

4. Environmental Consequences

4.1 Introduction

This section is an evaluation of the potential environmental effects of the Proposed Action and the No Action Alternative. The Proposed Action is inclusive of the Phase I and Phase II work as described in Chapter 2, as well as additional restoration actions that may be conducted at Reaches 1 through 4 as funding becomes available. Additional effects specific to the phases of development are included when relevant and foreseeable. This analysis includes likely beneficial and adverse effects on the human environment, including those that are short term or long term, direct or indirect, and cumulative. The analysis of effects on resources focuses on environmental issues in proportion to their potential effects. Detailed consideration is given to those resources that have a potential for environmental effects. Interpretation of effects in terms of their duration, intensity, and scale are provided, where possible.

The restoration techniques outlined in the Proposed Action are designed to improve riparian and in-channel habitat, extending the reach of connected good-quality habitat for the benefit of native aquatic and riparian plant and animal communities. Some or all of these actions may eventually be implemented, and the individual actions may be implemented at different times. However, impacts are assessed on the basis that the actions would be implemented together so that the total impact on the environment can be evaluated. Implementation of all actions may require additional permits, approvals, and funding. Environmental commitments and mitigation measures are recommended, where appropriate.

4.1.1 Terminology

Terms referring to intensity, context, and duration are used in the effects analysis. Unless otherwise stated, the standard definitions for these terms are as follows:

- *Negligible*: The effect is at the lower level of detection, and there would be no measurable change.
- *Minor*: The effect is slight but detectable, and there would be a small change.
- *Moderate*: The effect is readily apparent, and there would be a measurable change that could result in a small but permanent change.
- *Major*: The effect is severe, and there would be a highly noticeable, permanent, measurable change.
- *Localized Impact*: The effect occurs in a specific site or area. When comparing changes to existing conditions, the effects are detectable only in the localized area.

- *Short-Term Effect:* The effect occurs only during or immediately after implementation.
- *Long-Term Effect:* The effect could occur for an extended period after implementation. The effect could last several years or more and could be beneficial or adverse.

4.1.2 Thresholds of Significance

Significance thresholds are listed in Table 4-1 to help the reader and decision makers understand the magnitude and intensity of effects. Some thresholds are determined using quantitative data, while others rely on qualitative data.

**Table 4-1
Thresholds of Significance**

| Resource | Thresholds of Significance |
|----------------------------|---|
| <u>Land use</u> | Significance threshold would be reached if there were conflicts with established land uses or land use plans in the area, disruption or division of established land use configurations, or a substantial change in existing land uses. |
| <u>Geology and soils</u> | Significance threshold would be reached if an alternative were to result in a change in or loss of a unique geologic resource; if an alternative were to result in a substantial soil loss because of increased erosion or if there were a substantial risk of damage due to erosion; if an alternative were to convert federal prime farmland soils to incompatible uses; if an alternative were to contaminate the soil; or if an alternative resulted in a measurable decrease in water infiltration into soils. |
| <u>Climate/air quality</u> | Significance threshold would be reached if an alternative were to lead to an exceedance of the National Ambient Air Quality Standards or would result in substantial contribution to global climate change. |
| <u>Water resources</u> | Significance threshold would be reached if an action were to cause substantial flooding or erosion; if it were to substantially impair any significant water body, the health of any watershed, or the functionality of major rivers, wetlands, or floodplains; or if it were to decrease surface or groundwater quality or quantity. Significance threshold would be reached if an action were to cause substantial increases in flooding on adjacent properties or violate the limits of existing water rights or compact agreements. |

Table 4-1
Thresholds of Significance *(continued)*

| Resource | Thresholds of Significance |
|--|--|
| <u>Biological resources</u> | <p>Significance threshold would be reached if there were any of the following:</p> <ul style="list-style-type: none"> • An action that introduced or substantially encouraged the spread of invasive species; • A substantial loss or impairment of riparian or wetland habitats; • Harm or destruction of plant species, natural community, or habitat that is biologically significant; • An alteration or destruction of habitat that would prevent the reestablishment of native biological communities that inhabited the area prior to the disturbance; • A loss of a number of individuals of any native animal species sufficient to affect the viability of the local population of that species; • A substantial interference with movement of any resident or migratory fish or wildlife species sufficient to adversely affect the viability of the local population of the species; • Harm, harassment, or destruction of a species, natural community, or habitat that is recognized for scientific, recreational, ecological, or commercial importance; or • Harm, harassment, or destruction of any federally listed endangered, threatened, or candidate plant or animal species, its habitat, or its breeding areas. |
| <u>Cultural resources</u> | <p>Significance threshold would be reached if an alternative were to directly or indirectly alter the integrity and characteristics of a resource that would qualify it for inclusion in the National Register of Historic Places (36 CFR 800.5a). Significance threshold would be reached if it were determined that, in consultation with federally recognized tribes or other tradition-based communities, an alternative were to inhibit access to or use of culturally important locations or would interfere with cultural or religious practices.</p> |
| <u>Recreation and visitor facilities</u> | <p>Significance threshold would be reached if there was a substantial decline in the quality or quantity of recreational facilities. Effects on recreational activities would be considered significant if they were to result in a substantial decline in the quality or quantity of opportunities to participate in these recreational activities.</p> |
| <u>Visual resources</u> | <p>Significance threshold would be reached if an alternative were to noticeably increase visual contrast and reduce the scenic quality, if it were to block or disrupt existing views, or if it were to substantially reduce public opportunities to view scenic resources.</p> |

Table 4-1
Thresholds of Significance (continued)

| Resource | Thresholds of Significance |
|------------------------------|--|
| <u>Noise</u> | There are no universally applicable regulatory thresholds for assessing significance of noise effects, but environmental noise regulations and guidelines are defined by various federal and state agencies that provide a general context for assessing noise issues. In a refuge, there is a higher degree of sensitivity to noise levels than in many other environments. Significance threshold would be reached if an alternative were to violate any applicable noise standards at the boundaries of the project area over an extended period or were to disturb or harass protected animal species. |
| <u>Socioeconomics</u> | Significance threshold would be reached if an alternative were to create a substantial increase or decrease in population growth, demand for services, economic activity, or local employment. |
| <u>Environmental justice</u> | Significance threshold would be reached if a project alternative were to disproportionately negatively affect low-income and minority populations. |
| <u>Indian Trust Assets</u> | Significance threshold would be reached if the value, use, or enjoyment of Indian real property, physical assets, or intangible property rights would be substantially impaired by the action. |

4.2 Land Use

4.2.1 No Action Alternative

Direct and Indirect Effects

Implementing the No Action Alternative would not have any effect on existing land use in the project area or surrounding lands. The lands in the project area would continue to be managed for wildlife conservation but would not benefit from the proposed restoration. Ongoing smaller-scale actions to remove nonnative species and improve habitat at the refuge would continue.

4.2.2 Proposed Action

Direct and Indirect Effects

The Proposed Action would occur entirely within the Bitter Lake NWR, which is managed for wildlife conservation, wildlife-dependent recreation, and environmental education and interpretation. Efforts to improve riparian and in-channel habitat in the long term is consistent with the established land use at the refuge. There would be no change or effects on surrounding land uses, no anticipated effects on refuge facilities and infrastructure, and no effects on the refuge research natural areas or the Salt Creek Wilderness.

4.3 Geology and Soils

4.3.1 No Action Alternative

Direct and Indirect Effects

Implementing the No Action Alternative would have no impacts on geology and soils. The existing conditions would continue.

4.3.2 Proposed Action

Direct and Indirect Effects

The proposed restoration techniques for Phases I and II would disturb soil along the banks, floodplain, and terraces in the project area, access routes, refuge roads, on-site disposal areas, and staging areas. Abatement measures would be used to reduce dust, though most of the disturbed soils are likely to be unstructured sand. Mechanical clearing methods would be used to remove soil and vegetative cover, leaving soils temporarily exposed and subject to wind and water erosion and the potential for spread of invasive species. There would be short-term increases in sedimentation in the river associated with soil disturbance, erosion, and dust. Sediments would generally be redistributed within the river channel in the refuge.

Soils would be subject to minor short-term compaction from heavy equipment use. There would be minor improvement in soil quality, primarily through removal of salt deposition caused by saltcedar. No loss of prime and unique farmlands or mineral resources is expected.

The Pecos River is a dynamic system and naturally moves a great deal of sediment. The river at the Acme gage has an average sediment transport rate of approximately 640,000 tons per year (Tetra Tech, Inc. 2003). Within the Phase I project area, sediment is estimated to have a density of 116 pounds per cubic foot (lb/ft³), assuming soil composition of “sand, dense and mixed” (Lindeburg 2003). Total excavation for the restoration is estimated to be 56,000 cubic yards, which has a corresponding weight of 87,696 tons. Thus, the total amount of sediment excavated for the Phase I project is about 14 percent of what the river transports in an average year (Reclamation 2008).

The sediment volume excavated for the project is not necessarily equivalent to the amount of sediment that would be mobilized into the river as a result of the project. Much of the excavated sediment would be used to plug and fill the existing channel; it is very unlikely that the river would transport this sediment. Conversely, some additional sediment would be eroded from the banks of the newly constructed channel as it widens during high flows, such as during block releases and summer storms. Consequently, it is difficult to predict the exact amount of sediment that would be mobilized for transport as a result of the project. However, comparison of the excavated sediment volume probably results in a conservative estimate (i.e., higher than would likely occur) of the increase in sediment transported by the river (Reclamation 2008). Sediment would be transported,

but much would be redistributed by the river on-site, facilitating a natural process that has been inhibited by the channelization.

Lowering banks, reworking channel morphology, and diverting the river into historic oxbows would alter the long-term topography and geomorphology of the project site. There would be some minor increased risk to property and refuge facilities, such as impoundments, levees, and roads from erosion during subsequent storms. These risks were considered in defining the proposed restoration techniques for each reach. Soils should stabilize after vegetation regenerates in the disturbed areas, and water infiltration rates and moisture-holding ability should improve. Levels of sedimentation consistent with a dynamic sand bed river should develop and be passively maintained by block releases and storms. The wider river bed should decrease flow velocity and erosion hazard in time through the affected reach and downstream. The Service would monitor the effects of the restoration during and immediately after construction. If it determines that there would be a risk to infrastructure and property, the Service or Reclamation would take corrective actions, if necessary.

4.4 Climate/Air Quality

4.4.1 No Action

Direct and Indirect Effects

Implementing the No Action Alternative would have no impacts on air quality. The existing conditions would continue.

4.4.2 Proposed Action

Direct and Indirect Effects

Implementing the Proposed Action would result in short-term increases in fine particulate matter (PM₁₀) and other pollutants due to truck traffic and construction-related fugitive dust, diesel exhaust emissions and burning of woody debris. Visibility impacts due to dust would be reduced as soils stabilize. Smoke from the burning of woody debris would be temporarily visible on-site but would dissipate before reaching any population centers. The Proposed Action is in a Class II air quality area, which allows for moderate amounts of air quality degradation. The Salt Creek Wilderness is a Class I airshed but would not likely be impacted due to distance and the southwesterly prevailing winds.

Because of a violation in Chaves County of the federal standard for PM₁₀, measures to reduce particulate matter from human-caused sources would be incorporated into the project plans (NMED 2004, 2008). With these measures the potential for impacts would be minor. The project would not violate any other air quality standard or contribute substantially to air quality degradation.

The Proposed Action would contribute negligible amounts of greenhouse gases to the atmosphere from the use of construction equipment and worker vehicles during the restoration and from debris burning. Nonnative vegetation would be gradually replaced by other desirable species, and beneficial effects of plants on local cooling and the removal of carbon dioxide and production of oxygen would continue. Because climate change is global in scope, the mechanisms and interactions that may result in climate change are complex and speculative. However, because the project would be associated with negligible and short-term emissions, no effects are anticipated.

Effects on the Proposed Action from drought and climate change could include earlier snowmelt, reduced summer base flows, and warming and could potentially affect sediment movement, creation of backwater habitats, Pecos bluntnose shiner survival, and success of passive restoration measures. Effects are anticipated to be negligible.

4.5 Water Resources

4.5.1 No Action Alternative

Direct and Indirect Effects

Implementing the No Action Alternative would result in the continuation of current conditions. Reclamation and the Service would not improve the channel and riparian habitat, as proposed, but ongoing smaller-scale actions to remove nonnative species and improve habitat at the refuge would continue. Saltcedar would continue stabilizing the banks, decreasing the erosion at the bends and locking the straight sections in place. The straight sections would become increasingly entrenched, reducing interaction with the floodplain and further reducing the dynamic nature of this reach and the quality of instream and riverine habitat. There would be no actions that would affect the oxbow lakes or impoundments. Benefits to river flows, groundwater levels, and water quality would not be realized.

4.5.2 Proposed Action

Direct and Indirect Effects

The potential impacts of the Proposed Action on water resources are discussed for surface water hydrology, groundwater hydrology, water rights, and water quality.

Surface Water Hydrology. The Proposed Action is designed to have a major long-term positive effect on channel morphology and river function within the physical context of current conditions and river operations. Effects on other surface water features should be negligible or minor and positive.

Vegetation removal and bank lowering would decrease the stability of the banks and would enhance the river's interaction with the floodplain. The thick growth of vegetation

along the river banks induces sediment deposition and the buildup of natural levees, which reduce the frequency of beneficial overbank flows. The width of vegetation removal and current flows would be sufficient to allow the river to develop lateral movement and eventually create meanders with an average amplitude of 1,850 feet (FLO Engineering 1999). Where the channel morphology is reworked, the pattern of meanders would be created immediately. Returning the river to the historic oxbow under Phase I and developing meanders would increase the length of this section of the Pecos River, thereby decreasing the slope and increasing the sinuosity.

Bank lowering and grading of vertical cut banks, along with the changes in channel morphology, would reduce the current bank cutting and improve sediment transport. The river naturally carries a significant amount of sediment. There would be short-term increases in sedimentation in the river from construction, soil disturbance, erosion, and dust. Sediments dispersed within the river channel are expected to return to normal shortly after the restoration excavation work is completed. Sediments would generally be redistributed within the river channel in the refuge and would be unlikely to have any discernable downstream negative effects on infrastructure or property. Sediment loads would be redistributed, and there would be a more natural balance between sediment supply and flow, leading to improved instream bed form features and a dynamic floodplain. A variety of depths, velocities, substrates, and bed form features would be beneficial to instream habitat and river function.

The effects of the Proposed Action on flood control would be moderate and beneficial. The current channel allows the water to pass quickly, resulting in bank cutting and a rapid increase in peak flow downstream. Reconnecting the channel with the floodplain and returning sinuosity to its length would improve flood peak attenuation and flood flow storage. At locations where the channel is restored and slopes are reduced, water velocity would decrease and water would be stored in the floodplain, reducing damaging flood potential. As the water level recedes, the stored water in the floodplain would slowly reenter the stream. The potential for serious overbank flooding has been diminished due to the construction of Sumner Dam. While the river has adapted to less extreme floods, the channel would still remain capable of transmitting flood flows safely.

Any overbank flooding is not anticipated to damage property on or off the refuge. A channel would be excavated through Oxbow 4 and debris would be removed from the channel area, reducing the likelihood of any downstream damage due to debris flow. Rock vanes are included in the proposed action to ensure that infrastructure in the immediate vicinity of Oxbow 4 is protected. All actions are at least 1.9 miles above any downstream infrastructure.

The Proposed Action is designed to minimize risks of damage or loss of other surface water features. The rock vane revetments would decrease the risk to the refuge ponds and levees from diverting the river. There would be loss of oxbow lake habitat, but these features are not unique on the refuge. Surface water features that are connected to the shallow aquifer may benefit from higher water tables resulting from vegetation removal

in the short term. The higher water table should not impair the operation of refuge impoundments.

The Service would monitor the effects of the restoration during and immediately after the construction. If determines that there would be a risk to infrastructure and property, the Service or Reclamation would take corrective actions, if necessary. The Service would establish a long-term monitoring program to determine the river's response to restoration activities (Appendix B). Cross sections have been surveyed and set to datum points throughout the river reaches and oxbows. The monitoring plan includes annual assessments of surface flows, groundwater levels, and channel morphology, including sediment and bed forms.

Groundwater Hydrology. Although debated, removal of nonnative vegetation could raise the water table in the shallow aquifer adjacent to the Pecos River. Because of the head pressure of the artesian aquifer, the accrual location of any savings is expected to be in the shallow aquifer and the river rather than in the artesian aquifer. There would be no expected effect on the natural lakes and sinkholes of the refuge. The impact of the use of well water on aquifers for construction and dust abatement would be minor, and this use would be negligible, relative to the groundwater rights held by the refuge.

Water Rights. The Proposed Action would not exceed water rights held by the Bitter Lake NWR or affect the water rights of other parties. As described in detail in Section 3.5.3, the Bitter Lake NWR has surface and groundwater rights associated with the North Tract, Middle Unit, and the Farm Unit, which the State of New Mexico has recognized and allows the Service to manage its constructed wetlands and protect springs (Tashjian 2008). In recent years the Service has been implementing water conservation measures as part of its management of impounded wetlands and programs to remove saltcedar. The section of the Pecos River considered for restoration is a gaining reach and is not subject to the intermittency that has been experienced upstream in the past. In the Phase I project area, base flows may also be enhanced by reconnecting the oxbow to the river. The oxbow is spring-fed and has perennial water.

While the Proposed Action would increase areas subject to evaporation loss, the Service expects full implementation of Phase I and Phase II to increase the flow in the Pecos River channel due to greater connectivity with the local aquifer. Removing nonnative phreatophytes from the channel banks may also initially increase water to the system; however, a long-term increase to the system thus far has not been scientifically demonstrated.

The NMISC manages the state's limited water supply through a system of permits and licenses. In the Pecos River Basin, the NMISC is responsible for compliance with the Pecos River Compact (between New Mexico and Texas) and the Carlsbad Project Settlement Agreement. This requires that the water budget be quantified and water resources carefully managed using the best available science. Depletion estimates for both phases of the restoration prepared by the NMISC are found in Appendix C, Water Budget. These estimates do not include assumptions by the Service that removing

nonnative vegetation would result in contributions of water into the river system (US Fish and Wildlife Service 2008c). The Service and NMISC estimates are part of the hypothesis, which will be tested through monitoring, that there will be small changes to the water budget from this project.

Based on conservative estimates of water usage—that is, higher than would likely occur—the NMISC anticipates that Phase I restoration may consume 1.9 ac ft/yr, and Phase II may consume 7.6 ac ft/yr, for a total of 9.5 ac ft/yr . While the Service expects that less water would be used and benefits would be gained due to reduced evapotranspiration, depletions, if any, are expected to be minor. The Service will work with the NMISC to quantify and offset any changes to the water budget due to this project. The Service is committed to ensuring that any net depletions to the water budget resulting from the project will be compensated for and that there will be no adverse impact on downstream water rights nor interstate compact deliveries (Tashjian 2008).

Water Quality. The Proposed Action would cause short-term increases in sedimentation in the river associated with ground disturbance, exposed soils, and erosion (Reclamation 2008). There would also be a minor risk of inadvertent discharge of pollutants into surface waters from construction equipment and vehicles that would be used in the restoration and from burning of woody debris. No herbicide use is proposed. Water from the oxbow lake would be added to the main stem of the river, temporarily increasing organic matter immediately after reconnecting the oxbow. Sediment and water samples from Oxbow 4 were tested and were clear of PCBs and pesticides and had concentrations at or below average New Mexican background concentrations for arsenic, barium, and chromium (AALI 2008, Tashjian 2008). Negligible and short-term effects on water quality are anticipated during restoration work.

These impacts and risks would be minimized by implementing measures to control sediments, remove decayed vegetation from the oxbow, and burn debris and to prevent spills during restoration actions. Additional sediment would be mobilized by these actions, but it would be a small contribution relative to the load the river already carries. Dispersal of sediments within the river channel are expected to return to normal shortly after the restoration excavation work is completed. As beneficial vegetative cover returns, water quality in this section would improve in the long term to a better balance between flows and sediment loads, thereby restoring the sand beds and floodplain and reducing salt deposited by saltcedar. Better river function can also improve the ability of the river to contend with pollutants from other sources.

The Service applied for a Section 404 permit on May 22, 2008, with the US Army Corps of Engineers (USACE), Albuquerque District in compliance with Section 301 of the Clean Water Act, which prohibits the discharge of dredged or fill material into waters of the United States without a permit from the USACE. The USACE Albuquerque District Regulatory Branch determined on June 17, 2008 that the proposed work would not result in more than minimal individual or cumulative adverse effects and that the public interest would best be served by allowing the work to proceed under Nationwide Permit 27: Aquatic Habitat Restoration, Establishment and Enhancement Activities (Appendix E).

The NMED SWQB has reviewed the application and issued a Section 401 water quality certification on November 10, 2008 (Appendix E).

The Service would meet the requirements of USACE Section 404 Permit and the NMED Section 401 water quality certification. If needed, the Service would obtain an NPDES permit for discharges into the waters of the United States and would prepare a Stormwater Pollution Prevention Plan (SWPPP), which would detail specific sediment and erosion control measures for the project site during restoration. Actions in the floodplain would be timed to reduce the risk of floods and adverse downstream effects. Woody debris would be removed from the channel and burned, in compliance with site-specific burn plans (US Fish and Wildlife Service 2004) to avoid affecting water quality.

4.6 Biological Resources

4.6.1 No Action Alternative

Direct and Indirect Effects

Implementing the No Action Alternative would result in the continuation of current conditions. The Service would not improve the channel and riparian habitat as proposed, but ongoing smaller scale actions to remove nonnative species and improve habitat at the refuge would continue. Treatment of land for invasive species would continue under existing programs and annual goals, using other funding sources and the limited resources available to the refuge. Some natural channel corrections may occur, but the trend of reduced interaction with the floodplain and negative impacts on functioning channel habitat would continue. Nonnative vegetation is expected to continue to crowd out native riparian species and to spread to other parts of the refuge. Anticipated benefits to fish and wildlife habitat, vegetation, and wetlands would not be realized.

4.6.2 Proposed Action

Direct and Indirect Effects

The potential impacts of the Proposed Action on biological resources are discussed for vegetation, wetlands, wildlife, and special status species, with emphasis on the shiner.

Vegetation. The Proposed Action is designed to have a major long-term positive effect on riparian vegetation. Nonnative invasive saltcedar has crowded out most of the other types of vegetation and understory. Removing the saltcedar would allow the development and expansion of more diverse riparian vegetation and habitat capable of supporting a greater variety of wildlife. Removing the saltcedar would also decrease the risk of wildfire. While saltcedar would be targeted, other species, such as willows, cottonwoods, grasses, and cattails on the banks, may be affected by mechanical removal. There would be a short-term loss of natural cover provided by vegetation. While a complete revegetation effort is not anticipated, the Service would selectively plant native perennial

species after saltcedar removal to improve the success and speed of restoring riparian species and habitat, to reduce erosion, and to help keep the area free of weedy species. On the sections of the Bitter Lake NWR where saltcedar has been removed in the past, native grasses have reestablished in the original habitat within a few years, and the return to native habitat seems to be permanent. Areas where strips of saltcedar were removed in the early 1960s still retain the distinctive stripped pattern today, with no encroachment into the restored areas to date. The restored areas would be closely monitored to prevent the reestablishment of saltcedar and other nonnative species.

Wetland Habitats. Similar long-term positive effects for wetland vegetation and function are anticipated by removing saltcedar, reconnecting the river and the floodplain, and creating the new meanders. These actions are anticipated to result in a higher water table, more diverse plant communities, and more areas where self-sustaining wetlands would develop. Benefits of the improved wetlands include protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods. No adverse effects are anticipated on refuge impounded wetlands or other wetlands outside of the immediate vicinity of the Pecos River.

Wildlife. Long-term positive effects are anticipated for wildlife species. Restored channels, floodplains, wetlands, and riparian vegetation are expected to increase the abundance of birds, mammals, reptiles, amphibians, and fish relative to expanded habitat availability and quality. Some species may have declined in the past due to loss of natural riparian, wetland, and instream habitats; the restoration and expansion of these habitats should benefit these species in the long term. Effects on wildlife would not be immediate but would come with improved river function and the establishment of diverse native vegetation. Investigations of the native fishery within the Pecos River have revealed a preference of the native fishes for a wide, sand substrate and active channel bed. An active channel allows for the formation of backwaters, pools, and a variety of features that would provide additional habitat favorable to native species. During restoration some wildlife species may be killed and their dens or nests destroyed by heavy equipment. Heavy equipment in the channel, potential drying of pools, and changes in sediments could kill fish. Noise associated with restoration could also affect nesting or reproductive behavior of some species. However, work would be conducted to avoid nesting seasons and locations, and expected wildlife loss would be very limited. Removing vertical structure of vegetation would likely affect birds seeking cover or perches. These minor short-term adverse impacts in areas of poor habitat would be outweighed by the overall benefits to wildlife and habitat that would result from the Proposed Action during the life span of the project.

Special Status Species. In order to completely assess the impacts on special status species, the Service conducted an Intra-Service Section 7 consultation with the Ecological Services Field Office in Albuquerque. The Endangered Species Act requires this process for actions that may affect listed and proposed species. Although including candidate species is not required by law, it is Service policy to consider candidate species when relevant in making natural resource decisions. Through the Intra-Service Section 7

consultation, the Service has determined that the Pecos River Restoration at Bitter Lake National Wildlife Refuge, Chaves County, New Mexico, may affect, but is not likely to adversely affect, the Pecos bluntnose shiner. The restoration is expected to improve habitat for other riverine fishes. The Pecos gambusia is not found in the Pecos River but lives in spring heads and sinkholes at off-channel sites and would not be negatively affected by the restoration (Appendix E). Consultation has resulted in measures to minimize impacts from restoration and to avoid jeopardy; these measures are discussed in Chapter 5.

The Intra-Service Section 7 consultation included consideration of the species discussed below, which could be affected by the proposed restoration project. Effects on other special status species that were not subject to the Intra-Service Section 7 consultation would be expected to be similar to those described in general for vegetation, wetland habitats and wildlife.

Pecos sunflower. The only state or federal threatened, endangered, or candidate plant species included in Intra-Service Section 7 consultation is the Pecos sunflower. Favorable habitats have been reduced by lower water tables and encroachment by alien plants (US Fish and Wildlife Service 2005a). Because the Bitter Lake NWR has been identified as important core conservation and recovery area for the Pecos sunflower, restoration actions should be coordinated with the current review of water and wetlands management at the refuge. The goal of this review is to maximize the sunflower population, while meeting the other Refuge requirements for waterfowl and aquatic wildlife habitats.

The Pecos sunflower should benefit from this action. Saltcedar competes with the sunflower for space, light, moisture, and nutrients. Sunflowers often establish themselves beneath the former canopy of saltcedar once it has been top-killed by fire or otherwise removed. Gradually reduced soil salinities, as a result of saltcedar removal, should also promote the germination and growth of sunflowers.

Currently there is one population of Pecos sunflowers in the critical habitat that could be negatively affected if protective measures are not taken during Phase I. This population is adjacent to Oxbow 4 and could be impacted if not avoided during restoration construction or if the restored river eroded into the location of the population. In order to avoid negative impacts on these Pecos sunflowers, rock vane revetment structures would be set in place in order to block and reroute the river away from this sunflower stand.

Aquatic invertebrates. Protected aquatic invertebrates include the Roswell springsnail, Koster's springsnail, Noel's amphipod, and Pecos assiminea. These species inhabit springs, seeps, sinkholes, and outflows in the vicinity of Bitter Creek, the Sago Springs, Hunter's Marsh, and portions of some impoundments. Restoration is not expected to negatively impact their habitats, which are located far from the Proposed Action and the river, although negligible or minor beneficial effects could occur if a higher water table improves spring flows or supports suitable habitat. The removal of saltcedar along the river should increase water quantity and quality in the springs and ditches in surrounding areas, upon which all four species depend. Increasing spring flows to more historic levels

may allow populations to expand into presently unoccupied habitat. The Service is considering designating critical habitat for these species that may require additional consultation for implementing future restoration phases (Bryan 2009).

Migratory birds. Generally, special status bird species are not expected to nest or to be resident in the proposed restoration project area. Depending on the season, the Proposed Action may have minor short-term negative effects on some special status migratory birds due to noise and removal of vegetation used for cover, perches, or possibly nesting.

Southwestern willow flycatcher. Southwestern willow flycatchers are not known to nest along the Pecos River drainage in New Mexico, though they have been observed migrating through the Bitter Lake NWR. Restoration may benefit this species during migration, thus providing an increased diversity of prey after saltcedar has been removed and native vegetation persists and recovers. The effort should benefit this species due to increased available acreages of native riparian habitat that should harbor flycatcher prey items. There are no nesting pairs within 150 miles of any Proposed Action; therefore, only positive effects are expected from this action.

Interior least tern. The interior least tern nests on salt flats at the Bitter Lake NWR. The restoration is not expected to create any additional nesting areas along the river but may provide additional feeding and loafing areas among backwaters and small sandbars. Removal of dense saltcedar stands and dead saltcedar would remove habitat used by striped skunks or raccoons, which are potential predators of nesting terns. The action should also enhance tern prey (fish and invertebrate) abundance and/or accessibility. Saltcedar removal and increased floodplain habitat should ultimately increase native fish populations by improving the quantity and quality of refuge waters. There are no nesting tern colonies within 330 yards of any Proposed Action; therefore, no negative effects are expected from this action.

Lesser prairie chicken. Lesser prairie chickens occur rarely at the Bitter Lake NWR because refuge habitat does not generally correlate to desirable prairie chicken habitat. Prairie chickens are not associated with riparian habitats within the refuge and are not expected to be affected by these actions.

Pecos gambusia. The Pecos gambusia is not known to inhabit the Pecos River in the refuge. It is found in spring heads and sinkholes at off-channel sites. Pecos gambusia may benefit from this action. Further removal of saltcedar from the Pecos River drainage may increase spring flow and quantity and quality of fish habitat within surrounding systems. Since Pecos gambusia requires unique, clear spring-head and/or sinkhole habitats and there is no such suitable habitat within the action area, the Proposed Action should not negatively affect this species.

Pecos Bluntnose Shiner. Impacts on the shiner are discussed in more detail since this threatened species is the focus of multiple conservation efforts on the Pecos River, including this proposed restoration. The restoration project is a reasonable and prudent measure (RPM) of the Biological Opinion on the selected alternative from the Carlsbad

Water Operations EIS and implements goals of the refuge comprehensive conservation plan for this species (Research Management Consultants 1998, Reclamation 2006a, US Fish and Wildlife Service 2006).

The proposed restoration is expected to have long-term minor to moderate beneficial effects on shiner reproduction, recruitment rates, and survival at all of its life stages. The shiner spawns on flow events, such as spring runoff, summer storms, and irrigation releases. Females lay semibuoyant eggs that drift downstream. In order to develop into adulthood, drifting eggs and larvae must be retained in quality habitat. Degraded channelized conditions are associated with relatively high egg and larval transport rates to Brantley Reservoir. Where the energy of a flow event is dissipated by low velocity floodplain habitats, such as flooded bottomlands, oxbow lakes, and secondary channels, there is better retention of drifting eggs and larvae (Kehmeier et al. 2004b). Restoring this section of the Pecos River, where habitat transitions from quality to poor, would improve the reproduction efforts of the species by extending the quality reach and creating a critical downstream egg and larvae refugia.

Recent studies have clarified the habitat and flow requirements of the shiner through its life stages. The subsegments of the Pecos River, which are occupied by the core population of the shiner, have the combination of being buffered from the direct effects of dams and irrigation releases, high subsegment length, substantial sediment inputs from uncontrolled tributaries, substantial base flow, and high channel width in relation to discharge and lower salinity (Hoagstrom et al. 2008a, 2008b). It is clear that channels with uniformly high velocities and high depth do not provide for the needs of the shiner. Naturally functioning sand bed river channels are geomorphically complex and provide the shiner with a variety of depths, velocity, substrates, turbulence, cover, and food. The availability of lower-velocity areas, whether in plunge habitats or shoreline areas, appears to be important for shiner survival. As the juvenile shiners mature, they are less susceptible to downstream displacement but still need off-channel habitats for resting, food, and cover (Hoagstrom 2003; Kehmeier et al. 2004a). Backwaters and off-channel habitats are highly productive environments for maximizing the growth of larval and juvenile fish. Based on studies of other species, it is possible that juvenile and adult fish use these habitats for different segments of their life history, variously moving between main channel and off-channel habitats as flood pulses move through the system (Kehmeier et al. 2004b). The Proposed Action would correct degraded channel morphology in this reach and would allow the development and maintenance of habitat features that would support the shiner through its life stages.

The Phase I restoration actions would create additional shiner habitat (approximately 7,000 feet) that is far more favorable for shiner use than that of the current incised channel. After reconnection of Oxbow 4, the incised channel would likely be used as a nursery/breeding backwater for the shiner during high flows. Phase II and subsequent alterations of the channel would also influence the river to create plunge-pools, backwater, and open water areas, providing improved shiner habitat.

This species is adapted to high sediment loads, which naturally occur in the Pecos River with increased discharge. Temporary increased sediment loads and turbidity due to disturbances created by these actions would not negatively affect shiners currently residing downstream. Sediments and water samples from Oxbow 4 have been tested and would not likely pose a risk to aquatic life, nor to any endangered species should they be disturbed during proposed restoration efforts in Oxbow 4 (AALI 2008; Tashjian 2008).

The Proposed Action would result in negative effects on the shiner during restoration from the use of construction equipment in the channel and disturbance of sediments. Impacts would be short term but could result in take of a small number of the species in the immediate vicinity of actions. Through the Intra-Service Section 7 consultation, the Service has determined that the proposed restoration may affect the shiner. The shiner is not likely to be adversely affected if the specified measures, including seining and removal, are met to minimize impacts due to habitat restoration. This short-term negative effect to these individuals is not major compared to the benefits this project would provide for the species as a whole (Appendix E).

4.7 Cultural Resources

4.7.1 No Action

Direct and Indirect Effects

The No Action Alternative would result in no change in existing conditions and would have no effect on cultural resources.

4.7.2 Proposed Action

Direct and Indirect Effects

The Proposed Action is not expected to have any effects on cultural resources. No cultural resources have been recorded or are expected to be present in the proposed restoration project area. Federally recognized tribes and pueblos with potential ties to the project area were notified via letter of the proposed project. The only responses received requested notification should archaeological resources or human remains be found during restoration. No concerns or traditional cultural properties were identified by the parties consulted.

With the exception of the staging and river access locations, work would be conducted in active or recently active floodplains, channels, or oxbows. Access to these areas would be through refuge roads. Rock for the rock vanes would be obtained from commercial sources and would not require expansion of quarry facilities. The APE has experienced episodic flooding, refuge maintenance actions, channel diversion and shaping, parking, and associated earthmoving activities over the years, resulting in a highly disturbed setting. Portions of the APE are inaccessible due to dense vegetation and/or perennial

water. The APE for restoration staging and river access locations is enlarged so that sensitive plant resources and wet locations can be avoided, if necessary. Surveys have not been conducted, but the possibility of finding intact cultural resource sites that retain integrity is low. Although unlikely, consideration must also be given to the possibility of buried or undiscovered cultural resources that could be found during restoration.

Reclamation and the Service have consulted with the New Mexico State Historic Preservation Office (SHPO) on the Phase I and Phase II portions of the restoration project. Reclamation and the Service have completed the Section 106 process for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for consulting with appropriate agencies to avoid, reduce, or minimize adverse effects. The SHPO has concurred with the finding that no historic properties would be affected. Future phases of restoration in Reaches 1 through 4 are not fully developed as undertakings, and additional SHPO consultation would be needed for implementation.

4.8 Recreation/Visitor Facilities

4.8.1 No Action

Direct and Indirect Effects

Implementing the No Action Alternative would have no effects on recreation and visitor facilities.

4.8.2 Proposed Action

Direct and Indirect Effects

Implementing the Proposed Action would result in minor short-term negative effects on wildlife-based recreation and visitor facilities in the refuge. During restoration there would be heavy equipment use, land disturbance, vegetation removal, and noise, which could interfere with recreational activities such as wildlife viewing, hunting and photography. Hunter access would be accommodated. Refuge roads would be more heavily used to move workers, supplies, and equipment, creating dust in visitor areas and possibly requiring additional maintenance. However, restoration would be conducted in phases, and with the exception of the Phase I activities, most actions would be half a mile or more from the auto loop and other popular visitor facilities. After restoration these impacts would cease. Abatement measures would be used to reduce dust. The proposed auto loop pullout, viewing platform, and interpretive signage at the Phase I restoration site would afford the public the opportunity to observe the Pecos River in the restored oxbow and to learn about the river restoration. This would be the only site on the auto loop where the Pecos River would be visible to the public. In the long term, visitors may experience an increase in the abundance and variety of wildlife and more recreational and interpretive opportunities in the restored areas near the Pecos River.

4.9 Visual Resources

4.9.1 No Action

Direct and Indirect Effects

The No Action Alternative would have no effect on visual resources.

4.9.2 Proposed Action

Direct and Indirect Effects

Implementing the Proposed Action would have a short-term minor negative effect on visual resources in the refuge. Minor visual effects could occur from construction vehicles and equipment, dust, and the loss of vegetative cover. Some of the restoration actions may be visible in the distance from the west side of the auto tour loop and the visitor center site. Occasional truck traffic and dust would also be visible on the auto tour route. Abatement measures would be used to reduce dust. Views from the east side of the auto tour loop would be closer to the restoration actions and at a similar elevation. The staging area for Phase I as well as the construction site for the viewing platform would be adjacent to a portion of the auto tour loop road. After the Phase I restoration is complete, there may be a time lag before the viewing platform is constructed. After restoration these impacts would cease. In the long term, visitors may experience improved visual quality of the site and its surroundings consistent with natural riparian function and vegetation. The viewing platform at the Phase I restoration site would create a new viewpoint and afford the public a new opportunity to observe the Pecos River in the restored oxbow. The river is currently not visible along the auto tour loop.

4.10 Noise

4.10.1 No Action Alternative

Direct and Indirect Effects

Implementing the No Action Alternative would retain current ambient noise levels.

4.10.2 Proposed Action

Direct and Indirect Effects

Implementing the Proposed Action would result in noise and ground-borne vibrations from construction vehicles and equipment. These impacts would be short term, variable, and minor but may exceed 80 dBA in the immediate vicinity of the activity. With the exception of the Phase I construction, most actions would be half a mile or more from the auto loop and other popular visitor facilities. Although there would be some noise from

trucks on the auto tour road, there may be potential for effects on particular wildlife species or their nesting behavior. After restoration, these noise impacts would cease.

4.11 Socioeconomics

4.11.1 No Action

Direct and Indirect Effects

Implementing the No Action Alternative would not result in any impacts. The local economy would not benefit from construction expenditures or the indirect effects of the restoration.

4.11.2 Proposed Action

Direct and Indirect Effects

Implementing the Proposed Action would result in minor temporary increases in federal spending in Chaves County for construction support materials, fuels, and labor. In the long term, there would be indirect positive impacts on local and regional economies that may result from the restoration. New recreational opportunities in the restored areas may lead to increased refuge visitation and visitor spending in the local economy.

4.12 Environmental Justice

4.12.1 No Action

Direct and Indirect Effects

Implementing the No Action Alternative would not result in any environmental justice impacts.

4.12.2 Proposed Action

Direct and Indirect Effects

Implementing the Proposed Action would not result in any disproportionate impacts on minority or low-income communities, so there would be no environmental justice impacts.

4.13 Indian Trust Assets

4.13.1 No Action

Direct and Indirect Effects

Implementing the No Action Alternative would not result in any impacts on Indian Trust Assets.

4.13.2 Proposed Action

Direct and Indirect Effects

Implementing the Proposed Action would not result in any impacts on Indian Trust Assets. No Indian Trust Assets have been identified in the Pecos River Basin. There are no reservations or ceded lands present. Because resources are not believed to be present, no impacts are anticipated to result.

4.14 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that this use could have on future generations. Irreversible effects primarily result from the use or destruction of specific resources that cannot be replaced within a reasonable time frame, such as energy and minerals. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as extinction of a threatened or endangered species or the disturbance of a cultural resource. Neither the Proposed Action nor the No Action Alternative would result in a large commitment of nonrenewable resources.

Project construction would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by construction equipment and vehicles. The Proposed Action would result in unavoidable harm or harassment of some wildlife, including special status species. The Service would implement measures to minimize impacts as defined in the Intra-Service Section 7 consultation. Anticipated levels of take would not jeopardize the continued existence of any species.

4.15 Cumulative Impacts

4.15.1 Introduction

Cumulative effects are the direct and indirect effects of a proposed project alternative's incremental effects when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR, Part 1508.7). Guidance for implementing NEPA recommends that federal agencies identify the temporal and geographic boundaries of the potential cumulative effects of a Proposed Action (CEQ 1997). For the purposes of this EA, the temporal boundary of analysis is from approximately 2008 to 2012. This boundary encompasses a range within which data are reasonably available and forecasts can be reasonably made.

The geographic boundaries of analysis vary depending on the resource and potential effects. For most resources, the Bitter Lake NWR or Chaves County represent the analysis area. Impacts on resources with farther-reaching effects, such as those to surface water, are analyzed with a more regional perspective. The analysis area is described under each resource. Other projects, plans, agreements, and agency actions that may be relevant to the cumulative effects analysis are identified in Section 1.7. Some resources would be affected by several of the described activities, while others could be affected very little or not at all.

4.15.2 Land Use

The cumulative effects analysis area for land use is Chaves County. Implementing either of the alternatives would have no impact on land use in Chaves County and would not contribute to any cumulative impacts.

4.15.3 Geology and Soils

The cumulative effects analysis area for geology and soils includes the refuge and downstream environments that may be affected by sediments and erosion resulting from this project and other restoration or saltcedar removal projects. The increases in sediments resulting from the restoration project would be minor and beneficial when combined with those resulting from other similar actions. Minor beneficial downstream effects on erosion hazards would be expected from the dissipation of energy in a wider channel.

4.15.4 Air Quality/Climate

The cumulative effects analysis area for air quality is the area covered by the Chaves County Natural Events Action Plan (NEAP). With the incorporation of dust suppression measures, the project would not result in a cumulative net increase in PM₁₀. The project would result in negligible and short-term contributions of emissions from vehicles, equipment, and woody debris burning and would not contribute to cumulative air quality or climate change impacts.

4.15.5 Water Resources

The cumulative impacts analysis area for water resources is defined as the Pecos River, the surface water features at the Bitter Lake NWR, and the shallow aquifer. The Proposed Action is anticipated to contribute minor beneficial effects when combined with past, present, and reasonably foreseeable future actions on the Pecos River. There are concurrent actions to restore river segments or remove saltcedar for the benefit of the river channel morphology, flows, flood control, water quality, and riparian habitat. Reclamation has committed to restore an additional 1.5 miles of quality habitat by 2014. Actions to control saltcedar, primarily through aerial herbicide application without mechanical removal, are complementary to the Proposed Action but are less effective than restoration in producing positive water resource effects. Depletions, if any, are expected to be minor. The water budget will be monitored and the Service will work with the State of New Mexico to quantify and offset any changes to the water budget due to this project. The Service is committed to ensuring that any net depletions will be compensated for and that there will be no adverse impact on water rights nor interstate compact deliveries (Tashjian 2008). No effects are anticipated on downstream users, property, and state line water deliveries. Monitoring described in Appendix B would be conducted to determine actual effects.

4.15.6 Biological Resources

The cumulative impacts analysis area for biological resources is defined as the Pecos River and the Bitter Lake NWR. Effects of the Proposed Action are anticipated to contribute positively to cumulative effects in the area. Improved riparian and instream habitat that may aid in the recovery of the shiner would be extended. When combined with future river restoration projects, there would be further restoration of good habitat. Other actions to control saltcedar are complementary to the Proposed Action in creating more diverse vegetation that supports wildlife and in restoring wetlands.

4.15.7 Cultural Resources

The cumulative effects analysis area for cultural resources minimally includes the refuge and lands within five miles on each side of the river corridor. No direct or indirect effects on cultural resources are anticipated if the Proposed Action were implemented, so no cumulative effects are expected.

4.15.8 Recreation and Visitor Facilities

The cumulative effects analysis area for recreation and visitor facilities is the Bitter Lake NWR. Other maintenance and construction on the refuge could add to the minor short-term impacts on recreation and visitor facilities under the Proposed Action, but no cumulative effects are expected.

4.15.9 Visual Resources

The cumulative effects analysis area for visual resources is the Bitter Lake NWR. Other maintenance and construction on the refuge could add to the minor short-term impacts on visual resources under the Proposed Action, but no cumulative effects are anticipated.

4.15.10 Noise

The cumulative effects analysis area for noise is the Bitter Lake NWR. Other maintenance and construction on the refuge could add to the minor short-term noise impacts under the Proposed Action, but the project would not have a cumulative net increase in local noise levels.

4.15.11 Socioeconomic Resources

The cumulative effects analysis area includes Chaves County. The project would result in negligible positive cumulative socioeconomic effects through expenditures. To the extent that the restoration is able to improve habitat for the shiner, while not depleting water, the risk of other actions that would take money out of the local economy, such as forbearance or a priority call, would be precluded.

4.15.12 Environmental Justice

The cumulative effects analysis area is Chaves County. The project would not result in any environmental justice impacts and would not contribute to any cumulative impacts.

4.15.13 Indian Trust Assets

The cumulative effects analysis area is the Pecos River Basin. No Indian Trust Assets are present, and there would be no cumulative impacts.