9-11-14 AM

DRAFT
Environmental Assessment
for
Cooperative Recovery Initiative
Projects
Associated with Recovery of Federally-listed Species in Southeastern Arizona

Cochise County,
Arizona

Prepared by:

U.S. Fish & Wildlife Service
San Bernardino National Wildlife Refuge

September 2014

TABLE OF CONTENTS

Environmental Assessment
for
Cooperative Recovery Initiative Projects
Associated with Recovery of Federally-listed Species in Southeastern Arizona

1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE

1.1 Introduction

The United States Fish and Wildlife Service (Service) is proposing several habitat restoration projects on private lands associated with San Bernardino National Wildlife Refuge (SBNWR) and Leslie Canyon National Wildlife Refuge (LCNWR) to assist the recovery of various federally-listed threatened and endangered species and other wildlife.

The opportunity to fund these projects is available through the Service's Cooperative Recovery Initiative (CRI), a strategic cross-programmatic approach to help restore and recover federally-listed threatened and endangered species. Through this initiative, the Service combined the resources of the National Wildlife Refuge System, Endangered Species, Partners for Fish and Wildlife, Fisheries, Office of the Science Advisor, and the Migratory Bird Program to fund on-the-ground projects which provide the strongest conservation benefit to threatened or endangered species that occur on or near Refuges.

This Environmental Assessment (EA) is being prepared to evaluate the effects associated with this proposal and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (516 DM 8) and Service (550 FW 3) policies (see Section 1.7 for a list of additional regulations that this EA complies with). NEPA requires examination of the effects of proposed actions on the natural and human environment. In the following chapters, two alternatives are described and environmental consequences of each alternative are analyzed.

1.2 Location:

The project area location lies in extreme southeastern Arizona's Cochise County and extreme southwestern New Mexico's Hidalgo County, and includes the 2,369 acre SBNWR and the 2,765 acre LCNWR. These refuges were set aside in 1982 and 1988 to protect and recover populations of multiple federally-listed threatened and endangered species. The extensive 2,739 square mile project area supporting these refuges includes about 1-million acres surrounding the Chiricahua Mountains on the west and the Animas Mountains on the east (see map).

1.3 Background:

The major objective of SBNWR and LCNWR is the protection and recovery of fish, wildlife, and plants that are federally listed as threatened or endangered species. This project will facilitate the recovery of multiple federally-listed species through landscape scale restoration of wetland habitat, upland habitat, existing core fish and wildlife areas, and wildlife corridors within southeastern Arizona and southwestern New Mexico through an integral partnership between the Service and numerous organized partners. This landscape is important to a huge diversity of species, with some of the highest known species richness of mammals, reptiles, birds, and

invertebrates documented in any localized geographic area worldwide. Many of these species are valuable pollinators which help support a tremendous diversity of plants, some of which are localized endemics found nowhere else on earth. Implementing this project will accelerate the recovery criteria for delisting or downlisting federally-listed endangered Yaqui chub (*Gila purpurea*), Yaqui topminnow (*Poeciliopsis occidentalis sonoriensis*), and Huachuca water umbel (*Lilaeopsis schaffneriana* ssp. *recurva*); the federally-listed threatened beautiful shiner (*Cyprinella formosa*), Yaqui catfish (*Ictalurus pricei*), northern Mexican gartersnake (*Thamnophis eques megalops*), Chiricahua leopard frog (*Lithobates chiricahuensis*), and San Bernardino springsnail (*Pyrgulopsis bernardina*); and proposed threatened western distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*). The broad-scale approach will simultaneously benefit a huge number of other sensitive mammal, bird, reptile, amphibian, fish, invertebrate, and plant species in this exceedingly diverse landscape in SE Arizona and SW New Mexico.

The northern headwaters of the Rio Yaqui watershed begins in the Chiricahua, Pedregosa, Peloncillo, and Animas Mountains, and the river originates on SBNWR and flows for 300 miles south to its mouth in the Gulf of California. The species of fish in the Rio Yaqui are endemic and unique, being totally dependent upon protected, high quality springs, seeps, and associated healthy and dependable wetlands. The short stretches of perennial flow on the SBNWR and LCNWR are two of three remaining natural habitats for these fish in the U.S., and the refuges were established specifically to protect habitat for these fish. Several other listed species are dependent on this same aquatic habitat, including the northern Mexican gartersnake, Chiricahua leopard frog, Huachuca water umbel, and western yellow-billed cuckoo. These fish and wildlife populations have been impacted by habitat loss, non-native species, and water diversion, and the best opportunity to protect these species is in the small tributaries, which can be managed more easily than highly modified stretches of the main stem of the Rio Yaqui. The Malpai Borderlands Group, Cuenca Los Ojos Foundation Trust, and the American Museum of Natural History's Southwest Research Station work closely with the Service in several ways to improve habitat conditions for these species. The most extensive project that will benefit these species involves wetland restoration and watershed improvement work.

It is a major stated goal of the Service to work closely with the private landowners within the project area to initiate cooperative efforts for the recovery and long-term protection of endangered species and to improve overall habitat conditions for all fish and wildlife. These are important projects that have positive resource conservation implications on uplands and associated small isolated wetlands scattered across the landscape. Project work that benefits the shallow aquifer in the watershed is crucial in providing perennial wetlands for fish and wildlife throughout the area's private lands and also helps support fish, wildlife, and plants on the downstream refuges. Healthy uplands in the area are important to resident and wintering migratory birds throughout the watershed and help maintain and perpetuate economical livestock management in these undeveloped areas, ensuring perpetual open space, core areas, and corridors for all fish and wildlife.

1.4 Purpose of Action:

The purpose of the action is to facilitate recovery of federally-listed threatened and endangered species on a landscape-level scale. This EA is being prepared is to analyze implementation of the proposed habitat enhancement projects on lands associated with SBNWR and LCNWR which will help restore and recover the federally-listed species.

1.5 Need for Action:

This action is needed because a variety of conditions currently exist in the project area that threaten the health and survivability of several fish, wildlife, and plant species in their natural environment to the degree that they are facing potential extinction. These current conditions include brush encroachment of grasslands, long-term drought and loss of wetlands, inadequate fencing impacting natural wildlife movement, loss of topsoil, and related degradation that negatively impact federally-listed species and the landscapes upon which they live. The long-term goals of this project are to expand landscape scale watershed restoration, recovery of multiple listed species with specific down- and delisting criteria, and encouragement of continued cooperation of conservation-minded landowners and collaborators, without whom this work would not otherwise be attainable. The project area includes SBNWR, LCNWR, and multiple private lands such as the Diamond-A Ranch, Magoffin Ranch, Southwest Research Station, El Coronado Ranch, 99-Bar Ranch, Bar-Boot Ranch, Slaughter Ranch, and other properties that are enrolled in either conservation easements, Habitat Conservation Plans (HCP), or Safe Harbor Agreements (SHA). Restoration work will be focused within the headwaters of the Rio Yaqui watershed on private properties intermixed with State and Federal lands, where the project will benefit one entire, intact landscape which supports a uniquely high density of federally-listed species. To ensure the integrity of grasslands and the survivability and productivity by many native wildlife species, up to about 100,000 acres within the 1-million acre project area will be managed to reduce the impacts of perennial woody plants that have invaded the landscape. Management efforts will help encourage precipitation to remain on the landscape rather than running off as erosive floodwater, which will enhance soil moisture and infiltration, allow grassland stabilization, and help replenish the shallow aquifer throughout the watershed upstream from the two refuges.

Objectives of this habitat restoration project will be to: 1) Continue restoration and population expansion to meet the down- or de-listing goals for endangered Yaqui chub and Yaqui topminnow; 2) Secure populations to prevent extinction of threatened Yaqui catfish and beautiful shiner; and 3) Restore and expand populations to conserve Mexican longfin dace, Yaqui sucker, Mexican stoneroller, threatened San Bernardino springsnail, threatened northern Mexican gartersnake, threatened Chiricahua leopard frog, endangered Huachuca water umbel, proposed threatened western yellow-billed cuckoo, and multiple other species.

Recovery plans for federally-listed threatened and endangered species are written by subject matter experts, with assistance and input from others, and delineate reasonable actions which are believed to be required to recover and/or protect listed species. For example, the Fishes of the Rio Yaqui Recovery Plan (USFWS 1994) recommends recovery objectives for Yaqui chub, Yaqui topminnow, Yaqui catfish, and beautiful shiner. The overall objective for recovery of these listed species is to establish self-sustaining and secure populations at multiple sites. In addition to several other conditions, this recovery plan recommends the following conditions, incorporated into the potential individual management decisions being identified in this EA, that must be met before down-listing or de-listing of species can be considered: (Item 2.5) Develop or enhance new and existing habitats and monitor success of habitat management; (Item 3.5) Monitor health of fish populations and occupied habitats; (Item 5.1) Identify areas for possible reintroductions; (Item 5.2.3) Stock and monitor the success of reintroductions; and (Item 5.4) Work with public agencies and private landowners to manage existing and reintroduced populations of fishes of concern.

Additionally, on-the-ground planning decisions for recovery actions for the federally-listed threatened Chiricahua leopard frog were previously made by local recovery groups within the framework of the overall recovery plan for this species (USFWS 2007). The Service has an

overall recovery strategy of maintaining at least two metapopulations and one isolated robust population of Chiricahua leopard frogs, self-sustaining and free from threats for at least 25 years, in each of eight recovery units throughout Arizona, southwestern and central New Mexico, and Mexico.

The status and trends of fish, wildlife, and habitat conditions are not well known, or are currently not documented. Monitoring, using existing approved protocols, will be accomplished to help measure the success of upland and wetland habitat restoration activities, measure the success of multiple species re-introduction efforts, document the establishment of self-perpetuating populations of federally-listed species, and to document population trends of other species impacted by this project. Groundwater monitoring will be accomplished whenever possible at selected wells throughout the action area to help gather information regarding groundwater trends. Such information will ultimately help establish thresholds and trigger points for enacting potential additional management contingencies that may affect specific wetland-dependent species. Such contingencies could include additional actions to minimize evaporation and/or seepage, potentially decrease the volume of wetlands to minimize water use, or even potential future abandonment of selected wetlands being supported by domestic wells if such wells are determined to threaten the in-stream flow of adjacent stream systems.

Desired outcomes for this project would be a better functioning watershed that expands secure habitats for the Yaqui fishes and other native aquatic and terrestrial species. Benefits to listed aquatic species would include more populations, larger populations, and more secure populations that will prevent extinction and increase recovery potential. Invasive brush control will assist with native grassland restoration throughout the area, and benefit populations of all grassland dependent species in the watershed by: promoting grasslands and the environmental conditions that existed prior to invasion by mesquite and juniper; helping limit the elevated perches used by predatory species (ravens) that currently limit nesting success of grassland birds; encouraging an ecosystem dominated by native grasslands and the associated invertebrate species utilized as food by migratory and resident birds; and by promoting a more natural low flame length fire regime which benefits the nearly 70 species of grasses utilized by migratory birds and other wildlife in this area. In addition, this landscape-scale watershed enhancement project will benefit all wetland dependent species within the action area by: increasing the availability of seasonal and permanent water; by providing sanctuary areas during drought periods, by increasing the overall quality and quantity of groundwater; and by lessening the potential for erosive scouring of flood plain grasslands during extreme runoff events.

1.6 Decision to be Made:

The scope of the analysis in this EA covers the direct, indirect, and cumulative environmental effects of a variety of habitat restoration projects which will facilitate the recovery of multiple species of federally-listed fish and wildlife within southeastern Arizona and southwestern New Mexico through an integral partnership between the Service and numerous organized partners. The decision to be made concerns which alternative to implement and whether the alternative to be implemented will have a significant impact over the existing environment.

1.7 Regulatory Compliance:

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge

Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual.

The mission of the Refuge System is:

"... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Improvement Act of 1997, Public Law 105-57).

The goals of the Refuge System are to:

- *Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered;*
- *develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges;*
- *conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts;*
- *provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation);* and
- *foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.*

SBNWR was established on April 1, 1982 and LCNWR was established on May 31, 1988 under authority of the Endangered Species Act of 1973 and the Fish and Wildlife Act of 1956 in order to "…conserve fish or wildlife which are listed as endangered species or threatened species…or plants." These species include the Yaqui chub, Yaqui topminnow, Yaqui catfish, Yaqui beautiful shiner, Chiricahua leopard frog, northern Mexican gartersnake, Huachuca water umbel, and San Bernardino springsnail. Critical habitat is established on the refuge for the Yaqui chub, Yaqui catfish, and Yaqui beautiful shiner, and includes all aquatic habitats on SBNWR. Limited critical habitat for the San Bernardino springsnail has been established on small portions of SBNWR and Slaughter Ranch. Critical habitat has also been proposed for the northern Mexican gartersnake on most of SBNWR. Many additional fish, wildlife, invertebrate, and plant species occur on the refuge and are supported by associated upland, wetland, and riparian habitats.

The NWRS Improvement Act of 1997 provides guidelines and directives for the administration and management of all areas in the NWRS. It states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be compatible. A compatible use "… will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuges." In addition, "wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety." The act also recognized that wildlife-dependent recreational uses involving hunting, fishing, wildlife observation, photography, environmental education and interpretation, when determined to be compatible with the mission of the System and purposes of the Refuges, are legitimate and appropriate public uses of the NWRS and they shall receive priority consideration in planning and management.

This EA was prepared by the Service and represents compliance with applicable Federal statutes, regulations, Executive Orders, and other compliance documents, including the following:

- Administrative Procedures Act (5 U.S.C. 551-559, 701-706, and 801-808) as amended
- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Antiquities Act of 1906 (16 U.S.C. 431-433
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
- Bald Eagle Protection Act (16 U.S.C. 668-668d) as amended
- Clean Air Act of 1972, as amended (42 U.S.C. 7401 *et seq.*)
- Clean Water Act of 1972, as amended (33 U.S.C. 1251 *et seq.*)
- Endangered Species Act of 1973, (ESA) as amended (16 U.S.C. 1531 *et seq.*)
- Executive Order 12898, Federal Action Alternatives to Address Environmental Justice in Minority Populations and Low Income Populations, 1994.
- Executive Order 13112, Invasive Species (issued in February 1999)
- Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661 *et seq.*)
- Fish and Wildlife Improvement Act of 1978 (16 U.S.C. 7421)
- Floodplain Management (Executive Order 11988)
- Migratory Bird Treaty Act (16 U.S.C. 703-712 as amended
- National Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended
- National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*)
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq*.)
- National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et seq*.)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 *et seq.*)
- Protection and Enhancement of the Cultural Environment (Executive Order 11593)
- Protection of Wetlands (Executive Order 11990)
- National Pollutant Discharge Elimination System, as amended (33 U.S.C. 1251 *et seq.*)
- Soil and Water Conservation Act of 1977 (16 U.S.C. 2001-2009) as amended

Further, this EA reflects compliance with applicable State of Arizona and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources.

1.8 Public Involvement

This project benefits the recovery of fish and wildlife across a large landscape through upland and wetland habitat restoration and enhancement techniques, and is not considered controversial. Scoping is an early and open process for determining the scope of the issues to be address, and the Service prepared a News Release entitled "Wildlife Refuge Seeks Public Input on Proposed Projects to Benefit Threatened and Endangered Species" that was submitted to local newspapers for a two week comment period beginning July 25, 2014 and closing August 14, 2014. No comments were received from the public during this scoping period, and one contact was received from a Federal agency which resulted in an associated follow-up phone conversation on August 12, 2014 (see 1.9 below) during this scoping period. Additional review and comments were sought and were received from various state, federal, and non-governmental organization personnel, and also from the general public. These comments are incorporated into the EA.

1.9 Issues Raised During Project Planning and Public Scoping

A U.S. Forest Service, Coronado National Forest, Supervisor's Office Water, Soil, and Air Program Manager contacted the Service during the scoping period and offered a concern that any existing and/or new domestic shallow wells located on private properties along Cave Creek upstream from Portal, Arizona being used to sustain ponds constructed or enlarged as a result of this project in support of wildlife and focused on Chiricahua leopard frog recovery, might also negatively impact the volume and duration of in-stream seasonal flows in Cave Creek through increased groundwater withdrawal. Suggestions that were discussed and incorporated into this EA for addressing this concern included considering the spatial juxtaposition of potential wetlands and limiting their overall number to minimize potential negative impacts to available groundwater volumes, utilizing existing dirt tanks/wetlands whenever possible rather than constructing new ones, seeking any existing data that might help elucidate groundwater trends in the area, and beginning to monitor selected wells to help determine groundwater trends and to ultimately help establish thresholds that might identify trigger points for contingency actions. An associated e-mail summarizing the telephonic discussion is attached to this EA on page 44.

2.0 ALTERNATIVES

2.1 Alternative A--No Action Alternative:

Under the No Action Alternative, various individual management directions by private, State, and Federal partners would continue as they are currently being implemented. Under current conditions there is little or no collaboration between partners to implement coordinated projects. There is little or no collaboration to use a broad-scale approach to positively impact the population recovery of various species of fish and wildlife, including many federally-listed threatened and endangered species, in the project area. Negative impacts associated with climate change and other natural and anthropogenic causes are negatively influencing the project area landscape and are not being adequately addressed. Projects for endangered species protection and recovery on and adjacent to SBNWR and LCNWR are limited and are not adequate for meeting identified recovery objectives on private land.

a) Under the No Action Alternative, invasive perennial woody plants will continue to invade grasslands and become dominant within the project area's landscape. Management techniques such as prescribed fire, selective herbicide use, and mechanical brush removal are currently used only infrequently due primarily to inadequate funding and implementation, resulting in declining wetland and upland habitats. Many areas of the landscape are degraded, and naturally functioning processes that remove decadent vegetation, recycle nutrients, and help control the spread of woody vegetation are not being accomplished. The long term viability and integrity of wetland and upland habitats is currently being threatened by the incremental spread of perennial woody vegetation such as salt cedar, mesquite, whitethorn acacia, and other plants that are becoming invasive, altering grassland communities, and are increasingly dominating the landscape. Predatory birds such as ravens are provided an unnatural advantage in locating and preying upon native grassland nesting birds when the predators are able to utilize elevated perches provided by high densities of woody plants. This, in turn, impacts the productivity and survivorship of the many wildlife species that are being preyed upon. High densities of perennial woody plants are also capable of using soil moisture and shallow groundwater at a higher rate than would be used by native grassland plant species alone. Loss of soil moisture impacts the vegetation community composition and

abundance supporting a diversity of plant, animal, and invertebrate species, some of which are federally-listed as threatened or endangered. The resulting overall decline in grasslands favors soil desiccation, sheet erosion, lack of species diversity, and becomes incapable of supporting viable populations of grassland dependent species such as scaled quail, Botteri's sparrows, grasshopper sparrows, Cassin's sparrows, Lillian's meadowlarks, and a huge multitude of other migratory birds, small mammals, reptiles, amphibians, and invertebrates.

b) Under the No Action Alternative, the availability of water across the project area landscape will continue to be limited and inadequate in supporting breeding populations of many fish and wildlife species because wells and water delivery systems are inadequate or do not exist. During dry months of the year, many existing wetlands become dry and are not capable of supporting populations of federally-listed endangered and threatened species utilizing the project area's wetlands. Populations of Yaqui catfish, Yaqui chub, Yaqui topminnow, Yaqui beautiful shiner, Chiricahua leopard frogs, San Bernardino springsnails, Huachuca water umbel, and a multitude of other plants and animals are currently at risk of local extinction. Climate change and other natural and anthropogenic causes are negatively influencing the project area's landscape. Cave Creek, Leslie Creek, Rucker Creek, and other streams that support fish and wildlife are already at risk, in part, because of the long term mega-drought impacting the volume of winter precipitation being received in this geographic area. The lack of adequate snowfall and accumulation at high elevations is not currently providing adequate runoff to support area streams during much of the year. Because water in most of the area's flowing streams often becomes subsurface flow during most of the year, open water becomes unavailable to many fish and wildlife species. In the case of most aquatic organisms, the lack of open surface water prevents animals from successfully inhabiting such habitats (an otherwise healthy wetland need only be completely dry for one day during the year to eliminate fish, springsnails, and larval amphibian populations). Fish and wildlife metapopulations separated from one another by drought conditions often do not have the appropriate water quality and quantity for successful movement of individuals in support of gene flow to maintain viable populations in perpetuity. Under current conditions, the extinction of endemic or geographically restricted animals is a very real threat.

c) Under the No Action Alternative, the current condition of many wire fences does not allow the natural movement of some wildlife, and there is limited opportunity to construct or maintain wildlife-friendly wire fences within the project area's watersheds. Wildlife movement corridors and bird migration and hunting corridors are blocked by fences in some areas. Some existing barbed wire fence and twisted wire "sheep fence" impact the free passage of a large variety of wildlife across the landscape. Some existing barbed wire fence periodically injures and kills individual animals that collide with or become hung up and stranded upon barbed strands of wire. Some existing barbed wire fence alters the use of wildlife movement corridors. In other areas, a lack of fences allows livestock access into wetlands where they have the potential to damage important habitat utilized by federally-listed species.

d) Under the No Action Alternative, the availability of water across the project area landscape will continue to be limited and inadequate in supporting breeding populations of many fish and wildlife species. Perennial wetlands within the project area's watersheds are rare, and are scattered to a degree that they do not ideally benefit listed species. Many perennial wetlands in the project area have been lost or altered due to

anthropogenic or natural causes made worse through the impacts of climate change and prolonged drought. Currently, a variety of land uses impact precipitation runoff and natural drainage associated with watersheds in the project area, in some cases inhibiting and/or redirecting water flow in the basin. This altered or disrupted water flow currently impacts the vegetation community composition and abundance supporting a diversity of plant, animal, and invertebrate species, some of which are federally-listed as threatened or endangered. Altered and declining wetlands impact microclimates and dependent ground-dwelling organisms (invertebrates, reptiles, amphibians, small mammals) due to vegetation changes which impact heat ratios and evaporation. The current lack of perennial wetlands does not maintain adequate water resources necessary to provide habitat for endangered fish and leopard frog recovery.

e) Under the No Action Alternative, the erosive impacts of seasonal flood flows in the project area will continue to negatively impact the landscape by removing topsoil and adding sediment to wetlands. A variety of techniques are available to address erosion control, such as maintaining and constructing earthen and/or rock berms and dikes, and using rock and wire erosion control gabions to help protect wetland and upland habitats within the project area's watersheds, but these techniques are not broadly used due to lack of funding or implementation. Currently, many deeply incised and channelized water courses are negatively impacting the natural flow of precipitation runoff and shallow groundwater recharge, inhibiting and redirecting natural drainage and carrying loose sediment from sheet erosion into wetlands that support a variety of plants and animals including many federally-listed species. Resulting erosion reduces the opportunity for precipitation to remain on the landscape instead of running off as erosive floodwater. Without erosion control, there are currently inadequate methods to control runoff or to catch water-borne sediments being transported by flood events. The lack of erosion control negatively impacts natural floodplains and does not allow groundwater recharge, does not enhance soil moisture and water infiltration, and does not help grassland stabilization throughout the project area watersheds. Increased siltation from runoff during storm events negatively affects existing riparian vegetation in the project area. Other potential long-term impacts include increased streambed erosion, elimination of wetlands through aggradation, introduction or spread of non-native plant species, and negative impacts to the rooting zones of riparian plants. Federally-listed species are at increased risk because the increasing sedimentation of streams and other wetlands during precipitation events affect oxygen availability, gill function, and reproduction. Increased sedimentation in wetlands, generated by increased and unabated soil erosion, is damaging aquatic habitats by covering spawning sites, destroying benthic food sources, and reducing water clarity.

f) Under the No Action Alternative, the general lack of adequate monitoring to help determine the viability of plant and animal populations and habitat conditions within the project area's watersheds will continue. Groundwater monitoring is not being accomplished (or reported) to help measure hydrologic trends, and the condition of upland and wetland habitat restoration activities, multiple species re-introduction efforts, and other fish and wildlife population trends are not being accomplished to a degree that allows an adequate evaluation of success or failure. With inadequate monitoring in place to measure population trends, recovery of federally-listed species is not being documented, adaptive management strategies and techniques are not being employed, and local extinctions of endemic or geographically restricted animals are not being anticipated and adequately addressed. Species recovery is not being adequately implemented.

2.2 Alternative B—Proposed Action Alternative:

Under the Proposed Action Alternative, various potential individual management directions, as described in more detail below, will be implemented through a collaboration of Federal, State, and private partners. Individual projects will be accomplished using a broad-scale approach, strategically designed to positively impact the population recovery of various species of fish and wildlife including many federally-listed threatened and endangered species in the project area. The proposed projects all fall within the guidelines of specific species recovery plans, which have been thoroughly vetted with other agencies and stakeholders to develop strategic decisions about recovery for the various species. Therefore, this EA is not developing new ideas for recovery actions, rather it is analyzing implementation of management actions previously identified by participating recovery committees. While the various management actions will primarily benefit listed fish and frogs, they will also benefit the other listed species identified in this EA along with a tremendous diversity of plants, fish, wildlife, and invertebrates. Under the Proposed Action Alternative, the need for action identified in this EA will be satisfied, and previously approved species specific recovery documents are heavily relied upon to help focus the management actions identified in this EA.

a) Under the Proposed Action Alternative, management and control of invasive perennial woody plants currently invading grasslands and becoming dominant within the project area's landscape would be implemented. A variety of techniques, such as incorporating managed fire, hand application of selective herbicides such as Velpar, and mechanical brush removal, would be used as methods to enhance wetland and upland habitats. Such methods favor perennial and annual grasses and additional native vegetation types, helping restore naturally functioning processes on the landscape by removing decadent vegetation, recycling nutrients, and helping control the spread of woody vegetation. The long term viability and integrity of wetland and upland habitats currently being threatened by the incremental spread of perennial woody vegetation such as salt cedar, mesquite, whitethorn acacia, and other plants is altering grassland communities. Predatory birds such as ravens, which are currently being provided an unnatural advantage in locating and preying upon grassland nesting birds because the predators are utilizing elevated perches provided by woody plants, will have this advantage removed. Removal of woody vegetation will positively affect the productivity and survivorship of the many wildlife species subsequently able to avoid predation by ravens and similarly situated predators. Removing high densities of perennial woody plants will help conserve soil moisture and shallow groundwater utilized by grassland species. A subsequent increase in soil moisture will positively impacts vegetation community composition and abundance supporting a diversity of plant, animal, and invertebrate species, including federally-listed species. An increase in healthy grasslands will favor soil permeability, help prevent sheet erosion, help increase plant species diversity, and help support viable populations of grassland dependent species such as scaled quail, Botteri's sparrows, grasshopper sparrows, Cassin's sparrows, Lillian's meadowlarks, and a huge multitude of other migratory birds, small mammals, reptiles, amphibians, and invertebrates.

b) Under the Proposed Action Alternative, maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area that support a huge variety of fish and wildlife, including many federally-listed species will be accomplished. An adequate water supply having appropriate water quality capable of supporting various fish and wildlife populations, including federally-listed species utilizing the project area's wetlands, will be assured during dry months of the year.

Populations of Yaqui catfish, Yaqui chub, Yaqui topminnow, Yaqui beautiful shiner, Chiricahua leopard frogs, San Bernardino springsnails, Huachuca water umbel, and a multitude of other plants and animals will benefit from permanent water sources adjacent to seasonal wetlands which will provide travel corridors and ensure gene flow and mixing of metapopulations during wet seasons. Up to six individual private landowners along Cave Creek Canyon and Whitetail Canyon having adequate runoff, existing domestic wells, or low volume "livestock" wells will be able to use a portion of their permitted volume of water to support self-perpetuating populations of Chiricahua leopard frogs, bats, and a multitude of other fish and wildlife that would otherwise face decline or local extinction when the annual water flow in adjacent Cave Creek becomes subsurface. As a result, many negative impacts associated with climate change and other natural and anthropogenic causes will be mitigated within the project area's landscape. Using a carefully controlled spacing of such small permanent wetlands along Cave Creek (or other hydrologically similar stream systems), will assist recovery of federally-listed Chiricahua leopard frogs and also benefit a multitude of other wildlife without adversely affecting ground water use and recharge. Conservative use of water during this period will help fish and wildlife survive the long term mega-drought currently impacting the volume of winter precipitation being received in this geographic area. When adequate snowfall and accumulation at high elevations is ultimately received to provide adequate runoff and support area streams, there will still be existing metapopulations of rare species to inhabit the increasing wetland habitat. Such species recovery will be accomplished most cost effectively by supporting the construction and maintenance of the small permanent wetlands identified under the Proposed Action Alternative. Hydrologic function and populations of wetland dependent species will be enhanced by these wells, and positive impacts from individual projects will be realized on Federal, State, and private lands. With the threat of anthropomorphic influences and long-term drought impacting wetlands and associated plant and animal metapopulations, it is important that crucial corridors that interconnect populations of rare species will be protected and enhanced, along with the fish and wildlife populations that they support. This project is important to both the short term and long term conservation of all the target species.

c) "Wildlife-friendly fence" involves increasing the space between the ground surface and the bottom wire of the fence to provide easier passage for wildlife wishing to pass under the fence. Additionally, both the bottom wire and top wire of the fence is made of barbless (smooth) twisted wire to prevent wildlife from being hooked upon the fence while passing either over or under the fence. The fence otherwise is constructed in such a manner as to effectively restrict the movement of livestock. Under the Proposed Action Alternative, maintenance and installation of "wildlife-friendly fence" will be accomplished in such a manner as to effectively restrict the movement of livestock, while also ensuring that wildlife corridors, uplands, and wetlands are enhanced and made safer for the passage of native wildlife. Using barbless (smooth) twisted wire on both the bottom wire and top wire of fences, and raising the bottom wire further from the ground surface will help eliminate injury and death to a multitude of migratory birds and other wildlife by eliminating the potential for being hooked and stranded on barbs.

d) Under the Proposed Action Alternative, management, restoration, and construction of perennial wetlands within the project area's watersheds would be accomplished. A total of six new wetlands would be carefully spaced in the Whitetail Canyon/Cave Creek Canyon portion of the project area. Any new ponds would be lined to eliminate or minimize water loss through seepage. Exiting dirt tanks designed to catch water would

be altered and used whenever possible instead of constructing new tanks/ponds. Wetlands would be designed and monitored to ensure they are not negatively impacting the in-stream flow of adjacent seasonal or perennial streams. There would therefore be additional perennial wetlands to mitigate for those wetlands lost or altered due to anthropogenic or natural causes made worse through the impacts of climate change. Enhancement or creation of additional conservatively managed wetlands, designed to catch and hold overland water flow, and/or designed to otherwise hold permanent water throughout the year will support a higher diversity of plant, animal, and invertebrate species, including federally-listed species. Wetlands will positively impact microclimates and dependent ground-dwelling organisms, such as invertebrates, reptiles, amphibians, and small mammals, due to vegetation changes which will additionally impact heat ratios and evaporation. Wetland restoration will help maintain adequate water resources necessary to provide habitat for endangered fish and leopard frog recovery. Wetland management will be coordinated to maximize biodiversity and to optimize the wetland units for production and self-sustaining populations of native fish, amphibians, waterfowl, and various waterbirds and neotropical species. It is anticipated that the wetland units will be separated by distances that will allow potential downstream emigration of native amphibians during favorable conditions, but will be located far enough from wetlands impacted by non-native species so that bullfrogs will not be able to invade restored wetlands. Wetland restoration work will benefit populations of all wetland and upland dependent species in the area, including some of those on and adjacent to SBNWR and LCNWR, by protecting important migration corridors used by wildlife, by increasing the availability and quality of seasonal and permanent water, and by increasing the overall quality of native grasslands. The project is supported by the San Bernardino and Leslie Canyon National Wildlife Refuges Comprehensive Management Plan, which identifies management of productive wetland habitats as crucial to the perpetuation of biodiversity and species richness within the area.

e) Under the Proposed Action Alternative, improving the ability of selected portions within the project area's landscape to halt and slow the erosive impacts of seasonal flood flows, more effectively catch and hold precipitation runoff, provide water for fish and wildlife, and subsequently also provide food resources necessary for wildlife on and adjacent to these areas will be accomplished. Multiple erosion control structures, composed of rock-filled wire basket gabions, earthen berms, single rock dams, and appropriate dikes, each having site specific designs to optimize their effectiveness, will be constructed within the project area. This project will help accelerate fish and wildlife habitat restoration processes by enhancing wetlands, uplands, and crucial wildlife corridors. The construction and placement of additional erosion control structures in key locations in the watershed will help control the transport of water-borne sediment. Such structures will catch water-borne sediments being transported during precipitation events, improve the landscape's ability to halt and slow the scouring erosive impacts of seasonal flood flows, and more effectively catch and hold precipitation runoff to provide water for fish and wildlife. Erosion control structures will help re-build natural floodplains by controlling and directing aggradation, providing opportunities for precipitation to remain on the landscape rather than running off as floodwater, enhancing soil permeability and water infiltration, helping restore groundwater recharge in the shallow aquifer, allowing increased soil stabilization and subsequently helping enhance vegetation corridors for wildlife movement, and increasing the spread of native grasses and forbs and the wildlife associated with these habitats. Erosion control structures will help prevent the acceleration of stream channel erosion in sensitive riparian areas within watersheds located upstream from SBNWR and LCNWR, will catch the increased siltation from

runoff along dirt roadways during storm events and will help stabilize sensitive areas within the landscape. They will help restore soil stability at the rooting zones of plants which will positively affect riparian vegetation, enhancing the productivity of wetlands and native upland habitats. This stabilization will ultimately provide food resources necessary for fish and wildlife on and adjacent to these restored habitats, and will provide enhanced grassland conditions for nesting birds and other wildlife. Federally-listed aquatic species will benefit from the decreased sedimentation entering streams and other wetlands during precipitation events. Individual erosion control projects which actively decrease the volume of sediment reaching streams and other wetlands during precipitation events will positively impact oxygen availability, gill function, and reproduction of aquatic organisms.

f) Under the Proposed Action Alternative, monitoring plant and animal populations and habitat conditions within the project area will increase to an appropriate level. Some additional monitoring will be accomplished by both the Service and by private landowners to help measure groundwater trends and ultimately help establish thresholds and trigger points for enacting additional management contingencies, measure the success of upland and wetland habitat restoration activities, measure the success of multiple species re-introduction efforts, document the establishment of self-perpetuating populations of federally-listed species, and to document population trends of other species impacted by this project. With appropriate monitoring being conducted to measure population trends, recovery of federally-listed species can be documented, adaptive management strategies and techniques can be employed, and local extinctions of endemic or geographically restricted animals can be anticipated and addressed in a timely manner. Species recovery can be implemented when recovery plan goals are reached.

3.0 AFFECTED ENVIRONMENT

3.1 Physical Environment:

The Project Area lies within southeast Arizona and southwest New Mexico within the watersheds supporting SBNWR, LCNWR, and adjacent lands on about 1-million acres surrounding the Chiricahua Mountains on the west and the Animas Mountains on the east. The elevation within the extremely diverse mixture of habitats within this landscape ranges from about 3,500-feet in the San Bernardino Valley to nearly 10,000-feet at Chiricahua Peak. SBNWR and LCNWR are located at the northern margin of the Rio Yaqui Basin in Arizona, creating headwaters which eventually flow south into the Sea of Cortez. The vast majority of this watershed is in Mexico, with only about 2% draining from the United States.

3.1.1 Air Quality:

Air quality in this region is good, and is much improved from previous decades when copper production was a major part of the economies in both Arizona and Sonora. Some pollution from metropolitan areas comes primarily from Agua Prieta, Sonora in the form of dust and some carbon emissions from vehicles. Smoke resulting from heating with wood during winter months, and periodically from wildfires and/or prescribed fires can occur for short periods of time. Dust in the Project Area comes largely from vehicular traffic on multiple rural dirt roadways, with prevailing winds coming out of the SW.

3.1.2 Soils/Geology:

The Project Area is located in the Basin and Range physiographic province. Basaltic volcanism was active in the area contemporaneously with basin and range tectonic activities. As a result, the basin fill consists of alluvium interlayered with basalt flows. Limited dating of basalt flows suggests that volcanism was active on the valley floor from approximately 3.3 million years ago to about 274 thousand years ago.

3.1.3 Water Resources and Quality:

The Río Yaqui Basin is a large riverine system which drains portions of southeastern Arizona and southwestern New Mexico in the United States, and eastern Sonora and western Chihuahua in Mexico. These rivers flow southwesterly where they eventually join to empty into the Sea of Cortez near Ciudad Obregon, Sonora. The entire basin is approximately 73,000 square kilometers. Less than 2% of the entire basin is in the United States, with drainages receiving runoff from the Swisshelm, Chiricahua, Mule, Pedregosa, Perilla, and Peloncillo Mountains.

Wetlands in the Project Area include natural springs, seasonal and perennial streams, water impoundments, and ciénegas. Humans living within the Project Area have additionally drilled wells for both domestic and agricultural use, and these wells support a variety of water resources including small ponds and tanks for watering livestock. Other than mostly ephemeral stream channels, the San Bernardino Ciénega is the most extensive wetland in the region, and forms an important migratory link between mesic environments of the Sierra Madre Occidental with those further to the north. It supports a unique and endemic biota, varying from special vertebrates to invertebrates and plants; rare species listed as endangered or threatened both by Mexico and the United States are present. Its natural history is well known so baselines for restoration are available. The ciénega was well-watered in the past, beginning on what is now the SBNWR in the United States and extending into Sonora for >2.5 km (1.6 mi) along Río San Bernardino (Black Draw). It is now reduced to remnants associated with artesian wells, springs, and artificial ponds. Even in its degraded state it remains an oasis within these otherwise arid lands, providing stopover, breeding, and year-around habitat for a significant number and diversity of organisms.

Wetland restoration in the Project Area is a major objective. The existing rare, ciénega habitat types exists because of unique, regional, climatic and hydrographic features. Unlike most other marshlands formed in closed depressions, ciénegas grow in stream channels where perennial water intersects the surface in a flow sufficiently stable for biological succession to wetland. Stabilization results in channels blocked by coarse, flood-carried sediment deposited en masse due to flow dissipation by abrupt channel widening or infiltration, or dammed by a debris flow carried in by a highly erosive tributary. Ciénegas also may form when impervious, resistant strata cross a channel, forcing groundwater to surface and increasing stability just as low dams today protect remnant ciénega habitats. Once formed, mature ciénegas are controlled by permanently saturated soils; reducing conditions prevent colonization by any but specialized plants (e.g., sedges, rushes, grasses). Trees are limited to taxa such as willows that tolerate saturated soils. Adjacent soils may become salinized by capillarity and evapotranspiration, thus vegetated only by halophytes. Sacaton grows on adjacent terrace flats if soil aeration and salinity allow. These bottomland grasslands are then replaced by broadleaf woodland or by mesquite trees in drier sites.

New Mexico Institute of Mining and Technology's June 2003 "Investigation of the Properties of the San Bernardino Groundwater Basin in Arizona and Sonora, Mexico" culminated in several interesting results and identified many additional questions. The study showed that water in the center of the San Bernardino Valley is derived primarily from recharge in the 9,800-foot Chiricahua Mountains located about 60 miles northwest of the refuge, with some contribution from the other ranges that surround the valley. Based on carbon-14 analysis and tritium activity

from well water samples on the refuge, water appears to take between 50 to possibly more than 5,000 years to travel from the mountains to the groundwater and ultimately surface as springs on SBNWR.

Information regarding specific hydrology within other portions of the project area are either largely unknown or are poorly documented, and no long-term well records and trends have been identified. Given the unknown status of groundwater trends in some of these areas, it will be important to establish a well monitoring program to help document trends, thresholds, trigger points, and contingency management actions.

3.2 Biological Environment:

3.2.1 Vegetation Community:

Over 500 types of plants have been recorded within the Project Area. The vast majority of these are native species, leaving the ecosystem relatively free from exotic invader species. Some Russian thistle *Salsola iberica*, Johnsongrass *Sorghum halapense*, and Lehmann's lovegrass *Eragrostis lehmanniana* exists. Over 80 types of grasses have been recorded within the Project Area, indicative of the regional diversity and species richness. Wetland species include Huachuca water umbel, five species of sedge *Carex bolanderi, C. praegracilis, C. esculentis, C. niger*, and *C. odoratus*, spikerush *Eleocharis parishii*, bulrush *Scirpus americanus*, three species of rush *Juncus balticus, J. tenuis*, and *J. torreyi*, four species of duckweed *Lemna gibba, L. minor, L. minuta*, and *L. valdiviana*, sago pondweed *Potamogeton pectinatus*, cattail *Typha domingensis*, and others. These species and probably others were at one time abundant and widespread in the area, but are currently limited in distribution and abundance due to human caused changes to the habitat.

The landscape is located within the Basin and Range physiographic province, with basaltic volcanism once active in the area contemporary with basin and range tectonic activities. As a result, the basin fill consists of alluvium interlaid with basalt flows, which impacts water flow and permeability. The landscape receives runoff from the Swisshelm, Chiricahua, Pedregosa, Perilla, and Peloncillo Mountains, which feed the headwaters of the larger Río Yaqui Basin, and helps support a large and complex riverine system that eventually flows into the Sea of Cortez in Sonora, Mexico. The landscape supports a unique and endemic biota, varying from specialized vertebrates to invertebrates and plants.

The landscape is dominated by the Chiricahua Mountains, the largest single range in Arizona; higher than the continental divide in neighboring New Mexico and exceeded in elevation by only four other mountainous areas in the state. Five of the seven North American life zones originally described by C. Hart Merriam are represented in this mosaic landscape, and are highly dependent on slope expose. Limited Hudsonian Life Zone spruce-fir forest exists in the highest peaks of the Chiricahua Mountains. Canadian Life Zone fir and aspen forests occur at elevations above 8,000 feet. Transition Life Zone ponderosa pine forests dominate the landscape above 7,000 feet. The Upper Sonoran Life Zone completely surrounds the highlands with a variety of desert grasslands and/or brushlands composed of evergreen oak-pine woodlands and chaparral. The Lower Sonoran Life Zone lies generally below 4,500 feet with desert scrub habitat most representative of the Chihuahuan Desert. These areas are often bisected by deciduous riparian woodlands composed of more wetland-dependent vegetation that can be vastly different from the typical plants represented within the various life zones. The magnitude and diversity of habitats in this area are primarily responsible for an associated and equally diverse group of plants and animals, making it necessary to identify a more complex list of "surrogate species" to adequately represent the landscape.

Climate in this landscape varies considerably with elevation, exact location, and season. With some year-to-year variation, the 30-year mean daily average temperature of the landscape depicts June/July as the hottest months (80^{o} F) and December/January (46^{o} F) as the coldest months (Douglas-Bisbee International Airpost NOAA Station data). Precipitation is bi-seasonal and falls primarily during July - September (about 60% of annual precipitation) as almost daily, heavy, scattered "monsoonal" thunderstorms and during December – February (about 40% of annual precipitation) as slower moving, longer duration, storms that can cover higher elevations with three to seven feet of accumulated snow. Due to their vertical stature, the Chiricahua Mountains create a cloud magnet, typically receiving about 40 inches of precipitation annually, while lower elevations within the landscape typically receive less than 10 inches annually. April and May are traditionally the driest months.

Major drainages from the Chiricahua Mountains include Pinery Canyon, West Turkey Creek, Rucker Canyon, Leslie Canyon, and Cave Creek Canyon. All of the streams draining the mountainous regions in this landscape become subsurface, flowing into closed basins, such as the Willcox Playa, or eventually rising back to the surface as some of the headwaters of the Río Yaqui watershed. The important Río San Bernardino rises from springs in the San Bernardino Valley supported by accumulated Chiricahua Mountain precipitation and ultimately joins with flows from Guadalupe Canyon in the Peloncillo Mountain's to help support the Río Yaqui.

Within the project area, the elevation ranges from 9,796-feet at Chiricahua Peak to 3,505-feet at the location where the Río San Bernardino flows into Sonora, Mexico. Within this landscape are several areas of biological significance, including Chiricahua National Monument, Coronado National Forest, LCNWR, and SBNWR.

3.2.2 Wildlife:

The upper Río Yaqui watershed including SBNWR and LCNWR has long been famous for its biodiversity, beginning with E. A. Mearns who sampled there in 1892 and clearly anticipated far greater scientific discoveries in expressing regret he could not explore further. This early recognition carries to the present. At least 335 bird species have been documented on the SBNWR and LCNWR, including many nesting species. In addition, at least 67 mammal, 43 reptile, 13 amphibian, 8 native fish, and hundreds of invertebrate species have been recorded. Due to reduced populations, habitat loss, or a combination of causes, a number of species and species groups receive special protection or management designation. Twenty-two birds that use SBNWR and LCNWR are on Mexico's list of species of concern, 36 are on a "Priority Species Pool" developed by Partners in Flight for adoption by the Service as part of their "List of Species of Management Concern;" 6 are listed by the State of Arizona. Excluding bats, at least 11 mammals that frequent the area receive listing by the Mexican government, 6 as endangered. The noteworthy amphibians and reptiles are all restricted geographically and suffering population declines due to habitat loss or negative interactions with exotic species, and also are listed by Mexico. Eight of the nine fishes in the area are listed as threatened, endangered, or of special concern either by the Mexican government or by the Service. Six fish species also are "of concern" to the State of Arizona, and federally designated critical habitat exists for a shiner, chub, and catfish in the United States. Viable populations of all nine fishes persist in or adjacent to the area in Mexico. The endemic San Bernardino springsnail was recently listed as a Threatened species in the United States. While the diversity of fish has been well documented, baseline inventories of aquatic invertebrates are almost unknown. The potential for discovery of numerous new endemic species is great due to the unique geology, isolation, and diversity of habitats.

Waterfowl: Because wetland habitats are currently restricted within the Project Area, overall numbers of waterfowl are low. However, the diversity of waterfowl species is high, with at least 24 species recorded. The San Bernardino Valley is an important stopover area for migrating ducks and geese, with cinnamon teal, American wigeon, ring-necked ducks, redhead, and gadwall being the most common. Mexican ducks *Anas p. diazi*, mallards, and ruddy ducks nest here, and whistling swans, fulvous whistling ducks, and black-bellied whistling ducks have each been documented in the area.

Marsh and Waterbirds: The variety of ponds and streams in the Project Area provide important habitat for at least 25 species of wetland dependent birds, which include the green kingfisher, Virginia rail, sora, least bittern, American bittern, great egret, green heron, and white-faced ibis. Each of these species was undoubtedly more abundant when wetland habitats were more intact.

Shorebirds, Gulls, Terns, and Allied Species: The diversity within this group of wetland dependent birds that have been documented in the Project Area reaches at least 20 species. Some of the noteworthy species include the American avocet, spotted sandpiper, solitary sandpiper, long-billed curlew, Bonaparte's gull, black tern, and Forster's tern.

Raptors: Over 20 species of raptors utilize the Project Area, with nesting species including the Cooper's hawk, gray hawk, Swainson's hawk, red-tailed hawk, barn owl, Western screech owl, and great horned owl. Other noteworthy raptors include the Osprey, white-tailed kite, Common black hawk, Zone-tailed hawk, merlin, and peregrine falcon. Aplomado falcons formerly utilized desert grassland habitats in the San Bernardino Valley. Gray hawks are increasing in abundance in the San Bernardino Valley, with birds commonly seen and heard calling throughout the summer from cottonwood trees on both sides of the international border.

Neotropical Birds: The Rio San Bernardino provides a major migration route through this geographic area, and a diversity of neotropical migratory birds utilize the Project Area on a year-round basis. Because of its proximity to Mexican highlands, the area consistently attracts rather rare species from south of the border. Some of the noteworthy species include the ruddy ground dove, yellow-billed cuckoo, violet-crowned hummingbird, Northern beardless tyrannulet, Tropical kingbird, Chihuahuan raven, blue mockingbird, Lucy's warbler, Northern parula, crescent-chested warbler, American redstart, prothonotary warbler, Northern waterthrush, red-faced warbler, painted redstart, summer tanager, rufous-winged sparrow, Cassin's sparrow, Botteri's sparrow, swamp sparrow, yellow grosbeak, varied bunting, bronzed cowbird, and Lawrence's goldfinch.

Upland Birds: Upland birds in the Project Area include scaled quail, Gambel's quail, Montezuma quail, and Gould's turkey *Meleagris gallopavo mexicana*.

Mammals: Over 67 species of mammals have been documented in the Project Area, and still others may occur here. The rugged mountains which surround the Project Area are famous for records of jaguars (*Panthera onca)*, and ocelots *(Leopardus pardalis)* have been recorded. This tremendous species richness is largely due to the area's topographical variation and resulting variety of habitats. Most of the mammals occurring in the Project Area are secretive and nocturnal or crepuscular and are rarely seen. They utilize a variety of habitats on the refuges including wooded riparian areas and mesquite thickets, rocky bluffs and steep canyon walls, grasslands and creosote uplands, and perennial streams and ponds. With the exception of bats, all mammals in the Project Area are essentially year-round residents. The San Bernardino Valley and Sulphur Springs Valley provide important corridors for many migratory species, especially bats, moving back and forth between the United States and Mexico. In addition some mammals, such as bears, move between upper elevations and lower elevations depending upon the season and

food availability. Some of the noteworthy species include the banner-tailed kangaroo rat, yellow-nosed cotton rat, lesser long-nosed bat, Western red bat, hoary bat, pallid bat, Western mastiff bat, mountain lion, gray fox, black bear, white-nosed coati, hooded skunk, white-backed hog-nosed skunk, collared peccary, white-tailed deer, and mule deer.

Reptiles and Amphibians: Over 56 species of reptiles and amphibians have been documented in the Project Area. Some of the noteworthy species include the Sonoran desert toad, Chiricahua leopard frog, lowland leopard frog, plains leopard frog, Sonora mud turtle, Gila monster, Texas horned lizard, regal horned lizard, Great Plains skink, ring-necked snake, northern Mexican gartersnake, Sonoran coral snake, Western diamond-backed rattlesnake, Mohave rattlesnake, black-tailed rattlesnake, and banded rock rattlesnake.

Fish: Although fish are a relatively small minority of the total biodiversity of arid lands, they comprise an important sentinel group for the entire ecosystem. Their decline is a sensitive measure of significant environmental changes. SBNWR once was historic habitat for eight native fishes, representing 22% of the total number of native fish species in Arizona and 47% of the entire freshwater fish species of the Rio Yaqui in Mexico. These include the Yaqui chub, Yaqui topminnow, Yaqui beautiful shiner, Yaqui catfish, Yaqui sucker, Mexican longfin dace, Mexican stoneroller, and Mexican round-tailed chub. Six of these species currently occur on LCNWR and/or SBNWR, but the Yaqui sucker and Mexican round-tailed chub are currently extirpated from the Project Area, though they still exist in tributaries of the San Bernardino River just south of SBNWR in Mexico. The Yaqui chub and Yaqui topminnow are federally listed as endangered, while the Yaqui catfish and Yaqui beautiful shiner are listed as threatened. Seven of the eight native species are also considered imperiled by the State of Arizona. SBNWR is designated as critical habitat for the shiner, chub, and catfish, and the Service requires secure populations in Mexico before down-listing or de-listing can be considered for these species in the United States. The Chiricahua Mountains also contain several perennial streams that support important populations of native fish. Cave Creek supports an isolated population of speckled dace. Rucker Creek supports the largest population of Mexican stonerollers in the entire United States, and with West Turkey Creek provide crucial perennial flows for Mexican longfin dace. Leslie Creek and adjacent wetlands on private property provide habitat for Yaqui chub and Yaqui topminnow. Fish recovery actions include stabilization of existing populations, establishment of self-sustaining populations, and extensive restoration of wetland habitat in both the United States and in Mexico.

Invertebrates: A great number of invertebrates, including many endemic species, are known from the Project Area. For example, the San Bernardino Valley of Arizona/Sonora has the highest documented biodiversity of native bees in the entire world. In addition, at least 65 dragonfly and damselfly species are supported by the area's wetlands, and at least 87 species of butterflies have been documented on SBNWR and LCNWR, including one that is known from no other location in the United States. Freshwater mussels (*Anodonta dejecta* and *Anodonta mearnsiana dejecta*) were collected by Mearns from the Rio Yaqui watershed on the San Bernardino Ranch during the 1892-1893 US/Mexico boundary survey, but remain currently unknown in the system.

3.2.3 Threatened and Endangered Species and Other Special Status Species:

Various human activities have altered the landscape and ground water levels and have drastically changed the ecosystem since the turn of the century. The watersheds that support SBNWR and LCNWR provide a critical role in maintaining a sanctuary for multiple plant and wildlife species of special concern (Federal and/or State listed) which are identified in the following table.

Table 3.2.3. Known Federally-listed and State Species of Concern that Occur on and Immediately Adjacent to San Bernardino NWR and Leslie Canyon NWR. Status: WC1 = Arizona Wildlife Species of Special Concern, FE = Federally Listed Endangered, FT = Federally Listed Threatened, FPT = Federally Proposed Listed Threatened.

Status	Common Name	Scientific Name	Occurrence
FE	Huachuca water umbel	*Lilaeopsis schaffneriana ssp. recurva*	resident
FT	Cochise pincushion cactus	*Coryphantha robbinsorum*	resident
FT	San Bernardino springsnail	*Pyrgulopsis bernardina*	resident
FE/WC1	Yaqui chub	*Gila purpurea*	resident
FT/WC1	Yaqui beautiful shiner	*Cyprinella formosa*	resident
WC1	Yaqui sucker	*Catostomus bernardini*	resident
FT/WC1	Yaqui catfish	*Ictalurus pricei*	resident
FE/WC1	Yaqui topminnow	*Poeciliopsis o. sonoriensis*	resident
FT	Chiricahua leopard frog	*Lithobates chiricahuensis*	resident
FT/WC1	Northern Mexican gartersnake	*Thamnophis eques megalops*	resident
FPT	W. yellow-billed cuckoo	*Coccyzus americanus*	nesting
FE	Lesser long-nosed bat	*Leptonycteris c. yerbabuenae*	migrant
FE	Ocelot	*Leopardus pardalis*	resident
FE	Jaguar	*Panthera onca*	resident

The Huachuca Water Umbel is a small, herbaceous, semi-aquatic, perennial plant with slender, erect leaves that grow from creeping rhizomes. This wetland dependent plant has been documented in southeastern Arizona and adjacent Sonora, Mexico. The density of Huachuca water umbel plants and size of populations seems to fluctuate in response to specific habitat site characteristics and natural flood cycles. Modification and destruction of wetland habitats throughout the species range led to Federal listing of the Huachuca water umbel as endangered without critical habitat on January 06, 1997. As groundwater drops below the elevation of the stream channel bed, the wetland plant association is expected to be the first plant association lost. In addition, plant succession and competition with other species has had a negative impact on the water umbel. Populations of this plant occur on SBNWR in perennially wet portions of Black Draw and Hay Hollow Wash, at LCNWR along Leslie Creek, and at Slaughter Ranch in the House Pond drainage.

The San Bernardino springsnail was listed as a threatened species effective May 17, 2012, with designated critical habitat on 0.8 acres of SBNWR and 1.2 acres of the Slaughter Ranch. This is a small (<2mm) snail having a whorled shell that is narrowly conical with an obtusely blunt apex. In the United States, the species is known only from its type locality, a small spring complex adjacent to SBNWR on the Slaughter Ranch in Cochise County, Arizona. San Bernardino springsnails also occur at two known sites in Sonora on Rancho San Bernardino; with the largest

population located within ¼-mile of SBNWR in the large extant San Bernardino ciénega. A small spring system and ciénega known as Los Ojitos perched on the west side of Río San Bernardino south of Mexico Highway 2 contains another limited population of these springsnails. While the species remains relatively safe in ciénega wetlands just south of SBNWR in Sonora, the existence of the species in Arizona remains very tenuous. Snail Spring and Goat Spring, the only remaining springs supporting San Bernardino springsnails in the United States, are located on the Slaughter Ranch owned by the Johnson Historical Museum of the Southwest, where aquatic resources are under the management authority of the Service. The springs are located adjacent to House Pond, a 100-year old impoundment, and existing vegetation at the wetland sites is dominated by watercress and yerba-mansa, with large cottonwood trees providing some canopy. The springsnail was historically known from additional Slaughter Ranch springs in the immediate vicinity, but appears to have been extirpated from these sites. During 2014, springsnails were reintroduced into Snail Spring from Goat Spring. While natural events such as earthquakes and drought trends have altered Slaughter Ranch wetlands over time, the greatest habitat destruction and modification to the habitat appears to have resulted from anthropogenic influences. Currently, limited habitat seems to pose the largest problem to the species' survival. Introduction of non-native vegetation and mosquitofish, subsequent control efforts to eliminate non-native fish, poor historic grazing practices, large-scale water diversion, artificial landscaping, herbicide and fertilizer use, and perhaps other influences have reduced and isolated the population.

Yaqui chub can grow to be about five inches long, and are normally dark olive green or brownish, with breeding males turning blue. The historic distribution of Yaqui chub was restricted to Río Yaqui tributaries in southeastern Arizona and Sonora, Mexico. The species had been collected in the Sulphur Springs Valley south of the Willcox Playa in Arizona. The Yaqui chub lived in deep pools in creeks, scoured areas of ciénegas, and other stream-associated, quiet waters that were maintained by springs and artesian wells. However, the reduction of permanent water severely modified suitable habitat for this species. Having the most restricted geographic range of all the Río Yaqui fish, the Yaqui chub was federally listed as endangered, with critical habitat including all aquatic habitats in the main portion of SBNWR, on August 31, 1984 throughout its range. Current populations of Yaqui chub have responded well to intensive management, and have established large and viable populations in diverse habitats. Managed populations of this fish currently occur in nearly all wetlands on SBNWR. It has additionally been protected at LCNWR, in West Turkey Creek on the Coronado National Forest, and on important private land at Slaughter Ranch, El Coronado Ranch, Bar-Boot Ranch, 99-Bar Ranch, Douglas High School, and on Rancho San Bernardino in Mexico. Yaqui chub populations in the San Bernardino Valley and at Douglas High School continue to be threatened due to infestations by the non-native Asian tapeworm, while those on El Coronado Ranch, Bar-Boot Ranch, and Coronado National Forest currently remain free of this parasite.

The Yaqui beautiful shiner historically occurred in the United States only in the San Bernardino Valley of Arizona. Its range in Mexico included the Río Yaqui system in both Sonora and Chihuahua. The male beautiful shiner is iridescent blue with bright orange fins. The life history and ecology of this species are poorly known. It is a mid-water column species, occupying both swift and quiet waters, and often remaining near aquatic vegetation or other cover along pond margins. Reproduction appears to occur principally during May – July in warmer temperatures. Habitat alterations extirpated the beautiful shiner from the United States in 1970, and the species is continuing to suffer reductions in Mexico as a result of changes in land and water use along with impacts of non-indigenous species such as the red shiner. The species was federally listed as threatened, with critical habitat including all aquatic habitats of SBNWR, on August 31, 1984. About 900 beautiful shiner were collected under permit in Chihuahua from Arroyo Moctezuma

on the Bavispe drainage during October 1989. These fish were held and propagated at Dexter National Fish Hatchery (NFH) in New Mexico and 300 fish were ultimately reintroduced into Twin Pond on SBNWR on May15, 1990. The species is currently reproducing and thriving in the two adjacent Twin Ponds, Oasis Pond, North Pond, and in Black Draw.

Yaqui catfish are the only native catfish species found west of the Continental Divide, and were originally found in the Río Yaqui basin in southeastern Arizona and in Sonora and Chihuahua, Mexico. Little is known about the ecology of this fish, but it is most commonly caught in larger rivers in areas of medium to slow current over gravel and sand substrates. Yaqui catfish were probably extirpated from the wild in the United States prior to the 1960s when flows in Black Draw ceased. Habitat modification and hybridization with the channel catfish (*Ictalurus punctatus*) has further reduced or eliminated populations of Yaqui catfish. This species was federally listed as threatened, with critical habitat including all aquatic habitats of the main portion of SBNWR, on August 31, 1984. Initial collections of wild Yaqui catfish were made in 1987 and 1990 from the Río Aros sub-basin. Additional collections totaling 100 catfish were made with electro-fishing equipment from three sites within the Río Bavispe sub-basin (Tres Ríos, La Taranga, & Cobora) during June, 1995 and October 1995, and from Cajon Bonito during March 1996. These fish were transported to Dexter NFH to develop culture techniques, and fish were ultimately induced to spawn at Uvalde NFH during 1995, 1996, 1997 and 1999. On November 13, 1997, a total of 60 12-inch catfish and 100 6-inch catfish were stocked into Twin Pond on SBNWR, and a total of 100 12-inch catfish and 100 6-inch catfish were stocked into House Pond at Slaughter Ranch. All of the larger fish were PIT-tagged. A total of 1,464 Yaqui catfish were released on October 26, 1999 at El Coronado Ranch. Yaqui catfish are currently present, in unknown numbers, in Twin Pond on SBNWR, in House Pond on the Slaughter Ranch, and in "Big Tank" on El Coronado Ranch. While natural spawning in these three locations has yet to be documented, multiple age class catfish have been documented in House Pond by SBNWR staff during monitoring efforts, indicating the likelihood of natural reproduction.

The Yaqui topminnow is a small, live-bearing fish occurring throughout shallow, warmer waters within the Río Yaqui Basin. Females are tan or olive colored, while breeding males are black with orange colored fins. Yaqui topminnow eat vegetation and aquatic insects, including mosquito larvae. Yaqui topminnow were once found throughout the Río Yaqui drainage in southeastern Arizona and in Sonora and Chihuahua, Mexico, where they utilized shallow, warm, quiet waters and occasionally inhabited moderate to relatively swift currents. However, their populations were dramatically reduced in the United States because of habitat alteration and destruction. The Yaqui topminnow was federally listed as endangered, without critical habitat, on March 11, 1967, although it remains fairly abundant and widespread in parts of Mexico. A subsequent threat to the future status of Yaqui topminnow is the introduction of non-native Western mosquitofish (*Gambusia affinis*). The mosquitofish is a voracious predator that has already reduced formerly large and widespread populations of the native Gila topminnow (*Poeciliopsis occidentalis occidentalis*) in Arizona through both direct predation and through competition for food resources. Yaqui topminnow currently inhabit every wetland on SBNWR, and are also present at LCNWR, Slaughter Ranch, Bar-Boot Ranch, 99-Bar Ranch, and Rancho San Bernardino in Mexico, where populations are relatively secure from mosquitofish introductions and habitat alteration. Plant succession, especially the proliferation and spread of cattail, continues to take over wetlands upon which topminnow depend.

The Chiricahua leopard frog is distinguished from other leopard frogs by a distinctive pattern on the rear of the thigh; dorsolateral folds that are interrupted and deflected medially; stocky body proportions; relatively rough skin on the back and sides; and often bright green coloration on the head and back. The species also has a distinctive call consisting of a relatively long snore of one

to two seconds in duration. These frogs have maximum snout-vent lengths reaching up to 5.4 inches. Once common within the project area in scattered locations, naturally occurring Chiricahua leopard frogs have not been regularly observed during the past 20 years. From 1993 to 1996, researchers conducted intensive leopard frog conservation efforts on SBNWR, at the nearby Douglas High School, and on the Magoffin Ranch east of the refuge. Chiricahua leopard frogs were introduced to new sites where bullfrogs, which are voracious predators on the leopard frogs, were absent. Leopard frogs increased in number exponentially as a result of these efforts. However, during 1997, a rapid and alarming die-off of leopard frogs occurred on the refuge. Some of the dying and dead frogs at the study sites had a fungal skin infection that was ultimately identified by the University of Arizona's Veterinary Diagnostic Laboratory. This was among the first published reports of mortality in wild amphibians in Arizona that were associated with the chytridiomycosis fungus disease (Bradley et al., 2002). Effective July 15, 2002 the Service listed the Chiricahua leopard frog as a threatened species under the Endangered Species Act with a special rule to accommodate continued use and maintenance of livestock tanks on private and tribal lands. The Service revised the listing and designated critical habitat on March 20, 2012. This was accomplished because the species is now absent from many historic localities and numerous mountain ranges, valleys, and drainages within its former range. In areas where it is still present, populations are small and widely scattered. Threats to the frog include habitat alteration, destruction, and fragmentation; predation by non-native organisms; and disease. Problems associated with small population numbers and size also threaten the species. In recent years, there have been successful reintroduction efforts in Cave Creek and LCNWR. Naturally occurring populations occur in Rosewood Tank on Arizona State Trust Land, and on the Diamond-A Ranch in New Mexico.

The northern Mexican gartersnake was federally-listed as a threatened species effective August 7, 2014. One of three kinds of garter snakes on SBNWR, the northern Mexican gartersnake is the rarest. This snake can grow up to 44-inches long, and must have wetland habitat to survive. They typically eat fish, frogs, toads, and tadpoles. These gartersnakes live in dense vegetation along the banks or in the shallows of wetlands and streamside woodlands. Northern Mexican gartersnake populations are declining primarily due to the introduction of non-native bullfrogs, crayfish, warmwater sportfish, and predatory sportfish which have adversely impacted and threatened their survival. These non-native species directly compete with gartersnakes for available food resources, and also prey upon gartersnakes along with native prey species that are vital to the gartersnake's existence. Restoration of densely vegetated ciénega wetland habitats on SBNWR and the adjacent Rancho San Bernardino in Mexico should help the recovery of this unique snake. The species was last recorded in Black Draw at SBNWR during 2005.

The Western yellow-billed cuckoo is a bird approximately twelve inches long, grayish brown above, white below, with rufous primaries and a yellow lower mandible. Limited numbers of cuckoos occur seasonally within the project area on SBNWR, where they utilize the riparian habitat for nesting during June-September. The Service proposed the western distinct population segment (DPS) of the yellow-billed cuckoo as threatened on October 3, 2013 and proposed critical habitat for this DPS on August 15, 2014. This bird is also considered a species of concern by the Arizona Game & Fish Department. Biologists estimate that more than 90 percent of the bird's riparian habitat in the West has been lost or degraded. Threats to the western distinct population segment include loss of riparian habitat and habitat fragmentation as a result of altered hydrology and repeated conversion to agriculture, dams and river flow management, bank protection, overgrazing, desiccation and subsequent replacement by exotic Annual surveys conducted on SBNWR indicate that up to five nesting pairs of yellow-billed cuckoos utilize the refuge in and adjacent to Black Draw and Hay Hollow Wash. These refuge birds nest within the cottonwood riparian corridors and also forage in the adjacent mesquite and

hackberry-dominated habitat. Therefore, conserving such upland habitat adjacent to riparian habitats is considered important for foraging cuckoos. Elsewhere within the proposed project area, little is known regarding cuckoos. There are breeding season records recorded from LCNWR, Guadalupe Canyon, Diamond-A Ranch, and the Portal-Paradise area of the Chiricahua Mountains, but such records do not necessarily equate to these areas support nesting birds. Ornithologists are only beginning to learn the extent of cuckoo nesting in oak, hackberry, sycamore, and other drier canyon habitats.

The lesser long-nosed bat was federally-listed as endangered without critical habitat on September 30, 1988. This large bat species has an elongated muzzle, a small leaf-shaped nose, a long tongue, and a minute tail. Its geographic range includes El Salvador, western Mexico, and a small portion of the United States in southern Arizona and southwestern New Mexico. This species has been documented throughout the project area, with roosts reported near both SBNWR and LCNWR. During the daytime, these bats depend almost entirely on caves and abandoned mines and tunnels. At night, they can range long distances from their day roosts to feed on the flower nectar provided by saguaro cacti and agaves, and are therefore important desert plant pollinators. The bat will also drink sugar water from hummingbird feeders. This is typically a migrant species, which arrives in the United States during May and normally departs during September. The species is considered endangered due to disturbance of roosting sites, potential loss of food resources, and direct killing by humans, all of which led to population declines. The floral resources of both saguaro (*Carnegiea gigantea*) and Palmer's agave (*Agave palmeri*) are important food sources of the lesser long-nosed bat. Also, the effects of fire on the reproductive biology of agave plants have been studied to help determine the indirect effects of fire on this bat species.

3.3 Human Environment

3.3.1 Cultural Resources:

The project area lies within a rich cultural heritage area, with documented human inhabitation going back for at least 10,000 years. The area encompassing what is now SBNWR has been actively occupied during both the prehistoric and historic periods, and prehistoric sites appear to reflect both Mogollon (San Simon Branch) and a later Salado occupation of the area. Numerous archeological sites exist on SBNWR, and a large Salado habitation site at the north end of the refuge, named the "Slaughter Ranch Site," was partially excavated and recorded by Mills and Mills in 1966. A number of additional sites were recorded and reported by V. K. Pheriba Stacy in 1974. The refuge includes a portion of the San Bernardino Ranch National Historic Landmark (designated in 1963), though most of this landmark lies on the adjacent 131-acre Slaughter Ranch property. During 1982, an archaeological inventory was completed on this area and 24 archaeological sites were identified. These included the fortified military encampment used for troop training and border security, a number of historic house sites and associated trash dumps, and three prehistoric Mogollon sites. In addition, 33 sites and 99 isolated cultural features and artifacts existing on 2,000 acres of SBNWR west of Hay Hollow Wash have been documented by University of Arizona archeologists as part of a cultural resource inventory conducted under FWS contract from August 1984 - March 1985. These include archaic sites dating from 1500- 500 BC and also late prehistoric Animas phase (Mogollon and Salado) sites, including extensive settlements and pueblos, dating from about 1200 – 1400 AD. Although most sites are relatively secure from vandalism and "pot hunting" some of the sites are in the immediate proximity of high public use areas. Additionally, ground disturbing activities on the refuge have the potential to impact cultural resources.

During July 1901, the "Boundaries of the San Bernardino Private Land Grant" were surveyed by John A. Rockfellow, a Deputy Surveyor for the U.S. Surveyors General Office. He reported an abandoned, two-room house with intact roof and walls and an open central passage that straddled the international border. Local stories report that this site was occupied from 1880 to 1910 by a Mormon employee of John Slaughter who, in order to "legally" keep two wives, housed one in the United States and one in Mexico. The "Mormon House" was constructed of adobe bricks placed on basalt fieldstones without mortar, and the eroded walls have covered and protected most of the foundation for many years. During 2008, when DHS contract archeologists were surveying this portion of the international border prior to construction of a border road and vehicle barrier, refuge staff showed them the location of the "Mormon House" and urged DHS to protect the historic site. Ultimately, the portion of the site in the United States was excavated under contract by e^2M of Denver, Colorado and then covered with plastic sheeting, buried with soil and base coarse material, and fenced in an effort to protect the site from vehicle traffic and road maintenance equipment. The fieldstone foundation remains visible on the south side of the border.

3.3.2 Socioeconomic Resources: The project area surrounding SBNWR and LCNWR is located in southeast Arizona's Cochise County and in southwest New Mexico's Hidalgo County. The largest city in the area is Douglas, Arizona with a population of about 16,000. Several additional towns are within thirty to ninety miles away from the project area, with the city of Tucson located about 100 miles to the northwest. The predominant land uses in the vicinity of the project area are livestock grazing, with some irrigated farming. The Douglas Chamber of Commerce lists SBNWR as one of the area's main tourism attractions, and about 6,000 people visit SBNWR, LCNWR, and the adjacent Johnson Historical Museum of the Southwest each year. An abundance of public land and associated State Trust Land in Cochise County make southeast Arizona popular with hikers, birders, hunters, photographers, and other outdoor enthusiasts.

3.3.3 Visitor Services/Activities: Within the project area, the largest draw to visitors are lands managed by the U.S. Forest Service (USFS) as Coronado National Forest. The USFS maintains campgrounds, public restrooms, parking areas, signage, and hiking trails in the Chiricahua and Peloncillo Mountains. Main vehicle access routes include U.S. Highway 80, New Mexico State Highway 338, and numerous all-weather roads, dirt roads, and primitive roadways. Geronimo Trail Road and Guadalupe Canyon Road, both maintained by Cochise County, are the main routes for vehicular access through the San Bernardino Valley, which contains no formal visitor services other than those provided on SBNWR and Slaughter Ranch. Basic services include public restrooms, parking areas, regulatory signs, and educational signs.

3.3.4 Visual Resources: The project area is a sparsely populated, scenic area along the southwest border of New Mexico and the southwest border of Arizona. Few roads cross the region. The Chiricahua, Peloncillo, and Animas Mountains dominate views across the landscape north of the international boundary. Occasional, seasonal wildfires in these mountains and on surrounding lands can sometimes impact visual resources within the project area for short periods of time. Additionally, copper mining, once a dominant industry in the region which also negatively impacted air quality, is no longer a major economic contributor to the area.

3.5 Wilderness: Within the overall project area, the USFS manages the 87,700-acre Chiricahua Wilderness. Additionally, there are lands having wilderness characteristics located in portions of the Peloncillo and Animas Mountains. None of the Cooperative Recovery Initiative projects will be located in or adjacent to designated wilderness.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Physical Environment

4.1.1 Impacts on Air Quality

Alternative A – No Action Alternative

Under the No Action Alternative, for any of the proposed projects (a-f) described in section 2.2, there will be no change in air quality from current conditions. Bare portions of the landscape, having little or no grass cover, will continue to facilitate fine particles becoming airborne from medium to strong winds during dry periods.

Alternative B – Proposed Action Alternative

Under the Proposed Action Alternative, for any of the proposed projects (a-f) described in section 2.2, there will be minimal short-term negative effects to the air quality. These negative impacts would be attributed to exhaust from vehicles and heavy equipment and dust being generated from the use of vehicles and heavy equipment. If prescribed fire is used for brush control, there will be short-term air quality impacts from smoke generated from the combustion of plant materials. There will be no long-term effects to air quality from any of the proposed projects.

4.1.2 Impacts on Water Quality and Quantity

Alternative A – No Action Alternative

a) Under this alternative, if planned and coordinated management and control of invasive perennial woody plants that are currently invading grasslands portions of the project area landscape are not conducted, the project are would continue to lose some ability to catch and retain water during precipitation events to assist ground water recharge. There would also be no way for portions of the landscape to capture waterborne sediments during floods which would lead to continued erosion of stream channels and aggradation of downstream wetlands. Under this alternative there would be no anticipated change from current conditions.

b) Under this alternative, if planned and coordinated maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area is not accomplished to benefit wildlife, water quantity across the landscape will decrease and there will be less assurance of adequate aquatic habitat for fish and wildlife within the project area. Species currently dependent on existing water sources requiring maintenance will lose all or portions of their habitat to drying. Water currently being used from wells for domestic purposes will continue to be used, but would not additionally be made available to benefit fish and wildlife. The currently unmeasured and unknown “cone of depression” influences on groundwater resulting from water withdrawal at individual domestic wells, or other wells, within the project area will continue without a strategic plan that includes fish and wildlife conservation. Groundwater levels will continue to periodically rise and fall, dependent largely upon climatic conditions, winter precipitation, and runoff events. Under this alternative there would be no anticipated change from current conditions.

c) Under this alternative, if “wildlife-friendly fence” is not maintained or installed within the project area to restrict the movement of livestock from sensitive wetland areas, there would be no anticipated change in current water quality or quantity conditions.

d) Under this alternative, if planned and coordinated management, restoration, and construction of perennial wetlands are not accomplished to benefit fish and wildlife, there would be less seasonal and perennial water available and subsequently less assurance of adequate aquatic

habitat for the long-term survival of fish and wildlife within the project area. Wetlands currently within the project area would decrease in quality as they fill with silt or otherwise lose their ability to adequately hold water, and species currently dependent on existing water sources requiring maintenance will lose all or portions of their habitat to drying. Water currently being used from wells for domestic purposes will continue to be used, but would not additionally be made available to benefit fish and wildlife. The "cone of depression" influences on groundwater resulting from water withdrawal at individual domestic wells, or other wells, within the project area will continue without a strategic plan that includes fish and wildlife conservation. Groundwater levels will continue to periodically rise and fall, dependent largely upon climatic conditions, winter precipitation, and runoff events. Under this alternative there would be no anticipated change from current conditions.

e) Under this alternative, if planned and coordinated maintenance, restoration, and construction of various erosion control structures are not conducted within the project area, the landscape would continue to lose some ability to catch and retain water during precipitation events to assist ground water recharge. There would also be limited ability for the landscape to capture waterborne sediments during floods which would lead to continued erosion of stream channels and aggradation of wetlands. Under this alternative there would be no anticipated change from current conditions.

f) Under this alternative, if additional monitoring of plant and animal populations and habitat conditions (including groundwater trends) within the project area is not accomplished, there would be no impacts on water quality or quantity from current conditions. However, a lack of monitoring would not provide opportunities for cooperators to identify problems within the landscape (poor grazing practices, accelerated erosion, contaminates, construction activities, etc.) that may themselves perpetuate or begin to impact water quality and/or quantity within the project area. Hydrologic trends within the project area would continue to be unknown and undocumented.

Alternative B – Proposed Action Alternative

a) Under this proposed action alternative, planned and coordinated management and control of invasive perennial woody plants that are currently invading grasslands portions of the project area landscape will be conducted, increasing the ability of the landscape to catch and retain water during precipitation events to assist in increasing ground water recharge. Additionally, portions of the landscape will benefit from the capture of surface flow during flood events which will help minimize erosion of stream channels and help prevent aggradation of downstream wetlands, increasing water quality. There will be minimal short-term impacts on water quality expected during implementation of this project.

b) Under this proposed action alternative, planned and coordinated maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area will be accomplished to benefit wildlife. Water quantity across the landscape will increase and there will be increased assurance of adequate aquatic habitat to support long-term fish and wildlife populations within the project area. Species currently dependent on existing water sources requiring maintenance will benefit when their habitat is restored or expanded. Water currently being used from wells for domestic purposes will continue to be used, and will additionally be made available to benefit a huge array of fish and wildlife. The currently unmeasured and unknown "cone of depression" influences on groundwater resulting from water withdrawal at individual domestic wells, or other wells, within the project area will continue, but there will be a strategic plan in place, including a well monitoring program, that includes fish and wildlife conservation. Groundwater levels will continue to periodically rise and fall, dependent

largely upon climatic conditions, winter precipitation, and runoff events. There will be minimal short-term impacts on water quality during implementation of this project due to vehicle and equipment use in maintaining or installing pipe and casing.

c) Under this proposed action alternative, both water quality and quantity might be expected to improve within portions of the project area where "wildlife-friendly fence" is accomplished to restrict the movement of livestock from sensitive wetland areas.

d) Under this proposed action alternative, if planned and coordinated management, restoration, and construction of perennial wetlands are accomplished to benefit fish and wildlife, water quantity across the landscape will increase and there will be increased assurance of adequate aquatic habitat to support long-term fish and wildlife populations within the project area. Species currently dependent on existing water sources requiring maintenance will benefit when their habitat is restored or expanded. Water currently being used from wells for domestic purposes will continue to be used, and will additionally be made available to benefit a huge array of fish and wildlife. The currently unmeasured and unknown "cone of depression" influences on groundwater resulting from water withdrawal at individual domestic wells, or other wells, within the project area will continue, but there will be a strategic plan in place, including a well monitoring program, that includes fish and wildlife conservation. Groundwater levels will continue to periodically rise and fall, dependent largely upon climatic conditions, winter precipitation, and runoff events. There will be minimal short-term impacts on water quality during implementation of this project due to vehicle and equipment use in maintaining and constructing wetlands.

e) Under this proposed action alternative, planned and coordinated maintenance, restoration, and construction of various erosion control structures will be conducted within the project area, and the landscape will improve in its ability to catch and retain water during precipitation events to assist ground water recharge. The installation of multiple erosion control measures within the project area will stabilize stream channels and reduce sediment loads in waters during flood periods, benefiting water quality. In addition, water in stream channels would be slowed during flood events, allowing for ground water recharge; and potential contaminants would not be mobilized downstream. There will be potential short-term impacts on water quality during implementation of this project due to vehicle and equipment use in implementing erosion control projects.

f) Under this proposed action alternative, there will be no direct impacts on water quality or quantity from current conditions if monitoring plant and animal populations and habitat conditions is accomplished within the project area. It is possible that monitoring, particularly well monitoring, may provide opportunities for cooperators to identify problems within the landscape (declining groundwater tables, poor grazing practices, accelerated erosion, environmental contaminates, construction activities, etc.) that may themselves perpetuate or begin to impact water quality and/or quantity within the project area. With proposed well monitoring, information regarding groundwater trends can be gathered, ultimately helping establish thresholds and trigger points for enacting additional management contingencies. Contingencies could include potential additional actions to minimize evaporation and/or seepage, potentially decrease the volume of wetlands, or even potential future abandonment of selected wetlands being supported by domestic wells.

4.1.3 Impacts on Soils

Alternative A – No Action Alternative

a) Under this alternative, if planned and coordinated management and control of invasive perennial woody plants that are invading grasslands portions of the project area landscape are not accomplished, soils would continue to erode due to the current lack of adequate grass cover that helps the landscape to capture waterborne sediments during flood events. Without restoration of grasslands within the project area there would be a continued loss of topsoil due to unstabilized vegetation. No action would help perpetuate continued erosion of stream channels and aggradation of removed soils into downstream wetlands.

b) Under this alternative, if planned and coordinated maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area is not accomplished to benefit wildlife, there would be no anticipated change in soil quality from current conditions.

c) Under this alternative, if "wildlife-friendly fence" is not maintained or installed within the project area to restrict the movement of livestock, there would be no anticipated change in current soil quality conditions.

d) Under this alternative, if planned and coordinated management, restoration, and construction of perennial wetlands are not accomplished to benefit fish and wildlife, wetlands currently within the project area would decrease in quality as they fill with silt or otherwise lose their ability to adequately hold water, and species currently dependent on existing water sources requiring maintenance to remove accumulated silt deposition will lose all or portions of their habitat to drying.

e) Under this alternative, if planned and coordinated maintenance, restoration, and construction of various erosion control structures are not conducted within the project area, there would be a continued loss of streambed material during periods of flooding and continued destabilization of soil along riparian margins. The landscape would continue to lose the ability to capture waterborne sediments during flood events which would lead to continued erosion of stream channels and aggradation of wetlands with relocated soils. Under this alternative there would be no anticipated change from current conditions.

f) Under this alternative, if monitoring plant and animal populations and habitat conditions (including groundwater trends) within the project area is not accomplished, there would be no anticipated impacts on soils from current conditions. Under this alternative there would be no anticipated change from current conditions.

Alternative B – Proposed Action Alternative

Under the proposed action alternative all six proposed projects (a-f) would affect some short-term soil degradation. These impacts are short-term and will range from significant, in the case of wetland restoration, to minimal, as for implementing monitoring activities. The long-term benefits to the soil from each project are described below.

a) Under this proposed action alternative, planned and coordinated management and control of invasive perennial woody plants that are invading grasslands portions of the project area landscape will be accomplished, leading to increased grassland restoration. With the return of healthy grasslands, the landscape will experience a decrease in the loss of topsoil. In fact, topsoil will begin to be replaced and accumulated by stabilized grassland conditions, which will help the landscape to capture waterborne sediments during flood events. Grassland restoration will improve soil permeability for water infiltration; restore soil stability at the rooting zones of plants in riparian areas; and increase soil stabilization and promote native plant production. With the

removal of invasive woody plant species and the subsequent replacement with native grasses, soil chemistry will improve and support viable plant populations that ultimately increase soil retention.

b) Under this proposed action alternative, planned and coordinated maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area will be accomplished to benefit wildlife. Additional water sources will incrementally help the retention of hydric soils during precipitation events and during medium to strong winds.

c) Under this proposed action alternative, planned and coordinated maintenance and installation of "wildlife-friendly fence" to effectively restrict the movement of livestock, while also ensuring that wildlife corridors, uplands, and wetlands are enhanced and made safer for the passage of native wildlife within the project area, will be accomplished.

d) Under this proposed action alternative, planned and coordinated management, restoration, and construction of perennial wetlands within the project area, would be accomplished. With the restoration of wetland areas there will be increased stabilization of vegetation allowing for the retention of top soil during heavy precipitation events and strong winds. Additional water sources will also incrementally help the retention of hydric soils during precipitation events and during medium to strong wind events.

e) Under this proposed action alternative, planned and coordinated maintenance, restoration, and construction of various erosion control structures, including rock-filled wire basket gabions, earthen berms, single rock dams, and appropriate dikes, each having site specific designs to optimize their effectiveness within the project area, would be accomplished. Installing additional erosion control measures will improve soil permeability for water infiltration; restore soil stability at the rooting zones of plants in riparian areas; and increase soil stabilization promoting native plant production.

f) Under this proposed action alternative, planned and coordinated monitoring of plant and animal populations and habitat conditions, including groundwater trends, within the project area would be conducted. It is possible that monitoring may provide opportunities for cooperators to identify problems within the landscape (conservation easement violations, construction activities, poor grazing practices, accelerated erosion, environmental contaminates, etc.) that may themselves perpetuate or begin to impact soil conditions within the project area.

4.2 Biological Environment

4.2.1 Impacts on Habitat

Alternative A – No Action Alternative

a) Under this alternative, coordinated and planned management and control of invasive perennial woody plants currently invading grasslands and becoming dominant within the project area would not occur and there would be a continual increase in salt cedar, mesquite, juniper, and other woody species within the project area's grasslands. Under this alternative there would be no anticipated change from current conditions.

b) Under this alternative, coordinated and planned maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area would not occur and there would be a continual decrease in water available to multiple species of fish and wildlife within the project area. The number of available wetland meta-population sanctuaries would remain seriously limited during seasonal drought periods, functioning to concentrate fish

and wildlife into restricted areas where they are more prone to predation, disease, and local extinction. Expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's landscape would remain limited or would remain non-functional, and individual species recovery criteria would not be met.

c) Under this alternative, coordinated and planned maintenance and installation of "wildlife-friendly fence" within the project area would not occur. Effective restriction of livestock movement would remain unchanged from current conditions, which in some instances also restrict the free and safe passage of native wildlife trying to utilize travel corridors, uplands, and wetlands within the project area. Under this alternative there would be no anticipated change from current conditions.

d) Under this alternative, coordinated and planned management, restoration, and construction of perennial wetlands within the project area would not occur, providing continually less available aquatic habitat for multiple fish and wildlife species currently utilizing the project area, and allowing for the continued loss of wetland habitat and associated loss of plant and animal diversity. The number of existing wetland meta-population sanctuaries would continue to remain seriously limited during seasonal drought periods, functioning to concentrate fish and wildlife into restricted areas where they are increasingly prone to predation, disease, and local extinction. Expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's landscape would remain limited or would remain non-functional, and individual species recovery criteria would not be met.

e) Under this alternative, coordinated and planned maintenance, restoration, and construction of various erosion control structures, including rock-filled wire basket gabions, earthen berms, single rock dams, and appropriate dikes, each having site specific designs to optimize their effectiveness within the project area, would not occur. The current lack of effective erosion control measures in streams and washes within the project area would help perpetuate decreasing native plant populations in grassland and riparian habitats; help increase non-native plant species in disturbed areas; help lead to a continued loss of downstream wetland habitat to aggradation; and help lead to a continued loss of riparian habitat to siltation. Under this alternative there would be no anticipated change from current negative conditions.

f) Under this alternative, a coordinated and planned approach to monitoring plant and animal populations and habitat conditions (including groundwater trends) within the project area would not occur. Documenting the existence and population status and trends of various plant, fish, and wildlife species within the project area would remain inadequate. Recovery of federally-listed species would not be documented, adaptive management strategies and techniques would therefore not be employed, potential problems would not be able to be addressed in a timely manner, and local extinctions of endemic or geographically restricted animals would be anticipated. Individual species recovery plan goals would not be met. Under this alternative there would be no anticipated change from current conditions.

Alternative B – Proposed Action Alternative

a) Under this proposed action alternative, coordinated and planned management and control of invasive perennial woody plants, such as salt cedar, mesquite, juniper, and white-thorn acacia that are currently invading grasslands and becoming dominant within the project area will occur. There will be minimal short-term habitat disturbance during implementation of this project.

b) Under this proposed action alternative, coordinated and planned maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area

will occur to benefit multiple species of fish and wildlife, including federally-listed species. A limited number of additional water sources would be planned and developed to increase the population viability of multiple species of fish and wildlife, which would otherwise experience severe stress or local extinction during seasonal drought periods. Small water sources spaced across a larger landscape will help minimize concentrations of fish and wildlife utilizing restricted habitats where they are more prone to predation, disease, and local extinction. Water sources that are spaced across a larger landscape will allow for greater and more efficient expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's greater landscape during wet periods. Individual species recovery plan criteria of establishing multiple self-perpetuating populations will be more easily met. There will be minimal short-term habitat disturbance during implementation of this project.

c) Under this proposed action alternative, coordinated and planned maintenance and installation of "wildlife-friendly fence" within the project area will occur. Livestock movement will be effectively restricted, which in some instances also restrict the free and safe passage of native wildlife trying to utilize travel corridors, uplands, and wetlands within the project area. There will be minimal short-term habitat disturbance during implementation of this project.

d) Under this proposed action alternative, coordinated and planned management, restoration, and construction of perennial wetlands within the project area will occur, providing additional aquatic habitat for multiple fish and wildlife species currently utilizing the project area, and allowing for an increase in wetland habitat and an associated increase of plant and animal diversity. A limited number of additional meta-population sanctuaries will be planned and developed to increase the population viability of multiple species of fish and wildlife, which would otherwise experience severe stress or local extinction during seasonal drought periods. Wetlands will be designed and developed in such a manner that they benefit water availability without negatively impacting groundwater resources. Additional small wetlands, mindfully spaced across a larger landscape, will help minimize concentrations of fish and wildlife utilizing restricted habitats where they are more prone to predation, disease, and local extinction. Additional small wetlands that are mindfully spaced across a larger landscape will allow for greater and more efficient expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's greater landscape during wet periods. This will allow for greater species immigration, emigration, and gene flow, which are all crucial to long-term survival. Individual species recovery plan criteria of establishing multiple self-perpetuating populations will be more easily met. There will be minimal short-term habitat disturbance during implementation of this project. During the construction phase of individual projects there will be some loss of terrestrial habitat, but once completed the addition of restored wetlands will help stabilize soil and vegetation communities near the sites, increasing habitat quality. The addition of restored wetlands will also provide for adequate habitat for aquatic species that are dependent upon this habitat type.

e) Under this proposed action alternative, coordinated and planned maintenance, restoration, and construction of various erosion control structures, including rock-filled wire basket gabions, earthen berms, single rock dams, and appropriate dikes, each having site specific designs to optimize their effectiveness within the project area will occur. Placing additional effective erosion control measures in steams and washes within the project area will help increase native plant colonization and growth in grassland and riparian habitats through soil stabilization and by holding moisture on the landscape for longer periods. Additional effective erosion control will help maintain and restore downstream wetland habitat by preventing aggradation, and will help increase healthy riparian habitat by decreasing downcutting of streambeds and by trapping and holding alluvial soils in stream channels that hold water for longer periods and slowly release it

through the watershed. There will be some disturbance to habitat when placing the controls, but they will be minimal and short-term.

f) Under this proposed action alternative, a coordinated and planned approach to monitoring plant and animal populations and habitat conditions (including groundwater trends) within the project area will occur through a cooperative partnership. The existence and population status and trends of various plant, fish, and wildlife species within the project area will be documented. Problems that potentially threaten fish and wildlife populations will be identified and addressed in a timelier manner, and adaptive management strategies and techniques will be employed to help benefit these populations. Recovery of federally-listed species can be documented, and individual species recovery plan criteria for establishing multiple self-perpetuating populations will be more easily met. With proposed well monitoring, information regarding groundwater trends can be gathered, ultimately helping establish thresholds and trigger points for enacting additional management contingencies. Contingencies could include potential additional actions to minimize evaporation and/or seepage, potentially decrease the volume of wetlands, or even potential future abandonment of selected wetlands being supported by domestic wells. Under this alternative there would be no anticipated change from current conditions; monitoring will result in no habitat disturbance.

4.2.2 Impacts on Wildlife

Alternative A – No Action Alternative

Under the No Action Alternative for the six other proposed projects (a - f) there could be a decline in wildlife populations (aquatic and/or terrestrial) due to the continuing decline of habitat.

Alternative B – Proposed Action Alternative

a) Under this proposed action alternative, coordinated and planned management and control of invasive perennial woody plants, such as salt cedar, mesquite, juniper, and white-thorn acacia that are currently invading grasslands and becoming dominant within the project area will be accomplished. The restoration of grasslands will help increase quality food sources and forage for many species of wildlife, which is expected to lead to local and regional population increases. Predatory birds such as ravens that were previously provided an unnatural advantage in locating and preying upon native grassland nesting birds because the predators were able to utilize elevated perches provided by high densities of woody plants, will no longer be provided this same advantage. In turn, the impacts to productivity and survivorship of the many wildlife species that were previously being preyed upon will be expected to diminish. There may be some minimal short-term disturbance of invertebrate and other ground dwelling organisms as the invasive plants are removed.

b) Under this proposed action alternative, coordinated and planned maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area will occur to benefit multiple species of fish and wildlife. A limited number of additional water sources would be planned and developed to increase the population viability of multiple species of fish and wildlife, which would otherwise experience severe stress or local extinction during seasonal drought periods. Small water sources spaced across a larger landscape will help minimize concentrations of fish and wildlife utilizing restricted habitats where they are more prone to predation, disease, and local extinction. Water sources that are strategically spaced across a larger landscape will allow for greater and more efficient expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's greater landscape during wet periods. Individual species recovery plan criteria of establishing multiple self-perpetuating

populations will be more easily met. Wetland dependent species will be assured of adequate habitat throughout the year. Water levels and quality in isolated ponds will be stabilized, promoting healthy and viable populations of fish and wildlife. There will be some minimal disturbance to wildlife as any wells are being drilled and plumbing is installed. The restoration of wetlands will increase overall habitat quality, providing necessary cover and forage for wildlife species. The restoration of additional wetlands will also be beneficial in protecting migration corridors for waterfowl and neotropical birds. There will be minimal short-term disturbance to wildlife during implementation of this project, which will lead to tremendous long-term benefits.

c) Under this proposed action alternative, coordinated and planned maintenance and installation of "wildlife-friendly fence" within the project area will occur. Livestock movement will be effectively restricted from sensitive areas, which in most instances will also enable the free and safe passage of native wildlife trying to utilize travel corridors, uplands, and wetlands within the project area. There will be minimal short-term disturbance to wildlife during implementation of this project, which will lead to tremendous long-term benefits.

d) Under this proposed action alternative, coordinated and planned management, restoration, and construction of perennial wetlands within the project area will occur, providing additional aquatic habitat for multiple fish and wildlife species currently utilizing the project area, and allowing for an increase in wetland habitat and an associated increase of plant and animal diversity. A limited number of additional meta-population sanctuaries will be planned and developed to increase the population viability of multiple species of fish and wildlife, which would otherwise experience severe stress or local extinction during seasonal drought periods. Wetlands will be designed and developed in such a manner that they benefit water availability without negatively impacting groundwater resources. Additional small wetlands, mindfully spaced across a larger landscape, will help minimize concentrations of fish and wildlife utilizing restricted habitats where they are more prone to predation, disease, and local extinction. Additional small wetlands that are strategically spaced across a larger landscape will allow for greater and more efficient expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's greater landscape during wet periods. This will allow for greater species immigration, emigration, and gene flow, which are all crucial to long-term survival. During the construction phase of individual projects there will be some loss of terrestrial habitat, but once completed the addition of restored wetlands will help stabilize soil and vegetation communities near the sites, increasing habitat quality. The addition of restored wetlands will also provide for adequate habitat for aquatic species that are dependent upon this habitat type. Under this action, wetland dependent species will be assured of adequate habitat throughout the year. Water levels and quality in ponds will be stabilized, promoting healthy and viable populations of fish and wildlife. The restoration of wetlands will increase overall habitat quality, providing necessary cover and forage for wildlife species. The restoration of additional wetlands will also be beneficial in protecting migration corridors for waterfowl and neotropical birds. Under this alternative there will be minimal, short-term wildlife disturbance during construction. A long-term effect of establishing segregated metapopulations of native fish populations is that these will require ongoing active management to maintain genetic variability of those populations. However, segregated fish metapopulations will prevent non-natives from competing directly and indirectly with native species.

e) Under this proposed action alternative, coordinated and planned maintenance, restoration, and construction of various erosion control structures, including rock-filled wire basket gabions, earthen berms, single rock dams, and appropriate dikes, each having site specific designs to optimize their effectiveness within the project area will be accomplished. The placing of additional site-specific erosion control measures into appropriate streams and washes throughout

the project area will improve riparian and grassland habitats, stabilizing or increasing wildlife populations. There will be minimal short-term disturbance to wildlife during the placement of structure in the streams and washes, which will ultimately lead to tremendous long-term benefits.

f) Under this proposed action alternative, a coordinated and planned approach to monitoring plant and animal populations and habitat conditions, including groundwater trends, within the project area will occur through a cooperative partnership. The existence and population status and trends of various plant, fish, and wildlife species within the project area will be documented. Problems that potentially threaten fish and wildlife populations will be identified and addressed in a timelier manner, and adaptive management strategies and techniques will be employed to help benefit these populations. With proposed well monitoring, information regarding groundwater trends can be gathered, ultimately helping establish thresholds and trigger points for enacting additional management contingencies that may affect specific wetland-dependent species. Contingencies could include potential additional actions to minimize evaporation and/or seepage, potentially decrease the volume of wetlands, or even potential future abandonment of selected wetlands being supported by domestic wells. There will be minimal short-term disturbance to some individual fish and wildlife while conducting monitoring activities, and this will ultimately lead to long-term benefits for fish and wildlife in understanding population dynamics and responsiveness to management activities.

4.2.3 Impacts on Threatened and Endangered Species

Alternative A – No Action Alternative

Under the No Action Alternative for the six other proposed projects (a - f) there could be a decline in populations of threatened and endangered species (aquatic and/or terrestrial) due to the continuing decline of habitat.

Alternative B – Proposed Action Alternative

a) Under this proposed action alternative, coordinated and planned management and control of invasive perennial woody plants that are currently invading grasslands and becoming dominant within the project area will be accomplished. The resulting restoration of grasslands will help increase quality food sources and forage for many species of wildlife, which is expected to lead to local and regional population increases. Grassland restoration will help decrease sediment loads in streams and wetlands; improving egg survivability and hatching rates, improving respiration capabilities, and improving the prey base for federally-listed fish. There will be no disturbance to threatened or endangered plants, fish, or wildlife during implementation of this project.

b) Under this proposed action alternative, coordinated and planned maintenance and installation of additional water delivery pipe and associated low volume water wells within the project area will occur to benefit multiple species of fish and wildlife. A limited number of additional water sources would be planned and developed to increase the population viability of multiple species of fish and wildlife, which would otherwise experience severe stress or local extinction during seasonal drought periods. The strategic placement of water sources will increase the quality of habitat and create additional habitat for some of the federally-listed fish species as well as other listed species that utilize this habitat. Small water sources spaced across a larger landscape will help minimize concentrations of fish and wildlife utilizing restricted habitats where they are more prone to predation, disease, and local extinction. Water sources that are strategically spaced across a larger landscape will allow for greater and more efficient expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's greater landscape during

wet periods. Species dependent upon water will be assured of adequate habitat throughout the year. Water levels and chemistry in isolated ponds will be stabilized, promoting healthy and viable populations of fish and wildlife. The restoration of additional wetlands will also be beneficial in protecting migration corridors for waterfowl and neotropical migratory birds. Individual species recovery plan criteria of establishing multiple self-perpetuating populations will be more easily met. There may be some minimal short-term disturbance to listed fish and frogs as any wells are being drilled and pipe is installed, however, the maintenance and installation of water sources will increase overall habitat quality, providing necessary some of the necessary requirements for listed wildlife species.

c) Under this proposed action alternative, coordinated and planned maintenance and installation of "wildlife-friendly fence" within the project area will occur. Livestock movement will be effectively restricted from sensitive areas, which in most instances will also enable the free and safe passage of native wildlife trying to utilize travel corridors, uplands, and wetlands within the project area. Sensitive habitats surrounded by fencing will help protect Huachuca water umbel, northern Mexican gartersnakes, Chiricahua leopard frogs, San Bernardino springsnails, and listed fish species, from being directly impacted by livestock. There will be no disturbance to threatened or endangered plants, fish, or wildlife during implementation of this part of the project.

d) Under this proposed action alternative, coordinated and planned management, restoration, and construction of perennial wetlands within the project area will occur, providing additional aquatic habitat for multiple fish and wildlife species currently utilizing the project area, and allowing for an increase in wetland habitat and an associated increase of plant and animal diversity. The restoration or construction of wetlands will increase the quality of habitat and create additional habitat for the federally-listed fish species as well as other listed species that utilize this habitat. The distribution of ponds could be an influential force shaping the meta-population dynamics of various species, including the federally-listed threatened Chiricahua leopard frog. For this reason, a limited number of additional meta-population sanctuaries will be planned, developed, and strategically placed to increase the population viability of leopard frogs and multiple other species of fish and wildlife, which would otherwise experience severe stress or local extinction during seasonal drought periods. Wetlands will be designed, developed, and located in such a manner that they benefit water availability without negatively impacting groundwater resources. Additional small wetlands that are strategically spaced across a larger landscape, will help minimize concentrations of fish and wildlife utilizing restricted habitats where they are more prone to predation, disease, and local extinction. They will also allow for greater and more efficient expansion of fish and wildlife from existing small meta-population sanctuaries across the project area's greater landscape during wet periods. This will allow for greater species immigration, emigration, and gene flow, which are all crucial to long-term survival of listed species. During the construction phase of individual projects there will be some loss of terrestrial habitat, but once completed the addition of restored wetlands will help stabilize soil and vegetation communities near the sites, increasing habitat quality. The addition of restored wetlands will also provide for adequate habitat for aquatic species that are dependent upon this habitat type. Through such management, wetland dependent listed species will be assured of adequate habitat throughout the year. Water levels and chemistry in ponds will be stabilized, providing the necessary requirements to sustain populations of federally-listed fish and wildlife. The restoration of wetlands will increase overall habitat quality, providing necessary cover and forage for listed fish and wildlife species. The restoration of additional wetlands will also be beneficial in protecting migration corridors for waterfowl and neotropical migratory birds. Under this alternative there will be minimal, short-term wildlife disturbance during construction. A long-term effect of establishing segregated metapopulations of native fish is that these will require ongoing active management to maintain genetic variability of those populations.

However, the segregation of metapopulations of listed fish will also prevent the potential for non-native species from competing directly and indirectly with native species. Individual species recovery plan criteria of establishing multiple self-perpetuating populations will be more easily met. There may be some minimal short-term disturbance to any listed fish, frogs, and gartersnakes that are present when projects are initiated, however, the maintenance and installation of wetlands will increase overall habitat quality, providing some of the necessary requirements for listed wildlife species.

e) Under this proposed action alternative, coordinated and planned maintenance, restoration, and construction of various erosion control structures, including rock-filled wire basket gabions, earthen berms, single rock dams, and appropriate dikes, each having site specific designs to optimize their effectiveness within the project area will be accomplished. Placing additional site-specific erosion control measures into appropriate streams and washes throughout the project area will improve riparian and grassland habitats for listed species by decreasing sediment loads in streams and wetlands, improving birth/hatching rates, improving respiration capabilities, improving the invertebrate prey base for federally-listed fish, and ultimately stabilizing or increasing populations of multiple federally-listed species. Individual species recovery plan criteria for establishing multiple self-perpetuating populations will be more easily met. There will be no anticipated disturbance to threatened or endangered plants, fish, or wildlife during implementation of this part of the project. However, existing structures that require maintenance or repair will need to be carefully surveyed and monitored throughout the period of the project to ensure that any potentially occupied habitat created by the project itself is not placed at risk by the maintenance activity. Therefore, project areas that may require maintenance or repair will be surveyed for the presence of listed species at the site. If sites are occupied by any listed species, those species will either: need to be temporarily removed by the Service from the occupied sites prior to and during maintenance periods; the planned maintenance will need to be abandoned; or Section-7 consultation will need to be initiated or reinitiated due to the changed condition of the project site.

f) Under this proposed action alternative, a coordinated and planned approach to monitoring plant and animal populations and habitat conditions, including groundwater trends, within the project area will occur through a cooperative partnership. The existence and population status and trends of various federally-listed threatened and endangered plant, fish, and wildlife species within the project area will be documented. Problems that potentially threaten populations of listed species will be identified and addressed in a timelier manner, and adaptive management strategies and techniques will be employed to help benefit these populations. With proposed well monitoring, information regarding groundwater trends can be gathered, ultimately helping establish thresholds and trigger points for enacting additional management contingencies that may affect specific wetland-dependent species. Contingencies could include potential additional actions to minimize evaporation and/or seepage, potentially decrease the volume of wetlands, or even potential future abandonment of selected wetlands being supported by domestic wells. There will be minimal short-term disturbance to some individual listed species while conducting monitoring activities, and this will ultimately lead to long-term benefits for threatened and endangered species in understanding population dynamics and responsiveness to management activities. Recovery of federally-listed species can be documented, and individual species recovery plan criteria for establishing multiple self-perpetuating populations will be more easily met.

4.3 Human Environment

4.3.1 Impacts on Cultural Resources

Alternative A – No Action Alternative

Under this alternative, there are no anticipated direct or indirect impacts to the cultural environment, as current conditions will be maintained, and no ground disturbance will occur.

Alternative B – Proposed Action Alternative

Under this alternative there is little chance for impacts to cultural resources, and all measures will be taken to not disturb areas of known archeological significance during mechanical treatments and ground disturbing activities. Site-specific, off-refuge projects within the project area will need to be surveyed prior to initiating any ground disturbing activities, and archeological sites will be avoided.

4.3.2 Impacts on Socioeconomics

Alternative A – No Action Alternative

The economic and social condition of the overall project area would remain the same. The two refuges, adjacent public lands, and private lands will all continue to be some of the area's attractions for ecological tourism. The presence and operation of the refuges, the Coronado National Forest, and some of the private lands provide economic benefits to the surrounding communities that lie within an hour's drive of the project area. The refuges and Coronado National Forest attract local, national, and international visitors and by attracting visitors to the area, these public lands generate revenue for the local economy. Much of the annual budget for public lands within the project area is recycled into local businesses through employees, purchases of equipment and supplies, as well as contracts for local labor to accomplish government-funded projects. Private landowners contribute to the local economy in many of the same ways. These public and private lands provide full-time employment to individuals that live in nearby communities and support local economies.

Alternative B – Proposed Action Alternative

Under this alternative the economic and social condition of the project area will improve. The Cooperative Recovery Initiative will use local businesses for materials and local contractors for labor to complete the projects proposed for this action. The habitat improvements that will occur on public lands and on adjacent properties will make these areas more attractive to wildlife and this will have the possibility to increase visitors to the project area and surrounding communities, increasing local revenue through non-invasive ecotourism.

4.3.3 Impacts on Aesthetic and Visual Resources

Alternative A – No Action Alternative

Under this alternative, there would be no obvious immediate change to the existing project area landscape. In the long term there will be continued erosion and degradation of uplands, wetlands, and riparian corridors, impacting fish and wildlife through the loss of native vegetation and significant amounts of soil. Views of the sweeping grasslands and the wildlife they support will be diminished or gone.

Alternative B – Proposed Action Alternative

All projects under the Proposed Action Alternative will have short-term negative effects to aesthetic resources on the project area's landscape. The minor visual effects could occur from construction equipment, dust, and the loss of vegetative cover. In the long-term, residents and

visitors will experience improved visual quality of the surrounding healthy landscape and the sustainable populations of fish and wildlife consistent with natural ecological function.

4.4 Assessment of Cumulative Impacts

The Service is not aware of any past, present, or future planned actions that would result in a significant cumulative impact when added to the proposed actions, as outlined in Alternative B. The adverse direct and indirect effects of the proposed actions on air, water, soil, habitat, wildlife, and aesthetic/visual resources are expected to be minor and short-term. The benefits to long-term ecosystem health that these projects will accomplish far outweigh any of the short-term adverse impacts discussed in this document.

4.5 Environmental Justice

None of the alternatives for the proposed projects described in this EA will disproportionately place any adverse environmental, economic, social, or health impacts on minority or low income populations. Implementation of the proposed actions is anticipated to benefit the environment and the people in the surrounding communities.

4.6 Indian Trust Effects

No Indian Trust Assets have been identified in the portion of the project area in which individual projects will occur. There are no reservations or ceded lands present. Because resources are not believed to be present, no impacts are anticipated to result from implementation of either alternative for the projects proposed in this EA.

4.7 Unavoidable Adverse Effects

As proposed under Alternative B, there will be some loss of wildlife habitat at project sites that will require several years to recover. In addition, there will be some short-term disturbance to resident wildlife, but these impacts are expected to be minimal. Opportunities for public viewing, hiking, and photography of wildlife within the project area will not be impacted.

4.8 Irreversible and Irretrievable Commitment of Resources

Neither of the alternatives for the proposed projects in this EA would result in a large commitment of nonrenewable resources. Implementation of the projects will require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by heavy equipment and vehicles. The proposed projects will result in the unavoidable harm or harassment to some wildlife. The Service will implement best management practices to minimize potential impacts.

4.9 Table 1 – Summary of Environmental Effects by Alternative

Environmental Resource	Alternative A: No Action Alternative	Alternative B: Proposed Action Alternative
Impacts to Air Quality	a, b, c, d, e, f - short-term no effect, long-term adverse (dust from desertification of grasslands)	a, b, c, d, e, f - minimal, short-term adverse effects during implementation of projects (vehicle exhaust, dust from equipment during construction and maintenance, smoke from prescribed fire) long-term beneficial effects (increased grass cover and less desertification)
Impacts to Water Quality and Quantity	a, b, c, d, e, f - short-term no effect, long-term adverse (erosion, siltation, and aggradation of wetlands)	a,b,d,e - minimal, short-term adverse effects during implementation of projects (erosion and soil mobilization), long-term beneficial (minimize erosion, increased wetland volume, overall benefits to watershed), currently unknown long-term effects on shallow groundwater aquifer.
		c – beneficial effect (exclusion of livestock from sensitive wetland areas)
		f – no effect
Impacts to Soils	a, b, c, e, f - no short-term effect, adverse long-term effect (loss of topsoil through increased desertification, increased erosion)	a, b, c, d, e, f - short term adverse effect (soil disturbance from brush control, maintenance, and construction activity), long-term beneficial effects (increased grass cover, less desertification).
	d – adverse effect (increasing erosion, leading to increasing siltation and ultimate aggradation of wetlands)	
Impacts to Habitat	a, c, e, f - no short-term effect, adverse long-term effect (declining quality and quantity of upland and wetland habitats)	a, b, c, d, e - short term adverse effect (soil disturbance from brush control, maintenance, and construction activities), long-term beneficial effects (increased grass cover, less desertification, increase in quality and quantity of wetland habitat)
	b, d – adverse effect (declining quality and quantity of water sources and wetland habitats)	f – no effect
Impacts to Wildlife	a, b, c, d, e, f, - no short term; long term adverse (loss of habitat quality and quality)	a, b, c, d, e, f - short term adverse (harassment and possible harm to wildlife during construction); long term beneficial (increase in habitat quality and quantity)
Impacts to Threatened and Endangered Species	a, b, c, d, e, f, - no short term; long term negative (loss of habitat quality and quality)	a, c, e - no short-term; long-term beneficial (increase in habitat quality and quantity)
		b, d, e – short-term negative (loss of habitat quality and quality), long-term beneficial (increase in habitat quality and quantity, and resulting stabilized/increasing populations).
Impacts to Cultural Resources	a, b, c, d, e, f - no effect	a, b, c, d, e, f- no effect
Impacts on Socioeconomic Resources	a, b, c, d, e, f - no short-term effects; long-term adverse (decreased visitation to area and decreased tourism dollars spent in local communities)	a, b, c, d, e, f - short-term beneficial (create local jobs, increased revenue for local communities); long-term beneficial (increased tourism dollars for local communities)
Impacts on Aesthetic and Visual Resources	a, b, c, d, e, f - no short-term effects; long-term adverse (habitat degradation; decrease in resident wildlife)	a, b, c, d, e, f - short-term adverse (loss of landscape integrity, decrease in wildlife viewing opportunities); long-term beneficial (restoration of habitat, increase in wildlife viewing opportunities)

5.0 CONSULTATION, COORDINATION, AND DOCUMENT PREPARATION

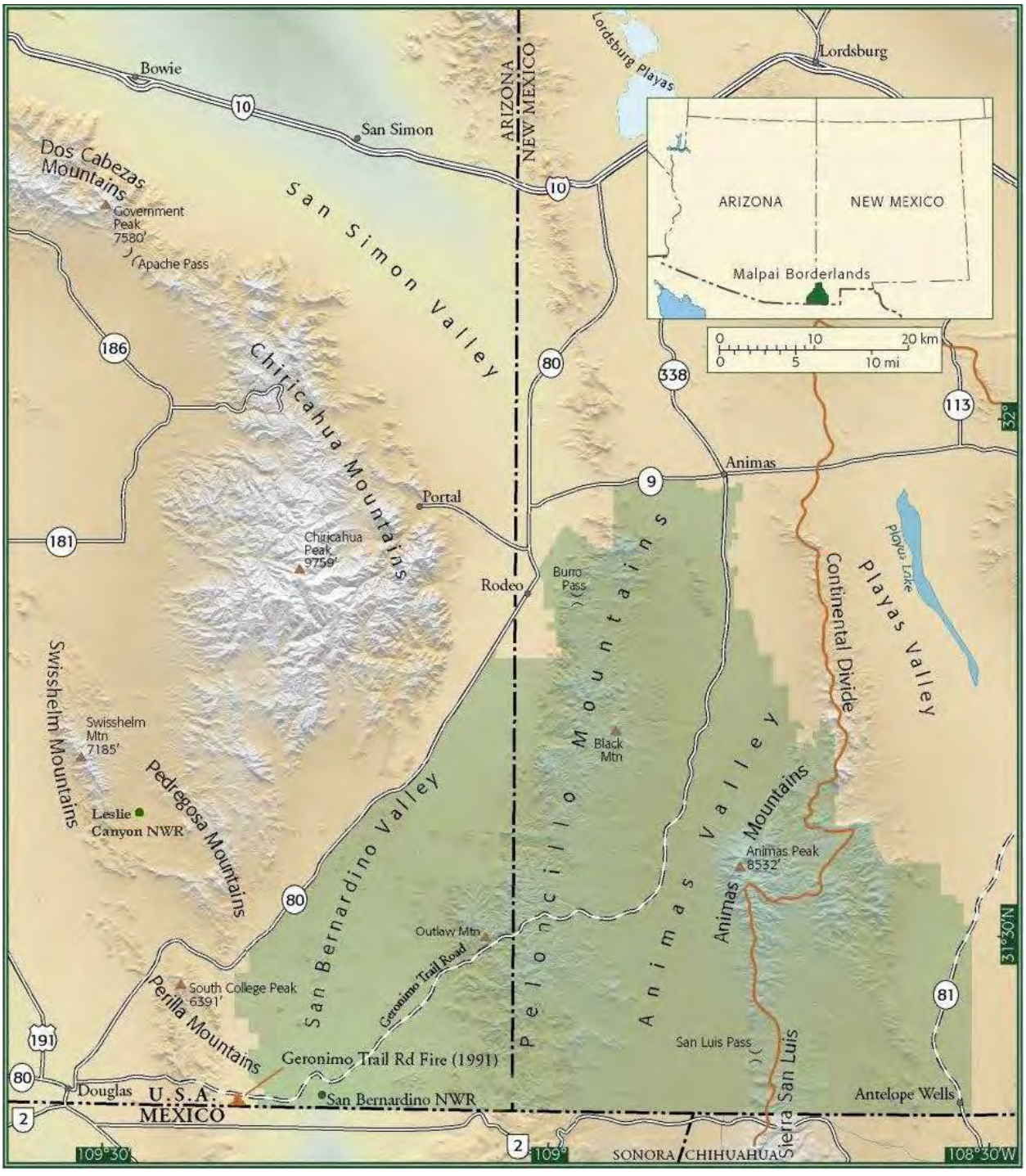
This document was prepared by Refuge Staff, San Bernardino National Wildlife Refuge, U.S. Fish and Wildlife Service, Douglas, Arizona, with input from U.S. Forest Service staff. The document was reviewed by the Arizona Ecological Services Office, U. S. Fish and Wildlife Service, Tucson, Arizona, and by the Zone Biologist, Division of Biological Sciences, U. S. Fish and Wildlife Service, Tucson, Arizona.

REFERENCES:

U.S. Fish and Wildlife Service. 1994. Yaqui Fishes Recovery Plan. USDI Fish and Wildlife Service, Albuquerque, New Mexico. 48 pp.

U.S. Fish and Wildlife Service. 2007. Chiricahua Leopard Frog (*Rana chiricahuensis*) Recovery Plan. U.S. Fish and Wildlife Service, Southwest Region, Albuquerque, NM. 149 pp. + Appendices A-M.

MAP:



The Malpai Borderlands Region of SE Arizona and SW New Mexico. Project Area includes the dark green ~800,000-acre Malpai Borderlands Group area boundary which helps support San Bernardino NWR, and the adjacent ~200,000-acre foothills of the Chiricahua Mountains which supports Leslie Canyon NWR. Map courtesy of: http://www.malpaiborderlandsgroup.org

ATTACHMENTS: USFS e:mail Correspondence related to Cave Creek Projects

Girard, Michele M -FS <mmgirard@fs.fed.us> Tue, Aug 12, 2014 at 1:54 PM
To: "Warner, Kevin -FS" <kwarner@fs.fed.us>, "Gay, Reuben L -FS" <reubenlgay@fs.fed.us>, "Harris, Joseph E -FS" <josephharris@fs.fed.us>, "Taiz, Josh -FS" <jtaiz@fs.fed.us>, "Kraft, John P -FS" <jpkraft@fs.fed.us>
Cc: "Bill_Radke@fws.gov" <Bill_Radke@fws.gov>, Carianne Campbell <carianne@skyislandalliance.org>

Hello, In May I attended a wetland restoration workshop sponsored by SIA. Part of the workshop was to build and/or assess different CLF pond locations. We visited three pond locations, two of which I didn't think were good pond sites. My overall concern being new to the CLF recovery project was that I got pieces of the picture, but not an understanding of how all the ponds fit together and projected dispersal areas, priorities, etc. Or how USFS lands fit into the overall priorities and recovery. I also had a concern that the third pond was on private land and would have pumped shallow ground water, essentially out of Cave Creek, to maintain the artificial pond. The pumping had the potential to impact instream flows and other aquatic species. I questioned the use of federal dollars to negatively impact water resources. I voiced this concern and was directed to talk with Bill Radke, FWS, who is helping administer the CLF recovery funds.

Bill and I finally caught up with each other today and had a great discussion. We are on the same wavelength as far as working together to recover the CLF, meeting multiple species habitat objectives, and minimizing negative resource impacts. I shared some of the concerns we have discussed at the CNF about not understanding the 'master plan' for recovery in this area, and the need for a spatial display of the proposed recovery sites. Bill has a better knowledge of the area and understanding of how some of the proposed ponds fit into dispersal and recovery. This gave me a better understanding of the thoughts that have gone into some of the locations, but with my limited time on the ground – I am still hoping for a more detailed plan and map.

We agreed it is important to take an overall look at the 'master plan' and discuss positive/negative impacts of all of the proposed locations as a group. I shared our experience at Ash Springs where one of the ponds is not holding water and is causing dewatering of a portion of the wet meadow. This has made CNF much more cautious as we move forward in evaluating 'wetland restoration', pond creation, and heavy disturbances in healthy, functioning ecosystems. We also talked about our recent visit to the Hermitage Site where we think we can meet habitat objectives for CLF, bats, nectar feeders, and Monarch butterflies with a few minor changes. Bill agreed that the Heritage example is also what he is hoping for in the CLF recovery….minimal impacts and benefits to more than one species.

Bill has some great ideas on monitoring water levels and ponds. He will be talking with Kevin about visiting the district to see what kind of information/knowledge is available on some of the areas, and if there is information on well depths. He shared that it is an advantage to have ponds on private lands as the residents help monitor the CLF populations. I agree with this advantage, but also think there may be opportunities to use existing tanks and work with SIA on their Adopt-a-Spring program to get volunteers to monitor these locations.

Bill and I couldn't help but reminisce about the good-old-days when we sat through some really contentious meetings with Border Patrol about off-road impacts and mitigation measures for BP proposed infrastructure on DOI lands, etc. We agreed that working on CLF recovery is much more rewarding and whatever concerns we have about some of the proposals can be openly discussed and easily remedied!