

Draft Environmental Assessment

Bitter Lake National Wildlife Refuge Rio Hondo Restoration

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&

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1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE

1.1 Introduction

The United States Fish and Wildlife Service (Service) is proposing to restore and re-route portions of the Rio Hondo on the South Tract of the Bitter Lake National Wildlife Refuge, for the benefit of seven federally listed species and several state listed species. 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, three alternatives are described and environmental consequences of each alternative are analyzed.

1.2 Location

Bitter Lake National Wildlife Refuge (NWR) is located approximately nine miles northeast of Roswell, New Mexico, in Chaves County. Bitter Lake NWR consists of 24,609 acres in three noncontiguous units along the Pecos River (see Project Description Map). These units include the South Tract, the Middle Tract, and the North Tract. The South Tract, also called the Farm Unit, consists of 1,177 acres closed to the public and historically used for agricultural croplands. Currently, there is no agricultural activity among the 500 farmable acres that remain on the South Tract. The Middle Tract contains approximately 11,000 acres that include the Refuge headquarters, Joseph R. Skeen Visitor Center, auto-tour loop, Bitter Lake, several sinkholes and natural wetlands, desert uplands, riparian areas, and impoundments. The North Tract occupies approximately 12,160 acres and includes the 9,620-acre Salt Creek Wilderness. The proposed action occurs solely in the South Tract (Farm Unit).

1.3 Background

Bitter Lake NWR was established on October 8, 1937, by Executive Order 7724 “as a refuge and breeding ground for migratory birds and other wildlife.” Additional laws direct Refuge activities. These include the Migratory Bird Conservation Act (16 USC 715d), which identifies the Refuge “for use as an inviolate sanctuary, or for any other management purpose for migratory birds.” The Refuge Recreation Act (16 USC 460-1) identifies the Refuge as being suitable “for incidental fish and wildlife-oriented development, the protection of natural resources, and the conservation of endangered or threatened species.” The Wilderness Act of

1964 (PL 88-577) directs the USFWS to “maintain wilderness as a naturally functioning ecosystem” on portions of the Refuge. The Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884) including The Endangered Species Act as amended by Public Law 97-304 and The Endangered Species Act Amendments of 1982, dated February 1983 to “protect and recover imperiled species and the ecosystems upon which they depend”.

While originally established to protect wetland habitats for the benefit to migratory waterfowl, the three non-contiguous tracts of the Refuge also play an important role in providing an important sanctuary for several unique species, some of which occur nowhere else in the world. The Refuge as a whole provides habitat for at least 352 bird species, 57 mammal species, 52 reptile and amphibian species, and 24 fish species.

The South Tract, formally known as the J.P. White Farm, was acquired by the U.S. Fish and Wildlife Service in 1988. It consists of 1,177 acres closed to the public and was historically used for agricultural croplands that provided a small percentage of crops for wildlife use. Currently, all farming activities have ceased after the 2012 growing season as a result of an Environmental Assessment conducted in 2011. In addition, the Pecos and the Hondo Rivers flow through this tract of the Refuge, of which both systems were greatly altered and straightened prior to the acquisition of this portion of the Refuge. The South Tract currently harbors three federally listed species including the Pecos sunflower (*Helianthus paradoxus*), Noel’s amphipod (*Gammarus desperatus*) and Pecos bluntnose shiner (*Notropis simus pecosensis*), all of which are associated with the Pecos or Hondo Rivers. The South Tract maintains the potential to establish new populations of four other federally listed species which are the Roswell springsnail (*Pyrgulopsis roswellensis*), Koster’s springsnail (*Juturnia kosteri*), Pecos assiminea snail (*Assiminea pecos*) and Pecos gambusia (*Gambusia nobilis*), that currently occupy the Middle Tract of the Refuge and will be of focus concerning this project proposal. In addition, the South Tract maintains the potential to establish a new population of the state listed greenthroat darter (*Euthostoma lepidum*) and provide enhanced/additional habitat for the state listed Mexican tetra (*Astyanax mexicanus*), Pecos pupfish (*Cyprinodon pecosensis*), arid land ribbonsnake (*Thamnophis proximus diabolicus*), least shrew (*Cryptotis parva*), Wright’s marsh thistle (*Cirsium wrightii*) and wrinkled marshsnail (*Stagnicola caperata*).

The Middle Tract includes approximately 11,000 acres and contains the Refuge headquarters, Joseph R. Skeen Visitor Center, auto-tour loop, Bitter Lake, many sinkholes and spring runs/heads, desert uplands, Pecos River riparian areas, and wetland impoundments. The Middle Tract harbors the core populations of the eight federally listed species (Noel’s amphipod, Roswell springsnail, Koster’s springsnail, Pecos assiminea snail, Pecos gambusia, Pecos bluntnose shiner, interior least tern (*Sterna antillarum*) and Pecos sunflower) on the Refuge and serves as the main wetland management prescription area for the benefit of waterbird and native fish species. Large scale habitat restoration efforts have been implemented on this portion of the Refuge, several of which are currently in progress for the benefit of federal and state listed

species of concern. These efforts include removal of invasive plants, expanding Pecos River native fish habitat and restoring native function to sensitive spring runs. The Middle Tract would serve as the re-stocking source for all federally listed species proposed to be transported to the South Tract concerning this project.

The North Tract occupies approximately 12,160 acres and includes the 9,620-acre Salt Creek Wilderness. The North Tract serves as a healthy upland/grassland and Pecos River riparian system that is currently occupied by the Pecos bluntnose shiner. Major restoration efforts are currently in progress focusing on salt cedar removal along the Pecos River riparian zone for the benefit of the federally listed Pecos bluntnose shiner and other native wildlife species.

This proposed action occurs solely in the South Tract (Farm Unit) and includes alteration of the Rio Hondo river channel. The Rio Hondo river channel historically meandered from northwest to southeast through what is currently the South Tract of the Refuge, ultimately feeding the Pecos River. Within the Refuge South Tract, the historic channel exhibited wide meanders and moderately sized disconnected oxbows which are common for a dynamic river floodplain within the Pecos River Valley. The current Rio Hondo river channel was excavated, re-routed and straightened well before the Refuge acquired the property in 1988 and is currently maintained as a water conveyance system. The upper stretch of the river, which originates near Hondo, New Mexico at the confluence of the Rio Ruidoso and Rio Bonito Rivers, typically flows year-round up to approximately 40 miles west of the Refuge; although irrigation along this length of the river diverts much of the natural flow. Surface water flows no longer reach Roswell, except after major storm events and/or during the spring runoff following an exceptionally wet winter. Prior to river flows entering the South Tract of the Refuge, the Rio Hondo runs through Roswell. The channel and its tributaries have been greatly altered by channelization and reinforcement of its banks with concrete. In addition, treated waste water flows are seasonally diverted into the current Rio Hondo channel upstream of the Refuge boundary.

Within the South Tract of the Refuge, six very short spring runs were recently discovered, all of which harbor the federally Endangered Noel's amphipod. These spring runs (< 5 meters in length) flow from spring vents located along the upper banks of the current Hondo River channel, which ultimately flow directly into the main Hondo River channel. Water quality sampling efforts of both the occupied spring runs and the current Rio Hondo channel flows (Lusk 2010) indicates that the water flowing through the current Rio Hondo channel is not suitable for Noel's amphipod, as well as associated endangered species: Roswell springsnail, Koster's springsnail, and Pecos gambusia. Existing populations of Noel's amphipod in these springs currently experience stress, and likely mortality, during high flow events in the Rio Hondo, which inundate the springs.

During mapping and investigative efforts for Noel's amphipod, more than 20 similar spring vents were discovered that originate within the main channel of the Rio Hondo. Recent monitoring of flows within this critical stretch of the Hondo River indicated that the spring flows contribute approximately .5 – 1.5 cubic feet per second (cfs) of water flow per mile within the area proposed for restoration. We suspect that these spring vents have the potential to provide additional suitable habitat for all listed invertebrates on the Refuge as well as the endangered Pecos gambusia and threatened Pecos sunflower, if the current Rio Hondo flows are diverted and back flows during Pecos River block releases or storm events are limited.

The Refuge supports plant and animal communities adapted to the diverse and unique habitats within the region. The isolated springs, seeps, and associated wetlands protected by the Refuge have been recognized as providing some of the last known habitats in the world for several unique species. The Pecos River Valley is a highly altered system that historically served (and currently serves) an important role in providing habitat for breeding, migratory, and wintering wildlife. Management at Bitter Lake NWR emphasizes: 1) the protection and enhancement of habitat for federally threatened, endangered, and candidate species, 2) maintenance and improvement of migratory and nesting shorebird, wading bird, and waterfowl habitat, 3) reduction of fertilizer and chemical use on Refuge lands, particularly lands adjacent to sensitive or "critical habitat" utilized by threatened or endangered species, and 4) the maintenance, enhancement, and restoration of natural ecosystem processes.

In 1998, the Comprehensive Conservation Plan (CCP) was completed for Bitter Lake NWR in accordance with the National Wildlife Refuge System Improvement Act of 1997. This document guides overall management of the Refuge.

The CCP identified the following goals for the Refuge:

1. To restore, enhance and protect the natural diversity on the Bitter Lake NWR including threatened and endangered species by: (1) appropriate management of habitat and wildlife resources on refuge lands; and (2) by strengthening existing, and establishing new cooperative efforts with public and private stakeholders and partners.
2. To restore and maintain selected portions of a hydrological system that more closely mimics the natural processes along the reach of the Pecos River adjacent to the Bitter Lake NWR by: (1) restoration of the river channel, as well as restoration of threatened, endangered and special concern species; and (2) control of exotic species and manage trust responsibilities for maintenance of plant and animal communities and to satisfy traditional recreational demands.
3. To offer compatible wildlife-dependent public access and recreational opportunities to include compatible forms of hunting, wildlife observation and photography, and continue wildlife interpretation and education efforts.
4. To protect and maintain cultural resources on the Bitter Lake NWR for the benefit of present and future generations.

5. To strengthen interagency and jurisdictional relationships in order to coordinate efforts with respect to refuge and surrounding area issues, resulting in decisions benefiting fish and wildlife resources, while at the same time avoiding duplication of effort.
6. To effect improvement to staffing and funding that will result in long-term enhancement of habitat and wildlife resources in the area of ecological concern, and allow the achievement of the goals of this plan and the goals of the National Wildlife Refuge System.

To meet the goals and objectives outlined in the CCP, Bitter Lake NWR has administered restoration prescriptions and management practices to enhance/create available habitat for the benefit of federally and state listed species and native plants and animals. This includes: 1) removing non-native plants and animals from sensitive spring systems of the refuge, 2) implementing restoration and re-stocking efforts to enhance federally and state listed species populations, 3) implementing wetland management prescriptions to support wintering and nesting populations of migratory waterbirds, native fish, native amphibians, reptiles, and invertebrates, 4) Implementing wetland management prescriptions and invasive species removal efforts to benefit Pecos sunflower critical habitat and native plant communities, 5) Implementing wetland management prescriptions to benefit interior least tern habitat, 6) implement restoration efforts to enhance native grassland species for the benefit of mammals, grassland birds and reptiles, 6) Implementing large scale restoration efforts in coordination with other agencies efforts to enhance/increase Pecos bluntnose shiner available habitat, 7) monitoring population health and impacts of Threatened or Endangered species in response to management techniques and restoration efforts, 8) conduct an annual youth hunt and implement wetland management prescriptions to enhance hunting opportunities, wildlife observation, photography and educational outreach programs.

1.4 Purpose of Action

The purpose of this action is to protect the existing populations of Noel's amphipod within the Refuge South Tract, allow for population expansion and connection, and provide additional habitat for six of the Refuge's listed species, which are highly endemic and all have core populations approximately four miles away within the Refuge Middle Tract. For the invertebrates (Noel's amphipod, Roswell springsnail, Koster's springsnail, and Pecos assiminea snail), potential reintroduction sites are extremely limited and had previously been thought nonexistent. In addition, the threatened Pecos bluntnose shiner would benefit during high water level events in the Pecos River; the sinuous nature of the new Rio Hondo channel would provide important side channel habitat for spawning. This project would re-route the Rio Hondo away from six spring runs/vents that are currently designated as critical habitat for and occupied by Noel's amphipod, preventing the poor quality water in the Rio Hondo from inundating the springs, expanding suitable habitat for the amphipod and creating habitat for the springsnails,

upland snail, fish, and sunflower in and adjacent to the restored Rio Hondo spring run. The restoration of additional populations throughout the restored Rio Hondo spring run and the newly excavated portions of the new Rio Hondo channel will bring these species closer to recovery. The opportunities presented by this project are critical to recovery of these species.

Furthermore, nonnative plant species such as salt cedar (*Tamarix spp.*), Russian knapweed (*Acroptilon repens*), perennial pepperweed (*Lepidium latifolium*), and phragmites (*Phragmites australis*) have taken hold along the banks of the current Rio Hondo channel. Removing these plant species will greatly benefit the Pecos sunflower, which at this time unsuccessfully competes for resources alongside these invasive species.

The purpose of the Environmental Assessment is to determine the adequacy of this proposed project in meeting the purpose of Bitter Lake NWR and fulfilling the needs of threatened or endangered species, and other resident/migratory wildlife and to analyze the impacts concerning this project. An additional purpose of the EA is to remain consistent with current law, regulation, and policy (National Environmental Policy Act of 1969 and National Wildlife Refuge System Improvement Act of 1997).

1.5 Need for Action

There is a need to protect occupied Threatened and/or Endangered species habitat from threats posed by unsuitable water quality on the current Rio Hondo channel and provide additional habitat to the Noels amphipod, Roswell springsnail, Koster's springsnail, Pecos assiminea snail, Pecos gambusia, Pecos sunflower and Pecos bluntnose shiner; thus bringing these species closer to recovery/de-listing. There is a need to evaluate thoroughly the impacts of this project, in conjunction with the purpose of the Refuge and current law, regulation, and policy, and to determine if the current proposal is the most biologically efficient means of meeting our wildlife management and Federally listed species objectives. In accordance with the Service's Biological Integrity policy, the Refuge must maintain and restore, where appropriate, the biological integrity, diversity, and environmental health of the National Wildlife Refuge System.

The proposed restoration efforts which may include creating new habitats, is consistent with the goals, objectives, and strategies outlined within the CCP. As noted on page 52 of the CCP, such strategies include developing management strategies with other federal, state and non-governmental agencies (NGOs) to support maintenance and restoration of habitats supporting (or potentially supporting) native communities with special emphasis on federal and state listed species. As outlined by Objective 2 on page 52, there is also a need to restore populations of aquatic species designated as endangered, threatened, or of special concern to a sustainable level. Aquatic species in these categories include greenthroat darter, Pecos gambusia, Pecos bluntnose shiner, Pecos pupfish, Mexican tetra, Pecos assiminea snail, Koster's tyronia (springsnail),

Roswell springsnail, Noel's amphipod, and Pecos sunflower. In addition, it is outlined on page 50 under Goal 2 of the CCP, to restore and maintain a hydrological system that mimics the natural processes along the Pecos River drainage: (1) restoration of the channel, as well as restoration of threatened, endangered and special concern species; and (2) control exotic species and manage trust responsibilities for maintenance of plant and animal communities and to satisfy traditional recreational demands.

1.6 Decision to be Made

This EA is an evaluation of the environmental impacts of the alternatives and provides information to help the Service fully consider these impacts and any proposed mitigation. Using the analysis in this EA, the Regional Director of the Southwest Region (Region 2 of the U.S. Fish and Wildlife Service) will decide which alternatives to implement and whether there would be any significant effects associated with the selected alternative that would require the preparation of an environmental impact statement. If no significant impacts are identified, a Finding of No Significant Impact (FONSI) will be prepared.

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.*

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)

- 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.*)
- National Pollutant Discharge Elimination System, as amended (33 U.S.C. 1251 *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)
- U.S. Fish and Wildlife Service Manual 601 FW 3, Biological Integrity, Diversity, and Environmental Health
- The Final Comprehensive Conservation Plan and Environmental Assessment for Bitter Lake National Wildlife Refuge (1998, as required by 43 CFR 1610.5).

Further, this EA reflects compliance with applicable State of New Mexico 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 Scoping/Public Involvement and Issues Identified

Scoping

Scoping was initiated on May 18, 2013. The Refuge distributed a news release to the Roswell Daily Record which was published on May 18. The Refuge simultaneously posted a public notice in the visitor center that established a 30-day scoping period with a scheduled culmination date of June 18, 2013. A field trip to explain the project was provided to the Roswell Office of New Mexico Game & Fish on June 3. A presentation was given to Aron Bylock- Pecos Valley Artesian Conservation District Superintendent on May 14. The refuge notified the Chaves County Flood Control District Manager- Dick Smith via telephone on May 15 to inquire if his office desired a formal notice of the project. Mr. Smith declined the offer to provide comments at that time but stated that he would like to review the draft EA when it was prepared. Due to unexpected delays in the development of the draft EA, preparation work did not resume until December 1, 2013. At that time, two additional interested parties- neighboring landowners Clint Lynch and Jerry Voz- dba the Voz Dairy were identified, and letters were sent to each.

Service determined that additional time was necessary to involve the many interested parties in the EA process, and the public scoping period was extended through December 31, 2013.

During the scoping period, which lasted until December 31, 2013, the Refuge received no responses from the local community.

Internal scoping of refuge and regional office staff was also conducted to identify issues, concerns, and management opportunities. Based on internal and external scoping, the following issues were identified and considered in the development of the alternatives in Chapter 2 of this EA:

1. Water quality and quantity parameters of both the current Rio Hondo channel and the spring runs occupied by the Noel's amphipod.
2. Rio Hondo channel excavation alternatives and cost/benefits to wildlife and budget expenditure.
3. Impacts to Threatened and/or Endangered species including "critical habitat" and current status of the occupied habitats.

Public Review for Draft EA

A draft of this EA was released for a 30 day public review period, which ended April 5, 2014. Copies of the draft EA were provided in the Bitter Lake NWR Visitor Center and online at the National Wildlife Refuge System SW Region Division of Planning's website and the Refuge's website. Public notices were posted at the Refuge's Joseph R. Skeen Visitor Center, Roswell City Library, BLM Office (Roswell), and New Mexico Game & Fish Office (Roswell). The Service released a news release to the Roswell Daily Record, Friends of Bitter Lake Refuge newsletter, and other local media outlets. A letter was also sent to interested parties in the area, soliciting their feedback on the draft EA. An open house was held at the Visitor Center on March 19, 2014 from 2:00-6:00 p.m. Finally, a copy of the draft EA was also mailed to two neighboring landowners.

The following issues were addressed while considering the proposed Alternatives:

1. Water quality sampling efforts of both the occupied spring runs and the current Rio Hondo channel were conducted by the USFWS Ecological Services office (Lusk 2010), which indicate that water flowing through the current Rio Hondo channel is not suitable for Noel's amphipod, as well as the associated endangered species: Roswell springsnail, Koster's springsnail, and Pecos gambusia.
2. Channel cross-section sites have been set in place by USFWS water resources specialists within the proposed restored Rio Hondo spring run stretch to monitor changes in channel geomorphology in response to restoration efforts. In addition, flow monitoring of the proposed restored Rio Hondo spring run stretch have been implemented to determine how much water the spring flows contribute to the current channel. It has been determined that the spring flows contribute .5 – 1.5 cfs of water flow per mile within the restored Rio Hondo spring run stretch.
3. Feasible excavation routes of the new Rio Hondo channel were determined while considering current Refuge infrastructure, cost/benefit to Threatened and/or

Endangered species, and overall cost of the project. It was determined that following portions of the historic Rio Hondo channel would yield the most favorable benefits to listed species, project budget and would not require the Refuge to sacrifice infrastructure already in place (i.e. wells, water conveyance piping, power transmission lines etc...).

4. Quarterly Noel's amphipod presence/absence sampling efforts (including water quality sampling) have been implemented by invertebrate specialists with the New Mexico Game and Fish and the Refuge. It has been determined that the Noel's amphipod is limited to only the spring runs and vents adjacent to the current Rio Hondo channel and no Federally listed invertebrates have been found within the current Rio Hondo channel. In addition, no other Federally listed invertebrates have been detected within the spring runs occupied by the Noel's amphipod.
5. Monthly presence/absence sampling efforts have been implemented along the banks of the current Rio Hondo channel in order to investigate if Pecos assiminea snails currently occur within the system. No Pecos assiminea snails have been detected and the habitat appears to be non-suitable at this time due to current Rio Hondo water function and quality.
6. Annual vegetation sampling efforts have been set in place to monitor the encroachment and removal of non-native plant species along the banks of the proposed restored Rio Hondo spring run stretch. These sampling efforts would also document the establishment of Pecos sunflower after the proposed restoration efforts have been implemented.
7. Annual sampling efforts of Pecos bluntnose shiners have been implemented by USFWS Fisheries Resources Office specialists at the current Rio Hondo channel and Pecos River confluence. It is expected that the proposed project would increase available Pecos bluntnose shiner habitat for adult and juvenile fish. An increase in available habitat would also hold true for state listed fish species and the Pecos gambusia within the restored Rio Hondo spring run, where several of these species will be introduced.

2.0 ALTERNATIVES

Alternatives are different approaches designed to meet the purpose and need for the proposed action. NEPA requires federal agencies to consider a reasonable range of alternatives that meet the purpose and need for the proposed action. Based on the issues, concerns, and opportunities heard during the scoping process, the following alternatives were identified. Three management scenarios that could meet the purpose and need of the proposed action were identified and are analyzed in detail in the EA. Alternative C is the proposed action. These alternatives represent feasible approaches to accomplishing habitat restoration goals on the Refuge.

2.1 Alternative A – No Action (Current Management)

Under the No Action Alternative, current management direction would continue. The Refuge would not re-route the Rio Hondo channel away from occupied Noel's amphipod habitat. All channel lengths would remain the same and no invasive species removal or restoration efforts would be implemented. An estimated 1.8 mile isolated spring run channel (i.e. restored Rio Hondo spring run) would not be created for the benefit of Threatened or Endangered species. Water delivery capability of the Rio Hondo Channel would remain the same.

Excavation Effort

Under the No Action Alternative, excavation efforts concerning the re-routing of the current Rio Hondo channel would not be implemented. No costs for this project would be accrued.

Restoration Impacts

The Refuge would continue to monitor and protect the Noel's Amphipod and Pecos sunflower designated critical habitats at the current level. Pecos sunflower habitat would continue to decline as non-native plant species encroachment increases, displacing sunflower habitat. Pecos sunflower population densities on the South Tract would remain lower than objectives outlined within Pecos Sunflower Recovery Plan (2005) and no recovery actions would be implemented concerning this project; thus a 2nd core population of this species would not be created adjacent to the Middle Tract population.

Noel's amphipod habitat would remain limited to the six small isolated spring runs adjacent to the current Rio Hondo Channel. High water events comprised of non-suitable water for this species would continue to inundate the occupied spring runs and designated critical habitat not allowing for species expansion. A core population concerning this species would not be established and the only core population would remain on the Middle Tract of the Refuge.

No re-introduction efforts will be implemented concerning the Roswell springsnail, Koster's springsnail, Pecos assimineia snail, Pecos gambusia or state listed fish species. The only core

populations for the Roswell springsnail and Koster's springsnail would remain on the Middle Tract of the Refuge. Another core population of Pecos gambusia and/or Pecos assiminea snails would not be established. Additional populations of state listed greenthroat darters, Pecos pupfish, or Mexican tetras would not be established or enhanced and monitored. Additional habitats would not be created or enhanced, benefiting the other state listed species mentioned under section 1.4 of this document. Steps to recovery of the species listed above would not occur under a No Action Alternative.

Backwater habitat for the benefit of the Pecos bluntnose shiner and other native/state listed species would not be enhanced. No backwater areas would be expanded allowing for additional refuge for young of year fish during high water events.

Monitoring

Monitoring efforts would remain to be limited to the Noel's amphipod, Pecos sunflower, Pecos bluntnose shiner and invasive species encroachment.

2.2 Alternative B—Route 1, Excavation Through Upland Sites

Channel Excavation

Under this alternative, the Refuge would excavate/divert a new Rio Hondo channel from west to east across fallow farm fields and two interior Refuge roads, then parallel the north side of the second interior dike road until it ends, at which point the channel would extend southeast across a sandy substrate upland site before it terminates within the Pecos River (see Project Description Map). Extensive excavation work would be required concerning the .25 mile stretch through the sandy upland site prior to reaching the Pecos River. This channel re-route would disconnect a 1.8 river mile section (referred to as the "restored Rio Hondo spring run" within this document) of the existing Rio Hondo channel that would ultimately serve as a long spring run exhibiting suitable habitat for six Federally listed species (four invertebrates, one fish and one plant) as well as provide habitat for several state listed species. The newly excavated channel (referred to as the "new Rio Hondo channel" within this document) would ultimately provide approximately 1.06 river miles of additional/newly created habitat for the Pecos sunflower, Pecos bluntnose shiner and several state listed species. In addition to the 1.06 river miles mentioned above, the project would benefit the threatened Pecos bluntnose shiner by providing an additional .75 river miles of available habitat where the restored Rio Hondo spring run meets the Pecos River; thus providing approximately 1.81 river miles (total) of backwater habitats for larval/juvenile forms of this species.

Excavation under this alternative would take approximately 2 – 3 months and be completed in late summer or fall of 2014. Excavation of the new Rio Hondo channel would begin first, which would meander approximately 1.06 river miles east and then southeast as mentioned above. The

new Rio Hondo channel would ultimately join with the Pecos River channel approximately 1.9 river miles north of the current Rio Hondo River/Pecos River confluence. Excavators, bulldozers, tractors with backhoes, and other heavy equipment would be used to excavate channels, set a pipe culvert driveway crossing within the new Rio Hondo channel, set a one-way water conveyance structure at the south end of the restored Rio Hondo spring run to deter flood events within the Pecos River, place native rock within the 1.8 river mile long restored Rio Hondo spring run to create invertebrate habitat, and create meanders/sculpt banks within sections of the restored Rio Hondo spring run.

The new Rio Hondo channel would not be reconnected immediately; rather, it would be excavated in its entirety except for two sediment plugs at the upstream and downstream ends of the newly excavated channel (see Project Description Map). In addition, the pipe culvert for passage of equipment and future access to other restored units would be set in place after the new Rio Hondo channel has been excavated. Crossing and culvert design would be engineered to allow for unrestricted river flow during high water or flood events. Upon completion of channel excavation, both sediment plugs within the new Rio Hondo channel would be removed to divert existing Rio Hondo flows, and a sediment plug with an estimated length of ~305', containing about 2,550 cubic yards of earthen fill will be installed. The earthen fill will be material taken from the upper portion of the newly excavated channel. The plug will be rip-rapped with ~100 cubic yards of 12" rock. Additionally, with funding availability, 8-10" native, angular limestone rock will be placed at the northern most reach of the restored Rio Hondo spring run to provide substrate habitat for the Noel's amphipod. After the plug is set in place, a large one-way water conveyance culvert would be set in place approximately 1.8 river miles downstream of the restored Rio Hondo spring run sediment plug. The footprint size of the structure is approximately 400 total square feet. This one-way water conveyance structure would deter flows from backing up into the restored Rio Hondo spring run stretch during high Pecos River flow events, but also allow flows to exit the restored Rio Hondo spring run in the case of a major flood event concerning the Rio Hondo channel system.

The total cost of the project following the upland site route would be approximately \$733K which is greater when compared to Alternative A and C.

Restoration Impacts

This project alternative would re-route the Rio Hondo away from the six spring runs/vents that are currently designated as critical habitat for and occupied by Noel's amphipod, preventing the poor quality water in the Rio Hondo from inundating the springs, expanding suitable habitat for the amphipod and creating habitat for the springsnails, upland snails, fish, and sunflower within and adjacent to the restored Rio Hondo spring run. The restoration of additional populations throughout the restored Rio Hondo spring run and the newly excavated portions of the new Rio Hondo channel would bring these species closer to recovery. In particular, populations of the

four invertebrates (Noel's amphipod, Roswell springsnail, Koster's springsnail, and Pecos assiminea snail) would benefit as they have extremely limited opportunities for population expansion; the opportunities presented by this project are critical to recovery of these species.

Furthermore, nonnative plant species such as salt cedar, Russian knapweed, perennial pepperweed, and phragmites have taken hold along the banks of the current Rio Hondo channel. Removing these plant species would greatly benefit the Pecos sunflower, which at this time unsuccessfully competes for resources alongside these invasive plant species. Pecos sunflower population densities on the South Tract would increase and the population would ultimately meet objectives outlined within Pecos Sunflower Recovery Plan (2005) and a 2nd core population of this species would be created adjacent to the Middle Tract population. Invasive plant species would be removed by Refuge staff utilizing heavy equipment and herbicide application methods along the banks of the restored Rio Hondo spring run and portions of the new Rio Hondo channel. Polaris herbicide (EPA # 228-534) or Polaris AC Complete herbicide (EPA #228-570) would be used to treat phragmites, salt cedar, and other invasive plant species (per label) that occur within the activity area utilizing cut-stump or foliar application methods. Mechanical removal of these species would also occur with the use of excavators or other heavy equipment to extract larger trees including their root systems.

After invasive plant treatments, Pecos gambusia would be removed from healthy core populations exhibiting known genetically pure strains of this species. The restored Rio Hondo spring run would then be stocked from only those locations occupied by genetically pure Pecos gambusia.

In addition, Refuge volunteers and staff would collect Pecos sunflower seeds from the restored Rio Hondo spring run (as many as possible) and other areas throughout the Refuge where densely occupied populations occur, prior to the scheduled heavy equipment work. The seeds would then be stored in a cool dry place during the winter months. These seeds would later be dispersed throughout the restored Rio Hondo spring run and possibly the new Rio Hondo channel.

During the spring and/or summer months (April-June), Pecos assiminea snails would be removed from the Sago Springs or Snail Units within the Middle Tract of the Refuge and placed along the edges of the restored Rio Hondo spring run where suitable habitat was created or previously existed. Also, Roswell springsnails and Koster's springsnails would be removed from healthy core populations throughout the middle tract of the Refuge and stocked throughout the restored Rio Hondo spring run until viable populations exist. At that time, the Pecos sunflower seeds that were collected the previous fall would be dispersed along the banks of the restored Rio Hondo spring run and possibly the new Rio Hondo channel. Native plant species would be removed

from other parts of the Refuge or purchased and transplanted by Refuge volunteers along the banks of both channels.

Monitoring

In addition, tiles, data loggers, and other monitoring equipment would be deployed prior to project activities to regularly monitor habitat changes, population expansion/decline of listed species and water quality parameters throughout the restored Rio Hondo spring run and the Middle Tract reference locations (i.e. Sago Springs, Bitter Creek and Wetland Unit spring ditches). This monitoring effort would require Fish and Wildlife Service personnel, volunteers and professionals from other agencies to enter these areas to collect data for many years to come.

Water chemistry and quality (for example, specific conductance, temperature, pH, dissolved oxygen) would be monitored monthly pre- and post-project within the restored Rio Hondo spring run, the new Rio Hondo channel, and the Middle Tract reference locations. These measurements would be taken with portable hand-held YSI meters (or similar instruments) which entails submerging a probe into the water column throughout the new Rio Hondo channel and reference locations. The Refuge would also deploy data loggers strategically placed throughout the restored Rio Hondo spring run and data loggers spread throughout the wetland unit spring ditches of the Middle Tract reference locations.

In addition, transects (cross-section transects) would be set-up at various sites throughout the restored Rio Hondo spring run and cross-sections may be set-up at Bitter Creek, Sago Springs and along the Wetland Unit spring ditch (Middle Tract reference sites). These cross-section transects may be monitored monthly, especially during the early stages of this project. At each transect, information concerning riparian and aquatic vegetation, stream bathymetry, water quality/chemistry, endangered species, and other fish, invertebrate, and wildlife would be recorded.

Density and population change surveys concerning the Noel's amphipod would be conducted throughout the restored Rio Hondo spring run and Middle Tract reference sites. This entails obtaining substrate and aquatic vegetation samples from occupied spring runs/vents. Surveys would be systematic in order to determine the extent to which Noel's amphipod occupies the restored Rio Hondo spring run.

Pecos bluntnose shiner monitoring efforts would be conducted by the New Mexico Fish and Wildlife Conservation Office in conjunction with their Pecos River fish community monitoring efforts. This would determine occupancy of Pecos bluntnose shiners as they utilize the new Rio Hondo channel and outflow of the restored Rio Hondo spring run.

Success of Pecos gambusia and Pecos pupfish (including other native fishes) reintroductions would be monitored using established protocols (Service 2012). Success of Roswell springsnail and Koster's springsnail reintroductions would be monitored using systematically placed tiles throughout the restored Rio Hondo spring run. In addition, density and survivorship surveys would be conducted using a benthic grab sampler method developed by officials of the New Mexico Game and fish. Monitoring efforts would occur for Pecos assiminea before and after introductions occur. Assiminea snail density/survivorship would be measured using both the newly developed Pecos assiminea monitoring protocol and experimental techniques (wood tiles) currently being evaluated by Texas Tech University.

Pecos sunflower population expansion mapping efforts would occur along the banks of the restored Rio Hondo spring run and the new Rio Hondo channel until both newly established populations became stable; success would be monitored following established protocols which would also be used to monitor encroachment of non-native plant species and expansion of native plants after the completion of this project. Density levels for this species would increase considerably as a result of this alternative.

For additional information concerning the monitoring protocols, refer to Biological Opinion #02ENNM00-2013-F-0057.

2.3 Alternative C- Route 2, Excavation Through Portions of Historic Rio Hondo Channel (Proposed Action Alternative)

The length of the restored Rio Hondo spring run and restoration prescriptions within it would be the same for Alternative C as described for Alternative B.

Channel Excavation

Under this alternative, the excavation would be the same as Alternative B from the permanent plug (current Rio Hondo side) to the end of the second interior dike road as shown on the Project Description Map. The route would then turn south along a historic Rio Hondo channel, then turn east again parallel to a third interior dike road, until it terminates within the Pecos River.

Although this route is longer than Alternative B, the necessary excavation will be less since it follows a portion of the historic Rio Hondo channel. Minimal excavation work would be required concerning the .70 mile stretch following the historic Rio Hondo channel which is generally a low area just prior to reaching the Pecos River. The newly excavated channel (referred to as the "new Rio Hondo channel") would provide additional/newly created habitat for the Pecos sunflower, the Pecos bluntnose shiner and several state listed species concerning both Alternatives B and C. Alternative C would result in approximately 1.50 river miles of additional/newly created habitat, compared to the 1.06 river miles that Alternative B creates. In addition, this Alternative as a whole would benefit the threatened Pecos bluntnose shiner by

providing approximately 2.25 river miles (as compared to 1.81 miles for Alternative B) of backwater habitats for larval/juvenile forms of this species.

Time of the excavation would be the same as Alternative B, but the duration of the project is expected to be approximately 3 weeks less than that of Alternative B. Similar to Alternative B, excavation of the new Rio Hondo channel would begin first, and the route would be the same until the end of the second interior dike road is reached. At that point, the route would meander approximately .70 river miles east and then south and then east again as mentioned above. The new Rio Hondo channel would ultimately join with the Pecos River channel approximately 1.72 river miles north of the current Rio Hondo River/Pecos River confluence, as opposed to approximately 1.9 river miles north of the same confluence when compared to Alternative B. Equipment used to set the pipe culvert driveway crossing, set the one-way water control structure, place the native rock, and to create meanders/sculpt banks within the restored Rio Hondo spring run would be the same as with Alternative B.

The timing of the new Rio Hondo channel excavation, reconnection, box culvert placement, sediment plug removal and size of the plug would be the same as described under Alternative B except that it will take less time to complete this Alternative. Concerning the restored Rio Hondo spring run, the placement of native angular limestone rock and placement of the one-way water control structure would be the same as described under Alternative B.

The total cost of the project following the historic Rio Hondo channel route would be approximately \$600K which is greater when compared to Alternative A and less when compared to Alternative B.

Restoration Impacts

The restoration impacts/benefits of Alternative C would be the same as described for Alternative B except that the length of the new Rio Hondo channel would be greater than with Alternative B, thus creating more habitat for the Pecos sunflower and Pecos bluntnose shiner, as explained above.

Monitoring

Same as Alternative B.

2.5 Comparison of Alternatives

Issue	<u>Alternative A</u> Current Management	<u>Alternative B</u> Route 1 across upland sites	<u>Alternative C</u> Route 2 following historic Rio Hondo Channel
Excavation Effort	No excavation would occur.	Extensive excavation effort.	Moderate excavation effort.
Threatened or Endangered Species Impacts	No positive impacts would occur. Negative impacts would continue to increase.	Positive impacts would occur. Negative impacts would greatly decrease.	Increased positive impacts would occur compared to Alternative B. Negative impacts would greatly decrease.
Restoration Considerations	No restoration efforts would be implemented and the channel would remain the same.	1.8 river miles of suitable Threatened and/or Endangered species spring habitat would be created. 1.06 river miles of new Rio Hondo River Channel would be created. 1.81 river miles of suitable habitat for Pecos bluntnose shiner and Pecos sunflower would be created/enhanced.	1.8 miles of suitable Threatened and/or Endangered species spring habitat would be created. 1.50 river miles of new Rio Hondo River Channel would be created. 2.25 miles of suitable habitat for Pecos bluntnose shiner and Pecos sunflower would be created/enhanced.

Water Conveyance Capabilities	No effect on water conveyance.	Rio Hondo water conveyance would have a more direct route to Pecos River	Rio Hondo water conveyance would have less of a direct route to the Pecos River than Alternative B.
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2.6 Alternatives Considered But Dismissed From Detailed Analysis

A number of other routes were considered, but were all found to be not feasible because they caused problems/conflicts with existing pipelines and other infrastructure. No other feasible alternatives were identified.

3.0 AFFECTED ENVIRONMENT

This section provides a description of the affected resources determined to be applicable to the range of alternatives. Bitter Lake NWR encompasses 24,609 acres in three noncontiguous tracts – the North Tract, the Middle Tract, and the South Tract. The proposed action area would occur entirely within the 1,177-acre South Tract of the Refuge. The South Tract is not open to the public and includes fallow Refuge croplands, which has the potential to support and attract large numbers of wintering migratory birds with restoration efforts.

3.1 Physical Environment

The Refuge is situated where the Chihuahuan Desert, short grass prairie, Pecos River, and Roswell Artesian Basin converge. Straddling the Pecos River, the Refuge consists of an assortment of water habitats surrounded by a harsh, dry environment. Native grasslands, sand dunes, brushy bottomlands, and red-rimmed plateaus provide a sharp contrast to the wetland habitats of the Refuge. The entire project area is located in the Refuge's South Tract where the Rio Hondo River historically converged with the Pecos River.

3.1.1 Air Quality

Under the Clean Air Act (42 USC 7401-7671q, as amended in 1990), the Service has a responsibility to protect air quality and related values from the adverse effects of air pollution and to comply with federal, state, and local air pollution control laws and regulations. The Salt Creek Wilderness is designated a Class I Air-shed area but lies in the North Tract, removed from the project area. The project area has excellent air quality, due to the rural land uses in most of the surrounding area.

3.1.2 Soils / Geology

Bitter Lake NWR is located in the Lower Pecos Valley Subsection of the Great Plains Physiographic Province of Southeastern New Mexico. Much of the Pecos Valley Section is underlain by Permian bedrock units composed of gypsiferous and saline evaporites, limestone and dolomite, mudstone, shale, and sandstone. Dissolution of evaporite and carbonate units is an active geomorphic process affecting landscape evolution in much of the region, and various sizes of solution-subsidence depressions are common landforms. From essentially the headwaters of the Pecos River, the sedimentary rocks of limestone, shale, and sandstone dip off the mountains in an easterly direction to form a large continuous regional aquifer system. The permeability of the aquifers varies considerably depending on the degree of dissolution or fracturing that has taken place. These processes have been most active in the southern part of the area and have resulted in the well-known Roswell Artesian Basin.

Soils in the area are dominated by aridisols, which are not well suited for non-irrigated agriculture because they lack the necessary moisture to support any long-term growth except arid-adapted vegetation. The soil horizon is low in organic matter and is light in color. Aridisols also exhibit special fertility problems due to unavailable micronutrients resulting from a high pH. Practices such as irrigation, fertilizer application and crop rotation are implemented to offset these deficiencies.

3.1.3 Water Resources and Quality

Bitter Lake NWR is at the juncture of the Roswell Artesian Basin of southeastern New Mexico and the Pecos River. The Roswell Artesian Basin is a natural hydrologic basin that extends from the summits of the Capitan, Sacramento, and Guadalupe Mountains to the west extending just beyond the Pecos River on the east. It includes most of Chaves County and Torrance, Guadalupe and Roosevelt Counties. The Pecos River runs through the eastern side of the basin from north to south through the Refuge. Several small tributaries drain from the west to the east, with the most prominent being the Hondo River. These two systems and their interactions account for the diversity of water resources within the Refuge, including sinkholes, springs, natural wetlands, oxbow lakes, and riparian riverine habitat.

The Roswell artesian aquifer and the Pecos River provide water for agricultural, industrial, residential, and recreational use for much of southeastern New Mexico and west Texas. The Pecos River and associated wetlands provide essential breeding, wintering, and migratory habitat for a tremendous number and diversity of wildlife, including one of the highest concentrations of endangered and sensitive species in the state of New Mexico.

Groundwater quality in the source-water capture zone for springs and seeps on the Middle Tract of Bitter Lake NWR ranges in quality from fresh water of suitable quality for drinking water, domestic, irrigation, and other uses to moderately saline water (NMDGF 2004). Shallow water tables and high permeability or transitivity in aquifers are conditions influencing the frequency and severity of groundwater contamination (New Mexico Water Quality Control Commission, 2002: 85). These conditions within the local area make the Refuge spring flows highly susceptible to pollutant sources including: household septic tanks and leach fields, illegal dumping, agricultural pesticide application, and below ground oil and gas well leaks.

The seeps and springs feed approximately 1,200 acres of surface water in the form of natural playa lakes, impoundments, sinkholes and spring runs. During the hot summer months, this surface water quickly evaporates due to high temperatures and constant winds, the salts and other solids in the water do not evaporate, and rather, they concentrate if water management

prescriptions are not implemented; thus yielding negative impacts to native species due to increased salinity levels.

Implementation of any of the alternatives mentioned pertaining to this document will not change or impact water users up or downstream of the activity areas. Under alternative A, no changes will occur and water conveyance capabilities of the Rio Hondo River would remain the same. Under alternatives B or C, water flowing down the Rio Hondo River from the north (Roswell area) will exhibit a more direct route than that of the current situation, therefore experiencing less evaporation since water will have a shorter distance of travel (refer to table 2.5 above for differences between B and C). Overall linear length of the Rio Hondo River from the NW corner of the Refuge will be reduced approximately 7,000 feet in length, allowing for a more direct connection of Rio Hondo River water into the Pecos River.

In addition, when considering all alternatives, any surface water rights that may be in place on the Rio Hondo or Pecos Rivers will not be impacted by these actions. Under alternatives B and C, water will still flow down the restored Rio Hondo spring run, through the one-way water control structure and continue to the Pecos River. It is estimated that 2cfs of water (4 acre feet per day) will be flowing within the restored Rio Hondo spring run at the terminus near the Pecos River. This should be adequate to supply permitted water rights along the Rio Hondo River.

3.2 Biological Environment

The Refuge lies within a unique and significant ecological area where the Chihuahuan Desert, short grass prairie, Pecos River and the Roswell artesian basin come together. The merging of these different ecological conditions has created some unusual biological situations. For example, organisms associated with wetlands often interact with desert creatures. Bitter Lake NWR is one of the most biologically significant wetland areas of the Pecos River watershed system.

3.2.1 Vegetative Communities

Vegetation on the Refuge consists primarily of mixed Chihuahuan shrub/grassland with areas of riparian vegetation. The project area, however, occurs completely within the 1,177-acre South Tract, which is a fallow farm dominated by some remaining cultivated plants growing voluntarily and pioneer and/or invasive plant species. 500 acres of the 1,177 are currently fallow. The remainder of the South Tract is a mosaic of scattered wetlands, grasslands, Rio Hondo and Pecos River riparian zones and mixed shrub communities.

3.2.2 Wildlife

The Refuge provides habitat for a wide variety of birds, mammals, reptiles, amphibians, and fish. Attracted to the area by its abundant water supply, at least 357 species of birds have been observed on the Refuge. At least 59 species of mammals, 50 species of reptiles and amphibians, and 24 fish species have been documented on the Refuge. Managed wetlands in the project area provide food and roosting sites for sandhill cranes, waterfowl, songbirds, mammals, and other wildlife.

The Refuge typically winters over 20,000 snow geese, Ross' geese, and Canada geese, and up to 30,000 lesser sandhill cranes. Marshbird, waterbird, and shorebird populations reach over 2,500 each spring and fall.

3.2.3 Threatened and Endangered Species and Other Special Status Species

Bitter Lake NWR provides a critical role in maintaining a sanctuary for at least 27 state or federal threatened, endangered, or candidate species. These species are primarily found in the Middle tract of the Refuge and include the Pecos puzzle sunflower, Roswell springsnail, Koster's springsnail, Pecos assimineia, Noel's amphipod, Pecos bluntnose shiner, Pecos gambusia, and interior least tern.

The small spring runs that remain within the project area provide refugia for the Endangered Noel's amphipod and Threatened Pecos sunflower. The Pecos and Rio Hondo Rivers provide habitat for the Pecos sunflower and Pecos bluntnose shiner, both of which are Federally listed.

3.3 Human Environment

The Middle Pecos River and the plains of eastern New Mexico are well known for evidence of the oldest human inhabitants in the Americas. Known by archeologists as the "Clovis" and "Folsom" culture, these early hunters followed herds of large, now extinct animals which roamed the land at the end of the last glacial era. Thousands of years later, but still during prehistoric times, small semi-permanent villages of farmers dotted the landscape. Their painted pottery and tools have been found here. Nomadic bands of Mescalero Apache and Comanche people roamed the region from the 1700s or earlier, but left little evidence of their passing.

3.3.1 Cultural Resources

No recent surveys have been conducted in the immediate vicinity of the proposed action, and no sites have been recorded. Large prehistoric archaeological sites and some historic features are known to exist on other parts of the Refuge. Large block surveys have been conducted in the upland areas immediately east of the Refuge in support of oil and gas development. Those conducting these inventories have recorded numerous archaeological sites indicating extensive

prehistoric use of the area nearby and the potential for discovery of more resources through surveys. However, the project area falls within historic croplands and floodplain where ground-disturbing activities have taken place for over 100 years.

3.3.2 Socioeconomic Resources

The Refuge is located approximately nine miles from the city of Roswell, New Mexico, with a population of about 50,000. Several other small towns are also within thirty to ninety miles away. The predominant land uses in Refuge vicinity are grazing, irrigated farming, and some oil and gas development. The Roswell Chamber of Commerce lists the Refuge as one of the area's main attractions. The Refuge also plays a role in the local economy as Refuge employees typically live in the community, own property and support local businesses through routine purchases.

3.3.3 Visitor Services/Activities

Bitter Lake NWR averages approximately 35,000 to 40,000 visitors annually. Principal recreational activities include wildlife observation, hiking, photography, environmental education, and hunting. The South Tract, and thus the entire project area, is closed to public use.

3.3.4 Visual Resources

Although the South Tract does provide visual resources in the way of the Pecos River and views of the bluffs, it is closed to public use and therefore does not provide visual opportunities to the public.

3.3.5 Wilderness

The Refuge contains the 9,621-acre Salt Creek Wilderness Area, which was established under PL 91-504 on October 23, 1970. This designated wilderness, however, occurs in the North Tract of the Refuge, far removed from the project area.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of the alternatives described in Chapter 2.0 of this EA. An analysis of the effects of management actions has been conducted on the physical environment (air quality, water quality, and soils); biological environment (vegetation, wildlife, and threatened and endangered species); and socioeconomic environment (cultural resources, socioeconomic features including public use/recreation, and visual and aesthetic resource). It has been determined that the current management and its alternatives will not have impacts on climate, geology, mineral resources, and visual/aesthetic resources; therefore, there will be no further discussion of these resources in the analysis. Potential impacts to all other resources are addressed below.

The direct, indirect, and cumulative impacts of each alternative are considered in the Environmental Assessment.

- **Direct effects** are the impacts that would be caused by the alternative at the same time and place as the action.
- **Indirect effects** are impacts that occur later in time or distance from the triggering action.
- **Cumulative effects** are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by federal and non-federal agencies, as well as undertaken by private individuals. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time.

The Refuge also considered various types of impacts during the Environmental Assessment. These include beneficial and adverse impacts.

- **Beneficial impacts** are those resulting from management actions that maintain or enhance the quality and/or quantity of identified refuge resources or recreational opportunities.
- **Adverse impacts** are those resulting from management actions that degrade the quality and/or quantity of identified refuge resources and recreational opportunities.

The Environmental Assessment also evaluates the reasonably expected duration of each impacts, whether short-term or long-term.

- **Short-term impacts** affect identified refuge resources or recreational opportunities and occur during implementation of the project but last no longer.
- **Long-term impacts** affect identified refuge resources or recreation opportunities and occur during implementation of the management action and are expected to persist in the 1-5 years following implementation.

Lastly, the Refuge considered the intensity of impact when evaluating the alternatives presented in the Environmental Assessment.

- **Minor impacts** result from a specified management action that can be reasonably expected to have detectable though limited effect on identified refuge resources or recreation opportunities at the identified scale.
- **Moderate impacts** result from a specified management action that can be reasonably expected to have apparent and detectable effects on identified refuge resources or recreation opportunities at the identified scale.
- **Major impacts** result from a specified management action that can be reasonably expected to have readily apparent and substantial effects on identified refuge resources and recreation opportunities at the identified scale.

4.1 Physical Environment

4.1.1 Impacts on Air Quality

Alternative A – No Action (Current Management)

Experience has shown that the current monitoring efforts would continue to result in some minor short-term negative impacts on air quality at a local scale. Exhaust gas and fugitive dust produced by the use of maintenance machinery (e.g., tractors, mowers and trucks) may produce negative short-term direct effects to air quality. Although the need for chemical use is minimized by implementing Integrated Pest Management techniques, even stringent use of chemical herbicides for treating invasive plant species may produce some chemical drift that would also produce minor negative effects on air quality in the short-term.

Alternative B – Route 1, Excavation through upland sites

The implementation of restoration prescriptions may result in major short term negative impacts including: exhaust gas and fugitive dust from machinery during excavation of the new channel and heavy dirt work, so impacts would be greater at the start of the project. After the channel is excavated, later phases of the project would result in less impact from machinery; therefore, short term minor negative impacts would lessen in time.

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel

The implementation of restoration prescriptions may result in moderate short term negative impacts including exhaust gas and fugitive dust from machinery. In comparison to Alternative B, the intensity of the negative impacts would be decreased initially, because less excavation would be required within the historic Rio Hondo channel compared to the effort required to excavate the sandy upland stretch. As with Alternative B, later phases of the project would result in fewer impacts over time.

4.1.2 Impacts on Water Quality, Quantity and Hydrology

Alternative A - No Action (Current Management)

Implementing the current monitoring and invasive species removal efforts would continue to pose potential minor short-term negative effects to water quality. The Refuge currently treats invasive species such as salt cedar mechanically and with herbicides. Along with potential issues resultant from erosion, chemical treatment of invasive flora and fauna associated with the current management could result in minor short-term chemical pollution of water bodies. In an effort to minimize the amount of chemical drift reaching water bodies, the Refuge would continue to use Integrated Pest Management techniques to decrease the need for chemical use. Also, the Refuge implements practices including the use of Ultra Low Volume chemicals, mowing, assessment of treatment options, evaluation of chemical benefits versus negative impacts, alternating herbicides chemistries, and early detection/treatment when and where possible, to control pests with reduced chemical inputs. Under the No Action alternative, these practices would continue, thus minimizing any potential minor affects to water quality.

The potential effect of pesticide leaching into the subsurface aquifer as a result of wetland management methods should not result in any negative impacts to water quality under this alternative, since the best management practices outlined within Pesticide Use Proposal and Intra-service section 7's will be strictly followed.

Under the no action alternative, no increases in sedimentation in the Pecos or Hondo rivers associated with ground disturbance, exposed soils, and erosion would occur. There would not be a risk of inadvertent discharge of pollutants into the surface waters from construction equipment and vehicles used for restoration and burning purposes.

No permits from US Army Corps of Engineers (USACE) would be required and Environmental Protection Agency discharge permits would not be required. The Service would not need to monitor any risk to infrastructure and property and corrective actions would not be necessary. A long term monitoring program along the Pecos and Rio Hondo River's would not be implanted therefore cross sections would not be set in place and surface flows, groundwater level monitoring and channel morphology would not be measured.

Similar to Alternative B and C, the No Action Alternative would not exceed water rights held by Bitter Lake NWR or would not impact or affect the water rights of other parties as described under section 3.1.3. Bitter Lake NWR has surface and groundwater rights associated with the North Tract, Middle Unit, and the South Tract, which the State of New Mexico has recognized and allows the Service to manage its constructed wetlands and protect springs. In recent years the Service has been implementing water conservation measures as part of its management of impounded wetlands and programs to remove salt cedar.

Alternative B – Route 1, Excavation through upland sites

The implementation of restoration prescriptions may result in moderate short-term negative impacts including: potential to increase erosion/sedimentation. During early stages of project implementation (excavation of the new Rio Hondo channel and placement of structures on the restored Rio Hondo spring run) impacts would be greater compared to that of the later final stages of the effort. Short-term negative impacts would lessen in time. As an example, the amount of disturbance/herbicide needed to treat invasive plant species along the Rio Hondo channels would be reduced in time since both plant infestations would be treated initially, greatly reducing their population, which would require less mechanical and/or herbicide application disturbance during future follow-up treatments. Ultimately, native plants will be restored within the disturbed sites and non-native invasive plants will be eradicated or very limited in population size.

The proposed action would cause short-term increases in sedimentation within the Pecos and Hondo rivers associated with ground disturbance, exposed soils, and erosion. There would also be a minor risk of inadvertent discharge of pollutants into surface waters from construction equipment and vehicles that would be used during restoration and from burning of woody debris along the banks of the Rio Hondo channels. 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, 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 Pecos and Rio Hondo River's already carry during block releases and/or storm events. Dispersal of sediments within the river channels 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 salts deposited by salt cedar. Better river function can also improve the ability of the river to contend with pollutants from other sources.

The Service has an application pending with the US Army Corps of Engineers (USACE), Albuquerque District for a Section 404 permit 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. A Section 401 water quality application with the NMED SWQB is also pending.

The Service would meet the requirements of USACE Section 404 Permit and the NMED Section 401 water quality certification. The Service would obtain an NPDES permit for discharges of

herbicide 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 Refuge burn plans to avoid affecting water quality.

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

As with alternative A and C, this action would not impact or affect water rights at Bitter lake NWR or other parties as described under section 3.1.3.

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel

Same as Alternative B, except that the intensity of negative impacts would be less initially, yielding a minor short-term negative impact since less dirt work would be required to excavate the new Rio Hondo channel when compared to Alternative B. All other impacts are the same as Alternative B.

4.1.3 Impacts on Soils

Alternative A - No Action (Current management)

Under the No Action alternative, the invasion of non-native plant species would increase and continue to pose potential moderate long-term negative effects to soil quality. Minimal invasive species removal efforts would occur concerning the proposed activity areas and soil quality would continue to degrade due to increased salt cedar, phragmites, and Russian knapweed infestations. Salt cedar would continue to disperse salts throughout the soils surface as its salt laden leaves drop every fall. Salt cedar shrubs would continue to increase in size and in population number thus dispersing more salts over time. Phragmites and Russian knapweed infestation would continue to increase by exhibiting allelopathic deterrence's that do not allow native plant species to survive and/or spread within the soils adjacent to these non-native plant species.

Alternative B – Route 1, Excavation through upland sites

The implementation of restoration prescriptions may result in moderate short-term negative impacts including increased soil erosion. However, since restoration efforts will require intensified management prescriptions during the early stages compared to that of the later final stages of the effort, short term negative impacts would lessen in time. After excavation efforts have been completed, negative impacts concerning soils should be nonexistent, thus yielding moderate beneficial impacts to soil health.

An increase in native vegetation that would occur along the banks of the excavated channels would have a long-term beneficial effect on organic matter accumulation. In addition, the native perennial plants that occur on the Refuge do not have allopathic qualities like that of phragmites or Russian knapweed and do not increase surface soil salinity levels like that of salt cedar. Soil health should improve once these non-native plants have been removed.

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel

Same as Alternative B except that the intensity of the negative impacts would be less initially, yielding a minor short-term negative impact since less excavation would be required to create the new Rio Hondo channel. Also, since the channel footprint that follows the historic Rio Hondo channel occurs within areas that are more heavily infested with non-native plant species (i.e. salt cedar), Alternative C would result in the removal of a greater amount of salt cedar, yielding major long-term beneficial impacts. In comparison to Alternative B, there would be greater positive impacts over a larger area in response to restoration efforts.

4.2 Biological Environment

4.2.1 Impacts on Habitat

Alternative A -No Action (Current Management)

The current management would maintain current habitat conditions on the Refuge. Wildlife and plant diversity along riparian areas associated with the Rio Hondo channels would remain low, due to displacement of native habitat by non-native plant species. Non-native and/or non-desirable plant species would continue to yield major long-term negative impacts and would require long-term intense Integrated Pest Management practices to maintain current habitat conditions, indirectly affecting soil, water, and air quality. The expansion of native habitat and many native species (including all Federally listed pertaining to this project) would remain to be limited to the six short spring runs adjacent to the current Rio Hondo channel. Restored Rio Hondo spring flows would not be separated from current non-suitable Rio Hondo flows and an extended 1.8 mile spring run exhibiting native plants and animals suitable for six Federally listed species and several state listed species would not be created. Backwater areas exhibiting lessened channel flows during high water events beneficial to native plants and animals (including the Federally listed Pecos bluntnose shiner) would not be created and/or enhanced.

Alternative B – Route 1, Excavation through upland sites

The implementation of this alternative may result in moderate short-term negative impacts initially. However, since restoration efforts would require intensified management prescriptions during the early stages, compared to that of the later final stages of the effort, short term negative impacts would lessen in time. From the permanent plug to the end of the second interior dike road, the excavation action would impact a minimal acreage of fallow farm field (<10 acres) since the channel follows an existing, disturbed former flood control levee. From the end of the second dike road to the Pecos River, 5-7 acres of upland shrub habitat intermixed with native grassland would be impacted since the channel follows a historic river channel. These habitat types are common in the area and impacts to overall habitat quality would be minor. After excavation efforts are completed and native plants (riparian habitat) have been restored to the activity areas, negative impacts concerning habitat should be nonexistent, thus yielding moderate long-term beneficial impacts to the soil quality, habitat and wildlife utilizing the area. Along the restored Rio Hondo spring run, there would be an increase in native vegetation, natural spring runs (1.8 additional river miles), available riparian zones and increase in suitable State and Federally listed species habitat (approximately 3.61 river miles in total). This would yield moderate long-term beneficial effects to wildlife diversity, plant and animal expansion and control of non-desirable plant species.

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel

Same as Alternative B except that short-term adverse impacts would be less when excavation efforts are more intensive, yielding a minor short-term negative impact. Also, the excavation action from the end of the dike road to the Pecos River would impact <5 acres of upland and riparian habitat compared to 5-7 acres under Alternative B, since Alternative C follows an historic river channel. Even though the length of this excavated stretch would be longer when compared to Alternative B, this alternative would yield minor short-term negative impacts initially, since less excavation would be required to create the new Rio Hondo channel. In addition, an increase in suitable State and Federally listed species habitat of approximately 4.05 additional river miles (compared to 3.61 river miles for Alternative B) would yield major long-term beneficial impacts to wildlife diversity, plant and animal expansion and control of non-desirable plant species.

4.2.2 Impacts on Wildlife

Alternative A--No Action (Current Management)

The current management would continue to cause moderate short-term disturbances to native wildlife using the Refuge. However, there are some moderate long-term negative impacts to wildlife under this action including: displacement of native wildlife, decreased plant and animal diversity, loss of suitable spring habitat and negative effects to native species during flood

events. Short-term impacts would include disturbance and displacement of wildlife during small scale invasive species treatments or monitoring efforts.

Alternative B – Route 1, Excavation through upland sites

The implementation of restoration prescriptions may result in moderate short-term negative impacts including: increased soil erosion, disturbance/displacement of wildlife, decreased plant and animal diversity, increased control efforts for non-desirable plant species and limitation of native plant and animal expansion. However, since restoration efforts would require intensified management prescriptions during the early stages compared to that of the later final stages of the effort, short-term negative impacts would lessen in time. After excavation efforts are completed and native plants have been restored to the activity areas, negative impacts concerning wildlife should be nonexistent, thus yielding moderate long-term beneficial impacts to native wildlife utilizing the area. An increase in native vegetation, natural spring runs (1.8 additional river miles), available riparian zones and increase in suitable State and Federally listed species habitat (approximately 3.61 river miles), would yield moderate long-term beneficial effects to wildlife diversity, including plant and animal expansion, and control of non-native plant species.

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel

Same as Alternative B, except that an increase in suitable State and Federally listed species habitat would be approximately 4.05 river miles in length compared to 3.61 river miles in length as with Alternative B. Therefore, major long-term beneficial effects to wildlife diversity, including plant and animal expansion, and control of non-native plant species would be greater than that of Alternative B.

4.2.3 Impacts on Threatened and Endangered Species and Special Status Species

Alternative A--No Action (Current Management)

Under the No Action Alternative, habitat conditions that exist would remain the same. Noel's amphipod habitats would remain limited to the six small isolated spring runs adjacent to the current Rio Hondo Channel. High water events comprised of non-suitable water for this species would continue to inundate the occupied spring runs and designated critical habitat not allowing for species expansion, yielding major long-term negative impacts for this species. A core population concerning this species would not be established and the only core population would remain on the Middle Tract of the Refuge.

The available spring flows would not be separated from non-suitable Rio Hondo flows and an extended 1.8 mile spring run exhibiting native plants and animals suitable for six Federally listed species and several State listed species would not be created. No re-introduction efforts will be implemented concerning the Roswell springsnail, Koster's springsnail, Pecos assiminea snail, Pecos gambusia or State listed fish species. The only core populations for the Roswell

spring snail and Koster's spring snail would remain on the Middle Tract of the Refuge. Another core population of Pecos gambusia and/or Pecos assiminea snails would not be established. Additional populations of State listed greenthroat darters, Pecos pupfish, or Mexican tetras would not be established or enhanced and monitored. Steps to recovery of the species listed above would not occur under this alternative.

Backwater areas exhibiting lessened channel flows during high water events beneficial to the Pecos bluntnose shiner, Pecos pupfish, Mexican tetra and greenthroat darter would not be created and/or enhanced therefore refugia for young of year fish would remain limited.

Pecos sunflower habitat would continue to decline as non-native plant species encroachment increases, displacing Pecos sunflower habitat. Pecos sunflower population densities on the South Tract would remain lower than objectives outlined within Pecos Sunflower Recovery Plan (2005) and no recovery actions would be implemented concerning this project; thus a 2nd core population of this species would not be created adjacent to the Middle Tract population.

Alternative B – Route 1, Excavation through upland sites

The implementation of restoration prescriptions would result in minor short-term negative impacts to 1.8 river miles of intermittently occupied Pecos sunflower habitat (i.e. along the restored Rio Hondo spring run) but will ultimately yield moderate long-term beneficial impacts to this species. Therefore, major long-term beneficial impacts would apply when considering expansion of the, Noel's amphipod, Roswell Springsnail, Koster's spring snail, Pecos assiminea snail, Pecos gambusia, Mexican tetra, greenthroat darter and Pecos pupfish into restored areas.

This project alternative would re-route the Rio Hondo away from the six spring runs/vents (< 5 meters in length) that are currently designated as critical habitat for and occupied by the Noel's amphipod, preventing the non-suitable water in the current Rio Hondo channel from inundating the springs and expand approximately 1.8 river miles of suitable habitat for the amphipod. The introduction of additional populations throughout the restored Rio Hondo spring run and the newly excavated portions of the new Rio Hondo channel would bring these species closer to recovery. In particular, populations of the four invertebrates (Noel's amphipod, Roswell springsnail, Koster's spring snail, and Pecos assiminea) would see a major long-term benefit as they have extremely limited opportunities for population expansion.

Non-native plant species such as salt cedar, Russian knapweed, perennial pepperweed, and phragmites would be removed from the banks of all activity areas (approximately 3.61 river miles) where present. Minor short-term negative impacts would occur to sunflower during the initial herbicide application or mechanical removal efforts; however, removing the non-native plant species component would yield moderate long-term benefits to the Pecos sunflower, which at this time unsuccessfully competes for resources alongside these invasive plant species. Pecos

sunflower population densities on the South Tract would increase in time and the population would ultimately meet objectives outlined within the Pecos Sunflower Recovery Plan (2005). Approximately 1.06 river miles of additional suitable Pecos sunflower habitat would be created and a 2nd core population of this species would exist adjacent to the Middle Tract population.

Pecos gambusia would be removed from healthy core populations on the Middle Tract of the Refuge and stocked into the 1.8 mile restored Rio Hondo spring run. Minor short-term negative impacts would occur to this species concerning the stocking source site; however, major long-term benefits would occur concerning the population as a whole. A 2nd core population of this species would be created adjacent to the Middle Tract population.

Roswell springsnails, Koster's springsnails and Pecos assiminea snails would be removed from healthy core populations throughout the Middle Tract of the Refuge and stocked throughout the restored Rio Hondo spring run until viable populations exist. Minor short-term negative impacts would occur to these species concerning the stocking source sites but major long-term benefits would occur concerning the population as a whole. A 2nd core population of these species would be created adjacent to the Middle Tract population.

Approximately 1.81 river miles of backwater areas exhibiting lessened channel flows during high water events, yielding moderate long-term beneficial impacts to the federally listed Pecos bluntnose shiner would be created (refer to Project Description Map). This includes an estimated 1.06 river mile stretch of the new Rio Hondo channel that would extend across an upland site to the Pecos River and the .75 river mile stretch at the end of the restored Rio Hondo spring run. In addition, 1.80 river miles of the restored Rio Hondo spring run would provide major long-term beneficial habitat for the Mexican tetra, Pecos pupfish and greenthroat darter. The greenthroat darter would be re-introduced into the restored Rio Hondo spring run with the stocking source being the occupied spring runs within the Middle Tract of the Refuge. The Mexican tetra and Pecos pupfish currently occupy all channels within the activity area and would benefit from all activities proposed under this alternative.

Endangered Species Act requirements have already been addressed and concurred upon through the Intra-service Section 7 process (Consultation No. 02ENNM00-2013-F-0057).

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel

Same as Alternative B except that 4.05 river miles of invasive plant species would be removed from the banks of activity areas compared to 3.61 river miles under Alternative B. This would yield major long-term beneficial impacts to the Pecos sunflower, since more available suitable habitat (1.50 river miles) would be created adjacent to the new Rio Hondo channel, compared to 1.06 river miles of suitable habitat created under Alternative B. Also, approximately 2.25 river miles of backwater areas yielding major long-term beneficial impacts for the Federally listed

Pecos bluntnose shiner would be created, compared to 1.81 river miles created under Alternative B. The 2.25 river mile stretch includes the 1.50 river mile new Rio Hondo channel and the .75 river mile stretch at the end of the restored Rio Hondo spring run.

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 would be maintained.

Alternative B– Route 1, Excavation through upland sites

There are no anticipated direct or indirect impacts to cultural resources since the site is already heavily disturbed; however, a cultural resources review per FWS and State of New Mexico requirements will be conducted on the chosen route.

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel There are no anticipated direct or indirect impacts to cultural resources since the site is already heavily disturbed; however, a cultural resources review per FWS and State of New Mexico requirements will be conducted on the chosen route.

4.3.2 Impacts on Socioeconomics

Alternative A--No Action Alternative

Under the No Action Alternative, the economic and social condition of the area would remain the same. The Refuge as a whole would continue to be one of the area's main attractions. The presence and operation of the Refuge provides minor short-term beneficial impacts to the surrounding communities within a 30-mile radius in several directions. The Refuge attracts local, national, and some international visitors and by attracting visitors to the area, the Refuge generates revenue for the local economy. Much of the Refuge's annual budget is recycled into local businesses through Refuge staff, purchases of equipment and supplies, as well as contracts for local labor to accomplish Refuge projects. The Refuge provides full-time employment for 11 individuals that live in nearby communities.

Alternative B – Route 1, Excavation through upland sites

The implementation of restoration prescriptions would result in a moderate short-term economic benefit to the local economy when compared to Alternative A. Restoration efforts would provide dike building, water conveyance and other dirt work to local contractors and/or vendors during the initial stages of the project. Materials, equipment, and fuel would be purchased from

surrounding vendors when excavating channels, building low water crossings and placing water control structures on the Refuge South Tract. Native seeds, native plants and herbicides would also be purchased from surrounding vendors, providing revenue to the local economy. Initially, benefits to the local economy would be high when compared to Alternative A.

Alternative C – Route 2, Excavation through portions of historic Rio Hondo channel

This alternative would result in similar impacts to the local economy as with Alternative B. Initially, benefits to the local economy would be greater when compared to Alternatives A and B. More salt cedar removal efforts will be implemented, resulting in a greater amount of herbicide, spray equipment and fuel purchased locally, yielding a major short-term benefit when compared to Alternatives A and B.

4.3.3 Impacts on Visual Resources

Although the South Tract does provide visual resources in the way of the Pecos River and views of the bluffs, it is closed to public use, and therefore does not provide visual opportunities to the public and will not impact visual resources.

4.3.4. Impacts on Wilderness Values

This designated Wilderness occurs in the North Tract of the Refuge, which is far removed from the project area; therefore, there will be no impact to wilderness values.

4.4 Assessment of Cumulative Impacts

A cumulative impact is defined as an impact on the environment that results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can “accumulate” spatially, when different actions affect different areas of the same resource. They can also accumulate over the course of time, from actions in the past, the present, and the future. Occasionally, different actions counterbalance one another, partially cancelling out each other’s effects on a resource. However, more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource.

This analysis considered an area larger than the Refuge, within the Pecos River Valley, as well as considering cumulative impacts resulting from the variety of projects (past, present, and

reasonably foreseeable) occurring on private, state, and other federal lands in the area. The Refuge is primarily surrounded by Bureau of Land Management owned land. Other adjacent landowners include State and privately owned properties. According to county data, the primary land uses within the area include farming and livestock grazing. Other nearby lands includes the Bottomless Lakes State Park to the south of the Refuge.

Bitter Lake NWR is approximately five miles northwest from Bottomless Lakes State Park, the first state park in New Mexico. Bottomless Lakes State Park is primarily managed for recreation including hiking, fishing, swimming, and scuba diving. The Bureau of Land Management (BLM) also manages about 1.4 million acres of public land near the project area through the Roswell Field Office. The BLM has recent environmental assessments documenting activities such as noxious weed treatments, prescribed fire activities, rangeland improvement projects, and restoration efforts. Salt cedar removal efforts are currently occurring throughout the Pecos River Valley by all public entities mentioned above. The Refuge itself is in the process of carrying out salt cedar treatment in an effort to restore areas along the Pecos River.

Cumulative Impacts to the Physical Environment

Farming operations occurring on adjacent lands likely involve use of farming equipment and chemicals which would cause far more impacts to the physical environment when compared to the results of Alternatives A, B or C of this EA. Because farming and grazing are the primary land uses within the county, it is expected that these activities have the potential to result in the same types of affects to air quality, water quality, water quantity, and soils as the alternatives analyzed in this EA. Salt cedar removal efforts and noxious weed treatments occurring in the nearby area (including on the Refuge) may include chemical and mechanical treatment methods, which could involve ground disturbance, chemical use, and heavy equipment use. Such actions may result in emissions, dust, and chemical drift similar to that of the alternatives analyzed in this EA. When these external factors are added to the similar environmental effects produced by each of the activities mentioned, the net effect is still expected to be minor due to the use of best management practices on the Refuge and short duration of disturbance in which Alternatives B or C creates.

Cumulative Impacts to the Biological Environment

There are activities occurring on nearby lands with the potential to affect wildlife, threatened and endangered species, and habitat which includes: grazing, weed control efforts, prescribed fire, rangeland improvement, and restoration efforts. The range of alternatives in this EA considers two excavation routes: one being shorter and extending across upland sites and the other following the (dry) historic Rio Hondo channel. All of these activities provide benefits to the biological environment with some short term negative side effects. Alternative C, the proposed action, involves re-routing the new Rio Hondo channel through portions of the historic Rio Hondo channel with minimal excavation concerning the historic portions and removal of an

increased amount of non-native plant species. When added to restoration activities occurring on nearby BLM lands, the collective beneficial impact to habitat and indirectly to wildlife would be moderate in the larger context. In addition, the salt cedar removal efforts also occurring on the Refuge would add to the proposed action to provide benefits to the quality of habitat provided on the Refuge.

Cumulative Impacts to the Human Environment

The Refuge will maintain the current conditions of cultural resources under all of the management alternatives, and no cumulative impacts to cultural resources are anticipated through any of the actions. Under each of the alternatives, there are positive effects to the local economy due to restoration efforts. While very minimal money would be spent on restoration related activities under Alternatives A through long-term efforts, increased spending would occur to support restoration efforts like dike building or weed control under Alternatives B or C, with C providing increased support. Overall, Alternatives A, B or C will provide some beneficial impacts to socioeconomic resources at various scales and intensities. Activities like rangeland improvement projects and restoration efforts occurring on nearby lands will add to these beneficial impacts to socioeconomics. Therefore, the cumulative impact to the human environment is expected to be beneficial.

4.5 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations; February 11, 1994) was designed to focus the attention of Federal Agencies on the environmental and human health conditions of minority and low-income populations, with the goal of achieving environmental protection for all communities. The order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations. The order is intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low income communities with access to public information and opportunities for participation in matters related to human health and the environment.

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

4.6 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 from implementation of either alternative described in the EA.

4.7 Unavoidable Adverse Effects

None of the alternatives would result in any unavoidable adverse impacts to Refuge resources. Restoration operations may result in some short-term disturbance to migratory and resident wildlife initially, but these impacts are expected to be negligible.

4.8 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 or 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.

None of the alternatives would result in a large commitment of nonrenewable resources. Project implementation would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by heavy equipment and vehicles. The Service would implement best management practices to minimize potential negative impacts.

4.9 Table 1 - Summary of Environmental Effects by Alternative

<u>Environmental Resource</u>	<u>Alternative A</u> Current Management	<u>Alternative B</u> Route 1, Excavation through upland site	<u>Alternative C</u> Route 2, Excavation through portions of historic Rio Hondo Channel (Proposed Action)
Impacts to Air Quality	Minor short-term adverse impacts (current management capability)	Major short-term adverse impacts (excavation/invasive spp. removal); Minor short-term adverse impacts (after restoration)	Moderate short-term adverse impacts (excavation/invasive spp. removal); Minor short-term adverse impacts (after restoration)
Impacts to Water Quality, Quantity and Hydrology	Minor short-term adverse impacts (current management capability)	Moderate short-term adverse impacts (excavation/invasive spp. removal); Major long-term beneficial impacts (after restoration)	Minor short-term adverse impacts (excavation/invasive spp. removal); Major long-term beneficial impacts (after restoration)
Impacts to Soils	Moderate long-term adverse impacts (current management capability)	Moderate short-term adverse impacts (excavation/invasive spp. removal); Moderate long-term beneficial impacts (after restoration)	Minor short-term adverse impacts (excavation/invasive spp. removal); Major long-term beneficial impacts (after restoration)
Impacts on Habitat	Major long-term adverse impacts (current management capability)	Moderate short-term adverse impacts (excavation/invasive spp. removal); Moderate long-term beneficial impacts (after restoration)	Minor short-term adverse impacts (excavation/invasive spp. removal); Major long-term beneficial impacts (restoration)

<u>Environmental Resource</u>	<u>Alternative A</u> Current Management	<u>Alternative B</u> Route 1, Excavation through upland sites	<u>Alternative C</u> Route 2, Excavation through portions of historic Rio Hondo Channel (Proposed Action)
Impacts on Wildlife	Moderate short-term disturbances and moderate long-term adverse impacts (current management capability)	Moderate short-term disturbances (excavation/invasive spp. removal); Moderate long-term beneficial impacts (after restoration)	Moderate short-term disturbances (excavation/invasive spp. removal); Major long-term beneficial impacts (after restoration)
Impacts on Threatened and Endangered Species	Major long-term adverse impacts (current management capability)	Minor short-term adverse impacts (excavation/invasive spp. removal); Moderate long-term beneficial impacts (after restoration - Pecos sunflower and Pecos bluntnose shiner); Major long-term benefits (after restoration - all four federally listed invertebrates, all state listed species and Pecos gambusia)	Minor short-term adverse impacts (excavation/invasive spp. removal); Major long-term beneficial impacts (after restoration – all seven federally listed species and all state listed species)
Impacts on Cultural Resources	Maintain current conditions	Maintain current conditions	Maintain current conditions

Impacts on Socioeconomic Resources	Minor short-term beneficial impacts (current management capability)	Moderate short-term beneficial impacts (excavation/invasive spp. removal); Minor long-term beneficial impacts (after restoration)	Minor short-term adverse impacts (excavation/invasive spp. removal); Moderate long-term beneficial impacts (after restoration)
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5.0 CONSULTATION, COORDINATION AND DOCUMENT PREPARATION

5.1 Agencies and individuals consulted in the preparation of this document include:

Document prepared by Division of Planning Staff, National Wildlife Refuge System, Southwest Region, Albuquerque, New Mexico, and Refuge Staff, Bitter Lake National Wildlife Refuge, U.S. Fish and Wildlife Service, Roswell, New Mexico.

Table 1. List of Preparers involved in the Draft EA.

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Floyd Truetken	Refuge Manager
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