of the Burro Mountains. This project is located approximately 45 kilometers (28 miles) from the Chino Mine, 31 kilometers (19 miles) from the Tyrone Mine, and 51 kilometers (32 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

Chihuahuan Desert grasslands are important breeding sites for migratory grassland birds (Panjabi et al., 2010). This project will benefit grassland-dependent wildlife, including migratory and breeding birds that use or depend on grassland habitats. Removing mesquite from grassland areas is expected to reduce competition between mesquite and grass, increase soil moisture, and allow grassland habitat to persist and expand. Restoring grassland habitat will improve wintering habitat and food availability for migratory birds and facilitate the recovery of grassland species that are already present in the area, including the grasshopper sparrow (*Ammodramus savannarum*), Sprague's pipit (*Anthus spragueii*), Botteri's sparrow (*Aimophila botterii*), Cassin's sparrow (*Peucaea cassinii*), chestnut-collared longspur (*Calcarius ornatus*), lark

bunting (*Calamospiza melanocorys*), and meadowlark (*Sturnella* spp.). The benefits associated with grassland treatment will take some time to be realized. This project will primarily benefit grassland-dependent birds and wildlife; it will also benefit livestock grazing by increasing forage availability.

Overview of maintenance and monitoring

After the initial implementation of herbicide treatments and prescribed burns, the ranch owners will maintain the treatments over time at a relatively low cost using periodic prescribed burning to reduce newly invading shrubs and maintain open grassland conditions in restored areas. With these maintenance activities, the benefits are expected to be long-lasting. Additional monitoring actions will include photo-point monitoring, establishment of permanent vegetation transects, and installation of three rain gauges to document and interpret the effects of treatment. Grassland bird monitoring will also be conducted using field-tested methodology developed by the Rocky Mountain Bird Observatory for grasslands.

Trustee evaluation

The Burro Cienaga Grassland Restoration project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. In general, the project received a mix of average and above-average ratings. However, the project received one below-average rating for one high-priority criterion: "likely to directly benefit birds that were affected by hazardous substance releases at the Sites." This project primarily benefits grassland-dependent birds and wildlife, with some indirect benefits to waterfowl and migratory birds. Because the wildlife affected by hazardous substance releases at the Sites were primarily waterfowl species, this project does not have as strong of a nexus to the birds injured at the Sites as other proposed projects. In addition, the protection of 289 hectares (714 acres) of desert grasslands at the City of Rocks State Park, which was part of the overall NRDAR wildlife settlement, has helped to compensate for injury to grassland bird species. This project also received one below-average rating for one medium-priority criterion: "cost-effective compared to other projects that provide similar benefits," because the project is not as cost-effective as other proposed grassland restoration projects.

4.5.2 Burro Cienaga Pinyon and Juniper Restoration

This project will restore riparian and wetland habitats in the Gila National Forest along the Burro Cienaga Watershed by removing encroaching pinyon pine (*Pinus edulis*) and juniper.

Project description

As described in Project 4.4.1, the Upper Burro Cienaga Watershed Association – a group of five private ranches and the Gila National Forest – is working to improve the functioning of the watershed. This watershed has been identified by the Gila National Forest as functioning at risk. The land is currently managed for livestock production, with some fuel wood harvesting and hunting. Within the watershed, a Watershed Restoration Action Plan has been developed to improve ecosystem health, water quality standards, and watershed conditions. As part of this action plan, some wetland, riparian, and upland restoration projects have been implemented, and livestock grazing management changes have already resulted in some natural recovery of the watershed.

This project will remove encroaching pinyon pine and juniper on 101 hectares (250 acres) in the Gila National Forest. Restoration actions would include using heavy equipment to uproot the trees, which would be sold as commercial fuel wood. Money received from the sale of wood products would be used in the treatment area to complete additional watershed stabilization work.

Project location

The project is located in the Gila National Forest in the Burro Cienaga Watershed, which is approximately 40 kilometers (25 miles) southwest of Silver City, New Mexico on the southeastern corner of the Burro Mountains. This project is located approximately 47 kilometers (29 miles) from the Chino Mine, 23 kilometers (14 miles) from the Tyrone Mine, and 51 kilometers (32 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

The Burro Cienaga provides surface water used by birds and other wildlife, including a number of federally and state-listed species such as the bald eagle, southwestern willow flycatcher, Bell's vireo, Chiricahua leopard frog, and Gila topminnow. Removing the encroaching pinyon pine and juniper will allow for the natural recovery of riparian vegetation and desert grassland habitat, and prevent further conversion of riparian and grassland areas to pinyon-juniper habitat.

The treatment of pinyon pine and juniper will be complete in one to five years, depending on the specific site. These restoration actions are expected to provide long-term benefits with minimal maintenance requirements.

Overview of maintenance and monitoring

Monitoring will be conducted by the Upper Burro Cienaga Watershed Association stakeholders and steering committee as part of the project implementation. Monitoring will include plant

transect surveys, photograph monitoring, noxious weed surveys, stream temperature monitoring, and estimation of sediment movement. Over the long-term, monitoring within the watershed will be the responsibility of the USFS.

Trustee evaluation

The Burro Cienaga Pinyon and Juniper Restoration project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. Similar to Project 4.5.1, this project received one below-average rating for one high-priority criterion: "likely to directly benefit birds that were affected by hazardous substance releases at the Sites." This project also primarily benefits grassland-dependent birds and wildlife, with some indirect benefits to waterfowl and migratory birds. Thus, this project does not have as strong of a nexus to the birds injured at the Sites as other proposed projects. This project also received one below-average rating for one medium-priority criterion: "cost-effective compared to other projects that provide similar benefits" because the project is not as cost-effective as other grassland restoration projects.

4.5.3 Burro Cienaga Stock Pond Restoration

This project aims to restore riparian and wetland habitats throughout the Burro Cienaga Watershed through maintaining and restoring stock ponds and reconstructing stock tanks.

Project description

As described in Project 4.5.2, the Upper Burro Cienaga Watershed Association – a group of five private ranches and the Gila National Forest – is working to restore habitat and hydrologic functions in the watershed. This project aims to provide habitat for migrating waterfowl by restoring and improving stock ponds at various locations throughout the watershed. Restoration actions include maintaining 48 stock ponds for open-water habitat that benefit waterfowl; reconstructing eight stock tanks to develop wetland and riparian habitats while providing an offsite water source for livestock; and restoring approximately 2.2 hectares (5.4 acres) of ponds with riparian vegetation for birds and wildlife. Included in this project are the AT Cross Ranch, the C Bar Ranch, the Thorne Ranch, and the Gila National Forest.

Project location

The project is located in the Burro Cienaga Watershed, which is approximately 40 kilometers (25 miles) southwest of Silver City, New Mexico on the southeast corner of the Burro Mountains. The project is approximately 47 kilometers (29 miles) from the Chino Mine, 23 kilometers (14 miles) from the Tyrone Mine, and 51 kilometers (32 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

Stock ponds provide important water sources for wildlife, especially in the desert areas of the southwest (Rosenstock et al., 1999; Taylor and Tuttle, 2012), as well as being important water sources for livestock. NMDGF (2006) has identified perennial tanks as important wildlife habitat. In the Burro Cienaga Watershed, stock tanks are important watering stops for migratory birds. Restoration of stock tanks for wildlife and livestock use could increase the availability of water resources for birds and other wildlife. For instance, in other locations, stock ponds support important populations of Chiricahua leopard frogs (USFWS, 2007).

The wildlife benefits associated with stock ponds depend on the stock ponds remaining functional. Drought can cause drying of stock tanks, potentially harming the wildlife dependent upon them, unless there is active groundwater pumping.

Overview of maintenance and monitoring

Over the long-term, monitoring and maintenance of the stock ponds will be the responsibility of the private and public landowners within the watershed. Because the stock ponds benefit livestock, the landowners have an incentive to maintain the stock ponds. Long-term maintenance needs are expected to be low.

Trustee evaluation

The Burro Cienaga Stock Pond Restoration project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. The project received one above-average rating for one high-priority criterion: “provisions for operation, maintenance, and monitoring are feasible and cost-effective,” because the long-term requirements for operations and maintenance are expected to be low and will be the responsibility of the landowners. The project received average ratings for all the other high-priority criteria. For example, the likelihood of long-term success is considered average because there are no land protections (e.g., conservation easements) that would guarantee long-term protection of the project for wildlife benefits. When compared with similar watershed restoration projects, the Burro Cienaga Stock Pond Restoration project is not as cost-effective as the other proposed projects. The project proponents submitted a number of different types of projects [e.g., Projects 4.4.1 (Burro Cienaga Stream Stabilization Restoration) and 4.5.2 (Burro Cienaga Pinyon and Juniper Restoration)] with different priority levels. This project was ranked as a medium priority relative to other proposed projects by the project proponents.

4.5.4 Grassland Restoration through Aerial Treatment of Mesquite

The goal of this project is to increase grass cover through aerial treatments of mesquite on approximately 4,000 hectares (10,000 acres) of Chihuahuan Desert grasslands and shrublands.

Project description

Chihuahuan Desert grasslands have undergone a dramatic vegetation change due to encroachment by shrubs and loss of perennial grass cover. This grassland restoration project, proposed by the AT Cross, Bar VK, and Cow Spring ranches, will increase grass on approximately 4,000 hectares (10,000 acres) of Chihuahuan Desert grasslands and shrublands. Aerial treatment will be completed using a new herbicide designed for removing mesquite. Herbicide treatment will be completed at three locations, covering approximately 1,335 hectares (3,300 acres) at each location. The goal of the treatment is to kill at least 64% of the treated mesquite. During the growing seasons after treatment, livestock stocking rates will be decreased to allow grasses to regrow more easily.

Project location

The project is located in the Burro Cienaga Watershed, which is approximately 24–48 kilometers (15–30 miles) southwest of Silver City on the southeastern corner of the Burro Mountains. The project site is located approximately 47 kilometers (29 miles) from the Chino Mine, 23 kilometers (14 miles) from the Tyrone Mine, and 51 kilometers (32 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

Chihuahuan desert grasslands are important breeding sites for migratory grassland birds (Panjabi et al., 2010). This project will benefit grassland-dependent wildlife, including migratory and breeding birds, and is expected to provide indirect benefits to migrating birds and waterfowl. Improvements in grassland habitat conditions will improve wintering habitat and food availability for migratory birds and facilitate the recovery of grassland species that are already present in the area. The benefits associated with grassland treatment will take some time to be realized. This project also will benefit livestock grazing and other large wildlife species. The project may also provide benefits to the public for wildlife viewing and hunting.

Overview of maintenance and monitoring

After the initial herbicide treatments, the landowners will maintain the treated areas to prevent reestablishment of mesquite using stewardship practices already used on the ranches.

Trustee evaluation

The Grassland Restoration through Aerial Treatment of Mesquite project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. The project received below-average ratings for two high-priority criteria: "likely to directly benefit birds that were affected by hazardous substance releases at the Sites" and "low risk of failure." This project primarily benefits grassland-dependent birds, wildlife, and grazing livestock, with some indirect benefits to waterfowl and migratory birds. Because the wildlife affected by hazardous substance releases at the Sites were primarily waterfowl species, this project does not have as strong of a nexus to birds injured at the Sites as other proposed projects. As discussed in Project 4.5.1, protection of 289 hectares (714 acres) of desert grasslands at the City of Rocks State Park as part of the overall NRDAR wildlife settlement also has helped to compensate for injuries to grassland bird species. The project also scored below-average for low risk of failure because none of the ranches involved in this project have permanent land protections (e.g., conservation easements) in place; thus long-term success of the restoration actions is not guaranteed. The success of aerial treatment of mesquite also depends on the spraying being conducted under specific environmental conditions.

4.5.5 Meadow Creek Restoration

This project aims to restore 11 kilometers (7 miles) of Meadow Creek in the Gila National Forest.

Project description

Meadow Creek is a tributary of the Gila River that feeds through Sapillo Creek. Under this project, proposed by WildEarth Guardians, the Gila National Forest would implement a riparian and wetland restoration project on up to 11 kilometers (7 miles) of the creek. Specific restoration actions have not yet been determined, and the final restoration design will depend on site-specific needs. Anticipated restoration actions include fencing riparian areas to limit access of grazing wildlife and cattle. The fences would be designed to allow access to water in a limited area for wildlife and cattle needs and for human access to recreation, while allowing most riparian areas to recover through natural restoration. Invasive species would also be removed as part of the project, but it is believed that the restoration site does not have a large population of invasive species.

Project location

This project is located on Meadow Creek in the Gila National Forest. The project site is located approximately 37 kilometers (23 miles) from the Chino Mine, 45 kilometers (28 miles) from the Tyrone Mine, and 26 kilometers (16 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

The proposed project is expected to conserve, restore, and enhance existing migratory bird habitat and surface waters. Many wildlife species are expected to benefit from this project, including native fish and amphibians, waterfowl and other bird species, and the Chiricahua leopard frog.

Overview of maintenance and monitoring

The Gila National Forest would assume responsibility for long-term operations and maintenance. Maintenance and monitoring activities would focus on maintaining fences in riparian areas to limit access of grazing wildlife and livestock, monitoring vegetation, and controlling invasive species, if required.

Trustee evaluation

The Meadow Creek restoration project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. In general, the project received a mix of average and above-average ratings. However, the project received one below-average rating for one high-priority criterion: "likely to directly benefit birds that were affected by hazardous substance releases at the Sites," and two below-average ratings for the medium-priority criteria: "likely to benefit multiple wildlife resources and services" and "cost-effective compared to other projects that provide similar benefits." Although the project is intended to benefit migratory bird habitat and wildlife, the extent of the benefits and the particular species that will benefit will depend on the specific locations chosen. Because specific restoration techniques and locations have not yet been identified, the Trustees rated the project as below-average for "likely to directly benefit birds affected by the hazardous substance releases" and "likely to benefit multiple wildlife resources and services." In addition, this project was rated as less cost-effective compared to similar riparian restoration projects.

4.5.6 Migratory Bird Grassland Restoration

The goal of this project is to increase grass cover on Chihuahuan desert grasslands through aerial treatments of creosote bush (*Larrea tridentata*) and mesquite on approximately 20,234 hectares (50,000 acres) of BLM priority watersheds.

Project description

Chihuahuan Desert grasslands have undergone a dramatic vegetation change due to encroachment by shrubs and loss of perennial grass cover. This grassland restoration project is part of the Restore New Mexico initiative, which has the goal of restoring degraded lands within

priority watersheds on a landscape scale through a public-private partnership approach. This project will restore native grassland habitat in priority landscapes identified by the BLM Las Cruces District and the Natural Resources Conservation Service (NRCS) as part of their Cooperative Conservation Planning Initiative: 15,718 hectares (38,839 acres) in Grant and Hidalgo counties, and 4,249 hectares (10,500 acres) in Sierra County. This project is part of a partnership between NRCS and BLM to fund grassland restoration projects in which private lands are commingled with state and public lands within priority watersheds. Grassland restoration will be accomplished through the treatment of creosote and mesquite using a soil-activated herbicide (i.e., tebuthiuron). The goal of this project is to reduce existing shrub densities, allowing more desirable vegetation species to flourish.

Project location

The project is located in the BLM Las Cruces District priority watersheds that have been designated as Cooperative Conservation Planning Initiatives, including the Arizona-New Mexico borderlands initiative in Grant and Hidalgo counties and the Jornada/Elephant Butte, Caballo, and El Paso initiative in Sierra County. Although the specific project sites have not yet been selected, approximate site locations are up to 108 kilometers (67 miles) from the Chino Mine, 124 kilometers (77 miles) from the Tyrone Mine, and 114 kilometers (71 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

As described in Project 4.5.4, Chihuahuan Desert grasslands are important breeding sites for migratory grassland birds (Panjabi et al., 2010). This project will benefit grassland-dependent wildlife, including migratory and breeding birds. Removal of encroaching shrubs from the grasslands will improve wintering habitat and food availability for migratory birds, and facilitate the recovery of grassland species that are already present in the area. In addition, grassland restoration will benefit the watershed by stabilizing the soil in upland areas. The benefits associated with grassland treatment will take some time to be realized. It will take 2–5 years for the herbaceous understory vegetation to respond to treatments and for the ground cover to expand. Post-treatment precipitation will be an important factor in the amount of time required for grasslands to recover. The primary wildlife benefit of this project will be to grassland-dependent species; the project will also benefit livestock grazing.

Overview of maintenance and monitoring

After herbicide treatments, there may be opportunities to maintain the desert grassland habitat through prescribed burns. Livestock operators will be required to defer grazing in the treated area for 2–5 years during the growing season after treatment; retreatment may be necessary in 20–30 years. The project proponents have begun scientific studies to establish baseline conditions

and document changes in the vegetation conditions and migratory grassland bird diversity and abundance over time.

Trustee evaluation

The Migratory Bird Grassland Restoration project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. The project received a below-average rating for one high-priority criterion: "likely to directly benefit birds that were affected by hazardous substance releases at the Sites." Similar to Project 4.5.4, this project primarily benefits grassland-dependent birds, wildlife, and grazing livestock, with some indirect benefits to waterfowl and migratory birds. Because the wildlife affected by hazardous substance releases at and from the Sites were primarily waterfowl species, this project does not have as strong of a nexus to birds injured at the Sites as other proposed projects. As discussed in Projects 4.5.1 and 4.5.4, protection of 289 hectares (714 acres) of desert grasslands at the City of Rocks State Park as part of the overall NRDAR wildlife settlement also has helped to compensate for injuries to grassland bird species. This project also received a below-average rating for one medium-priority criterion: "is located close to where the injuries occurred at the Chino, Tyrone, or Continental mines" because the project locations are between 108 kilometers (67 miles) and 124 kilometers (77 miles) from the mines, which are farther away than many of the other proposed projects.

4.5.7 Swan Pond Habitat Restoration

The purpose of this project is to diversify Swan Pond's wetland habitat for migratory passerine species, migratory water birds, marsh birds, and shorebirds.

Project description

Swan Pond is a 16.2-hectare (40-acre) marsh along the Rio Grande River in Broad Canyon Ranch, which is owned by New Mexico State Parks. To date, New Mexico State Parks, the USFWS, and the New Mexico Interstate Stream Commission have funded restoration projects to complete salt cedar eradication, conduct soil surveys, and plant willows and cottonwoods at Broad Canyon Ranch. In addition, Audubon New Mexico is working to acquire land and water rights for habitat restoration at this site.

This project will continue the restoration by converting the marsh dominated by cattail (*Typha* spp.) into a diverse wetland with four habitat types: open water, channel margin wetlands, cattail marsh, and coyote willow thicket (*Salix exigua*). To accomplish this, an open-water channel will be excavated along the western and southern shorelines of the pond to limit light penetration and help prevent future cattail growth. The interior channel edge would be shaped to create varying water depths and replanted with native sedges, rushes, and bulrushes.

The excavated materials will be placed to create a 4.25-hectare (10.5-acre) island in the middle of Swan Pond. The island will be elevated approximately 1 meter (3 feet) above the existing grade and planted with native vegetation by volunteers. Lastly, a hydraulic analysis will be conducted to evaluate the feasibility of constructing a high-flow side channel to bring Rio Grande River flows to the wetland during high-water conditions. Water rights to maintain the pond would need to be clarified. Other restoration actions, including possible future side-channel construction, are planned as part of a broader restoration plan for this location.

Project location

Swan Pond is located in Broad Canyon Ranch, which is owned by New Mexico State Parks, approximately 31 kilometers (19 miles) north of Las Cruces in northern Dona Ana County. The project site is located approximately 101 kilometers (63 miles) from the Chino Mine, 130 kilometers (81 miles) from the Tyrone Mine, and 108 kilometers (67 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

This project will add structural diversity and plant species diversity to the site, which will attract and support a variety of birds and wildlife. In a year when drought reduces habitat availability along the Gila or Mimbres rivers, migratory birds may seek stopover habitat in the Rio Grande River corridor. If successful, the project will provide valuable habitat along an alternative migratory corridor for birds that use the Gila and Mimbres rivers. Habitat along the Rio Grande has been largely converted to agriculture; remaining habitat patches tend to be small and uniform. This project will contribute to enhancing and restoring pond and marsh habitats, making the area more similar to the historical oxbow lakes present in the area. Benefits will begin immediately; however, full restoration of the hydrologic condition and revegetation will take some time.

This project is expected to have a lifespan of 10–30 years, unless another source of funding (not included here) is obtained for long-term stewardship and maintenance. There is some risk that high flows through the upland arroyo could deposit sediment into the excavated open water channel and limit its lifespan.

Local communities could also benefit from the project. The site is expected to become a state park in the near future and will allow for appropriate public access for wildlife viewing. Specifically, local hikers and bird watchers already visit the Broad Canyon Ranch regularly, and would enjoy additional birding opportunities resulting from the Swan Pond Habitat Restoration project.

Overview of maintenance and monitoring

Audubon New Mexico will conduct bird monitoring at the restoration site; their volunteers may also conduct plant surveys to monitor the success of the revegetation and identify and remove invasive species.

Trustee evaluation

The Swan Pond Habitat Restoration project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. The project received below-average ratings for two medium-priority criteria: "is located close to where the injuries occurred at the Chino, Tyrone, or Continental mines" and "is cost-effective compared to other projects that provide similar benefits." The project is located between 101 kilometers (63 miles) and 130 kilometers (81 miles) from the mines, which is farther away than many of the other proposed projects. The project also has a high cost per riparian acre restored.

If implemented, this project will require compliance with the Federal Endangered Species Act of 1973 (ESA) through the USFWS, and with CWA Sections 404 and 401 through the U.S. Army Corps of Engineers because it is hydrologically connected to the Rio Grande River. Compliance with these laws will require wetland delineation and biological surveys, respectively, in and around the project area to define the boundaries of the wetlands and determine if there are any special status species of plants or animals that might be adversely affected by the proposed project. Formal consultation with the USFWS or NMDGF will be necessary to identify appropriate mitigation.

4.5.8 York Canyon Rehabilitation

This project aims to restore the floodplain along the San Francisco River through levee setback, reconnecting of York Canyon to the river, broadening of the floodplain, and revegetation.

Project description

This project, proposed by the San Francisco River Association, entails restoration on 1.3 kilometers (0.8 miles) of the San Francisco River, encompassing 16 hectares (40 acres) of private land on five parcels. The levee has disconnected York Canyon from the river, which has interrupted natural fluvial processes and made the area vulnerable to flooding events. Aquatic and riparian habitats along the river are at risk from changes in peak flows, erosion, and loss of streamside shade. This project would set back the levee, reconnect York Canyon to the San Francisco River, broaden the floodplain, and revegetate the banks of the river. Restoration will be accomplished using induced meander methods and by revegetating bank areas with native species to create habitat and to filter and slow floodwaters. A one-rock dam will be placed

at the mouth of the delta to promote overbank flooding, and the substrate under the rock blanket will retain moisture, allowing grasses and sedges to trap fine particles in muddy water, build soil, and increase groundwater recharge.

Project location

The project is located on five parcels of private property in Pleasanton, Catron County, New Mexico in the San Francisco River Watershed approximately 72 kilometers (45 miles) northwest of Silver City. The project site is located approximately 98 kilometers (61 miles) from the Chino Mine, 84 kilometers (52 miles) from the Tyrone Mine, and 90 kilometers (56 miles) from the Cobre Mine.

Expected benefits and timeframe of benefits

The wildlife and wildlife habitat benefits would stem from increased surface water in the San Francisco River, a larger riparian vegetation zone, reestablishment of the wetland mouth of York Canyon, and an increased geomorphic complexity of the river. The San Francisco River is a migration corridor for migratory birds and provides roosts and foraging habitat for these birds, as well as residential birds. Other wildlife species, such as coati (*Nasua narica*), black bear (*Ursus americanus*), deer (*Cervidae*), and mountain lion (*Puma concolor*), currently use the habitat and may benefit from this project. Widening the floodplain will also protect small farms in the area from flood risk.

Overview of maintenance and monitoring

The project will be completed in a single field season; the long-term biological studies and maintenance will be conducted for five years by the project proponents.

Trustee evaluation

The York Canyon Rehabilitation project is proposed as a Tier 3 project. It ranked less highly than other proposed habitat restoration projects in Tier 1 and Tier 2. In general, the project received primarily average ratings. However, the project received a below-average rating for one medium-priority criterion: “is cost-effective compared to other projects that provide similar benefits.” If implemented, this project may require consultation with the U.S. Army Corps of Engineers regarding any legal or regulatory implications of the levee setback.

4.6 Projects Considered but Not Recommended for Funding

The wildlife restoration projects described in this section were evaluated by the Trustees but not recommended for funding.

4.6.1 EcoMetrix Ecosystem Service Model

The EcoMetrix Ecosystem Service Model is an assessment tool that quantifies the biodiversity and ecosystem value of the other wildlife restoration projects proposed for NRDAR funding. This model can quantify and score proposed wildlife projects by ecosystem function (such as wildlife habitat formation, carbon cycle support, and soil retention) and ecosystem services (such as biodiversity and freshwater provisioning). The score developed by this model would identify the ecosystem benefits that would result from the wildlife restoration projects proposed for NRDAR funding.

While this project assists in quantifying and enhancing environmental benefits supported by NRDAR funding, it does not provide an overall environmental benefit as a standalone project. To pass the screening criteria, projects must provide an overall environmental benefit.

4.6.2 Grant County Reservoir

Grant County proposes the construction of a reservoir in the Cameron Creek-Twin Sisters Creek Watershed. The project would be located in the vicinity of Bayard, Santa Clara, and Fort Bayard in central Grant County. According to the *Preliminary Hydrogeologic Evaluation of the Grant County Reservoir and Water Reuse Project, near Fort Bayard, New Mexico*, the reservoir "would store treated effluent from the Bayard Regional Wastewater Treatment Plant and potentially capture stormwater offset by an equal amount of effluent released downstream of the storage facility" (John Shomaker & Associates, 2011, p. 1). The hydrogeologic evaluation also indicates that the reservoir would be used primarily for recreation, fire suppression, and irrigation of recreational facilities, and would free up potable groundwater supplies. The county has proposed to plant vegetation along the reservoir to create riparian and wetland habitats, which could create a source of surface water and habitat for wildlife, including migratory birds.

While this project would provide benefits to wildlife and wildlife habitat, the main focus is to support recreation and provide a water supply for human use. The reservoir would be managed for these human uses, with wildlife and wildlife habitat indirectly benefiting from the project. To pass the screening criteria, projects must be subject to Trustee management, control, and monitoring. It is unclear whether this project would be subject to Trustee management, control, and monitoring aimed at maximizing benefits to wildlife and wildlife habitat.

4.6.3 Solar-powered Water Pumping Station

The Solar-powered Water Pumping Station project would replace obsolete pumping plants with a solar water pumping plant located centrally on three ranches – AT Cross Ranch, Bar VK Ranch, and Cow Spring Ranch – that will preserve the viability of the current pipeline water distribution

system and accommodate future growth of the system. The project is expected to benefit wildlife and wildlife habitat by providing a low-cost water source for stock ponds and, if possible, irrigating meadow grasslands.

The solar-powered water pumping station will be managed primarily for livestock, with wildlife and wildlife habitat indirectly benefiting from the project. To pass the screening criteria, projects must be subject to Trustee management, control, and monitoring. It is unclear whether this project would be subject to Trustee management, control, and monitoring aimed at maximizing benefits to wildlife and wildlife habitat.

4.6.4 Wetland and Beaver Habitat Assessment

The Wetland and Beaver Habitat Assessment project will model suitable beaver (*Castor canadensis*) and wetland habitat in the Gila National Forest. The project proponent, WildEarth Guardians, is currently conducting a statewide beaver and wetland assessment on a broad scale. This project would conduct the next phase of the statewide assessment by continuing an on-the-ground, field verification assessment in a smaller region of New Mexico. The intent of this project is to eventually develop a plan for restoration and beaver management in the Gila National Forest that will provide benefits to multiple wildlife resources and services in perpetuity.

Similar to the EcoMetrix Ecosystem Service Model, this project assists in quantifying and enhancing environmental benefits supported by NRDAR funding; however, it does not provide an overall environmental benefit as a standalone project. To pass the screening criteria, projects must provide an overall environmental benefit.

5. Affected Environment

This chapter describes the environmental conditions in the region where the potential restoration alternatives would be implemented. It provides the background information needed to assess the potential impacts of these restoration alternatives on the environment, as required by NEPA. It also describes the ecological environment (Section 5.1), the socioeconomic environment (Section 5.2), and the cultural and paleontological environment (Section 5.3) that could be affected by restoration activities.

The main sources of information for this chapter were the biological and socioeconomic analyses provided in existing regional planning documents. These documents are listed in Table 5.1 and cited throughout this chapter.

Table 5.1. Selected sources with detailed information on the biological and socioeconomic features of the region

Title	Citation and link
Mimbres Resource Management Plan	BLM, 1993 http://www.blm.gov/nm/st/en/fo/Las_Cruces_District_Office/mimbres_rmp.html
Mimbres Watershed Restoration Action Strategy	Meridian Institute et al., 2006 http://www.nmenv.state.nm.us/swqb/wps/WRAS/MimbresWRAS.pdf
Comprehensive Wildlife Conservation Strategy for New Mexico	NMDGF, 2006 http://fws-nmcfwru.nmsu.edu/cwcs/New_Mexico_CWCS.htm
Gila National Forest Plan	USFS, 1986 http://www.fs.usda.gov/main/gila/landmanagement/planning
Gila River Watershed Improvement Plan and Strategies	Soles, 2009 http://www.nmenv.state.nm.us/swqb/Gila

5.1 Ecological Environment

The restoration projects that together form the proposed restoration alternative would be implemented in southwestern New Mexico's Gila and Mimbres watersheds, primarily in Grant County. The elevation of Grant County ranges from approximately 1,219 meters (4,000 feet) above sea level in the desert in the southern portion of the county to approximately 3,048 meters (10,000 feet) above sea level in the mountains. In Grant County, average high temperatures are 10.4°C (50.7°F) in January and 30.7°C (87.3°F) in July, while average low temperatures are 4.4°C (24.0°F) in January and 15.3°C (59.6°F) in July. The southwestern portion of the state receives some of the lowest levels of precipitation in New Mexico. In Grant County, precipitation ranges from an average annual low of 173 millimeters (6.8 inches) to an average

annual high of 632 millimeters (24.9 inches), with an annual average of 409 millimeters (16.1 inches). Most of the precipitation occurs during the summer monsoon season, from late July through early September (Town of Silver City, 2012). Average annual snowfall in Grant County is 300 millimeters (11.8 inches) and falls primarily from December through February.

5.1.1 Ecoregions

The main ecoregions (Wiken et al., 2011)[1] where proposed restoration projects would be implemented are the Arizona/New Mexico Mountains and the Chihuahuan Desert (Figure 5.1). The Arizona/New Mexico Mountains ecoregion extends from northwestern Arizona into central and southern New Mexico. The southern reach of this ecoregion falls in the upper half of Grant County and the Gila Watershed; the Gila National Forest also lies within this ecoregion. Vegetation associated with drier, warmer environments is found in this ecoregion.

In the lower elevations, chaparral is common, and middle elevations are primarily covered in pinyon-juniper and oakwoods. At higher elevations there are mostly open to dense ponderosa pine (*Pinus ponderosa*) forests with some Douglas fir (*Pseudotsuga menziesii*), southwestern white pine (*Pinus strobiformis*), white fir (*Abies concolor*), and aspen (*Populus tremuloides*). There are many ephemeral, intermittent streams in this ecoregion, along with some perennial streams, with different levels of incline. This ecoregion provides water resources to adjacent lower-elevation regions. Common wildlife in this ecoregion include mule deer (*Odocoileus hemionus*), bighorn sheep, mountain lion, bobcat (*Lynx rufus*), ringtail cat (*Bassariscus astutus*), kit fox (*Vulpes macrotis*), black-tailed jackrabbit (*Lepus californicus*), tassel-eared squirrel (*Sciurus aberti*), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), canyon wren (*Catherpes mexicanus*), and Gila trout (*Oncorhynchus gilae*). Land use is primarily forestry, mining, recreation, woodland grazing, and some ranching and rangeland (Wiken et al., 2011).

The Chihuahuan Desert ecoregion begins in north-central New Mexico and extends through west Texas and south into Mexico more than 805 kilometers (500 miles). The northern reach of this ecoregion falls in the lower half of Grant County, including Silver City. In addition, most of the Mimbres Watershed is part of this ecoregion (Figure 5.1). The vegetation of this ecoregion is primarily desert grasslands and arid shrublands. At higher elevations, there are islands of oak (*Quercus* spp.), juniper, and pinyon pine woodlands. Streams are primarily ephemeral, and a few springs occur. This ecoregion has great diversity and endemic species adapted to desert conditions. Representative species in this ecoregion include desert bighorn sheep (*Ovis canadensis mexicana*), mule deer, pronghorn (*Antilocapra americana*), coyote (*Canis latrans*),

1. Ecological regions (ecoregions) of North America are defined according to a variety of biological, physical, and human factors, including location, climate, vegetation, hydrology, terrain, wildlife, and land use/human activities. For additional information about the ecoregions, see Wiken et al., 2011.

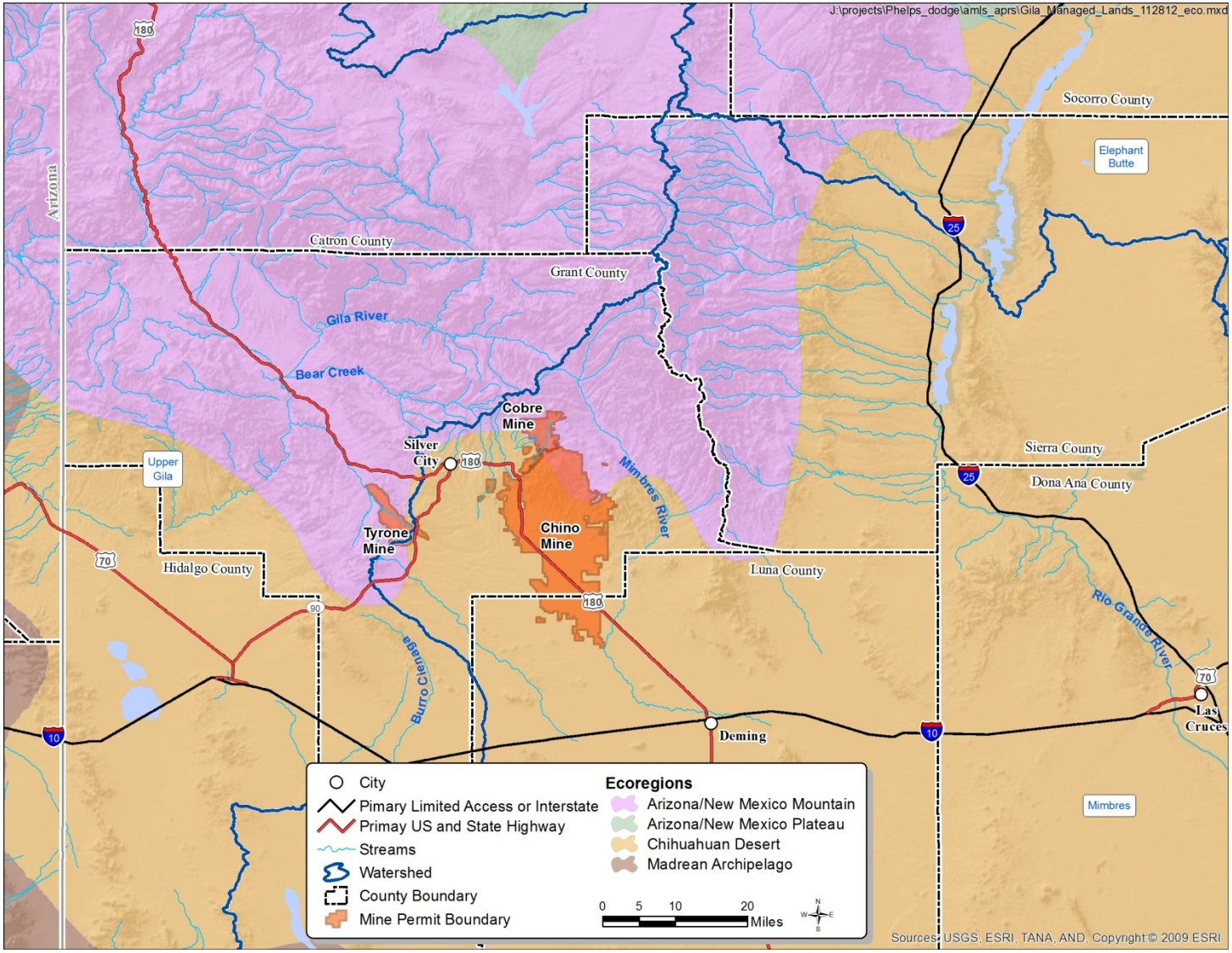


Figure 5.1. Ecoregions of the affected environment (after Wiken et al., 2011).

bobcat, kit fox, collared peccary (*Pecari tajacu*), jackrabbit (*Lepus*), Montezuma quail (*Cyrtonyx montezumae*), black-throated sparrow (*Amphispiza bilineata*), and Texas horned lizard (*Phrynosoma cornutum*). (See the list of additional Chihuahuan Desert bird species in Section 5.2, New Mexico State Parks.)

Land use is primarily ranching, livestock grazing, agriculture, and mining (Wiken et al., 2011).

5.1.2 Rivers and riparian habitat

In the watersheds where proposed restoration projects would be implemented, the major rivers are the Gila and the Mimbres. The Gila River is the only major free-flowing river in New Mexico, and its natural flow regime supports a unique array of biological diversity, both on land and in water. The Mimbres River is a closed-basin desert river that terminates approximately 16 kilometers (10 miles) east of Deming, New Mexico (NMWRRI, 2000), and most of its perennial waters are within Grant County (NMDGF, 2006). The Mimbres River supports the country's only remaining population of the Chihuahua chub and one of the largest remaining populations of Chiricahua leopard frogs.

Along these rivers and their tributaries, riparian habitat can be found. Riparian habitat is the interface between land and water and can occur where water is perennial, intermittent, or ephemeral. These riparian ecosystems support a greater diversity of plants and animals than upland ecosystems, and many wildlife species in the region depend on riparian habitat at some time during their lifecycles. In particular, migratory and waterfowl bird species depend on riparian habitat for food and resting places along their migration routes. In the Gila and Mimbres watersheds, riparian habitat includes not only the montane and floodplain habitats found along the rivers and their tributaries, but also reservoir and pond habitats (including stock ponds) and cienaga and spring habitats.

Riparian forests support a variety of species: in higher elevations, riparian forests support blue spruce (*Picea pungens*), Douglas fir, and aspen, while lower elevations support Arizona sycamore, Fremont cottonwood, willos (*Salix* spp.), and mesquite. This diverse vegetation provides vital habitat for wildlife species. In New Mexico, riparian habitat is relatively rare. Over the last century, riparian habitat has largely been altered, degraded, or lost due to a variety of impacts, including overgrazing by livestock, habitat modification, water withdrawal (i.e., groundwater pumping and draining), and invasive species. Despite the scarcity of riparian habitat, this remains an important habitat type for wildlife, particularly birds (NMDGF, 2006).

There are several small reservoirs (e.g., the Snow, Roberts, Wall, Bill Evans, and Bear Canyon reservoirs) and a number of ponds (e.g., the Ben Lilly and stock ponds) throughout the Gila and Mimbres watersheds. These riparian habitats regulate stream flows and support fish, bird, and other wildlife species. Currently, these reservoirs support non-native fish species, including catfish (*Ictalurus punctatus*) and rainbow trout (*Oncorhynchus mykiss*). There may be

opportunities to reintroduce native fish and amphibians, such as the Chiricahua leopard frog, to these habitats, if nonnative species can be removed.

Cienaga and spring habitats occur when geomorphology forces groundwater to the surface over a large area. Lower groundwater tables, largely a result of groundwater pumping, have decreased the extent of cienaga and spring habitats throughout the region (Hendrickson and Minckley, 1984). However, these areas provide islands of riparian habitat that are beneficial as resting and watering spots for migratory wildlife species, particularly birds.

5.1.3 Threatened and endangered species

The Gila and Mimbres watersheds host a high diversity of SGCN. In New Mexico's Comprehensive Wildlife Conservation Strategy, SGCN are defined as "species that are indicative of the diversity and health of the state's wildlife that are associated with key habitats, including low and declining populations, and species of high recreational, economic, or charismatic value" (NMDGF, 2006, p. 8). The Gila Watershed hosts 49 SGCN, excluding arthropods other than crustaceans. Most of these species (28 species; 57%) are classified as vulnerable, imperiled, critically imperiled, or possibly extirpated, both statewide and nationally. Nine species (18%) are federally listed as threatened or endangered, and 23 species (47%) are state-listed as threatened or endangered. The Mimbres Watershed hosts 37 SGCN, excluding arthropods other than crustaceans, and 17 of these species (46%) are classified as vulnerable, imperiled, critically imperiled, or possibly extirpated, both statewide and nationally. In addition, five species (14%) are federally listed as threatened or endangered and 12 species (32%) are state-listed as threatened or endangered (see Table 5.2).

5.2 Socioeconomic Environment

Most of the proposed restoration projects would be implemented in Grant County. The population of the county is 29,514 (U.S. Census Bureau, 2010), 10,315 of whom live in Silver City. Grant County has a median household income of $36,591. Of the 12,387 civilian employed population over 16 years of age in the county, 4,142 people (33.4%) are in the educational services, health care, and social assistance industries; 1,547 (12.5%) are in the agriculture, forestry, fishing and hunting, and mining industries; and 1,310 (10.6%) are in the retail trade industry (U.S. Census Bureau, 2010).

Land ownership in the region is a mix of private and public lands (Figure 5.2). Public land includes the Gila National Forest, BLM lands, and New Mexico State Parks. Land in this region is primarily managed for agriculture (both irrigated pasture and rangeland grazing), silviculture, recreation, mining, and municipal activities. Crop production is mainly grasses, small grains, alfalfa, and hay, and the main livestock production is cow/calf operations (Meridian Institute et al., 2006).

Table 5.2. SGCN in the Gila and Mimbres watersheds in New Mexico

Common name (*scientific name*)	Watershed (Gila and/or Mimbres)	State codes[a]	Federal codes[a]	USFWS status[b]	State status[c]
Birds					
Abert's towhee (*Melozone aberti*)	Gila	Imperiled	Vulnerable		Listed threatened
American bittern (*Botaurus lentiginosus*)	Gila, Mimbres	Vulnerable	Apparently secure		
American peregrine falcon (*Falco peregrinus anatum*)	Gila, Mimbres	Vulnerable	Apparently secure	Species of concern	Listed threatened
Bald eagle (*Haliaeetus leucocephalus*)	Gila, Mimbres	Vulnerable	Apparently secure	Protected by Eagle Act[d]	Listed threatened
Bank swallow (*Riparia riparia)*	Gila, Mimbres	Vulnerable	Secure		
Bell's vireo (*Vireo bellii*)	Gila, Mimbres	Imperiled	Apparently secure	Species of concern	Listed threatened
Common black hawk (*Buteogallus anthracinus*)	Gila, Mimbres	Imperiled	Vulnerable	Species of concern	Listed threatened
Eared grebe (*Podiceps nigricollis*)	Gila, Mimbres	Vulnerable	Secure		
Gila woodpecker (*Melanerpes uropygialis*)	Gila	Vulnerable	Apparently secure		Listed threatened
Lucy's warbler (*Oreothlypis luciae)*	Gila, Mimbres	Apparently secure	Apparently secure		
Northern harrier (*Circus cyaneus*)	Gila, Mimbres	Vulnerable	Vulnerable		
Northern pintail (*Anas acuta*)	Gila, Mimbres	Imperiled	Apparently secure		
Osprey (*Pandion haliaetus*)	Gila, Mimbres	Imperiled	Apparently secure		
Sandhill crane (*Grus canadensis*)	Gila, Mimbres	Vulnerable	Secure		
Southwestern willow flycatcher *(Empidonax traillii extimus)*	Gila, Mimbres	Imperiled	Apparently secure	Listed endangered	Listed endangered
White-faced ibis (*Plegadis chihi*)	Gila, Mimbres	Imperiled	Secure		
Yellow warbler (*Setophaga petechia)*	Gila, Mimbres	Vulnerable	Secure		

Table 5.2. SGCN in the Gila and Mimbres watersheds in New Mexico (cont.)

Common name (*scientific name*)	Watershed (Gila and/or Mimbres)	State codes[a]	Federal codes[a]	USFWS status[b]	State status[c]
Fish					
Chihuahua chub *(Gila nigrescens)*	Mimbres	Critically imperiled	Critically imperiled	Listed threatened	Listed endangered
Colorado pikeminnow (*Ptychocheilus lucius*)	Gila	Critically imperiled	Critically imperiled	Listed endangered	Listed endangered
Desert sucker (*Catostomus clarki*)	Gila	Imperiled	Imperiled	Species of concern	Sensitive species
Gila chub *(Gila intermedia)*	Gila	Critically imperiled	Critically imperiled	Listed endangered	Listed endangered
Gila topminnow *(Poeciliopsis occidentalis)*	Gila	Imperiled	Imperiled	Listed endangered	Listed threatened
Gila trout *(Oncorhynchus gilae*)	Gila, Mimbres	Critically imperiled	Critically imperiled	Listed threatened	Listed threatened
Headwater chub *(Gila nigra)*	Gila	Critically imperiled	Imperiled	Listed candidate	Listed endangered
Loach minnow *(Tiaroga cobitis)*	Gila	Critically imperiled	Critically imperiled	Listed endangered	Listed endangered
Razorback sucker (*Xyrauchen texanus*)	Gila	Critically imperiled	Critically imperiled	Listed endangered	Sensitive species
Rio Grande sucker (*Catostomus plebeius*)	Mimbres	Imperiled	Imperiled	Species of concern	
Roundtail chub *(Gila robusta)*	Gila	Critically imperiled	Imperiled	Listed candidate	Listed endangered
Sonora sucker (*Catostomus insignis*)	Gila	Imperiled	Imperiled	Species of concern	Sensitive species
Spikedace *(Meda fulgida)*	Gila	Critically imperiled	Critically imperiled	Listed endangered	Listed endangered

Table 5.2. SGCN in the Gila and Mimbres watersheds in New Mexico (cont.)

Common name (*scientific name*)	Watershed (Gila and/or Mimbres)	State codes[a]	Federal codes[a]	USFWS status[b]	State status[c]
Mammals					
Allen's big-eared bat (*Idionycteris phyllotis*)	Gila, Mimbres	Imperiled	Vulnerable	Species of concern	Sensitive species
American beaver (*Castor canadensis*)	Gila, Mimbres	Secure	Secure		
Arizona shrew (*Sorex arizonae*)	Gila, Mimbres	Critically imperiled	Imperiled	Species of concern	Listed endangered
Desert bighorn sheep (*Ovis canadensis mexicana*)	Gila	Imperiled	Vulnerable		Listed threatened
New Mexico meadow jumping mouse (*Zapus hudsonius luteus*)	Gila, Mimbres	Imperiled	Imperiled	Listed candidate	Listed endangered
Pocketed free-tailed bat (*Nyctinomops femorosaccus*)	Gila, Mimbres	Critically imperiled	Vulnerable		
Spotted bat (*Euderma maculatum*)	Gila, Mimbres	Vulnerable	Vulnerable		Listed threatened
Western red bat (*Lasiurus blossevillii*)	Gila, Mimbres	Imperiled	Apparently secure	Species of concern	
Amphibians					
Arizona toad (*Anaxyrus microscaphus)*	Gila, Mimbres	Vulnerable	Vulnerable		Sensitive species
Chiricahua leopard frog *(Lithobates chiricahuensis)*	Gila, Mimbres	Critically imperiled	Critically imperiled	Listed threatened	Sensitive species
Lowland leopard frog (*Lithobates yavapaiensis*)	Gila, Mimbres	Possibly Extirpated	Imperiled	Species of concern	Listed endangered
Northern leopard frog (*Lithobates pipiens*)	Gila, Mimbres	Imperiled	Vulnerable		
Plains leopard frog (*Lithobates blairi*)	Mimbres	Vulnerable	Vulnerable		
Tiger salamander (*Ambystoma tigrinum*)	Gila, Mimbres	Secure	Secure		
Western chorus frog (*Pseudacris triseriata*)	Gila, Mimbres	Secure	Secure		

Table 5.2. SGCN in the Gila and Mimbres watersheds in New Mexico (cont.)

Common name (*scientific name*)	Watershed (Gila and/or Mimbres)	State codes[a]	Federal codes[a]	USFWS status[b]	State status[c]
Reptiles					
Mexican garter snake (*Thamnophis eques*)	Gila, Mimbres	Possibly extirpated	Imperiled	Listed candidate	Listed endangered
Narrowhead garter snake (*Thamnophis rufipunctatus*)	Gila, Mimbres	Imperiled	Imperiled	Species of concern	Listed threatened
Sonoran mud turtle (*Kinosternon sonoriense*)	Gila, Mimbres	Apparently secure	Apparently secure		
Molluscs					
Blunt ambersnail (*Oxyloma retusum*)	Gila	Critically imperiled	Secure		
Gila pyrg snail (*Pyrgulopsis gilae*)	Gila	Imperiled	Imperiled		Listed threatened
New Mexico hotspring pyrg snail (*Pyrgulopsis thermalis*)	Gila	Critically imperiled	Critically imperiled		Listed threatened
Snail (*Pyrgulopsis* spp.)	Mimbres				
Crustacean					
Sideswimmers/scuds (*Hyalella* spp.)	Gila, Mimbres	Secure	Secure		

a. These conservation codes are from NatureServe:

Possibly extirpated: Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20–40 years.
Critically imperiled: Critically imperiled in the nation or state/province because of extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines, making it especially vulnerable to extirpation from the state/province.
Imperiled: Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors, making it very vulnerable to extirpation from the nation or state/province.
Vulnerable: Vulnerable in the nation or state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
Apparently secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.
Secure: Common, widespread, and abundant in the nation or state/province.

Table 5.2. SGCN in the Gila and Mimbres watersheds in New Mexico (cont.)

b. The definitions of USFWS status codes:

Species of concern: Taxa for which further biological research and field study are needed to resolve their conservation status or are considered sensitive, rare, or declining on lists maintained by natural heritage programs, state wildlife agencies, other federal agencies, or professional/academic scientific societies.
Listed candidate: Candidate species (taxa for which the USFWS has sufficient information to propose that they be added to list of endangered and threatened species, but the listing action has been precluded by other higher priority listing activities).
Listed threatened: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Listed endangered: Any species which is in danger of extinction throughout all or a significant portion of its range.

c. The definitions of state status:

Sensitive species: Taxa which, in the opinion of a qualified NMDGF biologist, deserve special consideration in management and planning, and are not listed as threatened or endangered by the State of New Mexico.
Listed threatened: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range in New Mexico.
Listed endangered: Any species whose prospects of survival or recruitment within the state are in jeopardy due to any of the following factors: (1) the present or threatened destruction, modification, or curtailment of its habitat; (2) overutilization for scientific, commercial, or sporting purposes; (3) the effect of disease or predation; (4) other natural or man-made factors affecting its prospects of survival or recruitment within the state; or (5) any combination of the foregoing factors.

d. Bald and Golden Eagle Act (16 USC § 668).

Sources: NMDFG, 2006; BISON-M Database, 2012; USFWS, Undated; state and federal codes are based on NatureServe conservation status codes and adjusted, as needed, by NMDGF experts; federal status codes are based off of USFWS New Mexico Ecological Services Field Office; and state status codes are based off of the NMDGF maintained Biota Information System of New Mexico database.

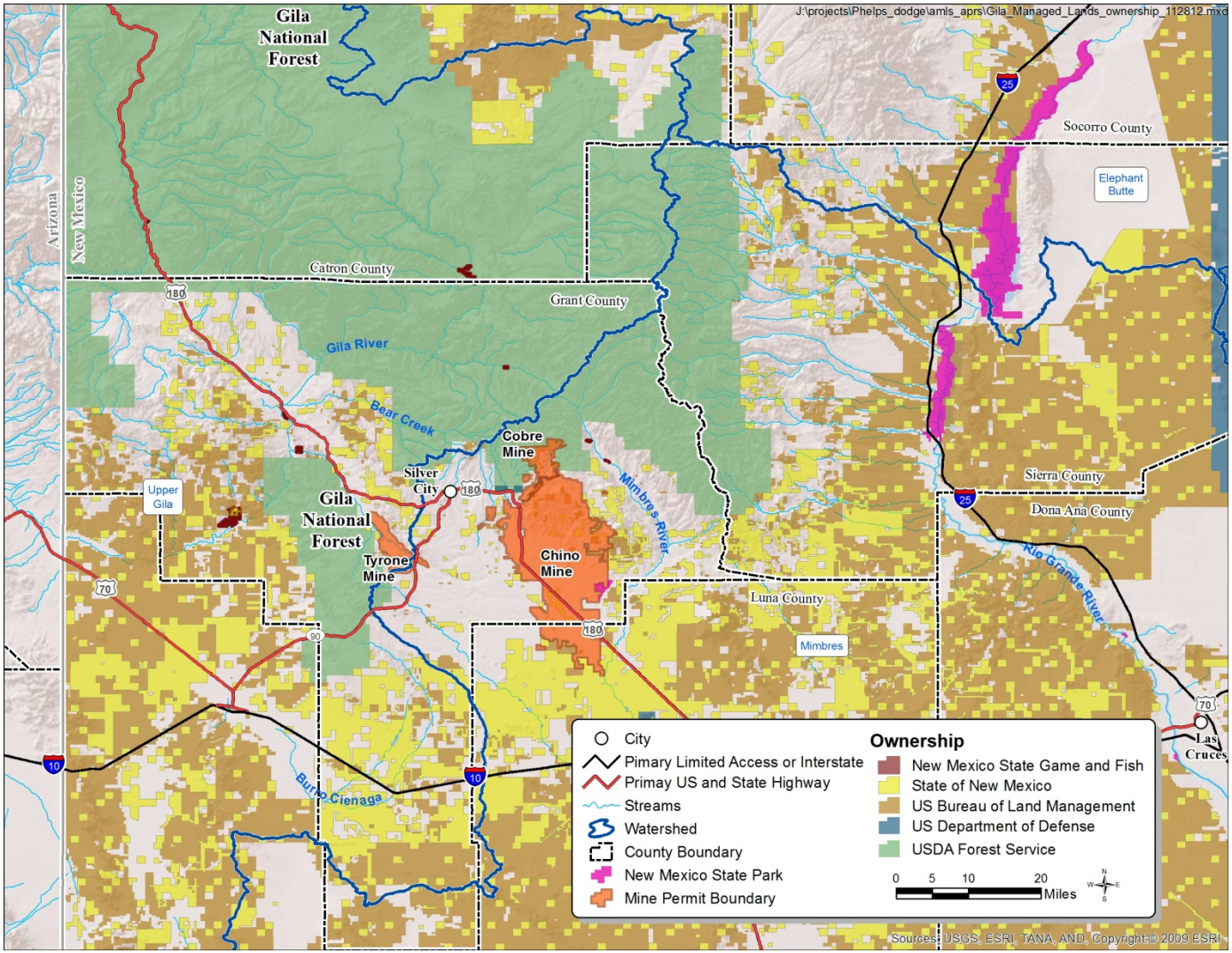


Figure 5.2. Land ownership in the affected environment.

Gila National Forest

The Gila National Forest, established in 1905, covers approximately 1,097,000 hectares (2,710,700 acres) of public land, making it the sixth largest national forest in the United States. Part of the Gila National Forest, the Gila Wilderness, was established in 1924 as the first designated wilderness area in the country. The headwaters for the Gila, Mimbres, and San Francisco rivers are in the Gila National Forest. Terrain ranges from mountain ecosystems with deep canyons to semi-desert grasslands.

BLM

BLM manages public land in the region for ecological and human uses, including leasing land for livestock grazing and mineral extraction, and improving land for wildlife habitat. Within this region, BLM has designated three ACECs. ACECs can be designated on federal land when special management attention is required. An ACEC is defined in the Federal Land Policy and Management Act as:

> … areas within the public land where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural system or process, or to protect life and safety from natural hazards (43 USC §§ 1601.0-5(a)).

The three ACECs established in the area where restoration activities may be implemented include the following:

1. The Bear Creek ACEC is approximately 600 hectares (1,480 acres) and is located on BLM land in central Grant County, approximately 24 kilometers (15 miles) northwest of Silver City, New Mexico. This ACEC is a riparian area that includes a perennial stream with a rare Arizona sycamore/Fremont cottonwood plant community. The Bear Creek ACEC is managed to protect riparian values.

2. The Gila Middle Box ACEC is approximately 340 ha (840 acres) and is located in southwestern Grant County, about 43 kilometers (27 miles) north of Lordsburg and 32 kilometers (20 miles) west of Silver City, along the Gila River. The area is a narrow canyon with a rich riparian community at the canyon bottom. It supports high species diversity, including a diverse bird community. The Gila Middle Box ACEC is managed for special status species (i.e., southwestern willow flycatcher, loach minnow, and spikedace), riparian habitat, and recreational values.

3. The Gila Lower Box ACEC is 2,626 hectares (6,490 acres) and is located in northwest Hidalgo County, approximately 48 kilometers (30 miles) north of Lordsburg, New Mexico, also on BLM land. This riparian area along the Gila River includes stands of

Arizona sycamore, Fremont cottonwood, willow, and associated riparian vegetation. The area provides habitat for several state-listed and federal candidate species. The Gila Lower Box ACEC is managed to protect riparian values.

New Mexico State Parks

The mission of the New Mexico State Parks is to "protect and enhance natural and cultural resources, provide first-class recreational and education facilities and opportunities, and promote public safety to benefit and enrich the lives of visitors" (NM EMNRD, 2000, p. 5). Currently, the City of Rocks State Park is the only state park in the region where restoration activities would be implemented; however, one additional park, Broad Canyon State Park, is in the process of being established as a state park.

The City of Rocks State Park was established on March 20, 1953 and is located near Deming, New Mexico. The additional transfer of 289 hectares (714 acres) of grasslands from FMI to the City of Rocks State Park increases the park to 526 hectares (1,300 acres). It is primarily a Chihuahuan semi-desert grasslands ecosystem. Wildlife includes common mammals [e.g., chipmunks (*Tamias*), kangaroo mice (*Microdipodops*), deer, coyote], red-tailed hawk, northern harrier, golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), turkey vultures, common raven (*Corvus corax*), purple finch (*Carpodacus purpureus*), canyon towhee (*Melozone fusca*), southwestern willow flycatcher, cactus wren (*Campylorhynchus brunneicapillus*) and canyon wren, mockingbirds (*Mimus polyglottos*), curve-billed thrashers (*Toxostoma curvirostre*), gambel's quail (*Callipepla gambelii*), scaled quail, rufous hummingbird (*Selasphorus rufus*) and black-chinned hummingbirds (*Archilochus alexandri*), the greater roadrunner (*Geococcyx californianus*), and many other songbirds. The dominant plant species are emory and black oak trees (*Quercus emoryi* and *velutina*), soaptree yucca (*Yucca elata*), lechuguilla agave (indigenous to the Chihuahuan Desert; *Agave lechuguilla*), barrel cactus (*Ferrocactus cylindraceus*), cholla (*Cylindropuntia),* prickly pear (*Opuntia*), creosote bush, and a wide variety of grasses and wildflowers.

The Broad Canyon State Park, a former ranch along a stretch of the Rio Grande River, is expected to become a New Mexico State Park in the near future. Protection of these 317 hectares (783 acres) at Broad Canyon Ranch would protect cottonwood and willow riparian habitat, including habitat for the endangered southwestern willow flycatcher (The Trust for Public Land, 2012). Swan Pond, which is the location of a proposed restoration project, is located within the future Broad Canyon State Park.

Other protected land

TNC has protected much land along the Gila and Mimbres rivers. Along the Gila River, TNC manages the Gila Riparian Preserve, which protects 486 hectares (1,200 acres) of riparian habitat along the river and provides habitat for neotropical migratory songbirds, particularly the

southwest willow flycatcher. Part of the Gila River Preserve includes the 32-hectare (80-acre) Gila River Farm, an agricultural farm that has been converted to an ecologically rich floodplain habitat of wet meadows, wetlands, semi-riparian woodlands, floodplain grasslands, and mesquite bosques. The Lichty Ecological Research Center, with the goal of advancing the understanding of the Gila and Mimbres watersheds, is located on the Gila River Farm. TNC was instrumental in protecting an additional 227 hectares (560 acres) in the Gila Lower Box, which is now managed by BLM.

Along the Mimbres River, TNC owns and manages two riparian reserves along the main channel of the Mimbres River. The Mimbres River Preserve, established in 1994, covers 243 hectares (600 acres) of riparian habitat along an 8-kilometer (5-mile) stretch of the river. This preserve was established to conserve river habitat for the endangered Chihuahua chub and Chiricahua leopard frog. Farther downstream where perennial flows persist, additional parcels were added to create the Lower Mimbres River Preserve. This preserve provides additional river habitat for birds and wildlife.

5.3 Cultural and Paleontological Environment

Several distinct cultural groups have inhabited the region in which restoration activities would be implemented. The earliest believed occupants of the region were there during the Paleo-Indian period, from about 9500 BCE (Before the Common Era) to 4000 BCE. The “Archaic” or “Desert Archaic” cultures are believed to have occupied the region from approximately 7000 BCE to 100 CE. The Mogollon cultural group occupied the region from approximately 200 CE to 1400 CE, and archeological sites from the three Mogollon periods – Early Pithouse Period, Late Pithouse Period, and Pueblo Period – are known to exist within the region. Lastly, the Apache are known to have occupied southern New Mexico from approximately 1650 CE to 1890 CE; however, archeological evidence is rare (BLM, 1993).

In the Gila National Forest and near the headwaters of the Gila River is the National Park Services’ Gila Cliff Dwellings National Monument. This monument was established in 1907 to protect the architecture and artifacts of the Puebloan people who lived in the Mogollon area more than 700 years ago. This site is managed by the USFS (Russell, 1992).

Paleontological resources occur throughout the region. These include vertebrate fossils and trace fossils from the Paleozoic, Cretaceous, early Tertiary, and Pliocene and Quaternary ages. There are also vertebrate fossil faunas from Permian amphibians and early reptiles (280 to 240 million years ago), Cretaceous dinosaurs (80 to 65 million years ago), primitive mammals from the Pliocene Santa Fe group (15 to 3 million years ago), and Pleistocene mammals (3 million to 12 thousand years ago) (BLM, 1993).

6. Environmental and Socioeconomic Impacts of Restoration Alternatives

The environmental and socioeconomic consequences associated with each individual restoration project in the proposed restoration alternative were identified in Chapter 4. This chapter provides a description of the cumulative impacts of the proposed alternative and compares these impacts to those of the no-action alternative.

Over the long-term, the proposed restoration projects that together form the proposed restoration alternative identified in this Draft RP/EA would provide positive environmental and socioeconomic benefits for the general vicinity of Silver City, New Mexico. The analysis of impacts assumes that all of the Tier 1 and Tier 2 restoration projects would be implemented. If funding is insufficient for implementation of all Tier 2 projects, then the cumulative impacts of restoration (both positive and negative) would be lessened. The analysis of the impacts of Tier 3 projects will occur at a later date should these projects be considered for implementation.

6.1 Environmental Impacts of the Proposed Alternative

Overall, the cumulative environmental impacts of the proposed alternative would be positive because natural resources would benefit from the proposed restoration actions. The impacts on specific categories of environmental resources are described below.

6.1.1 Water resources

Over the long-term, the proposed alternative would have a net positive impact on water resources in the Gila River, Mimbres River, Bear Creek, surface water portions of the Burro Cienaga, and the Rio Grande River. During implementation of restoration actions, including erosion control, riparian revegetation, and wetland enhancement projects, there would likely be temporary increases in sediment transport and in the turbidity level of surface water caused by heavy equipment, excavation, movement of large materials such as logs and rocks, and fence installation. These impacts would be temporary because the restoration activities would ultimately stabilize and revegetate stream banks, lead to long-term decreases in erosion from upland and riparian areas, and lead to improvements in water quality. Temporary impacts would be minimized by following Best Management Practices for erosion control work and adhering to rules dictated by the permits (e.g., CWA Sections 401 and 404) that would be required to conduct project work.

6.1.2 Vegetation resources

The restoration projects in the proposed alternative would enhance vegetation resources in riparian, floodplain, wetland, and upland habitats. The habitat protection and improvement projects would ensure that protected habitats (riparian and upland) are not at risk from further development; provide opportunities to reduce or eliminate grazing pressure in riparian and some degraded upland habitats; and restore and improve native riparian vegetation by removing invasive species, planting native riparian species, or providing conditions that support the natural regeneration of native species. Erosion control projects would restore hydrologic functions to degraded riparian and wetland habitats, allowing riparian vegetation to become reestablished in incised areas that are currently too dry to support the historical wetland and riparian communities. Riparian, pond, and stock pond restoration projects would also provide opportunities for removing invasive species and would restore and increase the total area of native riparian and wetland habitats in areas that are currently degraded.

6.1.3 Fish and wildlife resources

The restoration projects in the proposed alternative would enhance fish and wildlife resources in the Gila River, Mimbres River, Bear Creek, surface water sections of the Burro Cienaga, and the Rio Grande River. All projects in the proposed alternative are focused on benefiting wildlife, specifically migratory birds and waterfowl. These projects would increase the area and quality of riparian and wetland habitats used by birds and other wildlife, and would improve or create additional areas of clean surface water that would be used by birds and other wildlife. Specifically, the Double E Ranch Habitat Protection and Improvement project (see Chapter 4, Section 4.3.2) already provides critical habitat for the endangered loach minnow and may also provide habitat for the threatened Chiricahua leopard frog. Preserving this property would not only prevent development and grazing from affecting the existing habitat, but provide opportunities to improve it. The Upper Bear Creek Habitat Protection and Improvement project, the Redrock Property Habitat Protection and Improvement project, and the Mimbres River Watershed Wildlife and Habitat Restoration project would also improve or create potential habitat for loach minnow and Chiricahua leopard frog populations. In Chapter 4, Sections 4.3-4.4 present detailed descriptions of each of these projects.

6.1.4 Special status species

The ESA of 1973, as amended, 16 USC §§ 1531 et seq., was designed to protect species that are threatened with extinction. It provides for the conservation of ecosystems upon which these species depend, and provides a program for the identification and conservation of these species.

Federal agencies are required to ensure that any actions are not likely to jeopardize the continued existence of federally listed species.

Federally listed species found in the area in which restoration projects are proposed include several bird species (e.g., Bell's vireo, Gila woodpecker, and the Southwestern willow flycatcher), the endangered loach minnow and spikedace, and the threatened Chiricahua leopard frog. In general, disturbances resulting from construction activities at restoration sites would be short in duration (likely months to three years). In-stream construction activities may require compliance with ESA as well as CWA Sections 404 and 401. The restoration projects would improve not only habitat for T&E species, but would also provide long-term benefits to any of these species.

The Forest Service also has a list of sensitive species that have additional management measures (USFS, 2012) and BLM has special status species that are addressed in their resource management plans (BLM, 1993).

6.1.5 Air and noise

The restoration projects in the proposed alternative would be accomplished mostly with low-impact techniques. Heavy equipment may be used for some components of the restoration projects, which may generate local air pollution and noise pollution that could disturb wildlife temporarily. Because the work would be short-term and occur during daylight in limited locations, wildlife would likely be able to avoid significant noise and air pollution impacts.

6.1.6 Geology and mineral resources

The proposed alternative would not have a negative impact on geology or mineral resources. The proposed restoration projects would not result in any changes to mining activity in the area or to the use of mineral resources.

6.1.7 Soil resources

The proposed alternative would have a positive impact on soils because many of the projects would result in decreased erosion and increased soil stability. Specifically, the erosion control projects and riparian revegetation projects would improve soil stability and soil management.

6.2 Cultural and Socioeconomic Impacts of the Proposed Alternative

Overall, the cumulative cultural and socioeconomic impacts of the proposed alternative would be positive because the human population in the area affected by the proposed alternative would benefit from the proposed restoration actions. The impacts on specific categories of cultural and socioeconomic considerations are described below.

6.2.1 Lands and access

The proposed restoration projects that make up the proposed alternative would not conflict with county, state, or federal policies for land management. Habitat protection projects would conform to the policies of the agency accepting the land (e.g., BLM, USFS, NMDGF, New Mexico State Parks). Parcels proposed for acquisition are expected to be consistent with existing management plans, such as the Gila National Forest Land and Resource Management Plan (USFS, 1986) and the Mimbres Resource Management Plan (BLM, 1993). The proposed alternative would have minimal impact on existing land use. Depending on the parcels pursued for acquisition, the land use could change from private land to public land that is accessible for recreation.

Some opportunities for public access and recreation in the Gila and Mimbres watersheds would be limited during construction associated with the restoration projects. These impacts would occur directly from the presence of construction equipment, as well as indirectly if temporary increases in noise decrease opportunities for or enjoyment of birding, or if temporary increases in turbidity decrease opportunities for or enjoyment of water-based recreation. Ultimately, public access and recreation would benefit from the implementation of the proposed alternative.

6.2.2 Air, noise, and visual resources

Because most of the restoration work is planned for locations away from residential areas, the air, noise, and visual impacts to human populations would be minimal. During the implementation of the projects, some temporary negative impacts would occur. As described in Section 6.1.5 under environmental impacts, the use of heavy equipment to implement some of the projects would generate local air and noise pollution and could disrupt public enjoyment of the area. Over the long-term, protection of land parcels at risk of development would help to maintain the scenic viewshed of the region.

6.2.3 Cultural and paleontological resources

Under Secretarial Order 3206, DOI agencies must consult with tribes that might have cultural resources that may be affected by projects initiated through DOI. The USFWS has communicated in writing with tribes to request input on any concerns they may have regarding the implementation of the projects listed here.

The proposed restoration projects included in the proposed alternative would have a cumulative positive cultural impact on the region. The region has significant archeological resources, including archeological sites of the Mimbres people. The Double E Ranch Habitat Protection and Improvement project (see Chapter 4, Section 4.3.2) would conserve historically important cultural resources from the Pithouse and Classic Mimbres periods. In addition, the Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration project (see Chapter 4, Section 4.3.1) on Pitchfork Ranch would stabilize a 2.3-hectare (5.8-acre) severely incised Mimbres archeological site that was occupied from 750 CE to 1130 CE. Restoration of this site would preserve and maintain its historic and cultural integrity.

All projects would be required to comply with the National Historic Preservation Act (NHPA) and the Archaeological Resources Protection Act. NHPA of 1966, as amended, 16 USC §§ 470 et seq., is intended to preserve historical and archaeological sites. Compliance with the NHPA would be undertaken through consultation with the State Historic Preservation Officer for each project. The Archaeological Resources Protection Act of 1979, as amended, 16 USC §§ 470aa–mm, was enacted to secure the protection of archaeological resources and sites on public lands. A permit is required to excavate or remove any such archaeological resource. If such resources are identified in the areas affected by the proposed restoration projects, a permit will be obtained prior to disturbance.

6.2.4 Socioeconomic impacts

The proposed restoration projects included in the proposed alternative would have cumulative positive socioeconomic impacts on the region. Although there may be short-term negative impacts to public access and recreation during construction work in wetland and riparian habitats, these impacts would be outweighed by the long-term benefits to public access and recreation. These long-term benefits would result from the likely acquisition of land that would provide increased recreational access to birding, hiking, and other nature-based recreational opportunities as a result of improved wildlife habitat.

These projects would not only enhance or protect bird and wildlife habitats but also help to preserve the natural resource base that is at the heart of the area’s ranching, tourism, and recreation-based industries and quality of life. Construction projects would have a positive

economic effect on the area through potential employment opportunities, either directly or indirectly through the supply chain for materials. Educational opportunities through outdoor classroom learning on the Pitchfork Ranch and TNC preserves, as well as Bat Conservation International workshops and student field trips to restored sites on the Mimbres River, provide socioeconomic benefits for the communities surrounding these projects.

6.2.5 Environmental justice

The proposed restoration projects would benefit the residents of communities near the Sites, including minority and low-income populations, through improved recreational opportunities and overall economic benefits to the region.

6.3 Impacts of the No-action Alternative

Under the no-action alternative, no habitats would be preserved, restored, or enhanced beyond what agencies and organizations such as the BLM, USFS, TNC, Bat Conservation International, Audubon Society, and private citizens are already doing in the area with limited existing resources. Riparian and aquatic habitats would continue to be degraded throughout the general vicinity of Silver City. Land on the Double E Ranch, the Upper Bear Creek property, and Redrock Ranch would continue to be at risk for further development; riparian, wetland, and open-water habitats on these properties would remain degraded. Habitat in the Burro Cienaga would remain incised and degraded. Habitat in the Mimbres Watershed and at Swan Pond, near Las Cruces, would remain degraded. Old stock ponds would continue to be nonfunctional and would provide little or no benefit as wildlife habitat or as a source of water for wildlife and human use. Local populations would not have the benefits of an improved habitat or increased opportunities for wildlife viewing and recreation. Large areas of land would remain in private ownership with no public access. Future generations would not have access to an improved environment.

6.4 Cumulative Impacts of the Proposed Alternative and the No-action Alternative

The cumulative impacts of the proposed alternative and the no-action alternative are summarized in Table 6.1 and discussed below.

Table 6.1. Comparison of impacts by alternative

Category of impact	No-action alternative	Proposed action/proposed alternative
Habitat impacts	No additional habitats preserved, restored, or enhanced. Continued impairment of riparian, wetland, and aquatic resources.	Riparian, wetland, and aquatic habitats would be preserved, restored, and enhanced.
Biological impacts	Continued ongoing adverse impacts to birds, wildlife, and fish.	Improvements to bird, wildlife, and fish habitats.
Cultural and paleontological resource impacts	Cultural resources at the important historic Mimbres site on Pitchfork Ranch may be lost or degraded without restoration.	No impacts expected.
Environmental justice impacts	No benefits to residents in Silver City and surrounding areas, including minority and low-income populations.	Benefits to Silver City and area residents, including minority and low-income populations, from improved recreational opportunities.
Socioeconomic impacts	No positive indirect economic impacts on the local economy.	Restoration activities would generate short-term economic benefits. Improved recreational opportunities and habitat protection would generate long-term economic benefits, including benefits to the local ecotourism economy.
Indirect impacts	No indirect impacts.	Indirect beneficial impacts expected through improved habitat for birds, wildlife, and fish in the project areas.
Cumulative impacts	Cumulative impacts would be negative because of continued degradation of riparian, wetland, and aquatic habitats under current conditions.	Cumulative impacts expected to be beneficial through long-term benefits to riparian and wetland habitat quality, water quality, birds, wildlife, and fish in and around the project sites.

The Trustees selected the restoration projects included in the proposed alternative to improve natural resources as compensation for natural resource injuries. Therefore, the cumulative environmental impacts from implementing the restoration projects are expected to be beneficial. Any impacts to air quality, water quality, or noise associated with implementation of the projects are expected to be minimal and short-term. The projects would result in long-term benefits to water quality, vegetation, fish, and wildlife in and around the project sites. There would also be long-term socioeconomic benefits to Silver City and surrounding areas through protection and improvement of natural resources. Any negative impacts to cultural resources associated with

restoration actions would be mitigated according to requirements of the New Mexico Historic Preservation Division.

Under the no-action alternative, there would be no positive changes to habitats or wildlife beyond the actions taken by other agencies, organizations, and private citizens with limited funding. There would be no short-term impacts associated with project implementation and no long-term benefits from implementation of the proposed alternative. In short, the public would not be compensated for the injuries to wildlife and wildlife habitat resulting from the release of hazardous substances at and from the Sites.

7. Agencies, Organizations, and Parties Consulted

The Trustees consulted relevant agencies and government entities as part of an informal scoping process to help identify potential restoration projects (Table 7.1). The Trustees also consulted with organizations, stakeholder groups, and private citizens who chose to participate in the initial public meeting on May 30, 2012 in Silver City, New Mexico, or who contacted the Trustees to provide information about potential restoration project opportunities during the informal scoping process (Table 7.2).

Table 7.1. Agencies and government entities consulted during informal scoping

Federal
Bureau of Land Management, Las Cruces Division
U.S. Forest Service, Gila National Forest
State
New Mexico Environment Department
New Mexico State Parks Division
Local
Grant County, New Mexico

Table 7.2. Organizations, stakeholder groups, and private citizens consulted during informal scoping

AT Cross Ranch, Bar VK Ranch, Cow Spring Ranch (privately owned and operated)
Audubon New Mexico
Bat Conservation International
Gila Resources Information Project
New Mexico Land Conservancy
Parametrix
Pitchfork Ranch
San Francisco River Association
The Nature Conservancy
Upper Burro Cienaga Watershed Association
WildEarth Guardians

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Appendix. Complete Project List

Complete list of wildlife and wildlife habitat restoration projects identified by the Trustees

Project category	Project title	Project proponent
Habitat protection and improvement	Davis Property Habitat Protection and Improvement	The Nature Conservancy
	Double E Ranch Habitat Protection and Improvement	Gila Resources Information Project
	Porter Property Habitat Protection and Improvement	The Nature Conservancy
	Redrock Property Habitat Protection and Improvement	The Nature Conservancy
	River Ranch Habitat Protection and Improvement	New Mexico Land Conservancy
	Upper Bear Creek Habitat Protection and Improvement	Gila National Forest
Watershed habitat restoration	Burro Cienaga Side Channel, Floodplain, and Low Terrace Restoration	Pitchfork Ranch
	Burro Cienaga Stock Pond Restoration	Gila National Forest and Upper Burro Cienaga Watershed Association
	Burro Cienaga Stream Stabilization Restoration	Gila National Forest and Upper Burro Cienaga Watershed Association
Riparian habitat restoration	Meadow Creek Restoration	WildEarth Guardians
	Mimbres River Watershed Wildlife and Habitat Restoration	Bat Conservation International
	Swan Pond Habitat Restoration	Audubon New Mexico
	York Canyon Rehabilitation	San Francisco River Association
Grassland habitat restoration	Burro Cienaga Grassland Restoration	The Nature Conservancy, AT Cross Ranch, and Pitchfork Ranch
	Burro Cienaga Pinyon and Juniper Restoration	Gila National Forest and Upper Burro Cienaga Watershed Association
	Grassland Restoration through Aerial Treatment of Mesquite	AT Cross Ranch, Bar VK Ranch, and Cow Spring Ranch
	Migratory Bird Grassland Restoration	Bureau of Land Management, Las Cruces District
Model development/ assessment	EcoMetrix Ecosystem Service Model	Parametrix
	Wetland and Beaver Habitat Assessment	WildEarth Guardians
Other	Grant County Reservoir	Grant County
	Solar-Powered Water Pumping Station	AT Cross Ranch, Bar VK Ranch, and Cow Spring Ranch