ENVIRONMENTAL ASSESSMENT FOR UPPER CARSON SLOUGH RESTORATION AND TRAIL SYSTEM PROJECT AT ASH MEADOWS NATIONAL WILDLIFE REFUGE

EA 84550-13-01

Submitted to:

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Ash Meadows National Wildlife Refuge Background

Ash Meadows is a unit of the National Wildlife Refuge System. Unlike most U.S. Fish and Wildlife Service (USFWS) Refuges, Ash Meadows was created to "conserve and recover listed endangered, proposed endangered, and candidate plant and animal species found in the area" (USFWS 1984). Ash Meadows National Wildlife Refuge is a unit of the Desert National Wildlife Refuge Complex (the Refuge). The Refuge encompasses more than 23,000 acres (ac) (9,308 hectares [ha]) and provides habitat for at least 27 plant and animal species found nowhere else in the world. This distinguishes Ash Meadows as having the greatest concentration of endemic species of any area in the United States. Both a recovery plan (USFWS 1990) and conservation plan (USFWS 2009a) have been developed to aid in the recovery of listed species and their habitats.

1.2 Purpose for Taking Action

The purpose of the Proposed Action is to allow the Refuge to comply with the National Wildlife Refuge System Improvement Act of 1997 "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."

More specifically, the 2009 Desert Wildlife Refuge Complex Comprehensive Conservation Plan and Environmental Impact Statement (CCP EIS) (USFWS 2009a) calls for the implementation of a variety of management decisions that are intended to improve habitat for endemic species throughout the Refuge and increase visitor services (proposed project). These management decisions include restoring and maintaining viable populations of endemic and threatened and endangered species, and restoring and maintaining the ecological integrity of natural communities within the Refuge.

This Environmental Assessment (EA) is intended to tier to the CCP EIS and provide additional detail and analysis for specific management activities. The management activity addressed in this EA is the restoration of the Upper Carson Slough. Figure 1 shows the location of the proposed project in relationship to Refuge boundaries. Because implementation of the proposed project would directly meet goals 1 and 2 of the CCP EIS for the Refuge (USFWS 2009a), the proposed project achieves compliance with planning on local and national levels and would ultimately allow for more complete protection and restoration of endemic, endangered, and rare organisms.

1.3 Need for Taking Action

Restoration and maintenance of viable wildlife populations, coupled with restoration and maintenance of ecological integrity for natural communities, were identified in the CCP EIS as management goals. However, these goals have not yet been met and specific actions have not yet been taken. Specific actions identified in the CCP EIS include managing, monitoring, and restoring Refuge habitats (USFWS 2009a).

Springs at the Refuge have been severely impacted by historic anthropogenic activity. Restoration of spring habitats is a critical component in restoration efforts, particularly for endemic fish and invertebrate populations (USFWS 1985, 1990, 2009a). The *Recovery Plan for the Endangered and Threatened Species of Ash Meadows, Nevada* lists habitat alteration and exotic species as major threats to listed species (USFWS 1990). The primary objective of the Refuge and its recovery plan is to recover the listed species and their habitats through an ecosystem approach focusing on habitat restoration and the removal of threats. Restoration of springs and historic stream flows is identified as a key element in the recovery of Refuge species.

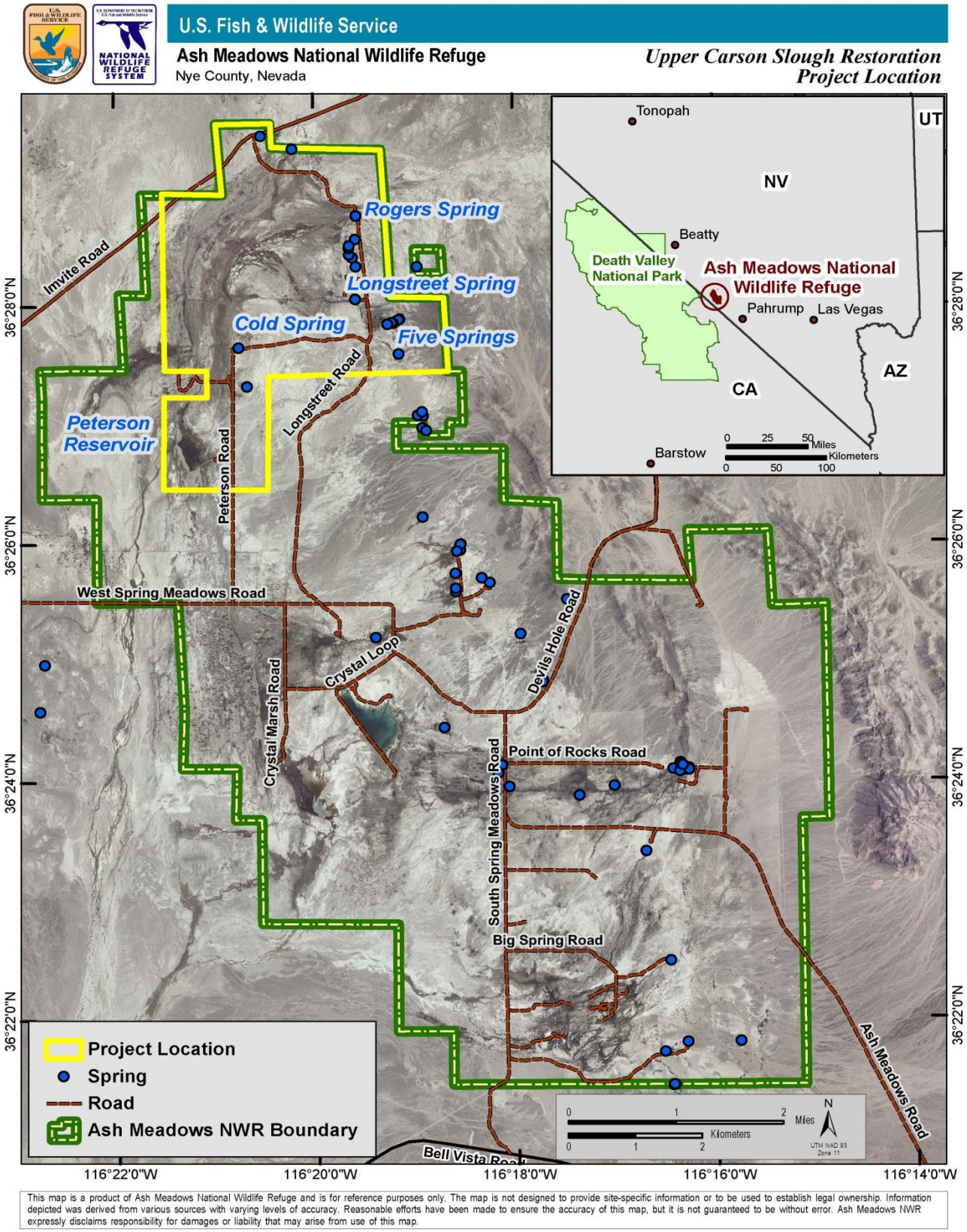

Figure 1. Location of Proposed Project, Ash Meadows National Wildlife Refuge.

The Carson Slough is the major artery of the Refuge ecosystem and the receiving end of a 385-square-mile (997-square-kilometer [km]) watershed, but anthropogenic alteration of hydrologic processes has resulted in the loss of ecosystem functions. The Upper Carson Slough was drained in the early 1960s, mined for peat, then leveled, tilled and converted to farm fields. The springs feeding into the slough were diverted into irrigation ditches. Numerous dams, levees, roads, and other obstructions to natural flow were constructed. Nonnative aquatic species were introduced, at least two or three endemic species went extinct, and the Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*) was extirpated from the entire Upper Carson Slough and its spring systems. Vegetation communities have also been altered with the introduction of nonnative and invasive species that often form monocultures and threaten endemic plants.

The outflow channels of Fairbanks Spring and Soda Spring, the first springs to feed into the Carson Slough, and the lower third of the combined Rogers Spring and Longstreet Spring outflows were restored in 2010. This resulted in 4.7 miles (7.7 km) of restored channel, which—coupled with the eradication of nonnative convict cichlids (*Archocentrus nigrofasciatus*) from the Fairbanks Spring and outflow in 2008—enabled the Refuge to reintroduce the Ash Meadows speckled dace into the Upper Carson Slough for the first time in more than 50 years. Also, in preparation for additional hydrological restoration, approximately 200 ac of nonnative saltcedar (*Tamarix* spp.) were extracted from the Upper Carson Slough. In 2011 nonnative sailfin mollies (*Poecilia latipinna*) were eradicated from the Longstreet Spring system.

The upper sections of Rogers Spring and Longstreet Spring outflows are still largely in irrigation ditches that provide little or no habitat and are in need of restoration as discussed in the CCP EIS. The Longstreet Spring has been enlarged and altered to the point that habitat conditions favor invasive cattail (*Typha* sp.) and nonnative bullfrogs (*Lithobates catesbeiana*) over sedges (*Carex* spp.) and native fish. Five Springs has been seriously altered by channelization and exploration for additional water conducted with heavy equipment. Cold Spring was also developed to provide irrigation to the agricultural fields.

In addition to altered springs, there are approximately 11 miles (18 km) of barriers to the natural flow through the Upper Carson Slough. These barriers consist of roads, dams, berms and irrigation ditches. (Most irrigation ditches are now dry, but portions of the current flows from Rogers Spring and Longstreet Spring are in ditches included in this total.) The largest barrier to restoration of the natural hydrology and a fully functioning wetland is Mud Lake Dam, which hinders the principal drainage into the Carson Slough. The dam is located adjacent to the Refuge boundary on federal lands administered by the Bureau of Land Management (BLM). Infrequent and high-magnitude floods, especially from the Mud Lake drainage, sustain aquatic habitat in the Upper Carson Slough by scouring vegetation, transporting sediment, and creating new stream channels. Flood events also transport coarse sediment into the stream channels. Transport and renewal of coarse sediment to the stream channels creates and maintains habitat for aquatic invertebrates and refreshes breeding substrate for native fish species. Although the dam does not impede or influence the frequency and magnitude of flood events due to a large breach in the dam, the location of the breach results in flows being directed toward the Fairbanks sub-basin instead of directly into the Rogers sub-basin where flows were routed naturally prior to dam construction. Because sediment is deposited behind the dam during floods, it has become not only a seed trap, but a seed source for nonnative species such as saltcedar and fivehorn smotherweed (*Bassia hyssopifolia*), which then disperse downstream into the Carson Slough. The Refuge has invested time and funding to control these species throughout the Refuge. The Refuge will continue to work with the BLM Las Vegas Field Office to control non-native vegetation and future actions regarding Mud Lake Dam.

In preparation for this multiyear restoration project, detailed elevation data were obtained to determine landscape alteration and aid in describing historic conditions in unaltered areas. Land-based topographic surveys were completed and channel alignments were determined. Hydrologic and hydraulic analyses were also completed and barriers to flow needing removal were identified. All proposed actions have been, and will continue to be, reviewed and approved by the Ash Meadows Recovery Implementation Team (AMRIT), which

consists of representatives from the Nevada Department of Wildlife (NDOW); U.S. Fish and Wildlife Service, Southern Nevada Field Office; U.S. Fish and Wildlife Service, Desert National Wildlife Refuge Complex Office, and Ash Meadows National Wildlife Refuge; U.S Geological Survey (USGS), Desert Research Institute (DRI); and Southern Oregon University.

The following management plans guide the proposed restoration and recovery actions: *Recovery Plan for the Endangered and Threatened Species of Ash Meadows, Nevada* (USFWS 1990), *Ash Meadows Geomorphic and Biological Assessment: Final Report* (OBEC SEC 2006), *Desert National Wildlife Refuge Complex – Ash Meadows, Desert, Moapa Valley, and Pahranagat National Wildlife Refuges: Final Comprehensive Conservation Plan and Environmental Impact Statement* (USFWS 2009a), and the *Draft Upper Carson Slough: Restoration Plan* (OBEC 2011).

1.4 Decision to Be Made by the Responsible Official

Based on the analysis documented in this draft EA, the Assistant Regional Director of Refuges, Pacific Southwest Region, must determine whether the proposed action would have a significant effect on the quality of the human environment. If the selected alternative has no significant impacts, a Finding of No Significant Impact (FONSI) will be prepared.

1.5 Scoping and Public Review of the Draft EA

The CCP EIS outlined the goals and objectives to be accomplished, as well as strategies anticipated to be employed, by the Refuge over the next 15 years, including future restoration efforts. Public meetings to obtain comments on the CCP EIS were held in Las Vegas, Amargosa Valley, Pahrump, Alamo, and Moapa, Nevada, August 4–6, 2008.

In an effort to coordinate with agencies and other stakeholders, Symposia on Ecological Investigations and Restoration Planning took place in February 2008, February 2009, and February 2010. Each year, more than100 researchers, multiagency staff, governmental partners, and local community members attended. The springs restoration plan and design was open to attendees for comments and discussion, with plan and design changes implemented on a collaborative basis.

Following a notice in the Pahrump, Nevada, newspaper, the Refuge opened a 30-day comment period for the proposed project on 01/30/2013. The public comment period was extended to 03/25/2013. The draft EA was available to the public on the Refuge's website and at the Refuge Office. We received one comment letter and four emails with comments. We made one change to the project description. Action number 9, the removal of the decommissioned Mud Lake Dam, is no longer part of our proposed action. The project description and impact analysis have been updated accordingly. Appendix A contains our response to comments received on the draft EA.

On October 18, 2011, the culturally affiliated Nuwuvi (Southern Paiute) and Newe (Western Shoshone) nations participated in a presentation and discussion about planned interpretation and restoration projects for the Refuge, which included the Upper Carson Slough project area. Information and concerns expressed during this meeting were incorporated into the proposed project.

As part of additional scoping efforts, the Refuge hosted three meetings in the community to discuss transportation alternatives within the Refuge. The alternatives discussed included the trail system that is part of the proposed project. The first of these meetings was held locally on March 11, 2010, with the two subsequent meetings held on November 3, 2010. Comments on the proposed trail system were solicited from the public at these meetings.

Issues were identified during scoping by the public, tribes, Refuge staff, consultants, and other agency personnel. These issues included questions and comments regarding threatened and endangered species, air quality, cultural resources, recreation, migratory birds, and wetlands. These issues are analyzed in this EA to determine whether significant impacts would occur to these resources resulting from the proposed project and to compare them with a baseline condition of No Action.

2.0 ALTERNATIVES

2.1 Alternative A (No Action)

Under the No Action Alternative, or Alternative A, no hydrological restoration or trail construction would take place. Restoration of habitat and recovery of species dependent on that habitat would not occur. Efforts to downlist and delist threatened and endangered species would not be as effective without the restoration of the required habitats that are currently degraded or lacking altogether. Habitats for some species could continue to degrade to the point of extinction. None of the eight objectives for species recovery outlined in the recovery plan (USFWS 1990) for threatened and endangered species would be met for the Upper Carson Slough portion of the Refuge. As a result, exotic plants and nonnative organisms would continue to dominate Refuge habitats vital to endemic species for the foreseeable future.

The Refuge would continue to manage threatened and endangered species and habitat as they have in the recent past. Cattails would be removed and Aquatic Invasive Species (AIS) would be trapped as time and staffing allowed.

2.2 Alternative B (Proposed Action)

Alternative B would allow five of the eight objectives outlined in the recovery plan (USFWS 1990) for threatened and endangered species on the Refuge. Components of the preferred alternative aim to restore hydrologic processes (sediment transport, stream channel scour, overland flow) and improve ecosystem function for native species. A proposed trail system would allow visitors to experience and learn about the area while minimizing potential impacts. Figure 2 provides an overview of the proposed hydrologic modifications and Figure 3 illustrates approximate trail routes. More specifically, components of the preferred alternative include the following actions:

1. Restore the spring pool at Longstreet Spring to natural size and shape.

2. Remove irrigation pipe from Rogers Spring to prevent unnatural seepage.

3. Restore the outflow channels from Longstreet Spring and Rogers Spring.

4. Install removable fish barriers on Rogers Spring and Longstreet Spring outflow channels, as well as a discharge measurement trench on Longstreet Spring channel.

5. Remove all remaining ditches, berms, and unnecessary roads that act as hydrologic barriers within the Upper Carson Slough.

6. Restore the outflow channel from Cold Spring.

7. Restore the outflow channel from Five Springs and replace the culvert that presently conveys flows from

Five Springs beneath the Longstreet Road.

8. Remove the northwest berm at Peterson Reservoir, reducing the overall size of the reservoir while maintaining approximately the same amount of open water (approximate current water level will be maintained).
9. Construct a network of backcountry hiking trails, leading visitors through the unique restored riparian and wetland areas of the Upper Carson Slough.

All of the components of the preferred alternative could reasonably be implemented within a 5-year period. Funding is currently available for items 1–5 (listed above), and the USFWS is actively seeking funding to complete all of the remaining components.

The remainder of Section 2 provides detailed descriptions for each of the components of the preferred alternative.

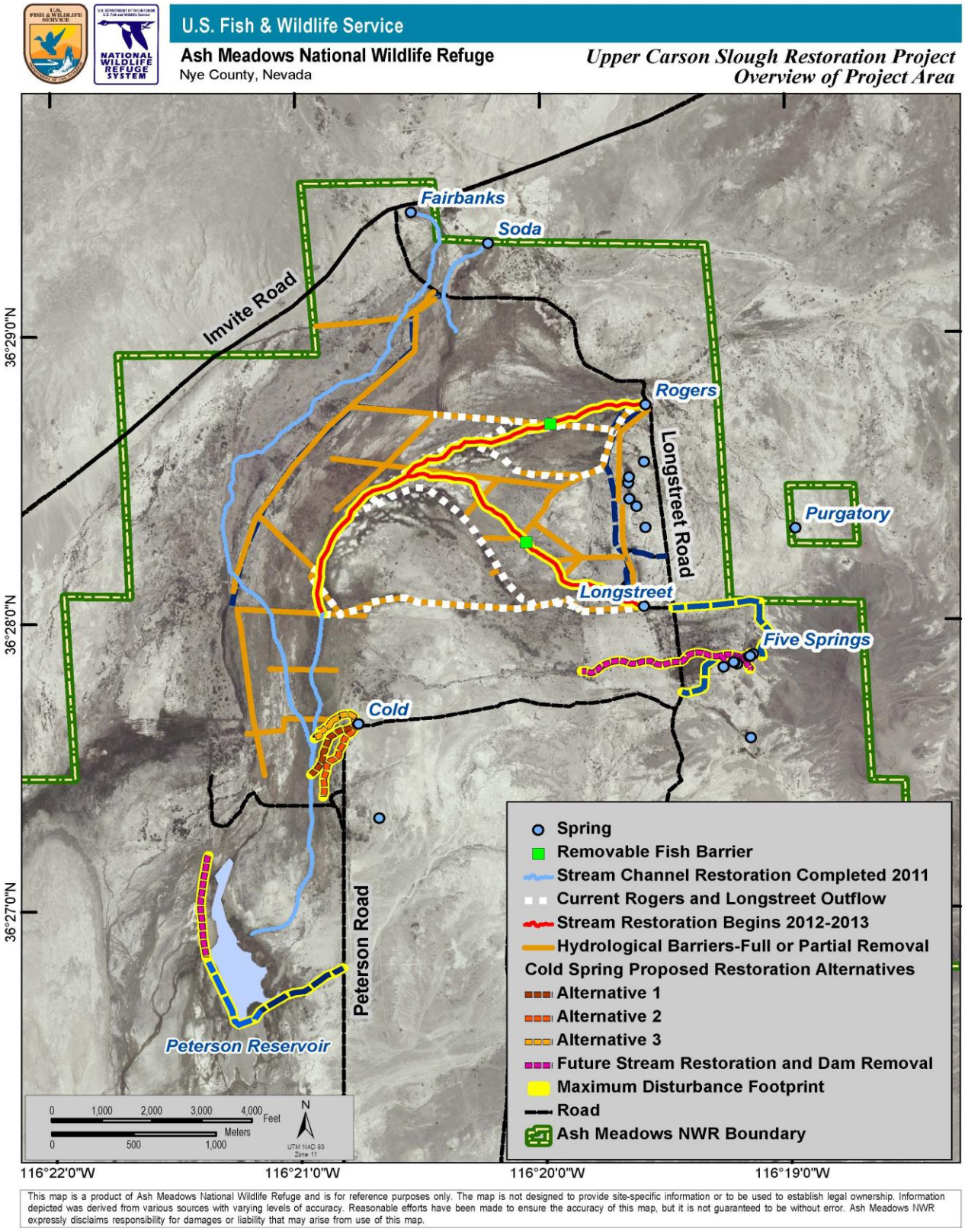

Figure 2. Upper Carson Slough Project Area Overview.

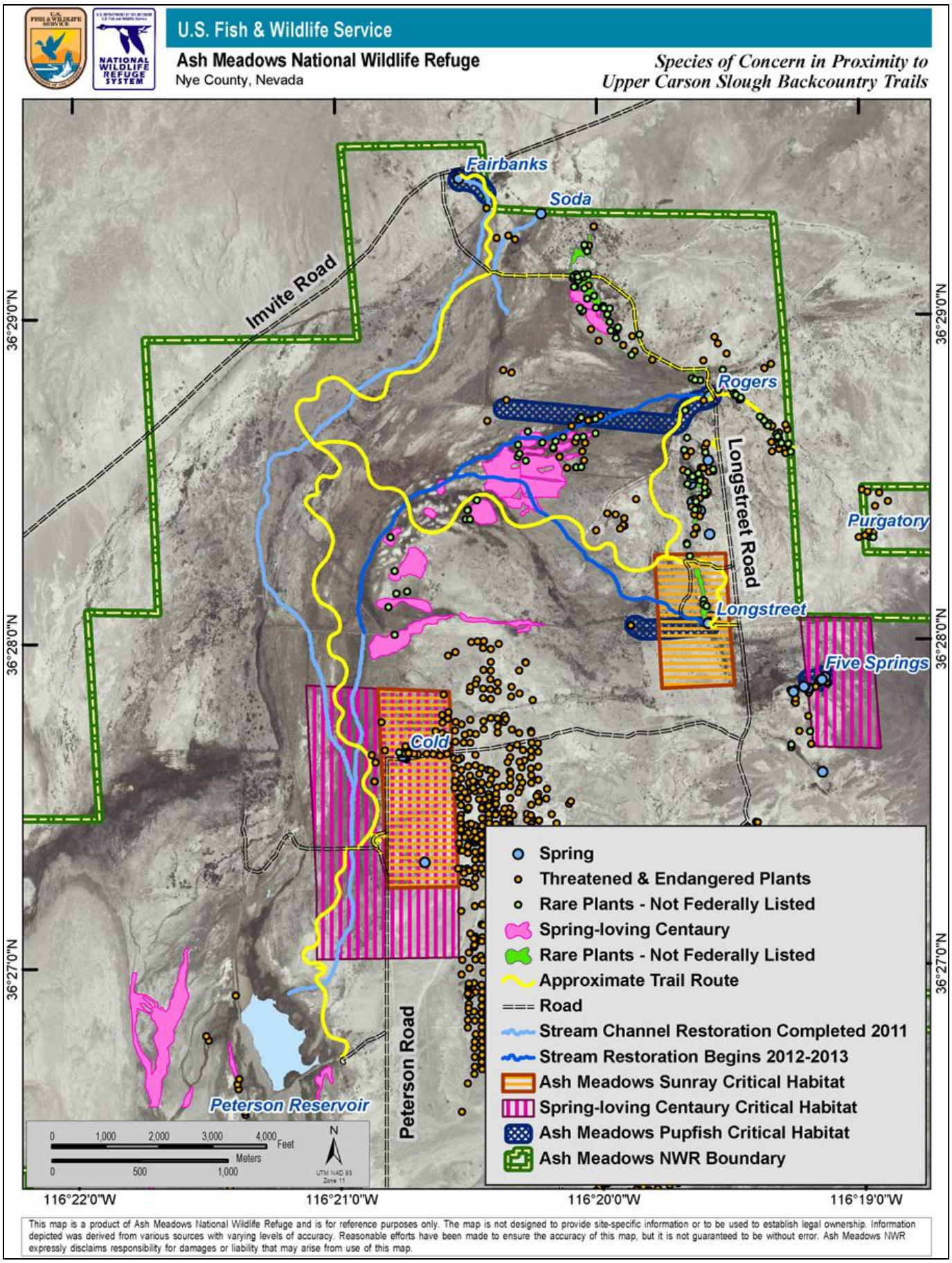

Figure 3. Upper Carson Slough Approximate Trail Routes.

2.2.1 Restore Longstreet Spring

Figure 4 provides a detailed illustration of the Rogers Spring–Longstreet Spring action area. At present, the Longstreet Spring source pool is excessively large due to anthropogenic modification, with an average diameter of 61 feet (ft) (approximately 70 ft x 55 ft) (19 meters [m]; 21 m x 17 m) and a maximum depth of 8.6 ft (2.6 m). Excavation of the Longstreet Spring source associated with water development activities prior to Refuge establishment increased the surface area of the source pool. Increased pool volume and surface area have resulted in increased residence time and increased heat loss. In addition, excavation of the spring source created shallow water habitat at the periphery. The shallow water promotes cattail colonization of the source pool. The combination of dense cattail growth and shallow water supports high densities of nonnative aquatic species including crayfish and bullfrog. Prior to eradication efforts at Longstreet Spring in 2011, the shallow water also provided breeding habitat for nonnative fish. Conserving the thermal characteristics of the water associated with a decreased residence time would result in increased thermal habitat downstream from the spring source. This is most important for the recovery of thermal endemic aquatic species that inhabit the Longstreet Spring and outflow channel.

The average discharge rate for Longstreet Spring, which has been declining slightly since 1993, is 2.33 cubic feet per second (cfs). Gourley and Ammon (1997), in their study of the restoration of Kings Spring at the Refuge, developed a chart comparing spring pool diameter to discharge rate for several spring pools. According to their study, Longstreet Spring should have an average diameter no greater than 30 ft (9 m), indicating that the pool is at least twice as large as it should be.

Prior to reducing the diameter of the spring source pool, the existing water monitoring flume will be removed and the spring source outlet will be shaped with large rocks in order to maintain the desired water level in the spring pool and create the desired aquatic habitat characteristics in the spring source outlet and outflow channel.

The spring pool diameter and volume will be reduced by placing large, locally derived boulders or rock/caliche slabs. The large rocks will be placed in an interlocking pattern and the interstitial space will be filled with gravel and sand to minimize cavities inhabitable by crayfish. The reconstructed spring pool diameter will be approximately 20–30 ft (6–9 m) in diameter. Large rocks will be placed in a manner that creates both vertical and horizontal surfaces below the water surface for the promotion of algal and aquatic invertebrate growth. These surfaces will also provide breeding territories for the Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*). This same restoration technique was used successfully at Kings Spring in 1997.

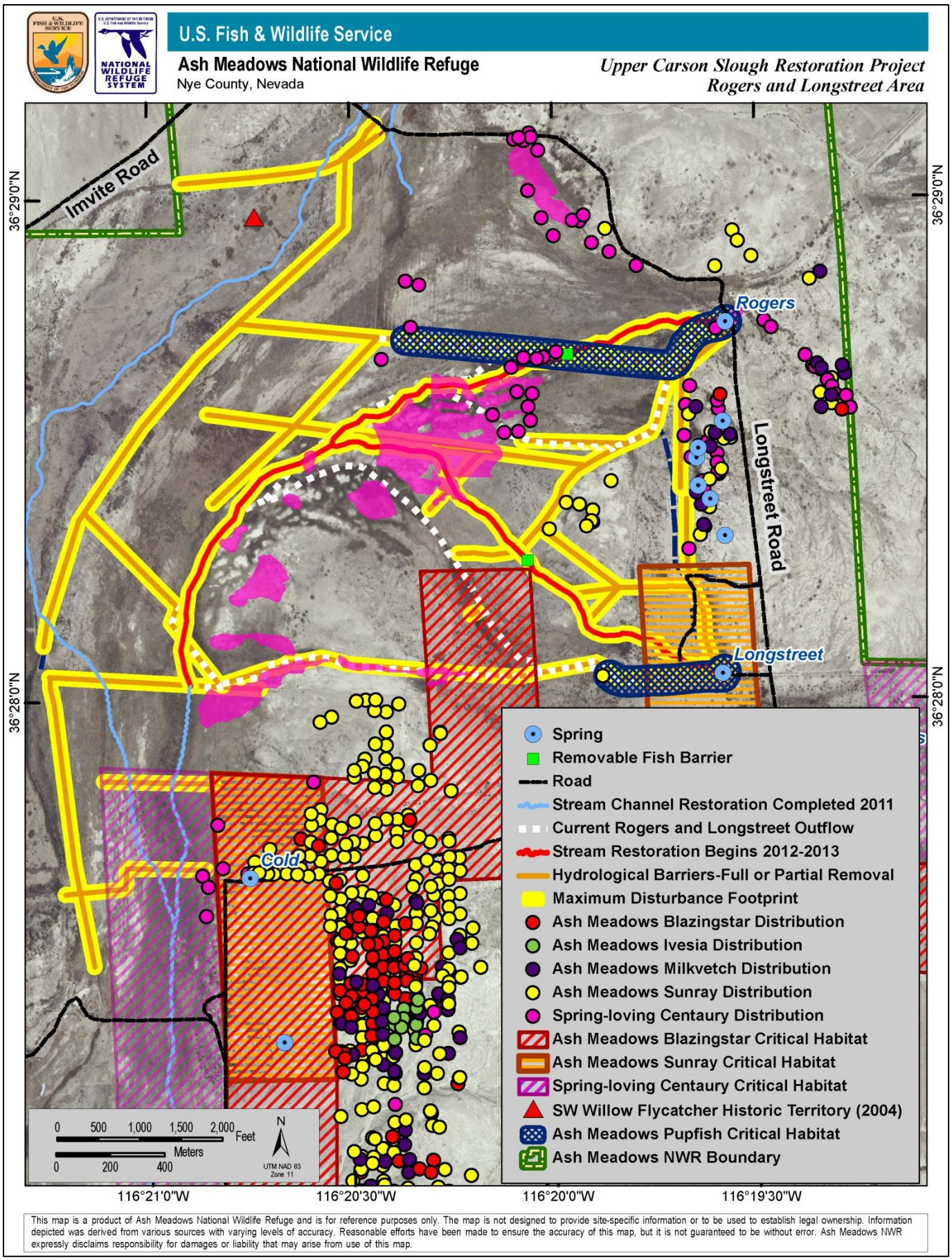

Figure 4. Rogers Spring–Longstreet Spring Action Area.

2.2.2 Remove Irrigation Pipe from Rogers Spring

Currently, water at Rogers Spring primarily discharges through a Parshall flume into a single outflow channel west of the spring. However, a cast iron pipe (approximately 6–12 inches [15–30 centimeters]) was installed on the north side of Rogers Spring (most likely during the 1960s–1970s agricultural period) to direct spring water via irrigation ditches to fields north and west of the spring source. The pipe still intermittently carries flow from Rogers Spring. Restoration would include removing pipe on the northern edge of the spring to prevent flows from seeping to an undesired location. This would be accomplished by temporarily pumping the water in Rogers Spring, if necessary, until it is below the level of the pipe (approximately 2 ft [0.6 m]). The water pump intake would be equipped with 1-millimeter mesh to prevent Ash Meadows Amargosa pupfish from being pulled into the pump; the intake would also be suspended to reduce the likelihood of pupfish eggs from becoming entrained in the intake. The pipe would then be removed with heavy machinery and replaced with compacted soil to prevent future seepage from Rogers Spring to the north. Removing the pipe is expected to benefit the Ash Meadows Amargosa pupfish in the long term because water temperature would remain warmer in the restored (single) outflow channel, improving conditions for reproduction.

2.2.3 Restore Rogers Spring and Longstreet Spring Outflow Channels

The Rogers Spring restored outflow channel would re-enter the existing drainage path approximately 3,000 ft (900 m) downstream from the Rogers Spring source and would connect with the Longstreet Spring outflow approximately 5,000 ft (1,520 m) downstream from the Rogers Spring source. The upper reach of the restored outflow channel for Rogers Spring would be excavated through the old field north of the existing outflow ditch. The restored channel would bypass the upper portion of the existing flow path/ditch. Bypassing the existing flow path/ditch would allow the restored channel to be excavated in open conditions and reduce the potential for the channel to become overgrown with cattail and common reed (*Phragmites* sp.), which presently dominate the existing flow path. Minimizing the potential for cattail and common reed growth increases the potential for maintaining high quality aquatic habitat for both the Ash Meadows Amargosa pupfish and Ash Meadows speckled dace.

The Longstreet Spring constructed channel would be excavated to the north of the existing outflow ditch. The constructed channel would bypass the upper portion of the existing flow path. Bypassing the existing flow path would allow the channel to be excavated in open, unobstructed meadow conditions (similar to the upper section of Fairbanks Spring outflow) and reduce the potential of the channel becoming overgrown by cattail and common reed, which presently dominate the existing flow path. As described above, minimizing the potential for cattail and common reed growth increases the potential for maintaining high quality aquatic habitat for both the Ash Meadows Amargosa pupfish and Ash Meadows speckled dace. Constructing the restored channel in a new location would allow water to remain in the existing ditch during restoration activities, while minimizing water management.

The proposed alignments for the restored Rogers Spring and Longstreet Spring outflow channels were selected based on historical (1948) aerial imagery and current LiDAR data. The alignments for the upper 2,000–3,000 ft (600–900 m) of restored stream channels for both Rogers Spring and Longstreet Spring were selected based on the need to maintain aquatic habitat for target species (native fish and aquatic invertebrates) and avoid areas dominated by invasive vegetation (cattail and common reed). The proposed channel alignments provide the steepest gradient for all possible alignments in the area. A steeper channel would better guarantee that the constructed channel would maintain an open channel free of vegetation overgrowth and provide conditions less suitable for nonnative aquatic species, particularly crayfish which do not withstand higher stream velocities.

Much of the lower reaches of the proposed alignments are dominated by dense vegetation including cattail and common reed. Although it is possible to bypass the dense vegetation along the upper 2,000–3,000 ft (600–900 m) of restored stream channel, due to natural topography it would be necessary to route the restored stream channels through these areas on the lower reaches. Alternatively, this section of the combined Rogers Spring

and Longstreet Spring outflows may be left "as is" through the dense vegetation. To reconnect the flows with the section of channel restored in 2010, channel construction would start again below the densely vegetated area.

In general, the desired stream channel dimensions would be 1.5–3 ft (0.5–0.9 m) wide and 13 ft (0.3–0.9 m) deep. The hydraulic conditions desired include a minor amount of variation in water depth within the constructed channel. The desired water depth is 1–3 ft (0.3–0.9 m). Dimensions specific to each channel section were determined using the Hydrologic Engineering Center's River Analysis System (HEC-RAS v. 4.1) (USACE 2010), and are provided below.

Rogers Spring Outflow Channel Design Parameters

- Discharge at Rogers Spring is approximately 1.4 cfs (628 gallons per minute [gpm])
- The upper channel length above the confluence of the Rogers Spring and Longstreet Spring outflow channels is approximately 5,000 ft (1,520 m)
- Channel excavation depth is 1.5–2 ft (0.5–0.6 m)
- Channel width is 1.5–2 ft (0.5–0.6 m)
- Channel water depth:
    - Pools are 1–2 ft (0.3–0.6 m) deep
    - Riffles are 0.5–0.75 ft (0.15–0.23 m) deep
    - Runs are 1–1.5 ft (0.3–0.5 m) deep
- Channel freeboard is 0.5–1 ft (0.15–0.3 m)
- Average channel slope is approximately 0.005–0.008
- Overall, the channel would have a low degree of sinuosity to minimize vegetation from obstructing the flow. Meanders would be added sparingly to provide variations in channel alignment and, as necessary, to create the desired hydraulic conditions and upstream water depth.

Longstreet Spring Outflow Channel Design Parameters

- Discharge at Longstreet Spring is approximately 2.33 cfs (1,045 gpm)
- The upper channel length above the confluence of the Rogers Spring and Longstreet Spring outflow channels is approximately 6,000 ft (1,820 m)
- Channel excavation depth is 1.5–2 ft (0.5–0.6 m)
- Channel width is 2–2.5 ft (0.6–0.76 m)
- Channel water depth:
    - Pools are 1–2 ft (0.3–0.6 m) deep
    - Riffles are 0.5–0.75 ft (0.15–0.23 m) deep
    - Runs are 1–1.5 ft (0.3–0.5 m) deep
- Channel freeboard is 0.5–1 ft (0.15–0.3 m)
- Average channel slope is approximately 0.007–0.01
- Overall, the channel would have a low degree of sinuosity to minimize vegetation from obstructing the flow. Meanders would be added sparingly to provide variations in channel alignment and, as necessary, to create the desired hydraulic conditions and upstream water depth.

Rogers Spring–Longstreet Spring Outflow Channel (Lower Channel) Design Parameters

- The combined discharge of both Rogers Spring and Longstreet Spring is approximately 3.8 cfs (1,705 gpm)
- The lower channel, downstream of the confluence of the Rogers Spring and Longstreet Spring outflow channels, to the previously restored lower channel, is approximately 4,000 ft (1,220 m)
- Channel excavation depth is 2–2.5 ft (0.6–0.76 m)
- Channel width is 2.5–3 ft (0.76–0.9 m)

- Channel water depth:
    - Pools are 1.5–2.5 ft (0.5–0.6 m) deep
    - Riffles are 0.5–1 ft (0.15–0.3 m) deep
    - Runs are 1–2 ft (0.3–0.6 m) deep
- Channel freeboard is 0.5–1 ft (0.15–0.3 m)
- Average channel slope is approximately 0.005–0.007
- Overall, the channel would have a low degree of sinuosity to minimize vegetation from obstructing the flow. Meanders would be added sparingly to provide variations in channel alignment and, as necessary, to create the desired hydraulic conditions and upstream water depth.

2.2.4 Install Removable Fish Barriers and Discharge Measurement Trench on Rogers Spring and Longstreet Spring Outflow Channels

Based on existing grade and topography, the preferred locations for the fish barriers are approximately 2,000 and 3,000 ft (600 and 900 m) downstream from the Rogers Spring and Longstreet Spring sources, respectively.

The selected fish barrier design includes a 6- to 12-ft-long (1.8- to 3.6-m-long) section of reinforced concrete box culvert with an open top. The culvert would be installed in line with the constructed stream channel. The culvert would be installed with a flash board system. Stream flow would pass through the culvert and over a locking and tamper-proof flash board fish barrier. The installation of a flash board system would allow adjustment of vertical water surface drop over the barrier and allow the barrier to be permanently or temporarily removed in the future if desired. Inside dimensions of the culvert would be 5 ft (1.5 m) high and 3 ft (0.9 m) wide. The flashboard would allow a range of vertical water surface drop over the structure from 0 to 3 ft (0 to 0.9 m).

A similar open concrete culvert would be installed on the Longstreet Spring outflow channel closer to the spring pool to house in-stream discharge measurement equipment. This culvert would replace the current water monitoring flume, which acts as an unintentional fish barrier limiting immigration into the pool. The water monitoring flume isolates the fish population in the pool and may result in reduced genetic diversity over time (Martin 2011). A discharge measurement trench is anticipated to alleviate this situation.

A discharge measurement trench may also be installed on the Rogers Spring outflow channel as described above if funding is available. This trench would be used for water monitoring concurrently with the existing water monitoring flume to compare measurements of the two methods prior to removing the flume.

2.2.5 Remove Existing Project Area Hydrologic Barriers within the Upper Carson Slough

The primary purpose of berm and ditch removal is to remove features of a former irrigation network that function as barriers to hydrologic processes and limit the recovery of ecosystem function. Within the Upper Carson Slough, excluding Peterson Dam, there are approximately 10 miles (16 km) of these hydrologic barriers. Figure 2 illustrates the proposed barrier removals.

Existing ditches would be used for dewatering prior to construction of the new/restored Rogers Spring and Longstreet Spring outflow channels (described in Section 2.2.2). Therefore, the removal of ditches associated with Rogers Spring and Longstreet Spring would be completed after channel construction is finished. It would be necessary to fill numerous former irrigation ditches in the vicinity of the restored Rogers Spring and Longstreet Spring outflow channels to prevent either channel from drifting or diverting into former irrigation ditches during high flow events.

All major ditches would be abandoned by filling with adjacent spoil piles that were placed during development of the former irrigation network. Most berms were constructed with soils excavated during the development of an adjacent irrigation ditch. These berms would be lowered and used to fill the adjacent former irrigation ditch.

Berms that were formed with transported materials would be reduced in size and recontoured to promote overland flow. In order to minimize disturbance and subsequent revegetation requirements, these berms would be transformed into low hummocks similar to the surrounding topography while reducing the diversion or impoundment of natural flow patterns. The large berm and ditch between Rogers Spring and Longstreet Spring would be recontoured and the topography restored to promote overland flow and reduce the potential for tamarisk (*Tamarix* spp.) colonization on the uphill side of the berm.

2.2.6 Cold Spring Outflow Channel Restoration

Cold Spring is a small spring with an average flow of 0.07 cfs (31 gpm). By 1920, the flows from this spring had been collected into an irrigation ditch, and by 1985 were joined with the network of ditches that carried water to extensive agricultural fields. At present, Cold Spring consists of a small spring pool with an adjacent cement pool (tank). Peterson Road currently separates the spring pool from what appears in the 1948 aerial photograph to be the direction of its historic drainage; however, this may only be a remnant of the 1920s-era ditch. No distinct trace of the historic channel remains. Therefore, a new, naturalized channel would need to be constructed. Three alternatives (design options) for the alignment of the Cold Spring outflow channel have been proposed.

Alternatives 1 and 3 (Figure 5) would connect Cold Spring with the outflows from Fairbanks Spring, Rogers Spring, and Longstreet Spring, maximizing genetic exchange between populations of fish. Alternative 2 would keep the flow separate, thereby affording a refuge from nonnative species, provided that mosquitofish (*Gambusia affinis*) and crayfish (*Procambarus clarkii*) are eradicated by desiccation during reconstruction of the outflow channel. This refuge would be especially beneficial for the Ash Meadows speckled dace, which, more than the Ash Meadows Amargosa pupfish, would thrive in the cooler temperatures of Cold Spring. Alternative 3 would avoid crossing the upper section of Peterson Road while Alternatives 1 and 2 would require two road culverts or removal of the road entirely.

The ditch that currently transports the Cold Spring outflows and the cement-lined pool would be removed as part of restoration efforts. The section of Peterson Road north of the road accessing the private inholding may be removed to allow Cold Spring to flow without obstruction if either Alternative 1 or Alternative 2 is chosen.

If Alternative 2 is chosen, restoration actions would include efforts to eradicate nonnative aquatic species. Crayfish and mosquitofish eradication efforts would require the temporary diversion of flow from the existing outflow ditch to an upland area away from all current sources of water. This would involve the excavation (using machinery) of a diversion channel or, if possible, the collection and transfer of water in PVC pipe from the spring orifice away from the current channel to allow for its complete desiccation.

Whichever alternative is chosen, the newly constructed channel would be excavated using a tracked excavator to minimize disturbance to the site. The channel would be an appropriate size for the low flow (approximately 1 ft [0.3 m] wide) and would be excavated as a dry channel. Depth of the stream channel would depend on the topography of the site, but would be suitable to contain spring flows. After construction of the new channel and completion of crayfish eradication efforts, flow would be diverted to the new channel. Creation of specific habitat types (riffles, diverse substrates, etc.) would then be completed using hand tools to create habitat suitable for native fish and invertebrates prior to their reintroduction. When sufficient algal growth and food supply are observed and confirmed by the USFWS, native fish and invertebrates would be reintroduced sequentially to allow Refuge biologists to monitor reintroduction success. If Alternative 2 is chosen, keeping the

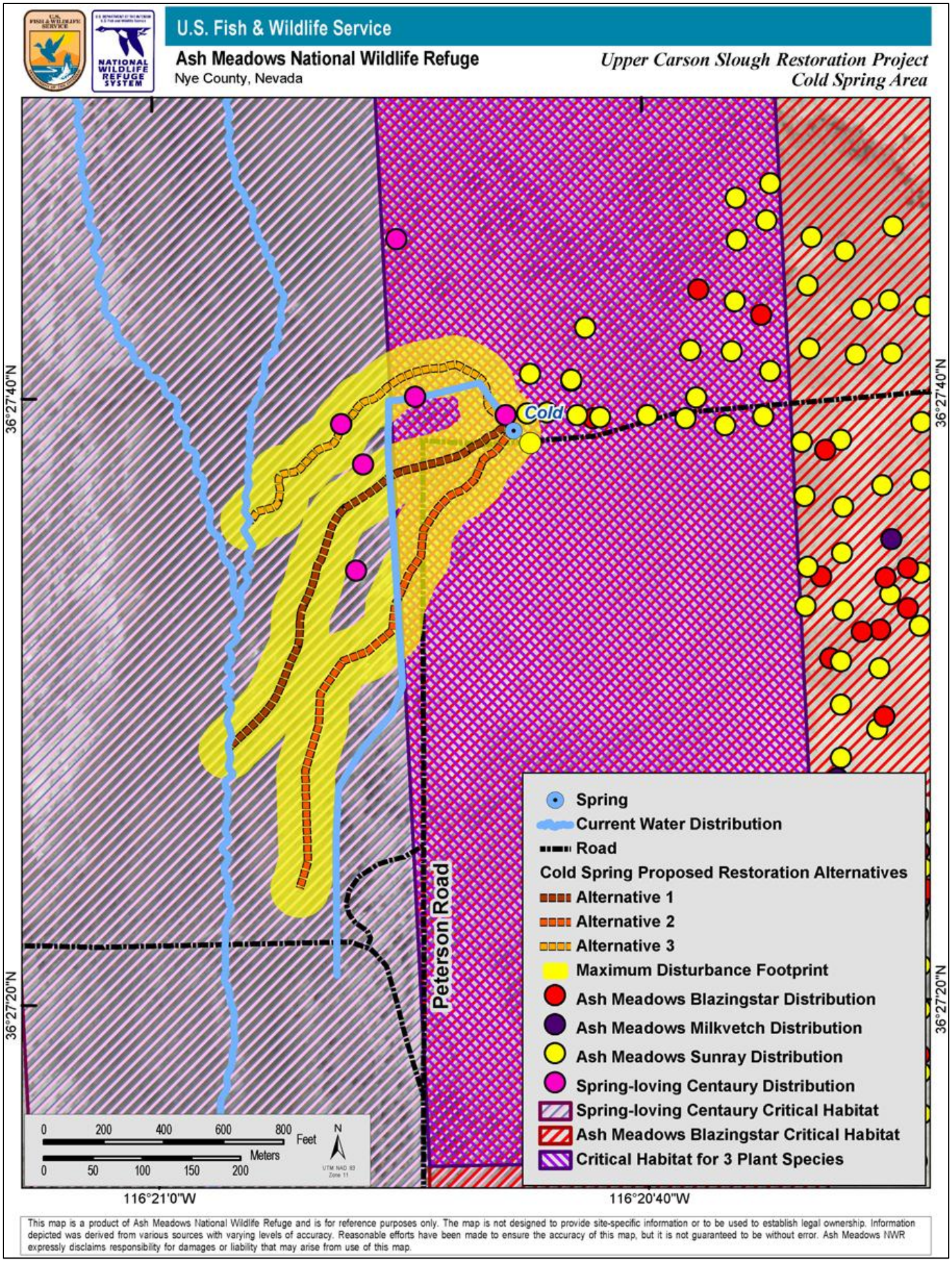

Figure 5. Cold Spring Action Area.

flow separate from the rest of the Upper Carson Slough, Ash Meadows speckled dace would be translocated from other systems (Jackrabbit Spring and Bradford Springs, and/or Fairbanks Spring) dependent on the status of each population and recommendations of the AMRIT.

2.2.7 Outflow Channel Restoration and Culvert Replacement for the Five Springs Area

The Five Springs area has been seriously altered and channelized. A well was installed at one of the springs during the corporate farming period, circa 1970, and the site shows evidence of manipulation by heavy equipment. Aerial photography from 1948 reveals a faint drainage leading away from Five Springs to the west, connecting with the Upper Carson Slough near Cold Spring. This may have been an ephemeral drainage, or a channel with very low flows. In the 1948 photograph, a fence line or ditch cuts through from Longstreet Spring to the south of Cold Spring, which may have been capturing some of the flows from the Five Springs. By the 1980s, flows from Five Springs were contained in man-made earthen ditches that connected with the outflow ditches from Longstreet Spring for use in the agricultural fields.

Figure 6 illustrates preferred alternative actions in the Five Springs area. Today, some of the springs have no pools, and some have small spring pools, mostly overgrown with vegetation. Recent measurements at one of the Five Springs average 0.06 cfs (26 gpm). The springs flow through a channel to the west, eventually spilling out of the irrigation ditch and into a marshy area where the water is trapped to the east of Longstreet Road. The road and an abandoned agricultural field west of the road severed Five Springs from what appears to have been its historic drainage. Since Longstreet Road provides the only access to the northern part of the Refuge, a culvert would need to be installed to allow the outflow from the Five Springs to cross without backing up and forming a cattail marsh. West of Longstreet Road where the old agricultural field removed all evidence of a channel, a new, naturalized channel would need to be constructed for approximately 2,000 ft (600 m) to direct the flow toward the historic drainage.

As with Cold Spring, any excavation near the spring sources would be accomplished with a tracked excavator to minimize further disturbance. Restoration sequencing would include the salvage of endemic Fairbanks springsnails (*Pyrgulopsis fairbanksensis*).

2.2.8 Remove Northwest Berm at Peterson Reservoir

Figure 7 illustrates preferred alternative actions at Peterson Reservoir. A report by Threloff (1992) found no documented evidence of a historical wetland in the site of present-day Peterson Reservoir and no wetlands were reported at this site during the 1881 township surveys. A water rights application from 1923, filed by Mary A. Rogers, mentions the “lime hills” near the present-day reservoir, but makes no mention of a wetland at this site. Aerial photography from 1948, however, shows a body of water located in what appears to be a natural depression in the site of the present-day Peterson Reservoir, but much reduced in size. Flows exited the natural impoundment in the northwest corner, just north of the sand dunes which form the western margin (OBEC 2011). A 1952 USGS topographic map (Ash Meadows, Nevada and California) shows an intermittent body of water in this same location that is also much smaller than the present-day Peterson Reservoir. By 1985, berms had been constructed along the south and northwest ends of the wetland area, enlarging and deepening it to form Peterson Reservoir. A major flood event in December 2010 breached the berm at the northwest end near the historic (1948) outflow point and seriously eroded the berm along the south end. However, the reservoir still holds more water than it likely did in the mid-1900s (OBEC 2011).

As with most of the impounded water in the Refuge, Peterson Reservoir fills in with invasive cattails and common reed, especially in the shallow, slack water areas of the north and south ends. Historically, seasonal expansion (winter) and contraction (summer) of inundated areas in the Refuge probably kept tall emergent species like cattail from expanding (Vradenburg 2009). To return Peterson Reservoir to a more natural size and reduce the area covered by cattails while still allowing for waterfowl and recreational use, the northwest berm

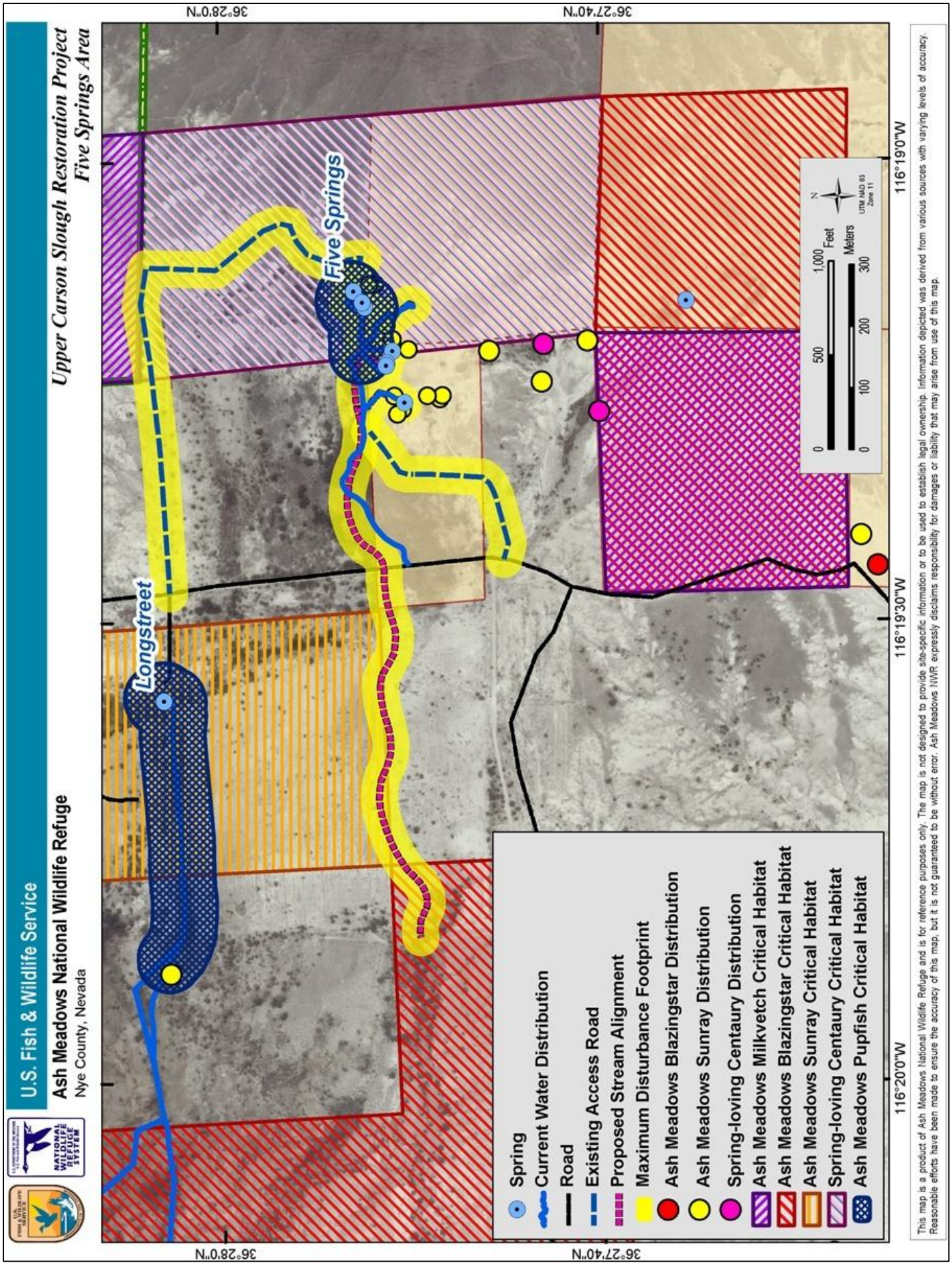

Figure 6. Five Springs Action Area.

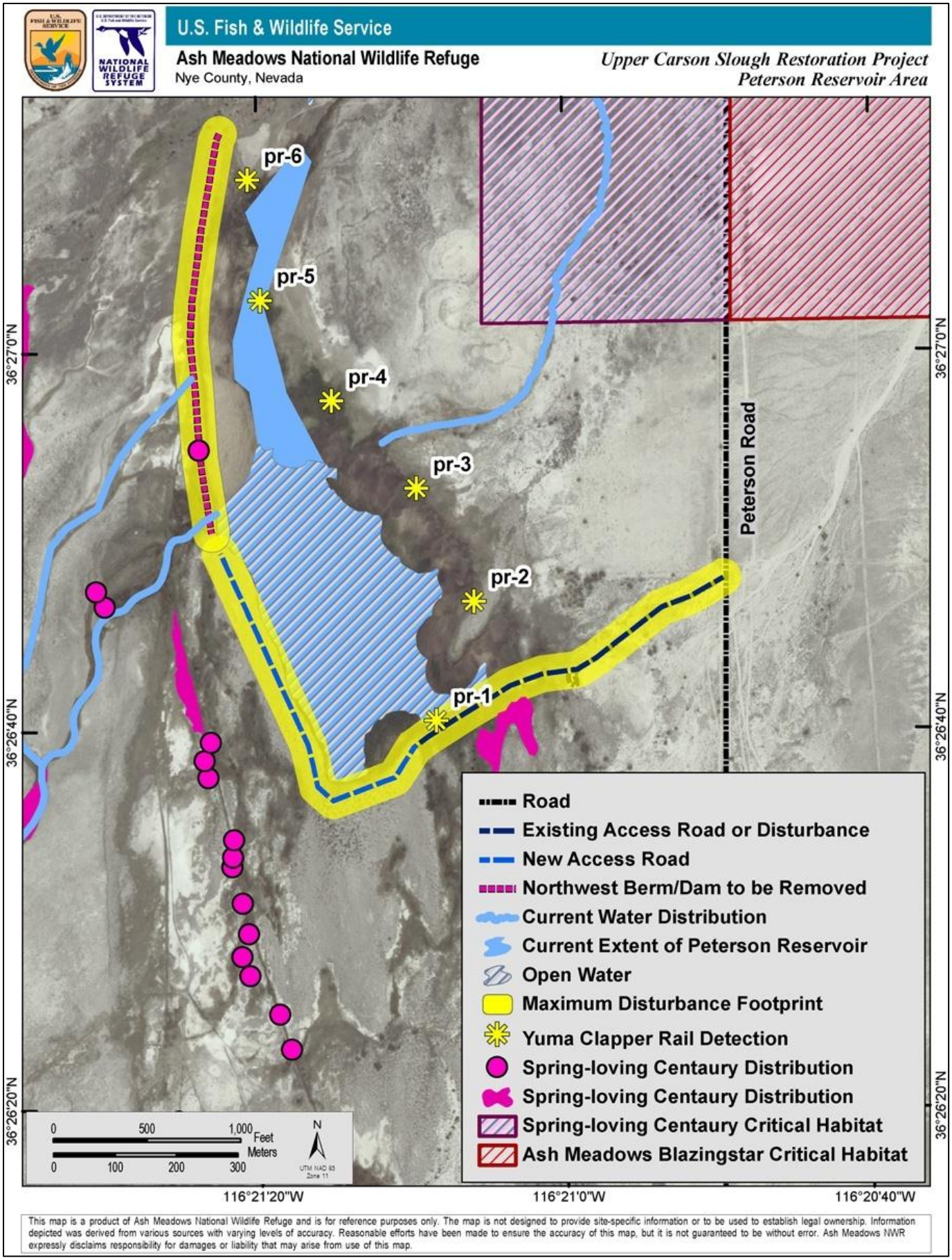

Figure 7. Peterson Reservoir Action Area.

would be removed, draining the shallow water from the northern-most section. The excavated berm material would be spread over this very shallow, cattail-covered section of the reservoir. This would also allow more water to be released downstream into the Carson Slough through natural outflow channels. Some modifications to or restoration of the severely eroded southern berm may be needed to access the berm on the northwest side of the reservoir.

2.2.10 Develop Trail System in the Upper Carson Slough

An incomparable opportunity exists to educate visitors about the ecological importance and beauty of this wetland oasis by developing an environmentally sensitive backcountry trail system. The exact location of trail features would be determined after restoration of the Rogers Spring and Longstreet Spring outflows and completion of barrier removal (approximate trail routes are illustrated in Figure 3). Trails could be routed to avoid all threatened and endangered plants. The trail system would be designed to maximize the use of existing disturbance corridors and restored linear disturbance areas. The following trails and overlooks are proposed as potential features of the trail system (OBEC FRD 2011):

- **Upper Carson Slough Loop Trail** – An approximately 4.6-mile (7.4-km) backcountry loop trail, of which a little over 1 mile (1.6 km) is an existing Refuge road. The trail crosses the Upper Carson Slough, winds through mesquite patches along the upper Fairbanks Channel, and returns along the dirt access road.
- **Fairbanks Spring Spur Trail** – A short offshoot from the Upper Carson Slough Loop Trail (0.46 mile [0.74 km] each way). Leads visitors to Fairbanks Spring.
- **Rogers/Longstreet Springs Connection Trail** – A 1.3-mile (2.1-km) trail from Longstreet Spring to Rogers Spring, with the option of looping back on Longstreet Road, a dirt Refuge access road (a 2-mile [3.2–km] loop).
- **Peterson Reservoir Trail** – A 2.8-mile (4.5-km) trail segment beginning near Peterson Reservoir, which winds north along the lower Fairbanks, Rogers, and Longstreet combined flows, and connects to the Upper Carson Slough Loop.
- **Trailheads and Parking Areas** – Four different parking areas and trailheads would allow visitors to access the trails from a variety of locations. Parking areas would be situated to minimize disturbance. Three trails are located at the location of current parking areas.
- **Upper Carson Slough Roadside Overlook** – A developed overlook viewpoint located at a high point near Rogers Spring and along Longstreet Road. This viewpoint would be accessed via a vehicle pull-off from the road, with short-term parking for two to three cars.
- **Rogers Spring Overlook** – An overlook at the top of a constructed earthen hill, in close proximity to the Rogers Spring parking lot. The hill would be kept small so as not to block morning sunlight from reaching the spring. The pathway to this viewpoint could be made Americans with Disabilities Act accessible.
- **Peterson Reservoir Overlook** – A viewpoint located on top of a hill overlooking Peterson Reservoir and the Upper Carson Slough, which would be accessed via the Peterson Reservoir Trail. The overlook would be relatively undeveloped.

The majority of trail surfaces would consist of primitive earthen pathways and would be approximately 3 ft (1 m) wide. Water crossings and boardwalks would be used in wet or marshy areas. A portion of the proposed Upper Carson Slough Loop Trail follows an existing dirt road.

2.2.10.1 Earthen Paths

The earthen path portion of the backcountry trail system would be constructed from native soils. The addition of crushed rock or other materials may be necessary in muddy areas.

2.2.10.2 Water Crossings

Small bridges would be installed as needed where trails cross the spring outflow channels. Materials and designs for these bridges are to be determined.

2.2.10.3 Boardwalks

For marsh crossings and areas where seasonal flooding is a concern, multiple options exist, including: primitive split-log boardwalk, traditional wooden-plank boardwalk, metal grate decking, or alternate options.

2.2.10.4 Refuge Access Road

Longstreet Road is currently closed to visitor vehicle traffic after Rogers Spring by a locked gate. A portion of the Upper Carson Slough Loop Trail would follow this dirt road from Rogers Spring to the Soda Spring channel crossing, approximately 1.04 miles (1.67 km) to the northwest. This road would be left in place as an administrative access road. It would be open to visitors by foot traffic only and to vehicles for administrative and maintenance use.

3.0 AFFECTED ENVIRONMENT

This section describes the area in which the proposed project would occur and focuses on those resources that could be affected through implementation of the proposed project. This section does not provide a detailed description of the environment at large, but supplies the needed information for the reader to understand the discussion in Section 4 pertaining to the anticipated changes in the affected environment resulting from implementation of the proposed project.

The project area is within the Refuge's Amargosa Valley of southwestern Nevada (Figure 1). The arid conditions of the surrounding valley floor and steep and uplifted mountain ranges provide a stark contrast to the lush environment of the Refuge. The project area occurs within Sections 9–11, 15–16, 21–23, and 28–29 of Township 17 South, Range 50 East, Mt. Diablo Meridian.

The project area ranges in elevation from approximately 2,176–2,295 ft (663–700 m) within the Mojave Desert. The predominant vegetation community in the project area is saltgrass (*Distichlis spicata*), Emory's baccharis (*Baccharis emoryi*), screwbean mesquite (*Prosopis pubescens*), and mesquite (*Prosopis juliflora*).

As noted, this EA is tiered to the CCP EIS. The affected environment section of the CCP EIS describes the general physical and biological environment, cultural resources, visitor services, and socioeconomic conditions of the Refuge. As such, resource descriptions in the CCP EIS are incorporated by reference.

3.1 Air Quality

The Air Quality section of Section 4.2.1: Physical Environment of the Final CCP EIS (USFWS 2009a) is hereby incorporated into this EA by reference.

Ambient air quality is not currently measured at the Refuge. It is expected that low ambient concentrations of criteria pollutants would occur in this area based on nearby uses. Fugitive dust may occasionally produce high amounts of pollutants from nearby activities related to the American Borate facility closure, as well as traffic on nearby dirt roads. The nearest development source of emissions is approximately 22 miles (35 km) to the

southeast in Pahrump, Nevada, and the Las Vegas area is approximately 80 miles (128 km) to the southeast. Because of synoptic wind patterns and the overall distance from these cities, these sources are not expected to have an impact on the project area.

3.2 Threatened and Endangered Species and their Critical Habitat

The Sensitive Plants and Sensitive Wildlife sections of Section 4.2.2: Biological Resources of the Final CCP EIS are hereby incorporated into this EA by reference.

Within the Refuge, eleven species that are listed as threatened or endangered under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) may occur within the project area or may be affected by the proposed project. These species and their affected environment are discussed below in detail.

3.2.1 Ash Meadows Amargosa Pupfish

The Ash Meadows Amargosa pupfish is a common fish relative to other endemic fishes on the Refuge (Scoppettone et al. 1995), occupying numerous springs and outflow channels within the Refuge. The abundance of Ash Meadows Amargosa pupfish varies depending on the habitat and season. Populations also exist in Crystal Reservoir, Horseshoe Reservoir, Lower Crystal Reservoir, and Peterson Reservoir, but these populations can vary by several orders of magnitude depending on the season and abundance of AIS. Because habitats of the Ash Meadows Amargosa pupfish comprise most of the surface water in the area, they were the most altered during agricultural development. The entire habitat of this species has been affected by diversion into earthen or concrete channels, impoundments, drying due to groundwater pumping, or elimination of riparian vegetation (DOI 2000).

Total population estimates of Ash Meadows Amargosa pupfish have been problematic. Since the Refuge was established, most effort has been placed on surveying springpools, which contain an unknown but likely small proportion of the total population. Additionally, survey protocol has been inconsistent over the years. Given these issues, population size cannot be determined using historic survey methods and existing data. These data can only be interpreted as an index to population change.

The USGS conducted surveys to determine relative abundance and distribution of the Refuge's native fishes in 2007–2008, and again in fall 2010 and spring 2011. The final surveys were conducted after restoration of the Fairbanks Spring and Soda Spring outflow channels was complete. Ash Meadows Amargosa pupfish were found to be numerous and widespread in the restored habitats (Scoppettone et al. 2011a, Scoppettone et al. 2011b).

Within the Upper Carson Slough project area, Rogers Spring, Longstreet Spring, Cold Spring, and Five Springs and their outflows, as well as Peterson Reservoir, have populations of pupfish. All action areas were surveyed by the USGS. A detailed summary of findings is included in the Intra-Service Section 7 Biological Assessment for the Upper Carson Slough project (USFWS 2012).

Total designated critical habitat for the Ash Meadows Amargosa pupfish is approximately 218 ac (88 ha). The primary constituent elements described in the final listing rule are warm-water springs and their outflows and surrounding land areas that provide vegetation cover and habitat for insects and other invertebrates on which the species feeds. Studies completed since their listing indicate that pupfish rely heavily on algae-derived carbon and prefer open channels that allow for algal growth (Kennedy et al. 2005, G. Scoppettone, pers. comm. 2012).

Within the project area, the following springs and portions of their outflows plus the surrounding land areas for a distance of 164 ft (50 m) are designated critical habitat: Rogers Spring, Longstreet Spring, and Five Springs.

Critical habitat at Rogers Springs is 33.6 ac (13.6 ha), representing 15.4% of total critical habitat. Longstreet Spring critical habitat is 13.8 ac (5.6 ha), or 6.3% of total critical habitat. Five Springs critical habitat is approximately 4.8 ac (1.9 ha), or 2.2% of the total critical habitat. Combined, the spring areas total approximately 52 ac (21 ha), or 23.9% of critical habitat for the Ash Meadows Amargosa pupfish.

3.2.2 Ash Meadows Speckled Dace

Few Ash Meadows speckled dace are found within the proposed action areas; however, potential effects from capture and relocation activities may result in harassment and direct loss of dace. Therefore, the proposed project may affect and is likely to adversely affect the Ash Meadows speckled dace. However, the proposed project would result in an additional 3 miles (4.8 km) of habitat for the dace.

Minimization measures such as the capture and relocation of native fish prior to, and/or during restoration activities, and protocol for holding and transporting fish (using Stress Coat®, acclimatizing fish to local conditions, minimizing holding time, etc.) will reduce adverse effects.

There is no Ash Meadows speckled dace critical habitat in the Upper Carson Slough project area. Two of the spring systems (Jackrabbit and Bradford) from which dace may be removed for translocation to the Upper Carson Slough are within designated critical habitat, but the proposed action would in no way adversely modify the habitat.

3.2.3 Devils Hole Pupfish

There are no Devils Hole pupfish (*Cyprinodon diabolis*) within the Upper Carson Slough project area. Critical habitat has not been designated for the Devils Hole pupfish; however, the Devils Hole Pupfish Recovery Plan of 1980 identifies essential habitat for the species as including 21,760 ac (8,806 ha) encompassing the area where groundwater removal most influences the water level in Devils Hole (USFWS 1990). Approximately 2,646 ac (1,071 ha) of this essential habitat falls within the boundary used to encompass the entire Upper Carson Slough project area.

3.2.4 Southwestern Willow Flycatcher

One breeding pair of southwestern willow flycatchers (*Empidonax traillii extimus*) occupied habitat in the Upper Carson Slough until a lightning-caused wildfire burned the habitat in 2004. The habitat was marginally suitable, consisting of dense mesquite and invasive tamarisk with interspersed stands of Saltbush Scrub (NDOW 2000). This breeding territory was west of the current location of the restored Fairbanks Spring outflow channel and outside of the disturbance footprint of proposed actions. The site no longer has suitable habitat.

Critical habitat was proposed for the southwestern willow flycatcher in the Refuge (USFWS 2011a, p. 50559–60); however, the extent and location of this habitat is still in discussion and the Final Rule has not been issued. As initially proposed, the Carson Slough (including Rogers Spring and Longstreet Spring outflows) would be included. At this time, the habitats in the Carson Slough do not provide primary constituent element 1 (riparian with specific requirements for tree and shrub species, canopy height, and density). Although some insects are present (primary constituent element 2), they are not useful to the southwestern willow flycatcher without the presence of primary constituent element 1. The habitats in the Upper Carson Slough are primarily Alkali Meadow or Mesquite Woodland, and no southwestern willow flycatchers have occupied the area since the 2004 wildfire burned the invasive tamarisk. (The tamarisk skeletons were later extracted to prevent resprouting.) The lead USFWS office (Region 2) for the revised critical habitat proposal is in agreement that landscape-level improvements to the Refuge restoring the natural hydrology, topography, and vegetation communities, are expected to provide suitable southwestern willow flycatcher habitat in the future.

3.2.5 Yuma Clapper Rail

Yuma clapper rail (*Rallus longirostris yumanensis*) has been detected in the Refuge each year since 2007 when marsh bird monitoring surveys were first implemented; it has been detected every year on at least one survey replicate at Peterson Reservoir (D. Weissenfluh, pers. comm. 2012). Based on 5 years of marsh bird survey data, Yuma clapper rail are present in relatively low abundance in the Refuge during the breeding season; however, the amount of recruitment, if any, is unclear as these surveys do not address recruitment. Details of monitoring surveys are included in the Biological Assessment for the Upper Carson Slough restoration (USFWS 2012). A Yuma clapper rail paired duet clatter was recorded on only one occasion (Peterson Reservoir, 2010, PR-1, Replicate Survey Number 3). There has been only one survey year (2009) when Yuma clapper rail were detected during all three replicate surveys at the same location (Peterson Reservoir). The Refuge may be the northernmost location where Yuma clapper rail has been positively detected although it was considered, until recently, an accidental in Nevada (Floyd et al. 2007).
Mostly between the 1960s–1980s, the landscape within the Refuge experienced large anthropogenic alterations that included the draining of wetlands and the impoundment of water into man-made reservoirs. No data are known to exist on the relative abundance of marsh bird species prior to the large-scale habitat manipulation; however, it is reasonable to assume the quantity and quality of habitat for marsh birds and the 12 other endemic, federally listed species in the Refuge were diminished as a result of the habitat manipulation.

There is no designated critical habitat within the action areas, although usable habitat is found at Peterson Reservoir along the southern and eastern shoreline.

3.2.6 Amargosa Niterwort

The Amargosa niterwort (*Nitrophila mohavensis*) is endemic to the Carson Slough and southern Amargosa River drainage in Nye County, Nevada and Inyo County, California. Most populations are found in highly alkaline, moist, salt-encrusted clay soils. Refuge-wide surveys of listed and rare plants, including the Amargosa niterwort, were conducted in 2008 and 2009 (BIO-WEST 2011). Prior to the surveys, only two populations were known to occur in the Refuge. BIO-WEST, Inc. (BIO-WEST) documented 11 occurrences at the Nevada Natural Heritage Program's minimum mapping scale of 0.1 mile (0.16 km) and 2 occurrences at the maximum mapping scale of 0.6 mile (1.0 km). The total population for all occurrences in the Refuge was estimated to be 58,292 ramets covering 21.4 ac (8.66 ha). However, the largest population of niterwort is located on 10.1 ac (4.09 ha) south of the Refuge in the Lower Carson Slough. This population was estimated to be 280,000 ramets (SERG 2004). There is no critical habitat for the Amargosa niterwort in the project area. All critical habitat lies outside the Refuge.

3.2.7 Ash Meadows Blazingstar

The Ash Meadows blazingstar (*Mentzelia leucophylla*) is endemic to the Ash Meadows area of Nye County, Nevada. The range of the Ash Meadows blazingstar encompasses the Refuge, adjacent BLM Areas of Critical Environmental Concern (ACEC), and private lands within the Refuge boundaries. Habitats where Ash Meadows blazingstar has been observed include xeric to intermittently flooded Alkali Shrub-Scrub and Salt Desert Shrub where plants populate small outcroppings, hills, or slopes with sparse vegetation cover and gravel to sandy-clay soils (BIO-WEST 2011). The 2008–2009 surveys estimated the population at 1,513 individuals in 12 occurrences at the minimum mapping scale (2 occurrences at the maximum mapping scale). The species covered an area of 13.52 ac (5.47 ha) within the Refuge. Within the larger Upper Carson Slough project area, mapped occurrences lie near the Rogers Spring–Longstreet Spring and Cold Spring action areas.

Total critical Ash Meadows blazingstar habitat is approximately 1,240 ac (502 ha). The primary constituent elements described in the final listing rule include sandy or saline clay soils along canyon washes and near springs and seeps (USFWS 1985). The distribution and ecological requirements of the Ash Meadows blazingstar were poorly understood when the USFWS designated critical habitat; consequently, some areas of designated critical habitat may no longer provide suitable habitat for the species due to changes in soil structure

as a result of past agricultural activities, and some designated areas may not have supported the species to begin with. Surveys for the species on private, designated critical habitat lands within the Refuge boundaries have not been conducted. While a considerable amount of information on species' distribution has been gained over the past few years, many aspects of the species ecological requirements, especially with respect to its hydrological requirements and watershed processes, remain unknown (S. Kulpa, pers. comm. 2011). Preliminary data from ongoing research indicate the Ash Meadows blazingstar is accepting of a variety of soil types as long as it is loosely compacted and well-drained. The amount of soil moisture and salt content may be controlling factors (Breit 2011 and G. Breit, pers. comm. 2012). Three action areas partially fall within Ash Meadows blazingstar critical habitat: Rogers Spring–Longstreet Spring, Cold Spring, and Five Springs.

3.2.8 Ash Meadows Ivesia

Ash Meadows ivesia (*Ivesia kingii* var. *eremica*) is known only to occur within Refuge boundaries. BIO-WEST estimated a population of 510,744 individuals mapped in 19 minimum scale occurrences and 2 maximum scale occurrences (2011). The approximate area covered by the species was 116.1 ac (47 ha). The species was often found in areas with shallow groundwater or saturated soils such as contour breaks and depressions where groundwater seeps to the surface.

Within the larger Upper Carson Slough project area, a small population of Ash Meadows ivesia starts approximately 90 ft (27 m) south of Cold Spring near a series of seeps on land that was private property until recently and, therefore, was not surveyed by BIO-WEST in 2008–2009. Although some of the plants lie at the edge of the maximum disturbance footprint of Cold Spring alternative 2 (as defined by a 98-ft [30–m] buffer), this area is on the opposite side of Peterson Road from Cold Spring and would not be accessed by construction equipment. The terrain is steep and the soil soft, and there is no need for equipment to cross this area.

Total Ash Meadows ivesia critical habitat is approximately 880 ac (356 ha). The primary elements described in the final listing rule include saline seep areas of light-colored clay uplands. The habitat as observed by BIO-WEST was described as mesic Intermittently Flooded to saturated Alkali Seeps, Wet Meadows, Alkali Meadows, and the edges of Alkali Shrub-Scrub (2011). Plants were located in soils that were saturated to moist clay with a prominent alkali crust. Due to the high alkalinity, these habitats are sparsely covered.

Only the Cold Spring action area partially falls within Ash Meadows ivesia critical habitat. The amount of Ash Meadows ivesia critical habitat within the Cold Spring action area depends on which of the three restoration alternatives are chosen and ranges from 2.3 ac (0.9 ha) for Alternative 1 to 3.5 ac (1.4 ha) for Alternative 2. For the purpose of this consultation and allowing latitude for the unknown, the highest of these estimates would be rounded up to 4 ac (1.6 ha) and used as the amount of critical habitat within the Cold Spring action area.

3.2.9 Ash Meadows Milkvetch

The Ash Meadows milkvetch (*Astragalus phoenix*) is endemic to the Ash Meadows area of Nye County, Nevada. The known range of the Ash Meadows milkvetch encompasses the Refuge, adjacent BLM ACEC, and private lands within the Refuge boundaries. The species is often found in moist alkaline soils, spring and seep areas, and clay flats. BIO-WEST surveyors observed the species in Alkali Shrub-Scrub and Alkali Meadow habitats that were often characterized by depressional areas with mesic conditions where water might collect following rain (BIO-WEST 2011). The 2008–2009 surveys estimated the population at 15,606 individuals in 12 occurrences at the minimum mapping scale and 2 occurrences at the maximum mapping scale. The species covered an area of 73.0 ac (29.5 ha) within the Refuge. Within the larger Upper Carson Slough project area, mapped occurrences lie near the Rogers Spring–Longstreet Spring and Cold Spring action areas.

Total Ash Meadows milkvetch critical habitat is approximately 1,200 ac (486 ha). The primary elements described in the final listing rule include dry, hard, white, barren, saline, clay flats, knolls and slopes. Although often found with Ash Meadows sunray (*Enceliopsis nudicaulis* var. *corrugata*), Ash Meadows milkvetch

habitats are often slightly more open with sparser herbaceous cover (BIO-WEST 2011). Surface and/or subsurface groundwater that reaches the surface through capillary action may be an important controlling factor. The distribution and ecological requirements of the Ash Meadows milkvetch were poorly understood when the USFWS designated critical habitat; consequently, some areas of designated critical habitat may no longer provide suitable habitat for the species due to changes in soil structure as a result of past agricultural activities, and some designated areas may not have supported the species to begin with. Surveys for the species on private, designated critical habitat lands within the Refuge boundaries have not been conducted. While a considerable amount of information on species' distribution has been gained over the past few years, many aspects of the species ecological requirements, especially with respect to its hydrological requirements and watershed processes, remain unknown (USFWS 2009b).

Only the Cold Spring action area partially falls within Ash Meadows milkvetch critical habitat. The amount of Ash Meadows milkvetch critical habitat within the Cold Spring action area depends on which of the three restoration alternatives are chosen and ranges from 2.3 ac (0.9 ha) for Alternative 1 to 3.5 ac (1.4 ha) for Alternative 2. For the purpose of this consultation and allowing latitude for the unknown, the highest of these estimates would be rounded up to 4 ac (1.6 ha) and used as the amount of critical habitat within the Cold Spring action area.

3.2.10 Ash Meadows Sunray

The Ash Meadows sunray is endemic to the Ash Meadows area of Nye County, Nevada. The range of the Ash Meadows sunray encompasses the Refuge, adjacent BLM ACEC, and private lands within the Refuge boundaries. The Ash Meadows sunray occurs across a broad range of habitats ranging from moist alkaline soils, spring and seep areas, to dry desert washes. The Ash Meadows sunray most often occupies Intermittently Flooded to upland mesic Alkali Shrub-Scrub habitat in alkali-clay soil and is occasionally a component of Salt Desert Scrub and desert pavement habitats (BIO-WEST 2011, p. 113). The 2008–2009 surveys estimated the Ash Meadows sunray population at 79,508 individuals in 30 occurrences at the minimum mapping scale (1 occurrence at the maximum scale). The species covered an area of 216.15 ac (87.47 ha) within the Refuge. Within the Upper Carson Slough project area, mapped occurrences lie in the Rogers Spring–Longstreet Spring, Cold Spring, and Five Springs action areas.

Total Ash Meadows sunray critical habitat is approximately 1,760 ac (712 ha). The primary constituent elements described in the final listing rule include dry washes or whitish saline soil associated with outcrops of pale whitish limestone. The distribution and ecological requirements of the Ash Meadows sunray were poorly understood when the USFWS designated critical habitat; consequently, some areas of designated critical habitat no longer provide suitable habitat for the species, while other areas not designated as critical habitat support large numbers of the species (USFWS 2011b). While a considerable amount of information on species' distribution has been gained over the past few years, many aspects of the species ecological requirements, especially with respect to its hydrological requirements and watershed processes, remain unknown; however, preliminary data from ongoing research indicate soil moisture and salt content may be controlling factors (Breit 2011 and G. Breit, pers. comm. 2012). Three action areas partially fall within Ash Meadows sunray critical habitat: Rogers Spring–Longstreet Spring, Cold Spring, and Five Springs.

3.2.11 Spring-loving Centaury

The spring-loving centaury (*Centaurium namophilum*) is adapted to mesic alkaline clay soils and is endemic to the Ash Meadows area of Nye County, Nevada. The known range of the spring-loving centaury is the Refuge, adjacent BLM ACEC, and private lands within the Refuge boundaries (and possibly private land within the ACEC). Based on the literature and opinion of local botanists, populations of spring-loving centaury in nearby Beatty, Nevada, and Death Valley, California, are considered taxonomically distinct and a different subspecies (USFWS 2009c, p. 2).

During the 2008–2009 surveys, BIO-WEST found spring-loving centaury to be wide-spread across the Refuge

in any area containing surface or near-surface water at any time during the year. Habitat where it was observed ranged from Seasonally Flooded Wetlands to Seasonally Moist Alkali Meadows to the edges of Alkali Shrub-Scrub communities (BIO-WEST 2011). BIO-WEST also observed this species blooming in waves; that is, individual populations or subpopulations blooming at different times during the season.

The estimated population of spring-loving centaury was 4,593,971 individual plants in 33 occurrences mapped at the minimum scale and 2 occurrences mapped at the maximum scale. Centaury covered an area of 527.19 ac (213.35 ha) within the Refuge. Since the 2008–2009 surveys, the spring-loving centaury population has increased along the recently restored Fairbanks Spring outflow channel, and has expanded its range along the new combined Fairbanks Spring–Rogers Spring–Longstreet Spring channel and the restored Indian Spring channel. With the exception of the Mud Lake Dam project area, locations outside the Refuge boundaries and on private property have not been surveyed.

Within the larger Upper Carson Slough project area, mapped occurrences of spring-loving centaury lie in or near the Rogers Spring–Longstreet Spring, Cold Spring, and Peterson Reservoir action areas. In analyzing the impacts to this species, it must be noted that the plant is an annual and population numbers may vary significantly from year to year, at least in drier locations, depending on the amount of rainfall received at appropriate times of the year.

Total spring-loving centaury critical habitat is approximately 1,840 ac (745 ha). The primary constituent elements described in the final listing rule include moist to wet clay soils along banks of streams or in seepage areas. Water availability is a limiting factor to this species' distribution (Pavlik and Manning 1986).

Some areas of designated critical habitat were unoccupied at the time of the 2008–2009 surveys; however, other areas not designated as critical habitat support large numbers of the species. Surveys for the spring-loving centaury on private, designated critical habitat lands within the Refuge boundary and within the ACEC have not been conducted. Three action areas partially fall within spring-loving centaury critical habitat: Rogers Spring–Longstreet Spring (hydrological barrier removal), Cold Spring, and Five Springs.

3.3 Cultural and Historic Resources

Section 4.2.3: Cultural Resources of the Final CCP EIS is hereby incorporated into this EA by reference.

The USFWS Cultural Resources Team reviewed the project elements and conducted research based on previous archaeological surveys. The survey conducted by HRA, Inc. followed methods similar to those for a BLM Class III inventory, with surveyors walking parallel transects spaced no more than 98 ft (30 m) apart. Transect stop and start points were recorded with a GPS. All sites (defined as at least 10 artifacts or a landscape feature) were recorded on to an IMACS site form and isolated finds were recorded with a GPS location point. The results of this survey are presented in *Shared Place: An Archaeological Survey of the Ash Meadows National Wildlife Refuge, Nye County, Nevada* (HRA 2008). Additionally, DRI conducted a random sample survey in 1990 that includes several areas within the current project. The DRI report, *Archaeological and Paleoenvironmental Investigations in the Ash Meadows National Wildlife Refuge, Nye County, Nevada* (Livingston and Nials 1990), was published by DRI as Report No. 70. The USFWS Cultural Resources Team has completed surveys at Fairbanks, Rogers, and Longstreet Springs over the past 15 years. The Fairbanks Spring area has been the focus of several archaeological investigations (Livingston and Nials 1990, USFWS 2002, HRA 2009).

Based on previous survey information, 70 sites have been identified within 0.5 mile (0.8 km) of the project area. However, of the 70 sites, 37 have been determined ineligible. The 33 eligible sites include 19 prehistoric sites, 3 historic sites, 5 sites with both prehistoric and historic resources, one historic cabin, and 5 sites of unknown vintage.

Prehistoric sites at the Refuge are noteworthy because they include large dune habitation sites with temporal markers that suggest a range in age from the Middle-to Late-Archaic, Prehistoric, and Late-Prehistoric (Southern Paiute) cultural phases. Sites with both prehistoric and historic components include Fairbanks Spring, Longstreet Spring, two sites between Longstreet Spring and Rogers Spring, and the McKenna Ranch. Three historic sites include two artifact scatters and a habitation. Five portions of trails were recorded but could not be assigned to a particular chronologic period.

3.4 Recreation

Section 4.2.4: Public Access and Recreation of the Final CCP EIS is hereby incorporated into this EA by reference.

The Refuge was established primarily to conserve threatened and endangered plant and animal species. In addition, the Refuge is managed to promote all native species of wildlife and provide wildlife-oriented recreational opportunities that are compatible with its primary purpose. Existing recreational opportunities include wildlife observation (particularly Ash Meadows Amargosa pupfish at springs and birding at Peterson Reservoir), primitive trails, and hunting (quail, dove, and waterfowl). Parking for recreational activities is undeveloped and limited to Rogers Spring.

3.5 Invasive and Nonnative Plants and Animals

The Noxious Weeds and Wildlife sections of Section 4.2.2: Biological Resources of the Final CCP EIS is hereby incorporated into this EA by reference.

According to the USFWS, invasive species have become the single greatest threat to the Refuge system. This threat is clearly visible throughout the Refuge, where close to 100 species of nonnative plants and animals have been introduced. The invasive nature of some of these species threatens the listed and endemic species of the Refuge, alters ecosystem processes, degrades wildlife habitat, reduces the quality of wildlife-dependent recreation, and prevents habitat restoration, public access, and construction of public facilities in infested areas.

The Refuge is mandated through policy to control or eradicate nonnative species. An estimated 4,460 ac (1,805 ha) within the Refuge were used for agricultural production and livestock grazing, including the project area. Many of these abandoned fields now contain monocultures of nonnative species, including: Russian knapweed (*Acroptilon repens*), hoary cress (*Cardaria draba*), fivehook bassia (*Bassia hyssopifolia*), Malta starthistle (*Centaurea melitensis*), yellow starthistle (*Centaurea solstitialis*), sorghum (*Sorghum bicolor*) and Johnson grass (*Sorghum halepense*), and red brome (*Bromus rubens*). In many parts of the Refuge, these monocultures appear to be expanding beyond the historic field into surrounding areas. The extent of this expansion and its threat are just beginning to be understood through preliminary vegetation mapping and research investigations funded by the Refuge. Weed expansion beyond the existing agricultural fields is a concern because of the potential threat posed to listed plants including the Ash Meadows gumplant (*Grindelia fraxino-pratensis*), spring-loving centaury, and Ash Meadows ivesia.

In 2002 and 2005, lightening ignited large wildfires in the thick saltcedar stands of the Upper Carson Slough in and near the project area. Currently, a Refuge-wide effort is underway to remove saltcedar mechanically. The historic outflow of Fairbanks Spring is now clear of saltcedar stands, but maintenance will be required in the future. In addition, AIS including convict cichlid, sailfin molly, gambusia, and crayfish have been found within the project area stream channels. These invasive species threaten endemic and native species including the Ash Meadows Amargosa pupfish and the Ash Meadows speckled dace, as well as frustrate reintroduction efforts.

3.6 Hydrology

Section 4.2.1: Physical Environment of the Final CCP EIS is hereby incorporated into this EA by reference.

Hydrologic conditions are discussed in greater detail in the CCP EIS to which this document in tiered, and in the Ash Meadows biophysical assessment and restoration plan (OBEC SEC 2006).

3.7 Floodplains

Section 4.2.1: Physical Environment of the Final CCP EIS is hereby incorporated into this EA by reference.

In general, the floodplain in the Upper Carson Slough has been altered primarily by water diversions and by Mud Lake Dam outside the refuge administrative boundary. However, floodplain mapping remains accurate for the Upper Carson Slough on the current flood insurance rate map.

3.8 Wetlands

The Vegetation section of Section 4.2.2: Biological Resources of the Final CCP EIS is hereby incorporated into this EA by reference.

The project area was historically the largest wetland in southern Nevada. However, peat mining in the 1960s destroyed the majority of the wetlands and decreased wetland function dramatically. The project area contains Alkali Shrub habitat, some Riparian Woodlands dominated by the nonnative tamarisk, and some Alkali Meadows. There are approximately 414 ac (167.54 ha) of wetlands in the project area (Figure 9).

Wetlands and other "Waters of the United States" are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. The proposed project would likely require an Individual Permit under Clean Water Act Section 404 because it would modify areas of land that include existing jurisdictional wetlands and Waters of the United States. Potential impacts to wetlands were assessed by:

- Developing and submitting to USACE a wetland delineation report (OBEC 2011)
- Coordinating with USACE to obtain a preliminary jurisdictional determination of existing wetlands (P. McQueary, pers. comm. 2012)
- Evaluating the potential for the proposed project to modify existing wetlands

A wetland delineation report was submitted to USACE on July 18, 2011. On October 11, 2012, USACE concurred with the delineation for the Upper Carson Slough project area. Concurrence with this delineation report is still in process from USACE.

3.9 Migratory Birds

The Birds section of Section 4.2.2: Biological Resources of the Final CCP EIS is hereby incorporated into this EA by reference.

Executive Order issued January 11, 2001, further defines the responsibilities of the federal agencies to protect

migratory birds; the Migratory Bird Treaty Act of 1918 and subsequent amendments (16 U.S.C. 703–711) state that it is unlawful to take, kill, or possess migratory birds. A list of those protected birds is found in 50 C.F.R. 10.13.

Bird species present under existing conditions in the vicinity of Upper Carson Slough are species generally representative of bird communities within the Refuge such as northern flicker (*Colaptes auratus*), verdin (*Auriparus flaviceps*), Bewick's wren (*Thryomanes bewickii*), loggerhead shrike (*Lanius ludovicianus*), common raven (*Corvus corax*), western kingbird (*Tyrannus verticalis*), northern mockingbird (*Mimus polyglottos*), Bullock's oriole (*Icterus bullockii*), Gambel's quail (*Callipepla gambelii*), western meadowlark (*Sturnella neglecta*), blue grosbeak (*Passerina caerulea*), and mourning dove (*Zenaida macroura*). Bird species known to occur at Peterson Reservoir under existing conditions include many species associated either with open water or emergent marsh, including waterfowl, terns, gulls, shorebirds, herons, egrets, bitterns, white-faced ibis (*Plegadis chihi*), grebes and rails. Some species known to occur at Peterson Reservoir, including rails, herons, egrets, white-faced ibis, and American bittern (*Botaurus lentiginosus*), also occur at Upper Carson Slough.

4.0 ENVIRONMENTAL CONSEQUENCES

Only environmental resources that would potentially be affected by the proposed project are considered in this EA. In this section those resources are evaluated for potential effects and analyzed using criteria that disclose the intensity of an impact as discussed in the CCP EIS.

4.1 Alternative A (No Action)

This section discloses the impacts and benefits associated with taking no action and serves as a baseline for comparison with the proposed project.

4.1.1 Air Quality

Under this alternative there would be no new restoration related construction; therefore, air quality at the Refuge and within the project area would remain unaffected under the No Action Alternative.

4.1.2 Threatened and Endangered Species and Their Critical Habitat

Threatened and endangered species would continue to be managed as they have in the recent past. No habitat modification from restoration activities would occur, and no effects from the proposed project would be realized. Habitat for endemic species would not improve and habitat modification in the form of increased invasive species would continue. Over time, habitat for threatened and endangered species would degrade and the viability of some species may come into question.

4.1.3 Cultural and Historic Resources

Cultural and historic resources in the vicinity of the project area would remain unaffected under the No Action Alternative because no ground disturbance would occur.

4.1.4 Recreation

Recreational opportunities would continue to be limited and remain as they have in the recent past under the No Action Alternative. Recreational opportunities would not be enhanced over time as a result of the Upper Carson Slough restoration. There would be no potential for minor or temporary impacts to wildlife or hunting opportunities.

4.1.5 Invasive and Nonnative Plants and Animals

Invasive plants and animals management would continue in the project area as it has in the recent past. Noxious weed infestations and the proliferation of AIS that potentially prey upon endemic species and compete for resources would likely continue or expand. Revegetation with native plants in the project area would not occur, and exotic plants would expand their range in the project area over time. Unnaturally severe wildfires associated with nonnative vegetation, which are particularly damaging to native aquatic wildlife, would continue. Invasive species such as convict cichlid, sailfin molly, gambusia, and crayfish would continue to compete for resources and prey upon endemic species.

4.1.6 Hydrology

Hydrology in the project area would not be restored, but would remain in a degraded and modified condition similar to the present.

4.1.7 Floodplains

Floodplains in the project area would not be restored, but would remain in a degraded and modified condition similar to the present.

4.1.8 Wetlands

Wetlands in the project area would not be restored, but would remain in a condition similar to the present.

4.1.9 Migratory Birds

Migratory birds would continue to utilize the project area to the extent that suitable habitat is available. No short-term construction impacts would occur and the habitat would not be enhanced for endemic species. Under this scenario (the No Action Alternative), it is not likely that habitat conditions would improve or bird populations increase.

4.2 Alternative B (Proposed Action)

This section discloses the impacts and benefits associated with implementation of the proposed project.

4.2.1 Air Quality

Construction activities associated with the proposed project would cause a short-term degradation of air quality within the project area. An increase in pollutant emissions is expected as a result of heavy equipment activity. This increase in construction-related emissions would be temporary and localized, with emission levels not anticipated to exceed the National Ambient Air Quality Standards. Emissions would be further reduced through use of equipment in good working order and by minimizing unnecessary idling of vehicles.

Generation of fugitive dust is expected in the project area as a result of earth excavation, vegetation removal, and heavy equipment operation. Fugitive dust emissions would vary depending on the level of activity, specific construction techniques, soil characteristics, and weather conditions. Fugitive dust is composed of relatively large particles that settle out quickly, thus localizing the effect to air quality. As described in the CCP/EIS, best management practices (BMPs) would be employed during construction activities. These BMPs include construction techniques such as utilizing water, mulching, and/or applying surfactants to minimize dust emissions. Limiting vehicle speeds to 15 mph in staging areas and on all unpaved access routes, using low or zero-emission construction vehicles and limiting idling time for construction vehicles as well as maintaining effective cover over stockpiles fill or debris materials will also minimize air quality impacts. In general, impacts to air quality would be localized and temporary. No significant impacts are likely to occur.

4.2.2 Threatened and Endangered Species and Their Critical Habitat

The overarching goal of the proposed project is the recovery of threatened and endangered species at Ash Meadows. As such, the proposed project design has been carefully tailored and modified based on past restoration activities to maximize recovery and survivability of species.

A Biological Assessment was prepared in April 2012 for 11 species that occur in the project area and could be affected by implementation of the proposed project. Two species had a "no effect" determination: the Devils Hole pupfish, and Amargosa niterwort.

Four species and their respective critical habitats were found to have a "may affect, not likely to adversely affect" determinations. These were the Yuma clapper rail, Ash Meadows blazingstar, Ash Meadows ivesia, and Ash Meadows milkvetch. One species, the Southwestern willow flycatcher, was found to have a "may affect, but not likely to adversely affect the species and proposed critical habitat."

The Biological Assessment concluded that adverse effects may occur to four species. Formal consultation was initiated for the Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Ash Meadows sunray, and spring-loving centaury. A Biological Opinion, file #84320-2012-F-0289 (USFWS 2012) was issued for the proposed project on August 13, 2012. Through formal consultation, the USFWS concluded that the proposed project is not likely to jeopardize the continued existence of any of these species or adversely modify their critical habitat. Specific potential impacts to individual species are included below. Section 4.2.3 lists the mitigation measures that are incorporated into the proposed action to minimize adverse effects to sensitive species.

4.2.2.1 Ash Meadows Amargosa Pupfish

Cold Spring has an extremely small population of Ash Meadows Amargosa pupfish. Only one pupfish was captured during the 2010–2011 surveys by the USGS. The temperature of Cold Spring is 18–22°C; Ash Meadows Amargosa pupfish prefer temperatures greater than 25°C (Scoppettone et al. 2011a), with reproduction occurring between 25–31°C (Gerking and Lee 1983).

The population of Ash Meadows Amargosa pupfish at Five Springs is larger, but still relatively small. The largest number of total pupfish captured during the USGS distribution and relative abundance surveys in this system was 46.

In the Rogers Spring and Longstreet Spring systems, Ash Meadows Amargosa pupfish density is greatest in the springpools (Scoppettone et al. 2011a). In the most recent surveys by Scoppettone et al. (2011b), traps throughout long stretches of outflow channel captured no fish. Actual numbers of pupfish occupying the two spring outflow channels are unknown, but they represent a fraction of the total population of Ash Meadows Amargosa pupfish. The springpool surveys conducted by Refuge staff in the fall of 2011 resulted in 1,924 and 512 pupfish in Longstreet Spring and Rogers Spring (source pools), respectively.

As with Cold Spring, the cooler temperatures of Peterson Reservoir keep pupfish numbers low. The number of pupfish increases again in the discharge stream.

Although the proposed actions for the Upper Carson Slough restoration project are recovery actions that would result in improved habitat benefiting Ash Meadows Amargosa pupfish in the long run, individuals may be adversely affected during these actions in the short term.

Minimization measures such as the capture and relocation of native fish prior to and/or during restoration activities, and protocol for holding and transporting fish (using Stress Coat®, acclimatizing fish to local conditions, minimizing holding time, etc.), will reduce adverse effects.

The proposed actions would temporarily disturb Ash Meadows Amargosa pupfish habitat, and the location of some of the species' habitat would shift slightly as irrigation ditches are replaced with naturalized stream channels. However, there would be no net loss in habitat, and the proposed actions would result in higher quality habitat. Therefore, the end result is long-term benefit from short-term disturbance.

4.2.2.2 Ash Meadows Speckled Dace

Potential adverse effects to the Ash Meadow speckled dace from the proposed action may include harassment and direct loss of dace during capture and relocation activities. Therefore, the proposed project may affect and is likely to adversely affect the Ash Meadows speckled dace. There would be no adverse modification of habitat and, in fact, the proposed action would result in doubling the available habitat for the Ash Meadows speckled dace.

Because the proposed project is likely to result in net long-term benefits to habitat and populations of Ash Meadows speckled dace in the project area, impacts would be minor and temporary. No significant adverse impacts would occur to Ash Meadows speckled dace.

4.2.2.3 Devils Hole Pupfish

The closest proposed actions would occur more than 3 miles (4.8 km) away from Devils Hole; distant enough to prevent Devils Hole pupfish exposure to any impacts. None of the proposed actions would impact the groundwater or the water level at Devils Hole. Therefore, there would be no effect on the Devils Hole pupfish or its essential habitat.

4.2.2.4 Southwestern Willow Flycatcher

The proposed action would help restore the natural hydrology and native vegetation communities of the Refuge, which, ultimately, should benefit the southwestern willow flycatcher. As southwestern willow flycatchers have not been detected in the Upper Carson Slough since the 2004 wildfire, the proposed action is not likely to adversely affect, but may benefit the species. The proposed actions would not adversely affect proposed critical habitat because no primary constituent elements are present in the project area.

4.2.2.5 Yuma Clapper Rail

Within the Upper Carson Slough project area, only actions in the Peterson Reservoir area would affect the Yuma clapper rail. Although Yuma clapper rails appear to use Peterson Reservoir more consistently than other surveyed locations, other marsh areas of the Refuge have been used by the species and would remain available for species' use during proposed project activities. In the long run, the Yuma clapper rail may benefit from hydrological restoration at the Refuge. Previous restoration projects have resulted in the development of suitable habitat (lower section of the combined Fairbanks Spring–Rogers Spring–Longstreet Spring channel where it enters Peterson Reservoir) and other areas that have the potential to develop into suitable habitat with time (e.g., mid-section of Fairbanks Spring outflow channel that is forming a marsh). There would be no significant impacts to the Yuma clapper rail as a result of proposed activities.

4.2.2.6 Amargosa Niterwort

Within the Upper Carson Slough project area there is one population of approximately 4,000 ramets (BIO-WEST 2011); however, it is located outside all action areas. The closest maximum disturbance footprint is over 0.3 mile (0.6 km) away. There would be no effect to the species or critical habitat.

4.2.2.7 Ash Meadows Blazingstar

There are no known Ash Meadows blazingstar within the maximum disturbance footprint of any action area. Those within a few hundred feet of the maximum disturbance area (e.g., Cold Spring area) may experience above-normal dust conditions, but the effect would be temporary. Minimization measures such as regular spraying of water along roads used by construction vehicles and on soil stockpiles as needed to maintain a surface crust would assist in preventing dust emission. Within the entire Upper Carson Slough project area, approximately 13.9 ac (5.6 ha), representing 0.6% of the total Ash Meadows blazingstar critical habitat, falls into one of the action areas. Except for the Cold Spring area, none of this habitat is currently occupied by the species.

Impacts to Ash Meadows blazingstar, if any, would likely be insignificant since no plants are located within the maximum disturbance footprint of any project area. There may be impacts to critical habitat; however, since the proposed actions within critical habitat involve returning spring outflows to their historic configuration (or as close as can be identified) and removing hydrological barriers, the impacts should be minimal or beneficial, if indeed, Ash Meadows blazingstar were ever found there. It is possible that the designated habitat in these areas never contained the elements required by the species.

4.2.2.8 Ash Meadows Ivesia

Although at least 25 Ash Meadows ivesia are known to occur on the edge of the 98-ft (30-m) buffer of one of the alternatives for the Cold Spring action area, their location is not accessible to construction equipment. These plants may experience above-normal dust conditions, but the effect would be temporary. Minimization measures such as regular spraying of water along roads used by construction vehicles and on soil stockpiles as needed to maintain a surface crust would assist in preventing dust emission. Within the entire Upper Carson Slough project area, approximately 4 ac (1.6 ha), representing 0.5% of the total Ash Meadows ivesia critical habitat, falls into one of the action areas.

Impacts to Ash Meadows ivesia, if any, would likely be insignificant since only a few plants are located at the edge of the maximum disturbance footprint of a project area, and this area would be off-limits to construction equipment. There may be impacts to critical habitat; however, since the proposed action within critical habitat involves returning a spring outflow to its historic configuration (or as close as can be identified) and removing hydrological barriers, the impacts should be minimal (no plants are expected to be lost during construction), and ultimately beneficial as the natural hydrology is restored and the habitat for this species improves.

4.2.2.9 Ash Meadows Milkvetch

Although at least 11 Ash Meadows milkvetch are known to occur within the 98-ft (30-m) buffer of one of the alternatives for the Cold Spring action area, their location is not accessible to construction equipment. These plants may experience above-normal dust conditions, but the effect would be temporary. Minimization measures such as regular spraying of water along roads used by construction vehicles and on soil stockpiles as needed to maintain a surface crust would assist in preventing dust emission. Within the entire Upper Carson Slough project area, approximately 4 ac (1.6 ha), representing 0.3% of the total Ash Meadows milkvetch critical habitat, falls into one of the action areas.

Impacts to Ash Meadows milkvetch, if any, would likely be insignificant since only a few plants are located at the edge of the maximum disturbance footprint of a project area, and this area would be off-limits to construction equipment. There may be impacts to critical habitat; however, since the proposed actions within critical habitat involve returning spring outflows to their historic configuration (or as close as can be identified) and removing hydrological barriers, the impacts should be minimal (no loss from construction) and beneficial as the natural hydrology is restored and habitat for this species improves.

4.2.2.10 Ash Meadows Sunray

Although the actual disturbance footprint is expected to be much smaller, around 175 Ash Meadows sunrays fall within or adjacent to the maximum potential disturbance footprint of all the action areas combined. These plants may be directly impacted by construction equipment (scraping, crushing) during hydrological barrier removal or desiccation and/or channel construction at Cold Spring and Five Springs. An additional 400 plants lie within 150 ft (46 m) of access roads or maximum disturbance footprints and may receive secondary impacts from dust, foot traffic, etc. Altogether, there is a potential to impact, permanently or temporarily, up to 575 individual plants. This represents 0.7% of the total surveyed Ash Meadows sunray population. Combining impacts from all action areas, approximately 23.5 ac (9.5 ha) of critical habitat, or 1.3% of the total critical habitat, fall within the maximum disturbance footprint. The majority of this acreage (83%) was farmed and has been slow to recover with native vegetation of any kind. It currently does not support Ash Meadows sunray.

Although fewer than 20 Ash Meadows sunray fall within a construction footprint (33-ft [10-m] buffer around proposed action), approximately 575 may be directly or indirectly affected at the maximum potential disturbance level. Therefore, the proposed actions may affect and are likely to adversely affect the Ash Meadows sunray. There may also be impacts to critical habitat; however, since the proposed actions within critical habitat involve returning spring outflows to their historic configuration (or as close as can be identified) and removing hydrological barriers, the impacts should be beneficial in the long term.

4.2.2.11 Spring-loving Centaury

Estimating on the high end, approximately 400,000 spring-loving centaury, or 8.7% of the surveyed population, fall within a maximum disturbance footprint within the Upper Carson Slough project area. Construction activities such as scraping and digging would cause mortality to individual plants. Equipment traffic may crush plants. Disturbance of soils may remove portions of the spring-loving centaury seed bank.

Combining impacts from all action areas, approximately 25.5 ac (10.3 ha) of critical habitat, or 1.4% of the total critical habitat, fall within the maximum disturbance footprint. Half of the acreage is the disturbance footprint for removing (filling in) two irrigation ditches. Currently, no spring-loving centaury grow along or near these ditches. Removal of the ditches and the associated undesirable vegetation (invasive cattails and nonnative weeds) would improve the habitat. The other half of the acreage falls within the disturbance footprint for restoring the spring outflow channels of Cold Spring and Five Springs, actions that would also improve the habitat for spring-loving centaury.

A large number of spring-loving centaury could potentially be impacted; however, the plant is an annual that responds well to short-term disturbance (e.g., fire) and hydrological restoration (e.g., School Springs, northern and southern Indian Spring, Fairbanks Spring Phase I and Phase II, Kings Spring, and Point of Rocks area). Most of the impact to spring-loving centaury would occur during the Rogers Spring and Longstreet Spring restored channel construction and hydrological barrier removal. Although there is the potential to impact a number of plants, this species is expected to benefit from the combined restoration actions.

There may also be impacts to critical habitat; however, since the proposed actions within critical habitat involve returning spring outflows to their historic configuration (or as close as can be identified) and removing hydrological barriers, the impacts should be minimal or beneficial in the long term.

4.2.3 Mitigation Measures to Reduce Effects on Threatened and Endangered Species

The following mitigation measures would be undertaken to reduce the effects of the proposed project.

1. A USFWS biologist would monitor all activities in the project area.

2. Equipment and human access zones would be delineated by fencing and flagging.

3. Rare plant populations occurring in or near the potential area of disturbance would be flagged and avoided to the extent feasible.

4. Threatened and endangered plants that cannot be avoided, would be transplanted or their seed collected for use in revegetation after channel restoration is completed. Spring-loving centaury would not be transplanted since it is an annual and widespread throughout the Refuge.

5. Prior to implementation of habitat improvement activities, all work equipment would be washed and visually inspected for materials that may contain invasive, nonnative seeds and reproductive plant parts attached to the equipment. Nonnative materials would be removed and disposed of appropriately. All equipment to be used for implementation would be thoroughly cleaned prior to mobilization to and from the project sites.

6. Soils within construction areas would be mechanically decompacted (ripped to a depth of 1 ft [0.3 m] with a dozer or excavator bucket) upon the completion of all habitat restoration activities to promote vegetation recovery.

7. Dust control would be strictly adhered to in order to protect the plants from dust impacts. This would include regular spraying of water along roads used by construction vehicles and on soil stockpiles as needed to maintain a surface crust and prevent dust emission.

8. Prior to, or during restoration activities in spring outflows, fish would be salvaged to the greatest extent possible in coordination with NDOW and/or Las Vegas Ecological Services biologists, using standard techniques to capture, hold, acclimatize, and release fish. Springsnails would be salvaged from Five Springs (only action area with Fairbanks springsnails).

9. All buckets used as short-term salvage containers for transportation of fish to the holding tanks would contain Stress Coat® (a fish and tap water conditioner that replaces a fish's slime coat and reduces electrolyte loss). Additionally, all fish would be acclimated to respective holding locations as quickly as possible.

10. Ash Meadows speckled dace may be translocated by Refuge staff in coordination with NDOW and/or Las Vegas Ecological Services biologists, using standard techniques to capture, hold, acclimatize, and release fish. The number of dace moved would be dependent on the status of source populations and would be determined in consultation with the AMRIT.

11. Fairbanks springsnails may be translocated to Rogers Spring and/or Longstreet Spring, which would be determined in consultation with the AMRIT. Handling procedures would follow those used successfully during previous restoration projects.

12. The Refuge would provide to the Las Vegas Ecological Services office and NDOW reports on the success of plant transplantation/seeding efforts, Ash Meadows Amargosa pupfish salvaging, and dace

reintroduction. Refuge staff would also work cooperatively with these agencies to ensure all activities are carried out to minimize adverse effects.

As a result of the determinations in the Biological Assessment and the mitigation measures that would be implemented, no significant impacts are expected to threatened or endangered species or their habitats.

4.2.4 Cultural and Historic Resources

Following the identification and survey of sites, the Refuge made the following determinations:

- Nine sites have been identified as being close to or overlapping the proposed trail and stream restoration project area. Of the nine sites, the project will have **No Effect** on four sites: NY13067, NY13069, NY13081, and the Longstreet Cabin because they are outside of the Area of Potential Effects (APE) and are easily avoided by construction.

- Two sites, NY13082 and NY13071, are adjacent to the APE and can be temporarily fenced during construction to ensure their protection. No trail or stream restoration work is proposed within the site boundary, thus there will be **No Effect**.

- A potential for an adverse effect is indicated for three sites: **NY11503, NY13082, and NY13074,** where the reclamation activity includes mechanically filling and smoothing the 1970s irrigation ditch. Irrigation ditch reclamation has the potential to adversely affect the sites. The USFWS is proposing to monitor the work in order to ensure that the scattered artifact concentrations are not affected by ditch reclamation at these three sites. An archaeological monitor will be positioned to observe the ground disturbing work. No trail work will affect the sites, thus trail work may proceed without monitoring.

The USFWS is preparing a monitoring plan to be included in the Upper Carson Slough Backcountry Trail and Stream Improvement Project documents to provide guidance to contractors and Refuge staff in order to safeguard the sites during irrigation ditch reclamation procedures.

The USFWS consulted with the State Historic Preservation Office (SHPO) regarding the status of cultural resources within 0.5 mile (0.8 km) of the project area on August 2, 2012. The USFWS requested that the SHPO concur that there will be a **No Historic Properties Affected outcome for 30 eligible sites** identified within 0.5 mile (0.8 km) of the project area because the trail and spring improvements have been designed to avoid these areas. Additionally, temporary fencing will be placed at sites NY13082 and NY13071 that are adjacent, but outside of the APE.

The USFWS also requested that the SHPO concur that on-site monitoring by an archaeologist during ditch reclamation at sites NY11503, NY13082, and NY13074 is a condition imposed on the undertaking that will ensure protection of the sites. Thus the activity will have a **No Adverse Effect on 3 historic properties**.

The SHPO provided concurrence to the USFWS's requests in a letter dated January 2, 2013 (SHPO 2013).

Additionally, the USFWS consulted with tribal members in October 2011 when the Refuge hosted an on-site tour and interactive presentation to the Nuwuvi Working Group that includes representatives from the Timbisha Shoshone, Pahrump Paiute, Las Vegas Paiute, and individuals interested in the area. The comments and observations provided by the tribal members are presented in the Nuwuvi Working Group report.

4.2.5 Recreation

Restoration activities are expected to benefit habitat for plants and wildlife within the project area. As a result, recreation activities associated with plants and animals are expected to be enhanced over time. These activities include wildlife observation, wildlife photography, interpretation, education, hiking, and hunting. An environmentally sensitive backcountry trail system has been proposed as a component of the proposed action. The exact location of trail features would be determined after restoration of the Rogers Spring and Longstreet Spring outflows and barrier removal are completed. Trails would be constructed as described in Section 2.2.10 and routed to avoid threatened and endangered plants. Trail footprints of new trails would affect small areas of potential habitat, but are not expected to affect individuals or populations to any significant degree. As noted, some trails are expected to follow existing roadways that would remain closed to vehicular traffic.

Some restoration activities may take place during hunting season. These activities have the potential to displace wildlife and/or hunting opportunities, since the construction areas would be closed to the public. These impacts would be minor and temporary because other areas on the Refuge would still be available for hunting and because wildlife is expected to return upon completion of the proposed project. No significant impacts are likely to occur to recreational resources.

4.2.6 Invasive and Nonnative Plants and Animals

Restoration has been proposed, in part, to decrease the prevalence of invasive plants and animals within this area of the Refuge. As such, it is likely that invasive plants and animals, particularly fish and noxious weeds, would decrease throughout the area and be replaced over time by endemic species.

However, project construction increases the likelihood that invasive plants and animals, particularly noxious weeds, could be transported by machinery, equipment, or people to portions of the project area and become established. The use of best management practices and continued monitoring would decrease the likelihood of noxious weeds becoming established. Best management practices include the washing of construction equipment before and after project use, educating construction crews, and following a revegetation plan focused on planting native vegetation. The use of mechanical controls and herbicides as appropriate may also be used.

The installation of fish barriers is part of the proposed project, intended to reduce predation of invasive fish such as convict cichlid, sailfin molly, and gambusia on endemic fishes. Although extirpation of exotic fishes has proven difficult, it is expected that use of fish barriers and continued maintenance would increase habitat quality for endemic species over time.

As a result, no significant impacts are likely to occur.

4.2.7 Hydrology

The proposed project would require the modification of existing channels Carson Slough The USFWS has modeled the hydrologic and hydraulic conditions in the Carson Slough, using the HEC-RAS model, but only for the purposes of ecological function and processes. The 100-year flood in the Upper Carson Slough is of such a magnitude that the restoration activities described in the proposed action will have no effect on future flood water elevations. The restoration activities affect drainage patterns and ecological functions during moderate and low flows, but are inconsequential with respect to changing hydraulic conditions during large flooding events (OBEC 2010).

Although changes to hydrology would have broadly positive effects on the ecology of the Refuge, no significant impacts are likely to occur.

4.2.8 Floodplains

The proposed project would require some excavation within existing floodplains. However, the minor maintenance, enhancement, and restoration actions taken by the USFWS will have no effect on the base flood (i.e., a flood that has a 1 percent or greater chance of occurrence in any given year) and therefore does not warrant evaluation or revision of the flood insurance rate map.

As described in a memorandum regarding compliance with Executive Order 11988, the actions taken by the USFWS have worked to return the floodplain condition to that shown on the current flood insurance rate map as these conditions were modified by past land use activities. The USFWS has modeled the hydrologic and hydraulic conditions in the Carson Slough, but only for the purposes of ecological function and processes. The 100-year flood in the Upper Carson Slough is of such a magnitude that the restoration activities described in the proposed action will have no affect on future flood water elevations. The restoration activities affect drainage patterns and ecological functions during moderate and low flows, but are inconsequential with respect to changing hydraulic conditions during large flooding events (OBEC 2010).

As a result, no significant impacts to floodplains are likely to occur.

4.2.9 Wetlands

The proposed project would require the excavation of some existing wetlands in order to more fully and completely restore the wetland ecosystems of the Upper Carson Slough. Earthen materials (approximately 3,000 cubic yards) would be excavated during stream channel construction and restoration and would be disposed of in a manner that would not result in permanent impacts to wetlands. The excavated materials would be placed and spread adjacent to the excavated stream channel within a minor portion of the designated project footprint. The excavated soils would be spread over a narrow (8- to 15-ft–wide [2- to 5-m-wide]) area with a maximum thickness of 0.5 ft (0.2 m). Minimizing the thickness of placed soils in this manner would allow native plants to recolonize the site from existing roots/rhizomes as well as from roots/rhizomes and seeds contained in the excavated soils. The total soil volume generated and disposal area necessary has been calculated based on excavation width and depth of each restored stream channel segment (Table 1); the combined total area necessary for excavated soil disposal is 3.8 ac (1.5 ha).

Table 1. Excavation Volume Resulting from Soils Generated during Stream Channel Excavation and Associated Fill Area Based on a Fill Depth Not to Exceed 0.5 foot (0.2 meter).

FEATURE	EXCAVATION VOLUME (cubic yards)	EXCAVATION VOLUME (cubic feet)	FILL WIDTH (feet)	FILL AREA (acres)
Upper Rogers Spring Stream Channel	741	20,000	8	1
Upper Longstreet Spring Stream Channel	1,111	30,000	10	1.4
Rogers Spring–Longstreet Spring (Lower Channel)	1,111	30,000	15	1.4
Total	**2,963**	**80,000**	**NA**	**3.8**

Any negative direct or indirect effects, such as covering of wetland soils and plants, would be temporary. Some of the materials excavated for the restored stream channels would be placed within areas presently delineated as wetlands. However, excavated materials would not obstruct surface flow and would be recolonized by wetland vegetation. In addition, because excavated soils would be placed and disposed of immediately adjacent to the excavation area, any soils placed in wetlands would be composed of wetland soils. The proposed soil disposal thickness (0.5 ft [0.2 m] maximum) would allow wetland vegetation to quickly recolonize the soil disposal area. Placement of shallow fill is the desired method of soil disposal due to the additional impacts associated with hauling, which would require road building and unnecessary soil compaction and wetland disturbance. In-place disposal of soil would not negatively impact wetland vegetation, surface flow, hydrology, or flooding. All surfaces would be revegetated through a combination of planting, seeding, and natural recolonization.

The 3.8 ac (1.5 ha) of wetland fill associated with the proposed project would constitute temporary impacts to wetlands. However, these temporary impacts would be made in a direct effort to generally improve and restore the wetland ecosystem in the Upper Carson Slough. In the long term, wetlands are expected to expand spatially with a subsequent increase in wetland functional values. As a result, these temporary impacts would not constitute significant impacts.

Avoidance and minimization of wetland impacts were high priorities in the development of project alternatives. A Clean Water Act Section 404 Individual Permit is required for the proposed action. All minimization measures identified in the Clean Water Act Section 404 permit will be adhered to if the proposed action is selected.

4.2.10 Migratory Birds

Restoration is anticipated to alter the hydrological regime and habitat structure and composition in the project area. Anticipated changes in habitat structure and composition may have minor impacts on bird populations, but the species impacted would likely be those that are relatively common on the Refuge. Long-term effects resulting from restoration of the historical hydrologic regime would likely result in changes in habitat structure and composition favorable to both migrant and resident bird communities.

Although considered common in the spring and fall, a species that may be temporarily impacted by the restoration of the Upper Carson Slough is the white-faced ibis. Ibis are known to use emergent marsh habitat in or near the project area, and are not abundant on the Refuge in the summer and winter months. Restoration of the historical hydrological regime would likely have positive long-term impacts on the species. However, short-term impacts to white-faced ibis could include disturbance of habitat and temporary displacement associated with construction activities. It should be noted that other habitat outside of the project area exists on the Refuge for potentially displaced ibis.

In general, heavy equipment that would be used in the restoration activities has the potential to disturb nesting or breeding migratory birds. However, heavy equipment operations are anticipated to be completed prior to breeding bird season (March 15 through August 15). Because of construction scheduling, it may be necessary to conduct some work within this time frame. In such a case, nest surveys would be completed prior to ground disturbance. Work would not proceed if an active nest was found until birds have fledged. Migratory birds would not be taken, killed, or possessed. Although impacts to migratory birds could result from disturbance or displacement, suitable habitat is found elsewhere on the Refuge and impacts would be considered minor and temporary. As a result, no significant impacts are likely to occur to migratory birds.

4.3 Cumulative Impacts

Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, or reasonably foreseeable actions regardless of what agency or person undertakes such other actions.

The reasonably foreseeable action scenario has been determined to be the Refuge within a time frame of 20 years. Within this spatial area and time frame, a variety of other projects and actions are planned and proposed. Past actions to which the proposed project would incrementally add include past restoration activities such as those at Point of Rocks Springs, Jackrabbit Spring, and School Spring and restoration of outflow channels of Fairbanks Spring and Soda Spring. Future actions to which the proposed project's impacts would add incrementally include projects and actions as outlined in the CCP EIS including future restoration activities, recreational enhancements, and roadway improvements on the Refuge.

Although the majority of cumulative impacts from these past and future actions are beneficial to the Refuge and its resources, implementation of the proposed project would incrementally add to the minor and temporary impacts to air quality, threatened and endangered species, recreational opportunities, invasive species, wetlands, and migratory birds. These impacts are individually minor, and are not expected to be collectively major or significant because the actions are separated by both space and time. The majority of the actions have not and would not happen simultaneously and are separated by considerable distance so as to buffer the effects. The impacts of the proposed project would be added to these past actions and planned future actions.

4.4 Impact Analysis Summary

Table 2 (next page) provides a summary of impacts by alternative.

Table 2. Summary of Impacts by Alternative.

IMPACT TOPICS	NO ACTION ALTERNATIVE	PROPOSED ACTION
Air Quality	No effect.	Construction activity would temporarily increase particulate matter and localized emissions. BMPs to minimize temporary and minor impacts. No significant impact.
Threatened and Endangered Species	Continued habitat degradation and likely increase in invasive species over time, ultimately impacting the viability of threatened and endangered species. The Refuge would not meet the objectives of species recovery outlined in the recovery plan. Species-specific impacts are discussed in Section 4.2.2 of this Environmental Assessment.	Broad beneficial impacts to threatened and endangered species and habitat over the long term. Proposed actions would not jeopardize the continued existence of any species or adversely modify their critical habitat. Short-term impacts could occur for individual plants or fish, but populations would improve over time. Minimization measures would limit potential impacts. No significant impacts.
Cultural and Historical Resources	No adverse effect.	Potential adverse effects to three properties. However, modifications would result in no effect. No significant impacts.
Recreation	Recreational resource degradation as invasive species continue to modify habitat for endemic species. No trails or view areas would be developed or expanded.	Temporary and minor impacts to wildlife through displacement and possible local loss of hunting opportunities if construction occurs during hunting season. Long-term beneficial impact resulting from anticipated habitat improvements. No significant impact.
Invasive and Nonnative Plants and Animals	Noxious weed infestations and the proliferation of Aquatic Invasive Species that prey upon endemic species and compete for resources would likely continue and/or expand.	Decrease in noxious weeds and Aquatic Invasive Species in the project area as endemic species become re-established. Improved habitat for native species. No significant impact.
Wetlands	Wetland resource degradation as invasive species continue to modify habitat for endemic species. Hydrologic barriers continue to inhibit proper functioning of wetland.	3.8 acres (1.5 hectares) of temporary impacts. General beneficial effects in the long term. No significant impact.
Migratory Birds	Minor disturbance by continued visitation. Continued habitat degradation as invasive species modify habitat.	Minor disturbance by continued visitation. Minor, temporary disturbance if impact to vegetation occurs during breeding season. No significant impact.

5.0 CONSULTATION AND COORDINATION

5.1 List of Preparers

The following USFWS personnel were consulted during the development of this EA:

Sharon McKelvey	USFWS Ash Meadows National Wildlife Refuge Manager
Cristi Baldino	USFWS Ash Meadows National Wildlife Refuge Biologist
Darrick Weissenfluh	USFWS Ash Meadows National Wildlife Refuge Biologist
LouAnn Speulda-Drews	USFWS Region 8 Archeologist

The following consultant personnel from BIO-WEST were consulted during the development of this EA:

Darren Olsen	Senior Hydrologist
Blaise Chanson	Senior Environmental Analyst
Ken Sim	Environmental Analyst II
Sean Keenan	Environmental Analyst
Craig Fosdick	Wildlife Biologist
Alyson Eddie	Ecologist
Janelle Egli	Editor

5.2 Pertinent Laws, Executive Orders, and Regulations

National Environmental Policy Act of 1969, as amended: The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions.

Endangered Species Act of 1973: This act provides for the conservation of the ecosystems upon which endangered species and threatened species depend and provides a program for the conservation of such endangered species and threatened species.

Fish and Wildlife Act of 1956: Under this act, the Secretary of Interior is authorized to take such steps required for the development, management, conservation and protection of fish and wildlife resources including but not limited to research, development of existing facilities, and acquisition by purchase or exchange of land and water.

National Wildlife Refuge System Administration Act of 1966: This act defines the National Wildlife Refuge System, and authorizes the Secretary of Interior to permit any use of an area provided such use is compatible with the major purpose for which the refuge was established.

National Wildlife Refuge Improvement Act of 1997: This act expands on the National Wildlife Refuge System Administration Act of 1966 by providing organic legislation for the National Wildlife Refuge System, and significant additional guidance on management and public use of the refuge system.

Archeological Resource Protection Act of 1979: This act protects irreplaceable archeological resources on federal lands that are 100 years or older.

National Historic Preservation Act: This act authorizes the National Register of Historic Places, establishes the Advisory Council on Historic Preservation, and grants power to the Council to review federal undertakings that affect historic properties.

Title 50 of the Code of Federal Regulations: This title implements numerous laws and executive orders concerning wildlife, including administration of National Wildlife Refuges.

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APPENDIX A

RESPONSE TO COMMENTS

Responses to Comments on the Draft Environmental Assessment

The draft Environmental Assessment was available for public review from January 30, 2013 through March 25, 2013. We received five comment letters from the public. Our responses to comments on the proposed project are presented below in Table 1. We are providing responses to comments that pertain directly to the EA for Upper Carson Slough Restoration and Trail System at Ash Meadows National Wildlife Refuge.

Reviewer Comment	**Service Response**
Victor Fuentes	
Use of the 1948 imagery is both historically and factually incorrect. For true "historical restoration", any "re-alignments" must be based on water flow as depicted on available maps dating back to 1881.	• Restoration efforts of this project are intended to return spring flows from irrigation ditches to free flowing streams in an appropriate landscape position and in an arrangement similar to that prior to landscape modification. The 1881 map is useful in that it provides one of the earliest maps of the Upper Carson Slough. However, it is limited in the amount of detail provided. The 1948 imagery provides more detail in relation to geomorphology, landscape patterns, vegetation patterns, and the overall hydrology of the Upper Carson Slough. As such, the 1948 imagery provides more information to understand how the ecosystem functioned prior to landscape alteration.
The EA is inconsistent on the discussion of historic wetlands. Page 15 of the EA states there is no documented evidence of a historical wetland at the present-day Peterson Reservoir and no wetlands were reported at this site during the 1881 township surveys. Page 29 of the EA says that the project area was historically the	• As stated in the EA on page 15, "Aerial photographs from 1948 show a body of water located in what appears to be a natural depression in the site of present-day Peterson Reservoir, but much reduced in size." and "A 1952 USGS topographic map shows an intermittent body of water in this same location that is also much smaller than the present-day Peterson Reservoir." It is recognized that Peterson Reservoir was constructed to allow for increased water storage. However, the presence of a wetland area in the vicinity of Peterson Reservoir prior to its construction is supported by aerial

largest wetland in southern Nevada.	photography, geomorphology and paleoecological studies.
The EA fails to acknowledge the landowners within the Refuge or that actions proposed will result in regular and possibly permanent flooding.	• The Upper Carson Slough has been designated as a 100 year floodplain by FEMA and is therefore prone to large flood events. The private property is within this floodplain and is also prone to large flood events. The proposed project does not increase the probability of flooding of private property within this floodplain.
The removal of Mud Lake Dam is outside the scope of the 2009 EIS and would result in regular flooding of private property. This action requires an EIS.	• The draft EA provided a complete analysis of the proposed action, including the removal of Mud Lake Dam. Our analysis has not discovered any significant environmental impacts. However, because of the coordination required at this time to work on property of another agency, the removal of Mud Lake Dam will not be pursued at this time.
The USF&W attempts to tier to a four-year-old EIS.	• Comment noted. The 2009 CCP/EIS sets the overall management direction for the Refuge, including habitat goals and objectives. It is appropriate to tier this EA, covering the restoration of Upper Carson Slough, to the 2009 CCP/EIS.
Because of the significant impact of the proposed action (some of which have already been taken), a full Economic Impact Statement should be prepared.	• None of the actions proposed in the 2013 EA have been initiated. Our analysis of the proposed action has not revealed any significant environmental impacts that would necessitate the preparation of an Environmental Impact Statement (we assume the commentor is referring to an "Environmental" Impact Statement).
The Army Corps of Engineers (USACE) permitting process was not adhered to.	• A wetland delineation report was submitted to the USACE in July 2011. In October 2012 the USACE concurred with the delineation for the Upper Carson Slough project area. As noted in the EA on page 41, a Clean Water Act Section 404 Individual Permit is required for the proposed action and will be obtained prior to construction.
Mockingbird, mi2brokn@gmail.com	
You are not using the 1881 map of the area. The 1881 map show the truest "historic stream flows."	• See response to the first comment above.
William Quan, wquan888@hotmail.com	

I am firmly against this.	• Comment noted.
Jim Little, jlittle66@hotmail.com	
FWS should leave things as they are. From what I hear when you change water flows, there are often unforeseen consequences.	• Comment noted.
Richard Tretter, ricktret@pacbell.net	
Writing to register opposition to this project. Does not think it will enhance Ash Meadows.	• Comment noted.