United States Department of the Interior

FISH AND WILDLIFE SERVICE
Southern Nevada Fish and Wildlife Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130

IN REPLY REFER TO:
08ENVS00-2019-F-0153

January 14, 2020

Memorandum

To: Field Manager,
Division of Renewable Resources
Bureau of Land Management
Las Vegas Field Office
Las Vegas, Nevada

GLEN KNOWLES Digitally signed by GLEN KNOWLES Date: 2020.01.13 17:19:59 -08'00'

From: Field Supervisor
Southern Nevada Fish and Wildlife Office
Las Vegas, Nevada

Subject: Formal Programmatic Consultation under Section 7 of the Endangered Species Act for Effects to Threatened and Endangered Species and their Critical Habitat that May Occur as a Result of Actions Proposed by the Southern Nevada District Office, Bureau of Land Management

This transmits the U.S. Fish and Wildlife Service's (Service) response to your memorandum received November 13, 2017, requesting reinitiation of formal consultation of the Bureau of Land Management (BLM) Southern Nevada District's Programmatic Biological Opinion (PBO); Clark and Nye Counties, Nevada (File No. 84320-2010-F-0365). This PBO addresses potential effects to the federally threatened Mojave desert tortoise (*Gopherus agassizii*) and its designated critical habitat, southwestern willow flycatcher (*Empidonax traillii extimus*) and its designated critical habitat, western yellow-billed cuckoo (*Coccyzus americanus*), Yuma clapper rail (*Rallus obsoletus yumanensis*), Virgin River chub (*Gila seminuda*) and its designated critical habitat, woundfin (*Plagopterus argentissimus*) and its designated critical habitat, Moapa dace (*Moapa* coriacea), spring-loving centaury (*Zeltnera (=Centaurium) namophilum*) and its designated critical habitat, Ash Meadows sunray (*Enceliopsis nudicaulis var. corrugata*) and its designated critical habitat, Ash Meadows milkvetch (*Astragalus phoenix*) and its designated critical habitat, Ash Meadows ivesia (*Ivesia kingii* var. *eremica*) and its designated critical habitat, Ash Meadows gumplant (*Grindelia fraxino-pratensis*) and its designated critical habitat, Amargosa niterwort (*Nitrophila mohavensis*), Ash Meadows naucorid (*Ambrysus aamargosus*) and its designated critical habitat, Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*) and its designated critical habitat, Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*), and Warm Springs pupfish (*Cyprinodon nevadensis pectoralis*) in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 et seq.) and

50 Code of Federal Regulations (CFR) Part 402 of our interagency regulations governing section 7 of the Act.

The BLM currently implements various land management activities within the Southern Nevada District Office (SNDO) planning area based on its 1998 Resource Management Plan (RMP). The Service issued the most recent PBO to the BLM for anticipated effects of the RMP in 2013.

BLM now requests reinitiation of that PBO based on the following requirements of 50 CFR § 402.16: a new species is listed that may be affected by the action, and new information reveals effects of the agency action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered. Since the Service issued the PBO, the western yellow-billed cuckoo, which occurs in the planning area, was listed as threatened in 2014. The BLM also requests reinitiation of the PBO to address new or additional effects to species through herbicide use. Finally, this reinitiation of the PBO will wholly incorporate all information from and replace the original PBO (84320-2010-F-0365) and all six reinitiations. This updated PBO will be in effect until a subsequent reinitiation of consultation occurs or a new RMP has been completed.

This PBO reinitiation is based on information provided in your memorandum; the biological assessment; amendments to the incidental take statement provisions of the implementing regulations for section 7 of the ESA of 1973 as amended (80 FR 26832; 50 CFR § 402.14(i)); in-person and e-mail communications between the Service and BLM; interagency section 7 consultation regulations in 50 CFR Part 402; scientific publications, articles, and reports; and our files. A complete project file of this consultation is available in the Service's Southern Nevada Fish and Wildlife Office in Las Vegas.

Programmatic Biological Opinion for Bureau of Land Management Activities Adversely Affecting 17 Listed Species and Critical Habitat

FILE NO. 08ENVS00-2019-F-0153

Issued to the Bureau of Land Management
Southern Nevada District Office
Las Vegas, Nevada

Prepared by the Southern Nevada Fish and Wildlife Office
December 11, 2019

Section 1: Table of Contents

Tables:

Figures:

Glossary and Acronyms

ac = acre(s)

ACEC (area of critical environmental concern) - the ACEC program was conceived in the 1976 Federal Lands Policy and Management Act, which established the first conservation ecology mandate for the BLM. The FLPMA mandate directs the BLM to protect important riparian corridors, threatened and endangered species habitats, cultural and archeological resources, and unique scenic landscapes that the agency assesses as in need of special management attention.

Act = Endangered Species Act of 1973, as amended

action area - all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 CFR § 402.02)

adverse effect – there is no definition of adverse effect in the Act; the Service considers adverse effects to the desert tortoise to include actions that result in any form of take (as defined below); reduced reproduction; a tortoise voiding its bladder as a direct or indirect effect of the action; behavior of any individual tortoise is modified which may negatively affect its breeding, feeding, or sheltering (e.g., causing a tortoise to emerge from its burrow); and habitat is disturbed or degraded to the extent that important habitat features are removed such as shrubs used for shelter, burrows, nests, forage, etc., that may result in harm to any tortoise. Adverse effects to designated critical habitat include effects to any of the essential features of critical habitat that would diminish the value of the habitat for the recovery of the species. Adverse effects vary from species to species. Contact a Service biologist for more information.

afy (acre-feet per year) = used most often to measure groundwater use; 1 acre-foot = 325,851 gallons or the volume of liquid that would cover an acre 1 foot deep

ATV (all-terrain vehicle) – A motorized vehicle 50 inches or less in width, designed for off-highway use and capable of maneuvering over uneven terrain and contains four or more low-pressure tires, a seat to be straddled by the operator, and handlebar for steering control.

AML = appropriate management level (wild horse and burro)

AUM (animal unit month) = the amount of forage needed to sustain one cow and her calf, one horse, or five sheep or goats for a month

BCCE = Boulder City Conservation Easement

C = Celsius

CHU =critical habitat unit

CFR = Code of Federal Regulations

cfs = cubic feet per second

conference – a process of early interagency cooperation involving informal or formal discussions between a Federal agency and the Service regarding the likely impact of an action on species proposed for listing as threatened or endangered or areas proposed to be designated as critical habitat. If formal consultation occurs, a conference opinion is issued by the Service.

conservation area (desert tortoise) - includes desert tortoise habitat within critical habitat, Desert Wildlife Management Areas, Areas of Critical Environmental Concern, Desert National Wildlife Refuge, National Park Service lands, and other areas or easements managed for desert tortoise recovery.

commercial race experience – A commercial activity that involves the use of specialty vehicles for guided trail rides that will travel at speeds faster than 25 miles per hour.

critical habitat – area essential to the conservation (recovery) of a listed species, though the area need not actually be occupied by the species at the time it is designated. This is a specific term and designation within the Act. Critical habitat consists of: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Act, on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act that is determined to be essential for the conservation of the species.

CSI = Coyote Springs Investment

DCP = desert conservation plan

desert tortoise most active period – Desert tortoises are known to be active aboveground every month of the year under certain conditions. The active periods for the desert tortoise are generally defined by the geographic area (elevation, latitude, etc.), temperature, precipitation, breeding season, forage availability, and age class of the tortoise. Within the action area for this consultation, most desert tortoise activity is predicted to occur March 16 through May 31 and September through October. For this consultation, the BLM and Service consider tortoises most active and potentially at greatest risk as a result of project activities during March 16-31, April, May, September, and October.

desert tortoise less active period – Desert tortoises are predicted to be less active when ambient temperatures exceed 100 degrees F or below 60 degrees F and during prolonged dry conditions. The less active season for tortoises is from June 1 through August 31 when ambient temperatures are mostly over 100 degrees F, though activity can still occur during early morning hours and during monsoon events.

desert tortoise least active period – The least active season for tortoises is from November 1 through March 15 when tortoises are brumating and temperatures are the coolest.

EPA = U.S. Environmental Protection Agency

event (recreation) – a single, structured, organized, consolidated or scheduled meeting or occurrence for recreational use of public land and water resources; may be comprised of several related activities

F = Fahrenheit

Federal action - any action authorized, funded, or carried out in whole or in part by a Federal agency which may involve non-Federal lands

Federal nexus - connection between a Federal and non-Federal action

FCR = field contact representative or compliance inspection contractor

FLPMA = Federal Land Policy and Management Act; governs the way in which the public lands administered by the BLM are managed

FMP = fire management plan

ft = foot/feet

GIS = geographic information system

GPS = global positioning system

ha = hectare(s)

harm – any act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering (also see adverse effects definition above)

HCP (habitat conservation plan) - under section 10(a)(2)(A) of the Act, a planning document that is a mandatory component of an incidental take permit application

HMA = herd management area

IC = incident command (fire)

incidental take - take (see definition below) that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

km = kilometer

km^2 = square kilometer

listed species – species listed as threatened or endangered under the Act

low-density desert tortoise habitat – for the purposes of this consultation, these areas occur outside Areas A and B and consist of areas characterized as suitable for desert tortoises but not of sufficient quality to support moderate to large tortoise populations. Nussear et al. (2009) modeled desert tortoise habitat and assigned values from 0.0 to 1.0 with 1.0 representing the highest quality habitat (Figure 28 Appendix B). Habitat in the action area with values 0.5 and below are generally considered low-density habitat.

m = meter

mi = mile(s)

mi^2 = square mile(s)

MOA = memorandum of agreement

mph = miles per hour

MSHCP = Multiple Species Habitat Conservation Plan

mm = millimeter

MVWD = Meadow Valley Water District

NAC = Nevada Administrative Code

NCA = national conservation area

NDOT = Nevada Department of Transportation

NDOW = Nevada Department of Wildlife

NRS = Nevada Revised Statute

NWR = National Wildlife Refuge (U.S. Fish and Wildlife Service managed land)

OHV = off-highway vehicle

PBA = programmatic biological assessment

PBO = programmatic biological opinion

PNC = potential natural community

R&PP Act (Recreation and Public Purposes Act) - established by Congress as a means for state and local governments and non-profit organizations to acquire public lands at no cost or reduced cost for needed local services and recreational activities

recovery - improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act

recovery unit - management subsets of the listed species range that are created to establish recovery goals or carrying out management actions

RMP = resource management plan

ROW = right-of-way

Section 7 (of the Act) - describes the responsibilities of Federal agencies in conserving threatened and endangered species. Section 7(a)(1) requires all Federal agencies "in consultation with and with the assistance of the Secretary [to] utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species." Section 7(a)(2) requires Federal agencies to "ensure that any action authorized, funded, or carried out by such agency...is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of..." designated critical habitat.

Section 9 (of the Act) - the section of the Act dealing with prohibited acts, including the "take" of any listed animal species without specific authorization of the Service for species under the jurisdiction of each agency.

Section 10 (of the Act) - the section of the Act dealing with exceptions to the prohibitions of section 9 of the Act. Section 10(a)(1)(A) allows for permits for the taking of threatened or endangered species for scientific purposes or for purposes of enhancement of propagation or survival; section 10(a)(1)(B) allows for permits for incidental taking of threatened or endangered species, typically issued for HCPs.

Service = U.S. Fish and Wildlife Service

SEZ = solar energy zone

SNDO = BLM's Southern Nevada District Office

SNWA = Southern Nevada Water Authority

specialty vehicles – Any motorized vehicle that has been modified, designed, or constructed exclusively or primarily for travel on or immediately over land, water, or other natural terrain and does not fit the definition of an ATV or UTV.

SR = state route (highway)

SRP (special recreation permit) - an authorization that allows specified recreational uses of the public lands and related waters. Special recreation permits are issued as a means to manage visitor use and to protect natural and cultural resources and as a mechanism to authorize commercial, competitive, and vending use; organized group activities and events; and individual or group use of special areas.

take (Act definition) - to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. There are no take provisions for plants.

USGS = U.S. Geological Survey

UTV (Utility-terrain vehicle) – A motorized vehicle 65 inches or less in width, designed for off-highway use and capable of maneuvering over uneven terrain; usually designed with side-by-side seats; and contains seatbelts and restraint system for each occupant, a steering wheel, four or more low-pressure tires, and a rollover protective structure. It may have doors attached.

WHB Act = Wild Free-Roaming Horses and Burros Act of 1971

Section 2: Consultation History

2.1 Prior Programmatic Biological Opinions

This programmatic biological opinion (PBO) is a comprehensive document that replaces the four previous PBOs issued to the Bureau of Land Management (BLM) in southern Nevada that involve the action area, as described below. Refer to the Consultation History of these PBOs for more information on the consultation history for BLM actions in southern Nevada. These PBOs are discussed in the Environmental Baseline section and in Appendix C.

Las Vegas Valley PBO (File No. 1-5-96-F-023R3)

On December 20, 2004, the U.S. Fish and Wildlife Service (Service) issued a PBO for potential adverse effects to the desert tortoise and conference opinion on the Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*), a plant taxon proposed by the State of Nevada for critically endangered status in accordance with Nevada Revised Statutes (NRS) 527.270-300. While the Las Vegas buckwheat was not proposed for listing as endangered or threatened under the Endangered Species Act of 1973, as amended, BLM and the Service agreed conferencing was appropriate to identify pertinent conservation measures that would reduce the level of effects to the species that are likely to occur from implementation of the proposed action and subsequent activities.

PBO for Multiple Use Activities within the Las Vegas Field Office (File No. 1-5-97-F-251)

On November 21, 1997, the Service issued a PBO to BLM for implementation of multiple-use actions within their Las Vegas District, excluding desert tortoise designated critical habitat, proposed desert tortoise Areas of Critical Environmental Concern (ACECs), and the area covered by the Las Vegas Valley PBO. BLM could authorize activities within the programmatic area that would result in loss of tortoises or their habitat through surface disturbance, land disposal, and fencing for a period of 5 years. The total area covered by this PBO was approximately 2,636,600 acres (ac) which included approximately 263,900 ac of BLM-withdrawn lands in Clark County.

PBO for the Las Vegas Resource Management Plan (RMP; File No. 1-5-98-F-053)

On June 18, 1998, the Service issued a PBO to BLM for implementation of the Las Vegas RMP. The project area for this consultation covered all lands managed by BLM's Las Vegas Field Office, including desert tortoise designated critical habitat, desert tortoise ACECs, and BLM-withdrawn lands.

On March 20, 2009, the Service issued an amendment to the PBO for the Las Vegas RMP. The amendment modified the Terms and Conditions of the incidental take statement and method of inclusion of future BLM actions in the category of *Management of Speed and Non-speed Off-Highway Vehicle (OHV) Events* in the PBO. The Service determined that certain speed and non-speed OHV events resulted in effects outside the analysis for the actions in the PBO; therefore, separate section 7 consultation was required for speed OHV events as they were no longer covered under the PBO.

PBO for the Las Vegas Resource Management Plan (File No. 84320-2010-F-0365)

On January 2, 2013, the Service issued a PBO to BLM for implementation of the Las Vegas RMP until a new RMP could be completed. The project area for this consultation covered all lands managed by the BLM's Las Vegas Field Office and Pahrump Field Office (collectively, the Southern Nevada District Office [SNDO]), including desert tortoise designated critical habitat, desert tortoise ACECs, and BLM-withdrawn lands. The PBO covered eight programs, including recreation management speed and non-speed events.

On July 12, 2013, the Service issued the first reinitiation of the SNDO PBO (84320-2010-F-0365.R001). The reinitiation modified the proposed action for permitted recreation events. Two new high speed race areas were included, a minimization measure was added, and the PBO text was modified.

On February 20, 2014, the Service issued the second reinitiation of the SNDO PBO (84320-2010-F-0365.R002). The reinitiation added 3.5 miles of race course to the proposed action for recreation management and added a new term and condition that applied to all high-speed races.

On October 17, 2014, the Service issued the third reinitiation of the SNDO PBO (84320-2010-F-0365.R003). The reinitiation modified the proposed action by adding 20 ac of new disturbance under Section 302 of the Federal Land Policy and Management Act, modifying the Jean Truck and Buggy racing routes, and adding 23 miles of course for use by rally cars in the Goodsprings area.

On February 10, 2016, the Service issued the fourth reinitiation of the SNDO PBO (84320-2010-F-0365.R004). The reinitiation modified the proposed action by increasing disposal acres from 3,000 to 7,000 ac, increasing acres for Recreation and Public Purposes Act actions from 1,000 to 1,400 ac, adding 72 miles of motorcycle course and 320 miles of truck and buggy course to connect existing and previously analyzed race courses, increasing the maximum number of motorcycle entrants from 160 to 200 in desert tortoise designated critical habitat outside areas of critical environmental concern for Nelson Hills, and correcting and modifying text.

The fifth and sixth reinitiations occurred during this consultation process and are described below.

2.2 Chronology of Events Leading to Initiation of Consultation

- Throughout 2017, BLM and the Service met periodically to discuss the proposed action and exchange comments on the draft programmatic biological assessment (PBA).
- November 13, 2017 - BLM submitted a PBA to the Service with their request for formal consultation. BLM determined that implementation of the proposed action

may affect, and is likely to adversely affect 17 threatened or endangered species, 12 of which have designated critical habitat within the action area. The Service received this request and PBA on November 13, 2017, and determined that BLM needed additional information to initiate formal consultation.

- December 18, 2017 - A final PBA was submitted. The Service determined the PBA to be complete, at which time consultation was initiated.
- Following initiation of consultation, the Service and BLM met periodically to discuss and clarify items associated with the consultation and to make final edits to the proposed action.
- February 7, 2018 - A draft of this PBO was provided to the BLM for review.
- February 21, 2018 - BLM provided comments on the draft PBO to the Service.
- April 26, 2018 - Final updated figures were received for some of the race courses in Appendix B.
- June 21, 2018 - Due to timeline issues, a condensed fifth reinitiation was issued by the Service for herbicide use and updated race courses (84320-2010-F-0365.R038).
- September 27, 2018 - The RMP was terminated. The current reinitiation was deleted in the Service's TAILS system. The BLM will request reinitiation again but will no longer include solar. Edits to the PBA need to be made.
- October 17, 2018 - The Service issued the sixth reinitiation of the SNDO PBO (84320-2010-F-0365.R0396). The reinitiation added 3,500 acres for disposal lands and a modification to the Crescent Peak race course to add ten miles to the course.
- July 24, 2019 – The Service and BLM met to discuss changes being made to the PBA and timeline moving forward.
- July 29, 2019 - BLM submitted the updated PBA to remove solar, update recreation maps, and update acres of disturbance. The consultation package was considered complete and request for formal consultation was initiated. The species and designated critical habitat that may be adversely affected by the proposed action are in Table 1.

Table 1. Species and designated critical habitat that may be adversely affected by the proposed action.

	Common Name	Scientific Name	Federal Status (T=Threatened, E=Endangered)	Critical Habitat
1	Desert tortoise	*Gopherus agassizii*	T	Clark and Nye Counties
2	Southwestern willow flycatcher	*Empidonax traillii extimus*	E	Clark County
3	Western yellow-billed cuckoo	*Coccyzus americanus*	T	No designated critical habitat
4	Yuma clapper rail[1]	*Rallus obsoletus yumanensis*	E	No critical habitat designated
5	Virgin River chub	*Gila seminuda*	E	Clark County
6	Woundfin	*Plagopterus argentissimus*	E	Clark County
7	Moapa dace	*Moapa coriacea*	E	No critical habitat designated
8	Spring-loving centaury	*Zeltnera (=Centaurium) namophilum*	T	Nye County
9	Ash Meadows sunray	*Enceliopsis nudicaulis var. corrugata*	T	Nye County
10	Ash Meadows milkvetch	*Astragalus phoenix*	T	Nye County
11	Ash Meadows ivesia	*Ivesia kingii* var. *eremica*	T	Nye County
12	Ash Meadows gumplant	*Grindelia fraxino-pratensis*	T	Nye County
13	Amargosa niterwort	*Nitrophila mohavensis*	E	No critical habitat within the action area

[1] Until the List of Threatened and Endangered Wildlife is revised (50 CFR 17.11), we refer to what is now commonly recognized as the Yuma Ridgway's rail (*R. o. yumanensis*) as Yuma clapper rail.

	Common Name	Scientific Name	Federal Status (T=Threatened, E=Endangered)	Critical Habitat
14	Ash Meadows naucorid	*Ambrysus aamargosus*	T	Nye County
15	Ash Meadows Amargosa pupfish	*Cyprinodon nevadensis mionectes*	E	Nye County
16	Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*	E	Nye County
17	Warm Springs pupfish	*Cyprinodon nevadensis pectoralis*	E	No critical habitat within the action area

Section 3: Programmatic Consultation

Programmatic consultation is a consultation addressing an agency's multiple actions on a program, region, or other basis. Programmatic consultations allow the Services to consult on the effects of programmatic actions such as (1) multiple similar, frequently occurring, or routine actions expected to be implemented in particular geographic areas and (2) a proposed program, plan, policy, or regulation providing a framework for future proposed actions.

This PBO was prepared to address potential adverse effects to listed species and designated critical habitat as a result of programs described in the SNDO's RMP and PBA, and it analyzes the potential effects of implementing BLM actions or actions with a BLM nexus. This PBO addresses a mixed programmatic action that means, for purposes of an incidental take statement, a Federal action that approves action(s) that would not be subject to further section 7 consultation (hereafter referred to as program-level actions), and also approves a framework for the development of future action(s) that are authorized, funded, or carried out at a later time and any take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further section 7 consultation (framework programmatic actions; hereafter referred to as project-level actions).

To streamline section 7 consultation for actions affecting the desert tortoise, we established a framework for actions that require project-specific consultation that would be appended this PBO when habitat disturbance thresholds are exceeded. Proposed actions anticipated to result in adverse effects to desert tortoise habitat that are greater than 5 acres of designated critical habitat or greater than 20 acres of non-critical habitat, are considered project-level actions and subject to further section 7 consultation before the BLM can authorize and implement the action. Further consultation would result in separate project-level analysis and documentation that would be appended to this PBO and include exempted incidental take for that specific action.

For all program-level actions equal to or below the previously identified acreage thresholds, the incidental take statement provided herein provides the basis for exemption of the incidental take for those program-level actions. References throughout this document to identified Terms and Conditions refer to terms and conditions included in the accompanying incidental take statement.

The PBO and the appended project-level documentation fulfill the consultation requirements for implementation of both program-level and framework programmatic (project-level) actions.

In this PBO, the Service determined the overall anticipated level of exempted incidental take of desert tortoise for all proposed BLM activities in the action area by program under the existing RMP (program-level and project-level). As each action is submitted by BLM to the Service to be appended to this PBO, the Service would determine the anticipated incidental take for each action as a subset of the incidental take anticipated in the PBO. The term of this biological opinion is in effect until reinitiation of consultation pursuant to one or more of the four reinitiation triggers in 50 CFR 402.16 occurs. All estimates of proposed disturbance and incidental take is new to this PBO and not carried over from the previous PBO. This PBO supersedes and replaces earlier PBOs.

Reports prepared by BLM and submitted to the Service for review assure that the effects analyses in the PBO are accurate including a comprehensive review of how the PBO is working and whether its implementing procedures are in compliance. BLM would submit information on all projects and their effects to desert tortoise and other listed species in annual reports (due January 31st following each calendar year). During this review, the environmental baseline should be reviewed and updated as needed to account for unanticipated effects or the lack of anticipated effects. BLM would be responsible for accurately reporting any incidental take of listed species to the Service that occurs in association with actions covered under this PBO.

3.1 Program- and Project-Level Procedures

Future BLM actions are expected to fall within the scope of one of eight programs; however, some projects may not match the proposed action for any of these programs, but the effects to listed species are similar. In such cases, the BLM would cover the action under the most appropriate program in the PBO.

If a BLM Federal nexus exists, future actions conducted on non-Federal or other Federal lands may be covered under this PBO if the actions fall within the scope of the analyses in the PBO and all involved parties agree in writing that BLM, through the SNDO, would exercise total discretion and oversight over the action throughout the action area during activities that may result in adverse effects to listed species. BLM must have sufficient involvement or oversight over the project to ensure compliance with this PBO and all required measures in the appended consultation document. BLM may delegate specific responsibilities to other agencies, but remains the ultimate responsible entity for compliance with section 7 of the Act. BLM and the Service would agree on the extent of BLM's responsibility for compliance during the program- and project-level consultation.

This consultation covers the activities of the BLM and other Federal agencies and non-Federal entities if: (1) a nexus exists to a SNDO action, (2) all discretionary Federal agencies that are involved in the project or action agree that the SNDO is the lead office for the consultation, and (3) the SNDO has discretion over the action to enforce terms and conditions of any incidental take exemption for the action. The scope of the proposed action is established by acreage thresholds for each program and sub-program.

If a project is proposed on non-Federal lands that falls under purview of a section 10 incidental take permit (e.g., the Clark County Multiple Species Habitat Conservation Plan [MSHCP]) involving a nexus to a BLM action with adverse effects to the desert tortoise, such projects may be covered or appended to this PBO. The project-specific consultation would evaluate only the effects of the Federal component, as effects to the non-Federal portion were analyzed prior to issuance of the section 10 permit. For example, if a project involves effects to BLM land ≤ 20 ac of desert tortoise non-critical habitat or ≤ 5 ac of desert tortoise designated critical habitat, the project may proceed with BLM approval; if the BLM acreage threshold is exceeded, the project would be appended.

Program-Level Actions

Program-level actions are those that are allowed to proceed without further section 7 consultation through the Service. Such activities considered program-level actions include all actions that may adversely affect ≤ 20 acres of desert tortoise non-critical habitat or ≤ 5 acres of desert tortoise designated critical habitat, as well as livestock grazing, casual recreation, and casual locatable mining activities.

Federal actions below the acreage thresholds would be approved by the BLM and may proceed without further review by the Service provided (1) the BLM requires appropriate protective measures in accordance with the measures outlined in this PBO and terms and conditions of the incidental take statement, (2) the BLM tracks this activity and includes it in the annual report provided to the Service within the required timeframe, and (3) the BLM has discretion over the action and would provide sufficient oversight to ensure compliance with this PBO.

Project-Level Actions (Framework Programmatic Actions)

Project-level actions are those actions that may adversely affect greater than 20 acres of desert tortoise non-critical habitat or 5 acres of desert tortoise designated critical habitat and need further section 7 consultation through the Service before being permitted.

Federal actions that exceed the acreage threshold would follow the appended procedures described below. The Service and BLM may revisit and modify the thresholds during the term of this PBO if information becomes available that project effects to the desert tortoise differ from our analysis. Take exemption is provided at the programmatic consultation level for the desert tortoise for all program-level and project-level actions.

The following general steps should be followed for future actions to be appended to this PBO:

Step 1. BLM would submit a request by hard copy to the Field Supervisor of the Service's Southern Nevada Fish and Wildlife Office to append the action to the PBO. Part A of the Request to Append Action Form, provided in Appendix A, should be completed for each action to be appended to the PBO. The Request to Append Action Form is the suggested format for providing all required information. The Service can provide to the BLM upon request the most recent Word version of the form, and will also provide any updated versions of the form to the BLM upon completion.

Step 2. The Service would review the request and determine if the information is sufficient. If the information is insufficient, the Service would promptly notify BLM. Incomplete information would likely delay the Service's response. If the information is sufficient, the Service would prepare a response Part B of the Request to Append Action Form, appending the action to the PBO. Prompt processing of appended actions would be dependent upon complete information on the project including all minimization measures and status of the desert tortoise in the action area including recent desert tortoise survey results unless agreed to otherwise during action development.

Step 3. The Service would send the BLM a completed copy of the Request to Append Action Form by email and mail. The regulatory timeframe to complete formal consultation and deliver the biological opinion to the Federal agency is 135 days; however, the estimated time required for the project-level consultation under programmatic consultation procedures is based on the scope of the action and the potential effects to listed species and their designated critical habitat. For example, a project that would disturb 40 ac and relatively few tortoises may require 30 days to complete while a 100-ac project with a complex effects analysis may require 90 days.

Step 4. Once the BLM receives the Service's response, BLM may proceed with the proposed action.

Section 4: Description of Proposed Action

The SNDO BLM proposes to implement various land management activities in the planning area as described in the Las Vegas RMP, Final Environmental Impact Statement (EIS), and PBA. The proposed action for this consultation is implementation of BLM projects and activities (Federal actions) under eight separate programs described below beginning with the date this PBO is issued to BLM. There is no estimated completion date for the RMP revision. BLM and the Service expect all future SNDO activities to fall within one of the eight programs, except renewable energy projects on BLM lands, which are beyond the scope of this PBO.

4.1 Definition of the Action Area

The implementing regulations for section 7(a)(2) of the Act define the action area as all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 CFR § 402.02). Subsequent analyses of the environmental baseline, effects of the action, cumulative effects, and levels of incidental take are based upon the action area as determined by the Service. The action area includes habitat for 17 species and designated critical habitat for 12 species.

The action area for this programmatic consultation is broadly defined as, all BLM land administered by the SNDO, except Red Rock Canyon National Conservation Area (RRCNCA) and Sloan Canyon National Conservation Area (Figure 1 Appendix B), and other lands which have a nexus to an SNDO action as described in *Consultation History*. These lands include public lands within the BLM Las Vegas and Pahrump Field Offices in Clark and Nye Counties. Projects may be covered under this PBO only if: (1) the SNDO is designated as the lead Federal agency for the consultation, (2) BLM retains discretion sufficient to ensure compliance with all applicable measures or terms and conditions required for the proposed action, and (3) the action is appended, or exempted from appending procedures, as specified in this PBO.

The action area for this consultation includes all habitat and designated critical habitat for the Mojave desert tortoise, southwestern willow flycatcher, western yellow-billed cuckoo, Yuma clapper rail, Virgin River chub, woundfin, Moapa dace, spring-loving centaury, Ash Meadows sunray, Ash Meadows milkvetch, Ash Meadows ivesia, Ash Meadows gumplant, Amargosa niterwort, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, and Warm Springs pupfish within the planning area, as well as habitat of listed species outside the planning area that may be indirectly adversely affected by actions proposed in the RMP and Final EIS.

4.2 Programs

BLM proposes to authorize, fund, or carry out various actions and projects that may adversely affect threatened and endangered species and their designated critical habitat (Table 2). These actions would be within the scope of the RMP. The scope of the proposed action is established by acreage thresholds for each program and sub-program as identified in Table 3.

The proposed action consists of eight programs (categories) of activities with sub-categories:

1. **Lands and Realty Actions**
   Land disposals
   Leases (Recreation and Public Purposes Act [R&PP] and Airport)
   Section 302 Federal Land Policy and Management Act (FLPMA) actions
2. **Rights-of-Way (ROWs)**
   Pre-project geotechnical explorations
   Linear ROWs
   Site-type ROWs
3. **Mining**
   Locatable minerals
   Leasable minerals
   Saleable minerals
4. **Recreation Management**
   Special Recreation Permits – speed events

Special Recreation Permits – non-speed and organized events
Trails
Casual recreation- unpermitted

5. **Livestock Grazing Management**
   Term permits

6. **Fire Management**
   Fire suppression
   Fuel breaks and treatments

7. **Vegetation Management**
   Restoration
   Noxious weed treatment

8. **Resource Management**
   Fish and wildlife projects (guzzlers, catchments, fish barriers)
   Desert Clean-up
   Hazardous Materials
   Abandoned mine closures (vehicles and equipment to sites)
   Public information and education projects (kiosks with minor disturbance)
   Cultural and paleontological resources
   Wild horse and burro management

Table 2. Potential adverse effects determination by program.

Species and Critical Habitat (CH)	**Lands and Realty**	**Rights-of-way**	**Mining**	**Recreation**	**Livestock Grazing**	**Fire Management**	**Vegetation Management**	**Resource Management**
Desert tortoise	X	X	X	X	X	X	X	X
Desert tortoise CH	X	X	X	X	-	X	X	X
Southwestern willow flycatcher	-	X	-	X	-	X	-	-
Southwestern willow flycatcher CH	-	-	-	X	-	X	X	-
Western yellow-billed cuckoo	-	X	-	X	-	X	-	-
Yuma clapper rail	-	X	-	-	-	X	X	-
Virgin River chub	-	X	-	-	-	X	-	-
Virgin River chub CH	-	X	-	-	-	X	-	-
Woundfin	-	X	-	-	-	X	-	-
Woundfin CH	-	X	-	-	-	X	-	-
Moapa dace	-	X		-	-	X	-	-
Ash Meadows Species								
Spring-loving centaury	-	X	-	-	-	X	-	-
Spring-loving centaury CH	-	X	-	-	-	X	-	-
Ash Meadows sunray	-	-	-	-	-	X	-	-
Ash Meadows sunray CH	-	-	-	-	-	X	-	-
Ash Meadows milkvetch	-	-	-	-	-	X	-	-
Ash Meadows milkvetch CH	-	-	-	-	-	X	-	-
Ash Meadows ivesia	-	-	-	-	-	X	-	-
Ash Meadows ivesia CH	-	-	-	-	-	X	-	-
Ash Meadows gumplant	-	X	-	-	-	X	-	-
Ash Meadows gumplant CH	-	X	-	-	-	X	-	-
Amargosa niterwort	-	X	-	-	-	X	-	-
Amargosa niterwort CH	-	X	-	-	-	X	-	-
Ash Meadows naucorid	-	X	-	-	-	X	-	-
Ash Meadows naucorid CH	-	X	-	-	-	X	-	-
Ash Meadows Amargosa pupfish	-	X	-	-	-	X	-	-
Ash Meadows Amargosa pupfish CH	-	X	-	-	-	X	-	-
Ash Meadows speckled dace	-	X	-	-	-	X	-	-
Ash Meadows speckled dace CH	-	X	-	-	-	X	-	-
Warm Springs pupfish	-	X	-	-	-	X	-	-

X = adverse effects anticipated

Table 3. Summary of adverse effect thresholds for desert tortoise habitat

PROGRAM	Maximum No. Acres Affected by Program	
	CRITICAL	NON-CRITICAL
1. Lands and Realty		
• Land disposal	0	4,500
• R&PP leases	0	1,000
• Airport leases	0	650
• Section 302 FLPMA actions	0	0
2. Rights-of-way		
• Pre-project geotechnical	5	100
• Linear ROWs[a]	1,500	2,000
• Site-type ROWs	25	750
3. Mining		
• Locatable	100	500
• Leasable	25	200
• Saleable	100	500
4. Recreation Management		
• Speed events (50 ac disturbance along existing or re-aligned courses, 40 ac course re-alignment, 20 ac new pits, 20 ac new spectator areas)	0	130
• Non-speed events	0	5
• Casual, non-permitted recreation	0	0
• Trails	5	15
5. Livestock Grazing[b]	0	5[b]
6. Fire Management		
• Suppression and rehabilitation	unknown[c]	unknown[c]
• Fuel breaks	800	200
7. Vegetation Management	5[d]	20[d]
8. Resource Management	5	20

[a] Major linear ROWs would be situated in corridors within the planning area; other ROWs may occur outside corridors. ACECs would be considered avoidance areas for ROWs and other land use authorizations in the future, but additional ROWs could be authorized subject to environmental impact analysis and section 7 consultation for specific applications. An unquantified portion of the designated utility corridors have already been disturbed or destroyed.

[b] Approximately 200,000 ac of non-critical desert tortoise habitat occurs in grazing allotments that may be grazed. No new habitat disturbance is anticipated as a result of proposed grazing; however, continuation of grazing is anticipated to result in some level of habitat disturbance and impact which would be determined at the allotment-level consultation for each allotment. Acres of disturbance allow for range improvements.

[c] The number of acres of fire suppression and rehabilitation activities are unknown. The actual acreage is dependent upon too many environmental factors to predict with accuracy.

[d] Herbicide treatments would not be tracked on a per-acre basis. BLM would submit Pesticide Application Records to the Service (same as submitted to the Environmental Protection Agency [EPA]) documenting area(s) treated and amount of active ingredient used.

Lands and Realty Program

Land and realty actions may directly adversely affect the desert tortoise and indirectly adversely affect desert tortoise designated critical habitat.

Land Disposals

BLM proposes to dispose of up to 4,500 ac of land in designated disposal areas as outlined in the RMP (as amended legislatively) under the term of this PBO. As of 2018, approximately 20,885 ac of public land are available for disposal within the boundary designated by the Southern Nevada Public Land Management Act and expanded by the Clark County Act. The proposed action for land disposal is based on the number of acres disposed from 2013 to 2017 and the projected demand by the local governments to include parcels in the nomination process. No designated critical habitat for any listed species would be disposed. Following disposal, the incidental take and other adverse effects to desert tortoises would fall under purview of section 10(a)(1)(B) of the Act unless BLM retains discretion over the action sufficient to ensure that all adverse effects to the desert tortoise have been minimized in compliance with the measures in this PBO and appended documents. Once BLM's discretion ends, additional effects to the desert tortoise would be evaluated under section 7 with another Federal nexus or section 10(a)(1)(B) of the Act.

BLM would append all land disposal actions, regardless of the number of acres, in the Pahrump and Amargosa basins until the Nye County RMP plan amendment is complete. The plan amendment would look at the number of acres and where and when land disposal actions would take place in the Pahrump and Amargosa basins. It is expected to be completed by December 2021. The updated USGS Dv2 groundwater flow model is expected to be finalized by December 2019, and would be used in the plan amendment analysis for ground water dependent species in those basins.

The lands may be transferred to local governments or offered for sale at fair market value in accordance with the procedures specified by law. Lands may become available for residential, commercial, and light industrial development. Activities associated with the development of the land may involve earthmoving and other construction activities; modification of native desert flora to residential and commercial landscapes; increased groundwater pumping to meet the increased water demand; alteration of the topography of the land; alteration of natural drainage patterns; an increase in storm water flows, stream sedimentation, and construction of flood-control structures; an increase in urban runoff that contains petroleum products and other contaminants; and indirect effects associated with an increase in human population densities in the region.

Leases

Recreation and Public Purposes Act Leases. A Federal action occurs when BLM proposes an action in response to an application for an R&PP lease, lease renewal, or any lease amendment. BLM proposes to issue R&PP leases under the term of this PBO for up to 1,000 acres. No leases would be proposed that involve designated critical habitat for listed species. R&PP Act leases may be issued for lands within designated disposal areas for appropriate facilities such as schools, parks, police stations, and churches. Generally, facilities are constructed under an R&PP lease and the land may be patented to the entity, transferring the lands out of Federal ownership under the authority of the R&PP Act. The R&PP lease contains a provision that ensures that use of the lands remain consistent with the intent of the R&PP Act. Lands leased under the authority of the R&PP Act remain under the jurisdiction of BLM until a patent is issued, during which time BLM has jurisdiction over ensuring compliance with the terms and conditions of the lease. Once patented, BLM retains jurisdiction only for ensuring compliance with the patent provision mentioned.

Public Airport Leases. During the term of this PBO, BLM may issue one lease for up to 650 ac for a public airport which may adversely affect the desert tortoise. Native vegetation would be removed, the soil compacted, and buildings, runways, and lighting guidance systems constructed. Construction of new airports often requires construction of support facilities, utilities, road rights-of-way, and flood-control structures in addition to the airport lease area. Airports may result in increased vehicle traffic and economic development on adjacent parcels. Land may be sold through direct sale to the local government following construction of the airport. BLM anticipates that all land within the lease would be lost as habitat unless the airport lease includes measures to preserve open space.

The Federal Aviation Administration may be the lead agency for consultation on future airport projects; however, if BLM proposes a Federal action such as a lease, the Service expects the action would be appended to this PBO and the acreage of disturbance tracked under this PBO.

Designated Leasing Area (DLA)

An amendment to the RMP would designate the Dry Lake East DLA be used for solar energy development. This would change the land designation from multiple-use to a DLA that would eventually have tortoise fencing and be cleared prior to construction of a solar project. The DLA would disturb 1,800 acres of non-critical desert tortoise habitat. The DLA would encompass lands managed by the BLM to the southeast of the Dry Lake Solar Energy Zone and north of Las Vegas between I-15 and the railroad (Figure 2 Appendix B). A desert tortoise translocation plan and separate section 7 consultation would be required for any project within the DLA. This PBO does not incorporate solar projects, and addressing the DLA merely identifies the RMP amendment of changing the land use of this area.

Section 302 FLPMA Actions

Film Permits. Film permits are issued for still photography and video where mechanized equipment and motorized vehicles are allowed. Film permits within the Las Vegas and Pahrump Field Offices are most often issued for the Jean Dry Lakebed, Big Dune in Nye

County, Logandale Trails, and the Bittersprings Backcountry Byway. Permitted filming actions range in intensity from single photographers who take commercial photographs of the landscape to production film crews that shoot movies, television shows, commercials, or music videos. Actions may involve concentration of large numbers of vehicles and individuals, construction of temporary sets including unnatural features or buildings, use of helicopters, and placement and operation of cameras off existing roads. Most filming activities occur outside listed species habitat, on dry lakebeds, existing roads, and on unvegetated portions of sand dunes and do not involve new disturbance of habitat for listed species.

Other Land Use Authorizations. Land use authorizations may be issued for research projects, field trips, class use, apiary sites, and other uses. The authorization process involves analysis of potential impacts to the environment that could result from the proposed action. Authorizations are done on a case-by-case basis when such uses do not fall under other land use categories and do not involve new disturbance of habitat for listed species.

Rights-of-way Program

Rights-of-way (ROWs) issued by BLM would result in the greatest adverse effects to listed species. ROWs may adversely affect all listed species and designated critical habitat in the action area except the Ash Meadows sunray and its designated critical habitat, Ash Meadows milkvetch and its designated critical habitat, Ash Meadows ivesia and its designated critical habitat, and southwestern willow flycatcher designated critical habitat. BLM issues ROWs for facilities over, on, under, or through public lands for construction, operation, maintenance, and termination of a project. Public lands are available throughout the planning area for ROWs. BLM designates ROW corridors to facilitate long distance transmission of utilities, resources, and transportation. ROWs are not restricted to designated corridors, though their use is highly encouraged. The planning area is subject to ROWs with the exception of defined exclusion areas. Exclusion and avoidance areas are areas where special environmental or management consideration exists. ROWs would not be authorized within exclusion zones but may be granted within avoidance areas subject to stringent terms and conditions. ROW authorizations are processed on a case-by-case basis as proposals for use are received.

BLM authorizes ROWs on BLM lands for a variety of uses including but not limited to roads, electrical power plants, and substations with associated transmission and distribution lines; telephone and fiber-optic lines; sewer lines; water lines; natural gas and petroleum pipelines; communication sites; and flood-control structures. Material site ROWs are granted to the Federal Highway Administration, the Nevada Department of Transportation (NDOT), and local municipalities. These ROWs provide sand and gravel for road maintenance and construction.

Activities associated with the installation, maintenance, or modification of ROWs include use of heavy equipment for clearing of vegetation, trenching, blading, and grading areas for installation of facilities, as well as improvements and maintenance to access roads.

Pre-Activity Geotechnical Excavations and Sampling

Excavations and sampling of soils and subsurface materials may occur prior to ROW construction or development. BLM estimates that up to 5 ac of desert tortoise designated critical habitat and 100 ac of non-critical tortoise habitat may be disturbed as a result of these proposed excavation and sampling activities. Activities are generally conducted to examine soils and substrata for engineering analyses prior to construction and to determine where underground aquifers may be tapped for wells. These activities generally follow BLM authorization of the project; however, in some cases the proponent needs more information about the project area in order to submit an application. Test holes are usually excavated using a track-mounted excavator or backhoe and are generally, but not always, 2 feet (ft) wide, 20 ft long, and 20 ft deep. After the material is sampled, the test hole is immediately backfilled and recontoured to the original grade using either the excavator or a small bulldozer. A drill rig or backhoe may also be used for the sampling. Access requires driving through vegetation or constructing temporary roads.

Linear ROWs

BLM grants underground and aboveground linear ROWs. BLM also authorizes maintenance of lines, structures, facilities, etc. on ROWs including those issued prior to federally listing the desert tortoise. Underground ROWs are issued for the construction or expansion of a buried pipeline, sewerline, powerline, or fiber-optic cable. Activities associated with this action include the use of heavy equipment for clearing vegetation, grading, digging trenches, and road construction; construction and blasting of the underground facility; construction of aboveground facilities; and worker vehicle travel and access. Up to 2000 ac of desert tortoise non-critical habitat and 1,500 ac of desert tortoise designated critical habitat may be disturbed by proposed linear ROW activities.

All pipelines would be buried in accordance with Federal standards for depth from surface. The depth and width of the trench is also determined by the size of the pipe or conduit being installed and the amount of room personnel need for construction of the line. For example, for natural gas lines, the minimum ditch width would be 56 inches, ditch depth would be sufficient to allow a minimum cover of 48 inches over the pipe under normal conditions, coverage across dry washes would be a minimum depth of 60 inches, and coverage under roads would be 54 inches. Where rock or rocky formations are crossed, a minimum depth of 18 inches would be provided. In areas where the pipeline crosses over other underground facilities, a minimum clearance of 12 inches would be provided.

Short-term ROWs are often required for linear projects and are generally up to 100 ft in width. A 50-ft wide permanent ROW is typically required for gas pipelines. Total disturbed acreage would vary with the size of project. Staging areas are typically required for each project, though the number of staging areas is determined by the size or length of the project. Construction force would vary according to the size of project.

Most fiber-optic cables would be buried 36 to 40 inches deep in a plowable conduit. Construction equipment may include a plow train, backhoes, trenchers, rock saws, air compressors, and dump trucks. Concrete manholes or vaults would be placed within the ROW to facilitate road crossings, splicing of cable, and future cable restoration. After conduit is buried, the original ground level would be restored as much as practical. Buried cable signs would be placed at 500-ft intervals. Existing transportation and utility corridors would be followed wherever possible. Construction of fiber-optic lines typically requires a 25-ft ROW. Long-term disturbance would typically involve a 15-ft wide path along the proposed ROW and short-term disturbance would occur along the remaining 10-ft width of the ROW.

Maintenance activities would occur on granted linear ROWs for both above ground and below ground activities. ROWs would be routinely patrolled and inspected by pedestrian inspectors or by vehicles using existing access roads. If damaged, the line would be repaired or sections replaced. The proposed maintenance and repair activities have been grouped into the following five general categories:

- Class I (Routine): Maintenance activities that do not result in new surface disturbance
- Class II (Major): Maintenance activities that result in surface disturbance during the less-active desert tortoise season
- Class III (Major): Maintenance activities that result in surface disturbance during the more-active desert tortoise season
- Class IV (Major): Maintenance activities that may extend outside the disturbed pipeline ROW into undisturbed soils and vegetation
- Class V: Emergency repairs

BLM also issues ROWs for building substations for linear transmission or distribution including buildings, combustion turbine generators, tanks for storage of backup fuel oil, aboveground water storage tanks, administrative and warehouse buildings, evaporative ponds, transformers, switchyards, wells, water pipelines, buried and overhead electric power lines, well pumps, roads, new natural gas pipelines, chain-link security fences, and septic systems. Gas pipelines transport natural gas from the gas company pipeline to the turbines. The evaporative ponds are lined and collect blowdown from the turbine intake coolers. During construction, the average daily number of truck and worker vehicle trips range from 10 to 50 round trips. Construction activities include drilling, trenching, paving, and material or equipment staging. Smaller ROWs are usually necessary for the long-term operation and maintenance of facilities. A limited number of vehicles would be used for operation and maintenance throughout the year.

BLM provides road ROWs to allow access to sites to accommodate various land uses including development, access to private property, infrastructure for future development, and inter- and intra-state transportation. Grants may be issued to authorize use of existing public roads and for access to and maintenance of projects such as mining claims or other facilities.

Project proponents may maintain existing and future paved and unpaved roads. Roadwork may require the use of heavy machinery and water trucks. The activities associated with construction, use, maintenance, and modification of roads include using motorized and mechanized vehicular traffic; grading; grubbing of vegetation; grooming and grading of dirt roads; installing gravel or pavement; installing water bars, culverts, or other drainage features; installing protective barriers, posts, or other barricades to limit proliferation of disturbance; installing and maintaining signs, trailhead markers, cattle and tortoise guards, retaining walls, fences, and gates; developing turn-around points and vehicle pull-out sites; using water trucks to apply water or palliatives for dust control; and staging and fueling areas. Palliatives may be used as an alternative to water only if approved by BLM and the Service. Most maintenance actions would be limited to existing disturbed areas.

Road widths range from a single lane approximately 8-ft wide to 200-ft wide highways. They may be paved or unpaved. The length of time involved in construction of a proposed road would vary depending upon the road length, width, and the complexity of the engineering. Temporary work areas may be required.

Site-Type ROWs

Up to 750 ac of desert tortoise non-critical habitat and 25 ac of desert tortoise designated critical habitat may be disturbed by proposed site-type ROWs.

Communication Sites. Operation, maintenance, and modification of existing communication sites and construction of new communications sites may occur within the action area. Sites typically occur on mountain tops and along highways. Communication sites generally include one or more towers bearing antennae and dishes, block houses or sheds containing electronic equipment, chain-link fencing to keep the public from accessing the facility, generators with fuel storage tanks or power lines providing power to the facility, and an access road. Multiple companies and multiple types of transmission may occur at the same site. Communication sites generally measure 100 ft by 100 ft with multi-use sites measuring one to two acres in size. Applications for communication sites may be received with towers exceeding 1,000 ft in height. Towers of that height require anchor points for guy wires up to 0.25 miles (mi) from the base of the tower, increasing the area required for the ROW and additional temporary habitat disturbance during construction from vehicles driving and crushing vegetation to access the anchor points. Habitat disturbance may also result from burying grounding wires.

Ground-disturbance activities related to the construction and maintenance of communication sites include blading, bulldozing, driving cross-country, constructing buildings, erecting fences, drilling anchor points, and constructing access roads. Clearing of vegetation and maintaining some areas clear after construction would also be needed.

Flood Control Structures. Flood-control activities reduce impacts from flash floods and strengthen dikes around facilities. Flood-control systems include dikes, levees, channels, pipes, boxes, bridges, detention basins, and storm drains. Most flood-control projects occur on BLM lands in and around population centers such as the outskirts of the Las Vegas

Valley, the east side of Pahrump, and the disposal boundaries of the towns and rural communities in Clark and southern Nye counties. Construction activities associated with flood-control include clearing and grubbing of vegetation, grading, cut and fill of washes, removal of excess soil to a stockpile location or disposed of through a mineral material sale, salvage of vegetation such as cactus and yucca, stockpile of topsoil, construction of the facility, and revegetation of disturbed areas and spreading out topsoil as required in the reclamation plan.

Operation and maintenance associated with flood-control structures include inspections at least annually and after significant rain events; removal of vegetation and soil from basins, channels, and washes; disposal of sediment; repairs similar to construction activities discussed above; and installation of erosion control measures.

Wells. BLM issues ROWs for water production, monitoring wells, and access to these sites. Activities include exploration, drilling, and operation and maintenance. During exploration, soil sampling, seismic testing, and test drilling may occur. Exploration may involve cross-country driving, bulldozing of a drill pad or soil test holes, and drilling holes with drill rigs. Drilling may involve construction of access roads and a drill pad; drilling holes with truck-mounted or tower-mounted augers; storing and installing pipes and casing; installing a well head, pump house, and human exclusion fence; and conveyance structures like belowground water lines or canals. Water production well ROWs are often associated with linear pipelines.

Mining Program

BLM mining actions may adversely affect the desert tortoise and its designated critical habitat. BLM mining authorizations usually involve permits, leases, or contracts. BLM may authorize mining actions under three mineral programs: locatable, leasable, or saleable minerals. The programs are based on the type of commodity that is sought, and each program has its own laws and regulations to be implemented.

Locatable Minerals

All "valuable mineral deposits" are locatable under the General Mining Law of 1872 (30 U.S. Code 22-54), except those listed in the leasable and saleable categories. Locatable minerals generally include metals and most industrial minerals such as gypsum, cement grade limestone, carbonates, silicates, and "uncommon" varieties of sand, stone, cinders, pumice, clay, etc. Up to 500 ac of desert tortoise non-critical habitat and 100 ac of desert tortoise designated critical habitat may be disturbed by proposed locatable mineral mining.

Locatable minerals are generally found and developed in mountains or pediments that have shallow or outcropping rock exposures. All locatable mining activity (except casual use) takes place within the polygons shown on Figure 3 (Appendix B). Mineral actions generally consist of exploration, mining, processing, and reclamation. Activities include blading; road construction; trenching; pit excavation; drilling, crushing, and screening of rock materials; blasting hardrock; chemical and non-chemical processing of ore, including washing of materials to concentrate minerals; and waste storage of mine and mill rock products. If gold is being mined, the ore piles may be sprayed with chemicals to leach out the gold. Reclamation actions attempt to restore surface disturbances and vegetation to its former state and neutralize any process activities that have created human and wildlife health and safety issues.

All mine operations permitted under the locatable minerals program are analyzed on a case-by-case basis. Operators are subject to general and performance standards that include technology; mitigating measures specified by BLM; mine wastes; erosion control; air quality; water quality; solid wastes; wildlife and plant habitat; cultural and paleontological resources; acid-forming, toxic, or other deleterious materials; leaching operations and impoundments; and maintenance and public safety. Operators are required to submit plans to BLM that describe the entire operation including disturbance area, the nature and location of proposed structures and facilities, operating plans for mining areas, site access, water management plans, quality assurance plans, spill contingency plans, reclamation plans, and monitoring plans. The plans must demonstrate that the proposed operation would not result in unnecessary or undue degradation to public lands.

Access routes. Access routes would be planned for only the minimum width needed for operations and would follow natural contours where practicable to minimize cut and fill. The authorized officer may require the operator to use existing roads to minimize the number of access routes, and if practicable, to construct access roads within a designated transportation or utility corridor. When commercial hauling is involved and the use of an existing road is required, the authorized officer may require the operator to make appropriate arrangements for use and maintenance.

Mining wastes. All tailings, dumps, deleterious materials or substances, and other waste produced by the operations would be disposed to prevent unnecessary or undue degradation and in accordance with applicable Federal and State Laws.

Reclamation. At the earliest feasible time, the operator would reclaim the disturbed area, except to the extent necessary to preserve evidence of mineralization, by taking reasonable measures to prevent or control onsite and offsite damage of the Federal lands. Reclamation would include, but would not be limited to, salvaging topsoil; controlling erosion, landslides, and water runoff; isolating, removing, or controlling toxic materials; reshaping the disturbed area; and applying topsoil and revegetating disturbed areas.

Acid-forming, toxic, or other deleterious materials. Operators would incorporate identification, handling, and placement of potentially acid-forming, toxic or other deleterious materials into operation plans to minimize the likelihood of acid formation and toxic and other deleterious leachate generation (source control). If the operator cannot prevent the formation of acid, toxic, or other deleterious drainage, the uncontrolled migration of leachate would be captured and treated. Long-term or post-mining effluent capture and treatment cannot substitute for source and migration control.

Leaching operations and impoundments. All leach pads, tailing impoundments, ponds, and solution-holding facilities would be designed, constructed, and operated according to standard engineering practices to achieve and maintain stability and facilitate reclamation. A low-permeability liner or containment system would be constructed to minimize the release of leaching solutions to the environment. Monitoring would be performed to detect potential releases of contaminants. Cyanide or other leaching facilities and impoundments would be designed, constructed, and operated to contain precipitation from the local 100-year, 24-hour storm event in addition to the maximum process solution inventory. A secondary containment system would be constructed around vats, tanks, or recovery circuits adequate to prevent the release of toxic solutions to the environment in the event of primary containment failure. Wildlife access to solution containment and transfer structures that contain lethal levels of cyanide or other solutions would be excluded. During closure and at final reclamation, leaching solutions and toxic materials would be detoxified by natural degradation, rinsing, chemical treatment, or equally successful alternative methods.

Casual, Non-permitted Locatable Minerals

Casual use mining activities are those non-permitted activities that would cause negligible to no disturbance such as collection of rock, soil, or mineral specimens with hand tools or hand panning. It can include the use of metal detectors and other battery-operated devices for sensing the presence of minerals. Casual mining does not involve using mechanized equipment or explosives. Motorized vehicles may be used for access provided the use is consistent with the regulations governing such use as determined in the RMP.

Contact with the BLM may be required for those intending to conduct casual use in areas where the cumulative effects of casual use may cause more than negligible disturbance. For activities other than casual use, operators are required to either submit a notice or a plan of operations.

Leasable Minerals

In the action area, leasable minerals include phosphate, oil, gas, borates, and solid and semi-solid bitumen and bituminous rock resources. Leases are granted on a competitive and non-competitive basis and require an annual rental fee. Upon production, a royalty is paid to the United States government. Testing, drilling, and production of leasable minerals are all Federal actions. Leasable mineral areas include all types of terrain including valley floors. Lands available for mineral leasing are all BLM jurisdictional lands within the SNDO planning area, subject to no surface occupancy except disposal areas, ACECs (solid minerals only), and riparian areas. A parcel must be nominated for leasing by the proponent and the lands are then leased by competitive bidding. Up to 200 ac of desert tortoise non-critical habitat and 25 ac of desert tortoise designated critical habitat may be disturbed by proposed leasable mineral mining.

The proposed action for leasable minerals is generally the same as those for locatables, differing mostly in the performance standards associated with the various commodities.

Saleable Minerals

Saleable minerals include common varieties of sand, stone, gravel, cinders, pumice, pumicite, clay, decorative rock, and boulders. The saleable minerals are generally common construction materials. BLM issues competitive and non-competitive contracts, free-use permits, exploration permits, and designated community pits. Free-use permits may be issued to any local, State, or Federal agency for periods up to 10 years. BLM issues a similar authorization to the NDOT for their established material site ROWs. BLM may require the operator to submit mining and reclamation plans before issuing a contract or permit. Up to 500 ac of desert tortoise non-critical habitat and 100 ac of desert tortoise designated critical habitat may be disturbed by proposed saleable mineral mining.

The sale and removal of mineral materials generally occur in the valleys, alluvial fans, and lower elevations of the surrounding hills. The sale of mineral materials by BLM is a discretionary action subject to other land uses in the area. The sale may take place in a community pit which is an area designated by BLM to mine mineral materials or in a place chosen by the proponent.

The proposed actions in the saleable program are like those in the locatable program and involve mining, processing, and reclamation. However, processing of mineral materials generally does not involve chemicals and does not generate waste products that require special handling, isolation, or treatment.

Mining of materials is usually accomplished with bulldozers, loaders, water trucks, and haul trucks. The extracted material may then be crushed, screened, or washed during processing. Process areas may also include concrete and asphalt batch plants on site. Mining activity occurs year round. Access and haul roads may use existing roads or may require construction of new roads or widening of existing roads.

Recreation Management Program

Recreation on BLM lands may adversely affect the desert tortoise and its designated critical habitat, the southwestern willow flycatcher and its designated habitat, and the western yellow-billed cuckoo. Annually, the SNDO issues approximately 60 special recreation permits (SRPs) for various uses. The action area for recreation is divided into eight Special Recreation Management Areas and one Southern Nevada Extensive Recreation Management Area. Within desert tortoise ACECs, authorized uses are allowed only on designated roads and trails. In ACECs not designated for tortoise, authorized uses are allowed on roads, trails, and dry washes.

Special Recreation Permits- Speed Events

BLM proposes to issue approximately 21 SRPs per year for speed-based events consisting of 9 truck and buggy events, 11 motorcycle or ATV events, and 1 rally car event. Locations of the courses for the speed events are in Figures 4-23 in Appendix B. The majority of the speed-based OHV permits are located in the valleys or foothills. Speed-based events are not allowed in tortoise designated critical habitat ACECs; however, they may be allowed on historic routes within desert tortoise designated critical habitat outside ACECs in the

Nelson/Eldorado Special Recreation Management Area. Mountain bike events and races would be allowed in ACECs not designated for desert tortoise on a case-by-case basis. Major OHV use areas include Eldorado Valley (outside the Piute-Eldorado ACEC), Nelson Hills, Laughlin, Nellis Dunes, Ivanpah Valley, Pahrump Valley, Dry Lake Valley, Lower Mormon Mesa and Amargosa Valley. Speed-based SRPs are classified as commercial, competitive, and organized group activity permits. Permits may be combinations of commercial-competitive and organized group-competitive; however, speed is the common element in each permitted activity. SRPs are classified as speed-based when the participants exceed a speed of 25 miles per hour (mph). Speed-based permits pose a greater risk to desert tortoises than non-speed events because desert tortoises become more difficult to see as the vehicle speed increases. Up to 130 ac of desert tortoise non-critical habitat may be disturbed by proposed speed events.

Within the four desert tortoise critical habitat ACECs, a maximum of 12 permitted non-speed events or non-speed portions of speed based events, with a limit of 300 vehicles, may be allowed annually from November 1 through February 28/29, with no more than four events per ACEC.

OHV racing is the predominant type of speed-based activity permitted by the SNDO. Truck and buggy race courses are typically 25 ft wide with 25-ft buffer areas on both sides. Motorcycle and ATV race courses are typically 4 ft wide with 8-ft buffers.

Speed-based permits may generate more dust than non-speed permits and often participants rely on using GPS technology to navigate through the authorized routes because of reduced visibility. Speed-based permits also involve the use of check-points along the race course to prevent short-coursing. Check-points are generally located in existing disturbed areas such as road crossings. Events would be permitted consistent with OHV designations and are limited to existing authorized routes.

In designated open areas, such as Nellis Dune and Big Dune recreation areas, or dry lake beds, speed-based permits may be issued without speed limits for commercial or competitive use because there are almost no definable roads or routes in such areas.

Desert tortoises are most active during March 16-31, April, May, September, and October during which time they are at greatest risk due to vehicle travel. BLM would not permit speed-based events during March 16 through May 31, September, or October. Speed-based SRP restrictions are listed in Tables 4 and 5. BLM anticipates that no more than 1.5 ac of new disturbance would incidentally occur for each truck and buggy race event, not to exceed 50 ac over the term of this PBO. In addition, 40 ac (13 miles by 25 ft wide) of habitat disturbance may occur as a result of course realignment during the term of this PBO.

Table 4. Seasonal restrictions in desert tortoise habitat for proposed speed-based events.

Month	Restriction
January-February	Allowed; post-event mortality sweep and standard measures apply.

Month	Restriction
March	Allowed March 1-15 but not allowed March 16-31 in Laughlin, North Jean Pit, Primm and Pahrump areas; pre-event surveys; pen tortoise along event course; post-event mortality sweep & standard measures apply.
April-May	No high speed events allowed in desert tortoise habitat outside Laughlin, North Jean Pit, Primm and Pahrump areas.
June-July-August	Allowed; pre-event surveys; pen tortoise along event course; post-event mortality sweep and standards measures; fewer measures for night high speed events one-half hour after sunset and the event must be finished by one-half hour before sunrise.
September - October	No high speed events allowed in desert tortoise habitat outside Laughlin, North Jean Pit, Primm and Pahrump areas.
November-December	Allowed; post-event mortality sweep and standard measures apply.

Table 5. Additional restrictions for speed-based events.

RESTRICTIONS	INSIDE CRITICAL HABITAT ACECs	CRITICAL HABITAT (outside ACECs)	OUTSIDE CRITICAL HABITAT AND OUTSIDE ACECs
Maximum no. entrants (buggy races)	No races permitted	No races permitted	determine on case-by-case basis
Maximum no. entrants (MC[1]/ATV RACES)	No races permitted	200	determine on case-by-case basis
Maximum no. laps	N/A	5	determine on case-by-case basis
Maximum no. events per year	N/A	5 MC/ATV[2]	38 various types
Seasonal constraints, time allowed (buggy)	N/A	N/A	Less and least active Season[3]
Seasonal constraints, time allowed (MC/ATV)	N/A	Less and least active Season[3]	Less and least active Season[3]
Publicity run allowed	NO	Less and least active Season[3]	Less and least active Season[3]
Mini-event allowed	NO	YES[2]	YES
Starting interval (buggy)	N/A	N/A	determine on case-by-case basis[4]
Starting interval (MC/ATV)	N/A	determine on case- by-case basis[4]	determine on case-by-case basis[4]
High-speed testing allowed	NO	NO	YES

[1] Motorcycle
[2] Nelson Hills
[3] Least active season is November 1 to March 15 and less active season is June 1 to August 31
[4] Starting interval depends on the size of the vehicle and race area.

To minimize effects to desert tortoise and desert tortoise habitat, BLM proposes to permit year-round speed events in the North Jean Pit (Figure 14 Appendix B) after the area is fenced, cleared, and cattleguards installed to exclude tortoises. BLM also proposes to permit year-round speed events in the Laughlin (Figure 15 Appendix B), Primm (Figure 16 Appendix B), and Pahrump (Figure 18 Appendix B) OHV areas. Laughlin OHV area is a heavily used area for multiple OHV events, outdoor events, and casual use recreation. The habitat has been impacted from those events over many years and is considered very low-density habitat. There has only been one tortoise found during events in the last 12 years.

Primm OHV area is a heavily used area for multiple OHV events, outdoor events, and casual use recreation. The habitat in the area has been impacted from those events over many years. The OHV course is located adjacent to business and the majority of OHV use in the area is on private land. BLM surveyed the five miles of race course on public land using Service-approved protocols. Surveyors observed no live tortoise or sign adjacent to the race course. Ground disturbance, weeds, and silty soils dominate the area surrounding the race course.

For Pahrump, BLM evaluated an area bounded by S.R. 160 to the south, U.S. Highway 95 to the east, the California state line to the west, and the SNDO management boundary line to the north for year-round high speed OHV events. The course identified between S.R. 373 and S.R. 160 (Figure 18 Appendix B) would be allowed for racing. In the area north of S.R. 373, all existing race courses would be available year round. BLM conducted tortoise surveys during April and May in 2016 and 2017. In 2016, one surveyor walked 10-meter transects on each side of existing course between S.R. 373 and the SNDO boundary line to the north for 12 miles, and observed no tortoise sign or live tortoises. In 2017, two surveyors walked 10-meter transects on each side of existing course between S.R. 373 and S.R 160 for 24 miles and observed 6 Class 1-5 borrows (2 Class 1-2 and 4 Class 3-5) but no live tortoises were found. BLM changed the course to exclude the area of the known burrows. Since the area between S.R. 373 and S.R 160 is an expansion of the year-round racing area, BLM would allow only one race event each spring and fall during the tortoise more active season, for a total of two per year, for the first three years while surveying the expansion course after each event searching for any tortoise-related injury or mortality. After the completion of three years of monitoring, BLM would coordinate with the Service to adjust the number or timing of race events as necessary.

Pits for Speed-based Events. Pits are typically located in previously disturbed areas. If a new pit is required, construction may consist of clearing, leveling, or grading the site using bulldozers and graders. The surface would not be paved but would consist of compacted soils, gravel, or sand. No more than 20 ac of new pit areas would be created through the duration of this PBO.

Spectator Areas. Spectator areas facilitate crowd control and decrease habitat disturbance by discouraging displaced event viewing. Spectator areas are typically located in existing disturbed sites but are not utilized with every speed-based SRP and may receive large periods of rest between scheduled permits. During the event, the spectator areas would be marked, monitored, and patrolled by BLM Law Enforcement for compliance with stipulations. No more than 20 ac of new spectator areas would be created through the duration of this PBO.

Course Maintenance. Over time, the routes used by speed-based permits become almost impassible due to deep ruts and whoops. BLM may authorize route grading associated with speed-based permits immediately prior to and immediately following the event. BLM may also authorize course grading during the less active season or winter months. The purpose of pre-event grading the routes is to keep the participants from straying into vegetation due to the deteriorated road condition and reduce route widening. Course maintenance would also encourage casual users to remain on the existing roadway. Up to 1.5 ac of unintentional new disturbance may result from each race (up to 50 ac) due to poor visibility and sandy conditions which BLM would mitigate by restoring habitat with fees paid by race companies to BLM to ensure no net increase in overall habitat degradation as a result of OHV events.

Mountain Bike Events and Races

Mountain bike events and races would be limited to existing roads, trails, and dry washes. Mountain bike events and races would not be permitted in desert tortoise critical habitat ACECs. Use in other ACECs would be evaluated on a case-by-case basis. BLM proposes to issue approximately five SRPs per year for mountain bike events and races.

Commercial Race Experience Tours

BLM may issue SRPs for commercial operations that utilize competitive OHV race vehicles for travel at speeds greater than 25 miles per hour. BLM considers this type of activity as a "commercial race experience" and the vehicles used for this activity as "specialty vehicles." Specialty vehicles would include OHVs such as trucks and buggies that have been modified, designed, or constructed exclusively or primarily for off-highway operation and do not fit the definition of an all-terrain vehicle, utility type vehicle, or motorcycle. Race experiences are characterized as guided trail tours that would have an average speed of 35 miles per hour and reach speeds no more than 50 miles per hour.

No race experience tours would be allowed in desert tortoise critical habitat ACEC's. During the most active season, race experience tours would be limited to the Laughlin, Pahrump, Primm, and North Jean Pit year-round racing areas. In the Laughlin, Primm, and Pahrump year-round racing areas, specialty vehicles would be limited to the existing roads and trails depicted in Figures 15, 16, and 18 (Appendix B). In the Jean/Roach Dry Lake area, outside of the North Jean Pit, race experience tours would be allowed during the less and least active seasons, on routes identified in Figure 17 (Appendix B). Routes that traverse the Ivanpah ACEC would only be used from November 16 to February 28/29. In Pahrump, during the less and least active seasons, race experience tours would be allowed on routes identified in Figure 19. In the North Jean Pit (Figure 14 Appendix B), race experience tours may be conducted year-round. Routes would vary in length from 25 miles to 100 miles.

A maximum of two tours would be conducted daily during the first year outside of the North Jean Pit. During the next two years, up to four tours would be conducted daily outside of the North Jean Pit depending on the results of the first year of monitoring. The North Jean Pit would be used year-round with unlimited number of tours per day.

To minimize effects to desert tortoise and desert tortoise habitat, BLM would monitor the potential effects of this new commercial activity for three years and determine if the number of tours needs to be reduced and ensure all incidental take is reported. To coincide with tortoise activity and densities, BLM would monitor at least one tour each week between March 1-15, and November 1-15 in the Jean/Roach Dry Lake, Primm and Pahrump areas. BLM would also monitor two tours during the months of June, July, and August in the Jean/Roach Dry Lake, Primm, and Pahrump areas. No tours would be monitored for potential take during November 16-30, December, January, or February. Monitoring would consist of

BLM staff driving the route after an event at speeds less than 25 mph to look for injuries or mortalities.

Special Recreation Permits for Non-Speed and Organized Events

BLM proposes to issue SRPs for non-speed events including commercial, competitive, and organized group activities in desert tortoise habitat. An SRP would be required for all organized groups with more than 25 vehicles or any commercial competitive event regardless of the number of vehicles. Average non-speed events last from one to three days with a maximum of two weeks to include setup and tear down. Non-speed events in desert tortoise ACECs would be limited to a maximum of one week. Up to 5 ac of desert tortoise non-critical habitat may be disturbed by proposed non-speed events.

Non-speed events would be allowed in desert tortoise critical habitat ACECs and designated critical habitat with limitations stated in Table 6. Within desert tortoise critical habitat ACECs and designated critical habitat, authorized uses would be allowed on designated roads and trails. In ACECs not designated for tortoise, authorized uses would be allowed on roads, trails, and dry washes. The areas available for non-speed SRPs range from areas in generally unsuitable habitat (dry lake beds and pinyon-juniper habitat) to creosote habitats supporting moderate to high density (designated critical habitat outside of ACECs) tortoise habitat.

Permits may be combinations of commercial and competitive or organized group activity with competition; however, average speeds are lower than 25 mph. At speeds less than 25 mph, participants are more capable of identifying small desert tortoises.

Non-speed and organized events proposed to be permitted by BLM are not anticipated to result in disturbance of designated critical habitat for any listed species and no more than 5 ac of disturbance of non-critical desert tortoise habitat.

A commercial tour guide using OHVs is the predominant non-speed commercial permit issued by the SNDO. Non-speed commercial permits involve trucks, buggies, cars, ATVs, motorcycles, UTVs, rock crawling vehicles, equestrians, outfitter and guide services, geocaching, etc. Other examples of non-speed permits are foot races, jeep rides, charity activities, publicity permits, high adventure sports, mountain bike tours and rides, rocket launches, large group activities like camping and festivals, etc. Non-speed permitted activities use authorized routes or locations to conduct the permitted activity.

Table 6. Restrictions on non-speed events and non-speed sections of events.

RESTRICTIONS	INSIDE CRITICAL HABITAT ACECs	CRITICAL HABITAT (outside ACECs)	OUTSIDE CRITICAL HABITAT AND ACECs
Seasonal constraints - most active season: March 16-31, April, May, September and October	No events	No restrictions	No restrictions
Max. no. events- less active season: June, July, and August	10 with no more than 3 events per ACEC	No restrictions	No restrictions
Max. no. entrants - less active season: June, July and August (all uses)	100	determine on case-by-case basis	determine on case-by-case basis
Max. no. events- least active season: November, December, January, February, and March 1-15	12 with no more than 4 events per ACEC	No restrictions	No restrictions
Max. no. entrants - least active season: November, December, January, February, and March 1-15 (all uses) [1]	300	determine on case-by-case basis	determine on case-by-case basis
Min. no. requiring permit	25	25	25
Max. no. laps or passes per day of event	1	determine on case-by-case basis	determine on case-by-case basis
Publicity run allowed	NO	determine on case-by-case basis	determine on case-by-case basis
Mini-events allowed	NO	NO	NO
Starting interval	determine on case-by-case basis	determine on case-by-case basis	determine on case-by-case basis
High-speed testing allowed	NO	NO	NO

[1] Existing Barstow to Vegas Dual Sport Ride at 500 entrants as long as CA BLM maintains that as an allowable limit.

Casual Shooting

The action area is open to casual shooting with exceptions surrounding Las Vegas, Pahrump, and within 1,000 ft of residences and developments. Shooting would continue to become displaced as Las Vegas and surrounding communities continue to grow. BLM does not issue permits for any shooting activities.

Dual Sport Events

Dual sport tours are non-speed, non-competitive, non-timed self-guided scenic motorcycle touring. All entrants follow roll chart maps provided by the promoter, and riders leisurely stop at any time to enjoy the scenery and aesthetics of the ride, take breaks, and take photos. These tours generally use unpaved roads.

The SNDO has issued SRPs to many dual sport tour events over the last 15 years. One regularly used route takes riders from Barstow, California to Las Vegas, Nevada. Another uses the old Mojave Road approximately six miles of which enters the SNDO area near Laughlin, Nevada.

Model Rockets

The Rocketry Club holds annual model rocket competitive rocket launches. The events typically consist of 150 to 250 entrants and 200 to 300 families and friends. Rocket events occur on dry lake beds four to six times per year. Participants drive on existing roads and then walk to retrieve their rockets. No cross country driving is allowed.

All entrants must be over 18 years of age and compete in three certification levels based on manufacturer, motors, designs, and aerodynamics. Rockets stand two to eight ft in height, and are powered by ammonium perchlorate, a solid rocket fuel. Each level is capable of attaining 10,000 to 20,000 ft or higher. The Federal Aviation Administration and McCarran Airport Traffic Control are notified. Event officials enforce strict flight line protocol at the launch site. All parking, staging, and registration occur away from the launch site.

Adventure and Obstacle Racing

Adventure racing is a combination of two or more disciplines including hiking, mountain biking, cross-country running, orienteering, climbing, and paddling. Mountain bike events and races are considered a speed event and not allowed in desert tortoise critical habitat ACECs but may be considered in other ACECs on a case-by-case basis. Obstacle races are foot races of multiple distances with temporary constructed obstacles along the routes with distances up to 20 miles and up to thousands of participants. Obstacles are set up in previously disturbed areas with running taking place on existing trails. Obstacle races would not be allowed in desert tortoise critical habitat ACEC's. Expedition events span one to 10 days with 10 to 150 entrants. Many events involve lands other than BLM including National Park Service lands. All participants are limited to existing roads and trails.

Compass Orienteering

Compass orienteering is performed by hiking only and consists of a timed compass course. Cross-country hiking is preferred rather than use of roads and trails. Entrants are judged and scored by their arrival at sequential compass locations. Events and activities involve 5 to 10 teams with two to four people per team.

Biathlon and Triathlon Events

Biathlon and triathlon events use cycling (mountain or road bikes), swimming, or running or kayaking. Mountain bike events and races are considered speed events and not allowed in desert tortoise ACECs but may be considered in other ACECs on a case-by-case basis. All staging, registration, technical inspection, first aid, etc. would occur in disturbed areas with good vehicle access. Mountain bike portions of the event are limited to existing roads, trails, and dry washes in non-tortoise ACECs.

Casual Non-permitted Recreation

BLM allows public use of existing roads and trails without the need for an SRP or other authorization unless the level of use meets the requirements for a permit. Open OHV areas allow vehicle use off existing roads and trails (e.g., Nellis Dunes Recreation Area). BLM minimizes the effects of casual use on the desert tortoise, southwestern willow flycatcher, and yellow-billed cuckoo by restricting vehicles to existing or designated roads and trails, providing law enforcement and public information and education through personal contacts in the field, and providing informative maps and pamphlets. No habitat disturbance is authorized for casual, non-permitted recreation.

Mountain Bike Tours and Rides

Mountain bike tours and rides would be limited to existing roads, trails, and dry washes. Mountain bike tours and rides would be limited to existing roads and trails in tortoise ACEC's and seasonal restrictions. Use in other ACECs would be evaluated on a case-by-case basis.

Trails

Trails provide recreational opportunities for hiking, horseback riding, and appropriate casual use of OHVs. The proposed action for trails includes the installation of trails, trailheads, and parking areas; restoration of trails or areas around trails; and trail maintenance. Activities may include trail inventory and designation, trail improvement or realignment, trail closure, or new trail construction to accommodate increased uses or reduce natural resource or user group conflicts. The activities associated with the construction, use, and maintenance of non-motorized trails include foot, equestrian, and mountain bicycle travel; presence of people and domestic pets such as dogs; cutting of vegetation to clear trail tread; digging and reshaping of soil to construct and maintain trails; installation of water bars, walls, and other structures for stabilization; installation and maintenance of signs, trailhead markers, and registration points; grading of trailheads and vehicle turn-around areas; wildlife viewing; photography; and picnicking. Up to 15 ac of desert tortoise non-critical habitat and 5 ac of desert tortoise designated critical habitat may be disturbed by proposed trails.

Livestock Grazing Program

Livestock grazing on BLM land may adversely affect the desert tortoise. The SNDO proposes to issue or renew term permits and administer five ephemeral allotments currently open to grazing: Flat Top Mesa, Hidden Valley, Lower Mormon Mesa, Muddy River, and Wheeler Wash. Only three of the allotments are actively grazed: Flat Top Mesa Allotment, Hidden Valley Allotment, and Lower Mormon Mesa Allotment. The location of these allotments is shown in Figure 24 (Appendix B). There are four additional allotments that would continue to be managed by the Arizona BLM Field Office that partially cross into eastern Nevada near Mesquite and are not considered in this consultation.

The number of Animal Unit Months (AUMs) authorized for livestock grazing in open allotments is based on results from the current year's production studies in accordance with Ephemeral Range Rules. The allotments are classified as ephemeral, meaning that they have a base allocation of AUMs for year-long operation. Voluntary relinquishment of grazing permits may reduce this number. No other allotments provide forage on a yearly basis or are permanently adjudicated AUMs for any allotment within the SNDO planning area.

In the Las Vegas RMP, BLM authorizes livestock grazing outside ACECs and under prescription 2 grazing management. Under prescription 2, livestock use would occur year-round on open allotments in desert tortoise habitat outside of ACECs. From March 1 to October 14, forage utilization management levels are 40 percent on key perennial grasses, forbs, and shrubs. Between October 15 and February 28, forage utilization management levels are 50 percent on key perennial grasses, and 45 percent on key shrubs and perennial forbs. When use levels are reached, livestock would be moved to another location within the allotment or taken entirely off the allotment. Within allotments classified as ephemeral, the number of livestock to be licensed during a particular period would be based upon the availability of forage consistent with the season of use and utilization management levels identified in the proposed grazing prescription.

Permittees may install and maintain range improvements that include boundary fences, interior pasture fences, drift fences, corrals, exclosures, vegetation study exclosures, cattle guards, troughs, spring developments, pipelines, water troughs, water storage tanks, earthen water tanks, loading chutes, temporary water hauls, vegetation manipulations such as seeding, cow trails, and others. With the closure of the allotments in the RMP and relinquishment of additional grazing permits, BLM may remove range improvements in disrepair or those that no longer serve a purpose; those that have a purpose may be repaired. Up to 5 ac of desert tortoise non-critical habitat may be disturbed by the installation of new range improvements.

Livestock Monitoring

Monitoring studies designed to measure results of livestock management are essential to measure progress toward meeting management objectives and making necessary changes over time. The minimum methods and procedures for monitoring studies on active allotments would be those identified in the Nevada Rangeland Monitoring Handbook (Nevada Range Studies Task Group 1984). Types of monitoring used on the allotment would include use pattern mapping, utilization, frequency, and canopy cover. Use-pattern mapping would be used to assess livestock distribution, identify any areas of unacceptable utilization, and to determine long-term stocking rate. The use data for each key species and use pattern maps would be compiled and analyzed each year. Proper stocking rates by pasture and allotment would be assessed in relation to vegetative production. Frequency and canopy cover trend data would be collected every three to five years. Ecological condition and existing plant community data would be collected for each active allotment, as time and funding permits, and every five years thereafter until ecological condition objectives are met or stable conditions are determined to exist. If the trend is determined to be upward, then movement toward the ecological condition objectives would be considered as met. After all key management area objectives and use level constraints have been assessed and evaluated, the studies would be consolidated and a determination would be made concerning the attainment of allotment level objectives at the end of each three to five year period. Management changes or alternatives would be considered at this time.

For the purpose of meeting the objectives, the upper limits of production of desirable plant species as described for the potential natural community (PNC) for each range site should be achieved. PNC is that vegetative community that is the highest successional stage that could be obtained were it not for the effects of man or natural phenomena that would have the effect of causing the community to be at a lower successional stage. Areas disturbed or degraded by previous human activities may require restoration methods to attain PNC objectives. It is assumed that the closer the vegetative community is toward reaching its maximum potential towards a truly natural condition unaffected by humans, the better the community would meet the needs of the desert tortoise. This is because the natural community in many cases, particularly as it relates to the Mojave Desert, is representative of a more diverse plant community with a more complex horizontal and vertical plant structure. This provides not only an increase in forage availability of desirable plant species but also increased ground cover, both of which would benefit the tortoise.

Fire Management Program

Because wildfires may occur throughout the action area, fire management activities may adversely affect all listed species and their designated critical habitat in the action area. BLM manages fire on approximately 3,332,000 ac of public lands based on Fire Management Unit objectives and strategies. The 2004 SNDO Fire Management Plan (FMP) describes these objectives and units. Fire management includes prevention, detection, suppression, emergency rehabilitation, use of prescribed fire, non-fire fuel treatments, and community assistance on every acre of burnable vegetation within the SNDO planning area. The FMP emphasizes that firefighter and public safety is the first priority and prescribes objectives and strategies to improve wildfire prevention and suppression, reduce hazardous fuels, restore fire adapted ecosystems, and promote community assistance.

Table 2-6 of the PBA identifies 23 fire management units established in the FMP which determines how fire suppression and management activities are managed. BLM conducts monitoring of active fuels projects and post-fire assessments for emergency stabilization and restoration annually. Monitoring may consist of an interdisciplinary team conducting vegetation and fuels assessments.

Protection of human life is the first and most important consideration in all wildfire events and suppression actions. Consultations for wildfire suppression activities that result in adverse effects to listed species typically follow emergency consultation procedures. Upon discovery of a wildfire, BLM contacts the Service to begin coordination and consultation for suppression if listed species may be affected by the fire or BLM activities. The measures in this PBO are general and intended to inform BLM of actions to consider for minimizing effects to the species.

Where appropriate, wildland fire would be used to restore or sustain ecosystem health, improve the ecological condition and productivity of range ecosystems, and maintain natural plant community diversity. In order to achieve long-term beneficial effects, it may be necessary to cause short-term adverse effects to listed species. Fire would be allowed to function in its ecological role when appropriate for the site and situation to protect, maintain, and enhance resource values.

Fire Suppression

Fire suppression activities may include construction of firelines by hand or with heavy equipment, fire trucks, or other vehicles driving cross country; aerial water drops; aerial fire retardant drops; and establishment and operation of temporary fire camps, staging areas, and heliports.

Revegetation

The treatment sites would be monitored for native recruitment and re-establishment. The SNDO with assistance from the National Resources Conservation Service, the Southern Nevada Restoration team, and other cooperators would conduct active revegetation operations (seeding, planting, watering, and drip-irrigating) where necessary.

Emergency Stabilization and Rehabilitation

Emergency stabilization and rehabilitation (ESR) efforts would be designed and implemented to achieve vegetation, habitat, soil stability, and watershed objectives. Aggressive actions would be taken in burned areas susceptible to conversion to cheatgrass or other invasive species. ESR activities would be developed for each wildfire in consultation with the Service.

Fuel Breaks and Treatments

A common fuel treatment strategy is to modify or remove fuels to reduce the likelihood of ignition, lessen potential fire damage, and lessen resistance to suppression control efforts.

Fuel breaks can be used to modify fuel characteristics in blocks or in strips to change fire behavior characteristics and allow fires to be more readily controlled. A fuel break system can be utilized by strategically placing treatments to tie strips and blocks around land units. Fuel projects and treatments are subject to and follow the FMP, RMP, and the National Fire Plan. Fuel projects are identified by need and priority annually. Up to 200 ac of desert tortoise non-critical habitat and 800 ac of desert tortoise designated critical habitat may be disturbed by proposed fuel breaks. Acres would be used to plan, implement, and report fuel breaks, since the entire block or strip would be treated using aerial applications of herbicides.

Fuels breaks in areas dominated by non-native annual grasses such as red brome (*Bromus rubens*), Mediterranean grass (*Schismus barbatos*) or cheatgrass (*Bromus tectorum*) may be accomplished using chemical control. Aerial applications of imazapic or Rimsulfuron may be utilized to create fuel breaks in annual grass dominated areas.

Fuels Treatments

Prescribed fire and non-fire fuels treatments (mechanical, chemical, and biological) would be developed and implemented in order to create fire safe communities, protect private property, achieve resource management objectives, and restore ecosystem health. The Las Vegas 1998 RMP allows for prescribed burns for resource enhancement in four areas: Gold Butte Allotment, South McCullough Range, Virgin River Floodplains, and Ash Meadows/Amargosa Flat area. Prescribed burns and non-fire fuel treatments include reseeding with native species to the extent practicable wherever residual vegetation is not adequately abundant to revegetate the sites naturally, prevent domination by non-native weed species, and meet ecosystem restoration objectives.

Wildland Urban Interface areas are of great concern to BLM and would be considered for fuels treatment projects. These areas are identified in the Communities at Risk section of each Fire Management Unit description. Additional collaborative project-level planning would be completed prior to implementation of fuels management actions. Additional at-risk areas and projects may be identified through a collaborative process on a case-by-case basis.

Virgin River Fuels Treatments

BLM plans to continue fuel treatments along the Virgin River, which were started in 1998 to reduce threats to the communities of Mesquite, Bunkerville, and Riverside and previously described in informal consultations 1-5-98-I-316, 1-5-03-I-438, 1-5-03-I-510, and 1-5-03-I-535. The Virgin River riparian corridor has converted to a dense tamarisk (also called saltcedar; *Tamarix* sp.) stand that contains a large fuel load that, if it ignites, would create a hot, fast fire and threaten adjacent communities. BLM rehabilitated parcels burned in 1998 and 2003 and treated additional stretches of BLM lands on the river to reduce tamarisk.

Treatments completed on the Virgin River would utilize mechanical removal of noxious and invasive vegetation such as tamarisk, chemical treatment of noxious or non-native species, and prescribed fire. As an opportunistic response to dynamic flood-caused changes or wildfire caused changes, chemical treatments may occur on the semi-wet and wet terraces under conditions where the vegetative cover has either been scoured clear or buried by silt. The sole treatment in these areas would consist of applying the herbicide Habitat (imazapyr), using the foliar method. The foliar method involves spraying the leaves of target plants during the growing season with a low concentration of herbicide. Other herbicide formulations or application methods that improve upon this method or treatment would be proposed to the Service on a case-by-case basis. The exclusive purpose for this method is to treat tamarisk seedlings and re-sprouts in post-flood or burned areas. Initial chemical treatment of these bare sites would only extend through the first two or three green-ups following flood disturbance or until the tamarisk seedlings have exceeded an average height limit to be determined by the Service. Maintenance using chemical treatment of these acres would continue to the minimum extent necessary to prevent site re-infestation and dominance by tamarisk.

Prescription Fire and Fuel Treatment Monitoring

Increased emphasis would be placed on natural resource objectives for each fire and fuels management treatment. A monitoring and evaluation program would be established to determine the effectiveness of the management actions. The program would include the purposeful collection and analysis of data to determine the results of implementing management actions and monitoring for both pre- and post-fire environmental conditions. Information from the monitoring and evaluation program would be used to adjust management determinations including adjustment in fire and fuels management practices.

Vegetation Management Program

Vegetation management includes both restoration and weed control. BLM monitors and treats noxious weed infestations on an as-needed basis. Methods, standard operating procedures, and chemical types for noxious weed control are defined and analyzed in detail in the *Final Programmatic EIS Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States* (BLM 2007) and the Final Programmatic Impact Statement for Vegetation Treatments Using Aminopyralid, Fluroxypyr and Rimsulfuron in Bureau of Land Management Lands in 17 Western States (BLM 2016). Both EIS's are available online.

In order to avoid treating non-target and native plants, BLM would apply herbicides to weeds through spot-treatment methods by hand or from a vehicle. BLM would submit annual Pesticide Application Records to the Service documenting area(s) treated and amount of active ingredient used (these are also submitted to the EPA). Because only non-native, noxious weeds would be targeted, the BLM and Service are not establishing acreage thresholds to limit noxious weed herbicide application. Up to 20 ac of desert tortoise non-critical habitat and 5 ac of desert tortoise designated critical habitat may be disturbed by proposed vegetation management through other methods (mechanical removal, etc.).

Restoration

Restoration may be conducted to reduce trail proliferation; minimize erosion; improve habitat conditions; and restore closed and unauthorized transportation routes, abandoned mine roads, trespass incursions, and fire scars. Restoration of riparian areas also would be implemented when necessary to improve riparian conditions. In addition, periodically illegal trespass activities occur such as unauthorized construction of roads, mines, and other facilities; restoration of these sites would also occur.

Fencing may be installed to protect biologically sensitive areas from trampling, visitor access, and other disturbance activities. Barriers may be installed around areas such as springs or riparian habitats, and along or across roads or trails. Barriers are typically made of fencing such as post and cable, smooth or barbed wire, large rocks, wooden pillars, or densely planted vegetation. Installation is done by hand tools or small backhoe and trencher.

Restoration activities include scarification or ripping of compacted soils, recontouring of the surface, applying soil amendments, seeding, and transplanting of native plants. Bobcats or other heavy equipment may be necessary for recontouring or decompacting soils. Water trucks or ATVs may be utilized on larger scale projects where intense replanting is required. In situations that require new disturbance, plants may be salvaged from areas planned for disturbance and stockpiled onsite. Where appropriate, berms, fences, or other features may be constructed or installed to block roads and aid in reducing recovery timeframes. The scale of restoration activities vary considerably and depend on the purpose and desired outcome.

BLM may conduct extensive restoration of riparian areas on public lands along the Muddy River, Virgin River, and Meadow Valley Wash. Restoration would involve removal and treatment of river stretches infested with tamarisk and other noxious weeds in order to improve habitat for southwestern willow flycatcher, yellow-billed cuckoo, and other riparian species. Treatments would be similar to those conducted as fuel treatments on the Virgin River, discussed under the Fire program above. Bulldozers, root plows, and chainsaws would be used as well as herbicides previously authorized for use on the Virgin River and others approved for use.

Noxious Weed Treatment

Herbicide use within the Las Vegas and Pahrump Field Offices would be implemented in accordance with the Las Vegas RMP and Final EIS, Las Vegas Integrated Weed Management Plan, pesticide labels, and all other applicable laws, policies and procedures. Application of herbicides may be performed by BLM personnel or project proponents or their contractors. Prior to use, all proponents would be required to prepare a Pesticide Use Proposal (PUP) and be reviewed and approved by the weed management specialist, District Manager, and the BLM Nevada State Office. All pesticide use on BLM land is tracked via Pesticide Application Records (PARs) and is reported annually to the EPA. The same reports would be submitted to the Service.

At least thirteen of the Nevada State listed noxious weeds have been identified to occur within the Las Vegas and Pahrump Field Offices. A multitude of other problematic non-native invasive plant species occur throughout the planning area. In the non-riparian areas, the most prevalent noxious species in the Las Vegas and Pahrump Field Offices that would be treated include Sahara mustard (*Brassica tournefortii*), Malta starthistle (*Centaurea melitensis*) and puncture vine (*Tribulus terrestris*). Other prevalent non-native, invasive plant species that would be treated include red brome, cheatgrass, Russian thistle (*Salsola kali*), and Mediterranean grass (*Schismus barbatus*).

The seven herbicides proposed for use in upland habitat within the Las Vegas and Pahrump Field Offices are Glyphosate, Imazapic, Imazapyr, Metsulfuron methyl, Rimsulfuron, Clopyralid and Aminopyralid (Table 7). Herbicides would be selected based upon the target plant species, minimization of potential risk to non-target species and would be applied according to the herbicide label and the applicable Programmatic EIS (PEIS; BLM 2007, 2016).

All seven proposed herbicides are EPA registered and have been approved for use on BLM lands (Table 7). These proposed herbicides are considered to have very low toxicity to mammals, birds, and fish when applied in accordance with all product label requirements and restrictions as well as any additional restrictions in the BLM Vegetation Treatments Using Herbicides PEISs (Vegetation PEISs). There is limited literature on toxicity trials involving reptiles. In accordance with the Vegetation PEISs, herbicides that are believed to have deleterious effects on reptiles, such as 2,4-D, are not proposed for use in the SNDO planning area where there is any potential for contact with desert tortoise (BLM 2007, 2016). Herbicides would be applied with the appropriate adjuvant to increase performance of the herbicide (Table 8).

Table 7. Herbicides proposed for use

Aminopyralid	Selective pre and post-emergent growth regulator; broadleaf weeds, especially thistles and clovers
Clopyralid	Selective, mimics plant hormones; annual and perennial broadleaf weeds
Imazapyr	Selective pre and post-emergent systemic; inhibits annual grasses and some perennial grasses and broadleaf forbs
Imazapic	Selective pre and post-emergent systemic; inhibits annual grasses and some perennial grasses and broadleaf forbs
Glyphosate	Non-selective systemic, annual and perennial grasses and broadleaf weeds, sedges, shrubs, and trees
Metsulfuron methyl	Selective; post-emergent; inhibits cell division in roots and shoots; annual and perennial broadleaf weeds, brush, and trees
Rimsulfuron	Selective pre and post-emergent systemic; inhibits annual grasses and some perennial grasses and broadleaf forbs

Table 8. Adjuvants that may be used with herbicides.

Trade Name	Type	Label Rate	Typical Rate
Methylated Spray Oil Concentrate	Methylated Seed Oil	32 oz/ac	16-32 oz/ac
Kinetic	Silicone based	64 oz/ 100 gal	6-32 oz/100 gal
Optima	Non-ionic surfactant	128 oz/100 gal	32-128 oz/100 gal
Activator 90	Surfactant	16-64 oz/100 gal	16-64 oz/100 gal
Mark It	Dye	12-32 oz/100 gal	16-32 oz/100 gal
Red River NIS	Non-ionic surfactant	8-32 oz/100 gal	8-32 oz/100 gal
Highllight	Dye	NA	1 quart/100 gal
JLB	Crop Oil	NA	NA
Induce	Non-ionic surfactant	8-48 oz/100 gal	8-48 oz/100 gal
Red River 90	Non-ionic surfactant	64 oz/100 gal	16-64 oz/100 gal
Alligare 90	Non-ionic surfactant	NA	16-64 oz/100 gal
Alligare Surface	Non-ionic surfactant	NA	16-64 oz/100 gal

Typical procedures for weed treatments include pre-treatment surveys for desert tortoise and other species if required, development of treatment recommendations, implementation of treatments, and monitoring of treatment areas. Access to treatment sites usually occurs via existing roads.

Treatment methods include manual, mechanical, and chemical (herbicide) for vegetation removal and control. Manual treatments include the use of simple hand tools such as saws, axes, shovels, machetes, mattocks, and brush hooks for hand grubbing, cutting, and girdling operations. Mechanical treatments include removal of aboveground portions of plants by mowing; chipping; cutting or roller chopping; and removal of the entire plant by plowing, tilling, and brush-beating. Herbicide treatments include the use of backpack sprayers, low pressure truck mounted power sprayers, or other handheld devices by an applicator using a plant-targeted application approach.

Aerial application of imazapic or rimsulfuron may be utilized to treat annual grasses. For all other herbicides under consideration, there would be no broadcast applications. Treatment sites may utilize one or all of these methods as needed for the target species.

Proposed upland noxious weed treatment areas would be prioritized using the size of the weed infestation and the species identified. Treatments would be conducted throughout the planning area including the desert tortoise critical habitat units.

Typical application for BLM weed projects are less than 100 acres with treatment area to include localized patches, roadways edges, and more linear application when in washes. Approved grants with applicants needing to control weeds on their sites can vary in size. This ranges from small substations and compressor stations needing to treat weeds inside their fenced area to large linear utility projects between 10 and 100 miles in a 200 foot row.

Resource Management Program

BLM resource management actions may adversely affect the desert tortoise and its designated critical habitat. This program of activities include fish and wildlife projects such as development and maintenance of wildlife guzzlers and catchments (collect and provide water for wildlife); construction and maintenance of protective fencing; closure of abandoned mine sites; construction of public kiosks, field work associated with cultural and paleontological resources; and wild horse and burro management. Up to 20 ac of desert tortoise non-critical habitat and 5 ac of desert tortoise designated critical habitat may be disturbed by proposed resource management.

Fish and Wildlife Projects

Actions in this category include wildlife developments and other actions to benefit fish and wildlife in the action area. Wildlife developments are man-made structures or treatments designed to protect resources or provide and maintain sufficient quality and quantity of food, water, cover, and space to satisfy needs of fish and wildlife. Improvements may include installation or removal of boundary fences or tortoise exclusion fencing, drift fences, corrals, exclosures, spring water developments, guzzlers, pipelines, water troughs, water storage tanks, earthen water tanks, and fish barriers.

Wildlife water developments (guzzlers) usually involve the installation of a water collection apron, a short pipeline, aboveground tanks, and drinkers both aboveground for large animals and belowground for small animals. Typically, large guzzlers (3,600 gallons) are constructed with a 30-ft by 40-ft metal apron and pipe rail fence. Small guzzlers (325 gallons) are constructed with an 8-ft by 12-ft metal apron and barbed wire fence. All guzzlers have wildlife escape ramps installed if deep enough to trap wildlife. Remotely located water developments are installed using a helicopter staged at road intersections or other disturbed area.

Spring water developments generally include installing a spring box at the source, a pipeline from the source, and a trough. All troughs have wildlife escape ramps installed if deep enough to trap wildlife. Excavation may be done by hand or with a backhoe.

Desert Clean-up

The accumulation of trash and debris on public land is a continuous and growing problem in the Las Vegas Valley and surrounding areas. Hundreds of illegal dump sites exist throughout southern Nevada. Materials found in these sites can include hazardous materials, landscape trimmings, household garbage, abandoned vehicles, target shooting debris, and construction rubble. Sites can contain a few localized garbage bags or be spread along miles of roadway. These sites are generally found in areas with easy vehicular access, but also occur deep in the desert via low-use roads. Activities associated with debris removal include driving to sites using existing roads, removing trash by hand or a Bobcat, loading trash into vehicles or dumpsters, properly disposing of debris, and placing appropriate signage. Vegetation may be crushed by vehicles or personnel during these activities.

Hazardous Materials

The Hazardous Materials Program has the responsibility for compliance with Federal, State, interstate and local management requirements. Waste is defined to include solid and hazardous waste, hazardous materials, and hazardous substances, as defined by BLM statutes (518 DM 2.3). Hazardous materials in the SNDO planning area are commonly in the form of petroleum products (vehicle fuels, lubricants, hydraulic, etc.), mining and ore processing chemicals, and agricultural chemicals (herbicides and pesticides) that are in immediate use, active storage, or abandoned storage or illegal dumps. No permanent hazardous waste disposal sites are maintained on SNDO lands.

Most hazardous materials sites in the SNDO planning area are illegal dump sites or abandoned mine sites in previously disturbed areas on or near roads or other points of easy access. Hazardous materials could potentially occur throughout the SNDO planning area in the form of illegal dumping. However, most hazard sites are associated with abandoned and orphaned mines, mill sites, closed landfills, and “midnight dumping” locations. In some cases, the material is contained and there is no release to the soil.

When hazardous materials are found on BLM lands, the site must be remediated. Everything on the site that is contaminated must be removed. The number of vehicles and personnel associated with the cleanup and the extent of habitat disturbance would be based upon the size and type of hazardous materials encountered. Cleanups associated with abandoned and orphaned mines may involve removal of extensive debris left by the operator including old storage tanks, evaporation ponds, and miscellaneous containers. Desert tortoises may occupy these sites and may be hidden under debris that must be removed. “Midnight dumping” sites are generally cleaned up before the hazardous material containers leak. BLM has an aggressive enforcement program which appears to be reducing incidents of illegal hazardous material dumping.

Activities associated with remediation include testing of the materials to identify the hazard; driving vehicles to the site (this may involve cross-county driving through vegetation); placing all contaminated containers, materials, and soil into a hazardous materials transport vehicle; and recontouring and restoring the site. Vegetation may be crushed by vehicles or trampled by personnel during these activities.

Abandoned Mine Land Closures

BLM works cooperatively with the State of Nevada Division of Minerals to eliminate abandoned mines through closure. Closures are conducted with a goal of remediating hazard sites, restoring the mine and adjoining area to a naturally appearing condition, and addressing wildlife occupancy and use of the site. Activities associated with mine closures include wildlife surveys, hazard inventories, use of heavy equipment to move spoils and tailings, construction of gates and fences, remediation of hazardous wastes, and providing access to the mine site over primitive roads or cross-country. The Abandoned Mine Land program is administered under Nevada Administrative Code (NAC) 513. Since 2002, the SNDO has authorized more than 36 actions within potential desert tortoise habitat.

Initial surveys are conducted to determine access routes, potential for habitat, and presence or absence of federally listed species. Immediately prior to closure, mines are surveyed for bat occupancy and recommended for soft (bat gate) or hard (filling) closure. If filling is deemed appropriate, remaining tailing piles are bulldozed back into the mineshaft. As many mines are very old and the roads to them may have deteriorated to varying degrees, access to these sites may require some cross-country travel. Restoration of disturbances is conducted as described for general restoration activities.

Public Information and Education

BLM provides public education through interpretive programs, signing, brochures, kiosks, etc. The majority of interpretation occurs where visitation is highest in the NCAs at the RRCNCA Visitor Center and Sloan Canyon NCA temporary visitor center, which are outside the action area for this consultation. Less intensive public education uses unmanned kiosks to explain the resource values of an area, public use restrictions, and locations of available uses. Signs and markers are used extensively to mark roads, trails, closures, and points of interest. Educational trailers provide manned public outreach to events that are temporal in nature.

This action includes the construction (and maintenance) of informational kiosks, signs, or visitor centers. Associated construction may include the development of restrooms, picnic areas, parking areas, trailheads, visitor information centers, utilities, spring protection, and educational sites.

Public information and education activities can occur throughout BLM jurisdictional lands within the SNDO planning area. Signs would be used throughout the SNDO area. Kiosks would be sited as needed, although they are most likely installed in areas with easy access to existing roads and trails. More intensive interpretive facilities would be authorized outside site-type ROW exclusion areas.

Most public information and education activities would involve installing signs with hand tools. Installation of kiosks may require the use of heavy equipment. Intensely used and previously disturbed sites are preferred locations for this authorized action but if unavailable, disturbance is generally less than 100 square feet.

More intensive educational facilities would require trenching, blading, and grading areas during construction. Asphalt and concrete may be installed during construction and maintenance. A ROW may be required in addition to this action for water, powerlines, and other utilities.

Cultural and Paleontological Resources

Cultural and paleontological resources are found throughout the SNDO planning area. Site specific locations are considered proprietary information and, therefore, not identified for this consultation. Cultural and paleontological resources are typically found in disturbed sites with high human activity. Use of existing roads, trails, or dry washes would be used to access the sites. Cultural and paleontological sites are generally left in place. Identification of sites and properties does not involve ground disturbance. If a site must be mitigated or a scientific excavation is initiated, ground disturbance may result. This may involve hand digging of small trenches, test pits, extracting fossils of small and large animals, excavating village sites, etc. Some vegetation may be removed.

Wild Horse and Burro Management

The objective of the wild horse and burro management program is to manage for healthy, genetically viable herds of wild horses and burros in a natural, thriving ecological balance with other rangeland uses. BLM manages wild horses and burros pursuant to multiple-use resource management requirements established by the RMPs, BLM policies, and implementing regulations under the *Wild and Free-Roaming Horses and Burros Act* of 1971 (WHB Act; Public Law 92-195). The WHB Act mandates that wild and free-roaming horses and burros be protected from unauthorized capture, branding, harassment, or death. The WHB Act also mandates that these animals are to be considered an integral part of the natural system, based on their distribution at the time the law was enacted.

Herd populations are monitored and managed using the following program sequence:

- ground observation of animal condition conducted on a continuing basis
- annual forage pattern mapping
- aerial population inventories to establish population numbers and distribution
- herd reduction gathers as needed to attain appropriate management level (AML) objectives
- calculation of AML.

Ground observations are accomplished through direct field observations by BLM staff and volunteers. Implementation of population inventories is dependent upon funding availability and priority needs. Aerial population inventories for the Herd Management Areas (HMA) were conducted in 1995, 1997, 2000, 2004, 2006, 2007, 2008, 2009, and 2011 through 2017. A total of eight HMAs are located within the BLM SNDO planning area, four of which BLM determined that the desert tortoise may be adversely affected by wild horses and burros (Gold Butte, Johnnie, Muddy Mountain, and Wheeler Pass [which is managed by BLM and the Forest Service]). The Amargosa, Ash Meadows, and Eldorado HMAs are managed for zero horses and burros.

AML for wild horses and burros is defined as the optimum number of animals within a specific HMA that would support achievement of multiple-use resource management objectives, while maintaining a thriving ecological balance. These levels are determined by evaluating current utilization patterns within the HMA and comparing that to the desired percent utilization of key forage plants within the HMA. This desired percent utilization is determined based on the level of use the range is capable of supporting while maintaining the resource management objectives defined in the RMP. The AML would be adjusted when monitoring determines that the animal population, forage, water, riparian, or other ecosystem management objectives are not being met. Wild horses and burros would be scheduled for removal when herds have expanded beyond designated herd area boundaries or the AML is exceeded.

Utilization of current year's production in desert tortoise habitat by all herbivores on key perennial forage species within HMAs would be limited to 50 percent of biomass for perennial grasses and 45 percent for shrubs and forbs. BLM would develop and maintain dependable water sources to allow more even distribution of horses and burros throughout the HMAs.

Activities involved in wild horse and burro management include population inventories; developing water hauls or springs (with an exclosure around the water source); and gathers which involve herding animals with horses or helicopters, constructing temporary corrals, removing some animals from the herd, and releasing the remaining animals.

4.3 Proposed Minimization Measures

General Compliance Measures (all activities, species)

- BLM wildlife staff (702-515-5000) and the Service (702-515-5230) must be notified immediately of death or injury of any listed species associated with a project, no later than close of business on the workday of the incident or the beginning of the next workday.

- BLM will designate an individual(s) as contact representative who will be responsible for overseeing compliance with the minimization measures included in the proposed action and the terms and conditions contained in the incidental take statement, and providing coordination with the Service.

- Project proponents will provide BLM with compliance reports.

- Tracking Log: BLM will keep an up-to-date log of all actions taken under this consultation including acreage affected, survey and removal activities (including reported number of desert tortoise injured, killed, or removed from the project site), and fees paid for each project.

Measures for Desert Tortoise

The minimization measures proposed by BLM for desert tortoise can be found in *Reasonable and Prudent Measures with Terms and Conditions.*

Measures for Listed Birds

Although this PBO does not exempt incidental take for listed birds, the measures proposed below by BLM will be applied on projects under this PBO to minimize potential effects to the species.

- No project activities will occur from April 15 through September 15 within 0.5 mi of southwestern willow flycatcher, yellow-billed cuckoo, or Yuma clapper rail nests.

- Minimize noise disturbance near southwestern willow flycatcher, yellow-billed cuckoo, and Yuma clapper rail breeding habitat. Birds are sensitive to vibration, which occurs with low-frequency noise (Kleist et al. 2018). Such efforts include rerouting trails and day-use areas away from occupied habitat.

- Minimize attractants to scavengers, predators, and brown-headed cowbirds. Where recreation users congregate, provide adequate waste facilities (covered trash receptacles, restrooms) and regular collection service. Place horse stables away from suitable and occupied habitat. Avoid use of birdseed feeders that use cowbird-preferred seeds such as millet.

- Verify evidence of new southwestern willow flycatcher, yellow-billed cuckoo, or Yuma clapper rail presence (via non-project related surveys, observations, etc.) by BLM, Service, or contract biologists. Vegetation management activity will be halted pending verification of each sighting. Confirmations will be documented in the official GIS project map as treatment avoidance polygons. The polygon dimension and shape will be determined by the Service. As a minimum default, point source sightings will be GIS buffered to a 200-ft radius.

- Do not allow competitive OHV events within 0.25 mi of natural water sources and associated riparian areas.

- Exclusively use the EPA aquatic registered herbicide *Habitat* within 25 ft of the daily high water mark of a river.

- Within 25 ft of the daily high water mark, use backpack sprayers. Spraying methods will include cut-stump, low volume basal bark, or foliar.

- Beyond 25 ft of the daily water mark, use either *Garlon 4* or *Habitat*, dependent upon site conditions. EPA label compliance, minimization of chemical uses overall, and tamarisk efficacy will be the selection criteria. Equipment will consist of ATV-mounted sprayers and backpack sprayers.

- Site or project access will be by existing road. Vehicles will not exceed 25 mph on unposted dirt roads.

- Protect important resting and nesting habitat such as riparian areas and mesquite and acacia woodlands. Minimize impacts that may result from projects that may adversely affect the water table supporting plant communities that provide habitat for these avian species.

- Place structures to avoid sensitive features such as, but not limited to, riparian areas and watercourses and to allow electric conductors to clearly span the features, within limits of the standard structure design. If the sensitive features cannot be completely avoided, structures will be placed to minimize disturbance.

- If off-site fill material is utilized, survey the fill source site for non-native plants. Only fill from non-contaminated sites will be used.

- Implement temporary or final erosion control measures immediately upon completion of clearing and grade building to reduce erosion during rainfall events. Material used for erosion control (straw, etc.) must be certified as weed free. Disturbed areas will be rehabilitated by seeding with native species collected from the project or general area. A list of seeds to be collected will be created and recommended seeding rates established, then reviewed and approved by the Service prior to the beginning of construction work. Seed collecting will be conducted when appropriate before the seed is needed so that the seed is viable when planted. Seeding needs to be done in the appropriate season to enhance germination (i.e., timed for rain).

- Minimize removal of vegetation by having transmission lines span washes.

- Whenever possible, avoid surface occupancy in riparian zones.

- Provide protection (such as fencing) around springs and riparian habitats to prevent habitat degradation from excessive use by grazing animals.

- Control or eradicate tamarisk in a manner not to disturb breeding or nesting birds. Rehabilitate the area with native species to help reduce the potential for tamarisk reestablishment and improve ecosystem health.

- Improve riparian areas, giving priority to areas functioning at risk with a downward trend. Implement measures to protect riparian areas, such as fencing or alternate water sources away from the riparian area. Ensure that the minimum requirement of Proper Functioning Condition on all riparian areas is maintained or achieved.

- Prohibit mechanical removal of standing tamarisk during the southwestern willow flycatcher and yellow-billed cuckoo breeding seasons in Nevada, which is from April 15 through September 15.

- Schedule subsurface mechanical removal of tamarisk root crowns (root plowing) outside the southwestern willow flycatcher and yellow-billed cuckoo breeding seasons in Nevada (April 15 through September 15). Root removal drastically increases the tamarisk kill rate; thus reducing the volume of (post-mechanical) chemical that must be applied to the tamarisk re-sprouts. Should abnormal delays (weather, logistics, etc.) develop during the spring root plowing treatment period, adherence to the April 15 shut-down date may be negotiated case-by-case with the Service. Such contingencies will trigger an additional minimization measure, in the form of leaving a 200-ft untreated buffer along any off-site vegetation that poses the potential for take in the form of harm of southwestern willow flycatcher or yellow-billed cuckoo.

- To prevent herbicide and sediment run-off from heavy equipment, a minimum 30-ft wide buffer of standing vegetation will remain untreated, measured from the daily high water mark (no treatment within 30 ft of daily high water mark). Less invasive weed treatments that do not pose risk of run-off can still be used to treat the 30-ft buffer.

- Prohibit native trees from being cut, shredded, crushed, or otherwise intentionally affected during the vegetation management activities. Patches of native shrubs greater than 15 ft in diameter will be avoided to the extent feasible, during mechanized treatment operations. Tamarisk in these patches will be hand-cut and backhauled.

- Mix and transfer chemicals in secondary containment tubs, to capture any spillage and to minimize exposure no closer than 200 ft from the daily high water mark, in order to catch spillage and to minimize exposure to non-target areas.

- Except during mechanical treatment operations, favor the use of ATV equipment over full-sized vehicles to the extent feasible, during on-site activities (seeding, harrowing, supply transport, spraying, etc.).

- Manage livestock grazing consistent with riparian objectives of reaching or maintaining Proper Functioning Condition.

- As grazing systems are developed for each allotment, ensure the system is consistent with the conservation of BLM sensitive species and federally listed species.

- Exercise due diligence to prevent work-related wildfires. Due diligence will consist of adhering to the specific measures identified above for hazardous fuels projects.

- After fire suppression is completed in Yuma clapper rail habitat, review any available survey records of the burn site and record in the fire report the number of rails recorded from the vicinity during these surveys.

- Evaluate past surveys for Yuma clapper rails as part of the planning for prescribed fire projects to document reduction in clapper rail use of the site that may be related to reduction in habitat quality. Post-project surveys should also be conducted to document the regrowth of cattail habitats and occupancy by clapper rails. This information will enhance our knowledge of the appropriate management cycle to maintain clapper rail habitat along the Colorado River.

- Conduct prescribed burns prior to the breeding season. There will be habitat adjacent to the burn area suitable for breeding.

Measures to Minimize Effects of Wildfire Fuel Reduction Projects on Listed Birds

- Any evidence of new southwestern willow flycatcher or yellow-billed cuckoo presence (via non-project related surveys, observations, etc.) will be immediately verified by BLM, Service, or contract biologists. Fuels project activity will be halted pending verification of each sighting. Confirmations will be documented in the official GIS project map as treatment avoidance polygons. The polygon dimension and shape will be determined by the Service. As a minimum default, point source southwestern willow flycatcher and yellow-billed cuckoo sightings will be GIS buffered to a 200-ft radius.

- Mechanical removal of standing tamarisk will occur outside of the southwestern willow flycatcher and yellow-billed cuckoo breeding seasons in Nevada, which is from April 15 through September 15.

- Subsurface mechanical removal of tamarisk root crowns (root plowing) will be scheduled outside the southwestern willow flycatcher and yellow-billed cuckoo breeding seasons in Nevada (April 15 through September 15). Root removal drastically increases the tamarisk kill rate; thus reducing the volume of (post-mechanical) chemical that must be applied to the tamarisk re-sprouts. Should abnormal delays (weather, logistics, etc.) develop during the spring root plowing treatment period, adherence to the April 15 shut-down date may be negotiated case-by-case with the Service. Such contingencies will trigger an additional minimization measure, in the form of leaving a 200-ft untreated buffer along any off-site vegetation that poses the potential for take in the form of harm of southwestern willow flycatcher or yellow-billed cuckoo.

- To prevent herbicide and sediment run-off from heavy equipment, a minimum 30-ft wide buffer of standing vegetation will remain untreated, measured from the daily high water mark (no treatment within 30 ft of daily high water mark). Less invasive weed treatments that do not pose risk of run-off can still be used to treat the 30-ft buffer.

- Where fish monitoring studies indicate such need, supplemental buffer structures (silt fences, straw wattles, etc.) will be installed on fuels treatment sites to remediate run-off impacts.

- No native trees will be cut, shredded, crushed or otherwise intentionally impacted during the hazardous fuels treatment activities. Patches of native shrubs greater than

15 ft in diameter will be avoided to the extent feasible during mechanized treatment operations. Tamarisk in these patches will be hand-cut and backhauled.

- Where monitoring reveals that a treated site is sustaining unacceptable impacts, temporary exclosure fencing may be erected. Fences will be located on prior disturbance and will not impact native vegetation.

- Aquatic-approved herbicides will be used within 25 ft of the daily high water mark of the river.

- Within 25 ft of the daily high water mark, herbicide equipment will consist of backpack sprayers. Spraying methods will include cut-stump, low volume basal bark, or foliar.

- Beyond 25 ft of the daily water mark, herbicides will consist of either *Garlon 4*, *Ultra*, or *Habitat*, dependent upon site conditions. EPA label compliance, minimization of chemical uses overall, plus tamarisk efficacy will be the selection criteria. Equipment will consist of ATV-mounted sprayers and backpack sprayers.

- Non-toxic marking dye will be added to the herbicide solution to ensure adequate coverage and to avoid redundant spraying of individual target plants.

- Weather reports will be monitored. Chemical applications will not occur within 24 hours of forecasted precipitation; nor whenever ground-level wind speeds exceed 10 mph.

- To minimize volatilization, herbicides will be used when ambient air temperatures are between 60 and 90°F.

- Mixing and transfer of chemicals will be done in secondary containment tubs, to capture any spillage and to minimize exposure no closer than 200 ft from the daily high water mark, in order to catch spillage and to minimize exposure to non-target areas.

- Containers and equipment will be handled per the chemical label instructions. Spill responses will comply with National Oil and Hazardous Substances Pollution Contingency Plan.

- Access will be by existing road. Vehicles will not exceed 25 mph on unposted dirt roads.

- Except during mechanical treatment operations, the use of ATV equipment will be preferred over full-sized vehicles to the extent feasible during on-site activities (seeding, harrowing, supply transport, spraying, etc.).

- No excavation or earthmoving will occur that would trigger the Section 404 Clean Water Act permit process with the U.S. Army Corps of Engineers.

- Monitoring will be conducted to detect initial presence or post-treatment recruitment of invasive or noxious weed species, including tamarisk. Monitoring and control efforts will comply with BLM Manual 9025.8 and the Nevada Weed Management Strategy.

- BLM or its contractors will exercise due diligence to prevent work-related wildfires. Due diligence will consist of adhering to these specific measures:

    - Hot chainsaws will only be set down on bare ground. If bare ground is not present, the crew will clear ground cover vegetation and duff in an appropriate minimum dimension.

    - All chainsaws will be equipped with Occupational Safety and Health Administration standard spark arrestors.

    - No open flames will be permitted in the project area.

    - No smoking will be permitted in the project area.

    - Crews operating chainsaws will be equipped with one 10-pound fire extinguisher and two fire shovels, at minimum. This suppression gear will be kept in immediate reach at all times during chainsaw operations.

    - If the above due diligence is exercised but an unintentional wildfire nonetheless is caused by the project proponents or contractors, BLM will consult with the Service on a case-by-case basis to identify appropriate rehabilitation treatment options.

Measures for Ash Meadows Plants

- All proposed projects in the Ash Meadows ACEC and adjacent BLM lands will be surveyed for listed plants species using techniques appropriate for the species. Projects will be sited to avoid impacts to the species, to the greatest extent possible.

- Projects sited within habitat of the Ash Meadows plants will be designed to reduce surface disturbance and loss of plants to the greatest extent possible if avoidance cannot be achieved.

- Prohibit commercial collection of vegetative specimens within the Ash Meadows ACEC.

- Avoid or minimize alterations of surface hydrology to ensure habitat is maintained for the species.

- Implement best management practices to prevent spills, drift, or erosion that will degrade habitat quality.

- Utilize existing roads to access mines and other use areas to the maximum extent feasible to reduce new habitat disturbance. Roads that will no longer be needed will be analyzed for closure and restoration.

- For spring-loving centaury, Ash Meadows gumplant, Ash Meadows ivesia, and Amargosa niterwort, BLM will install signs at springs explaining the need for their protection and to reiterate State law that prohibits camping within 100 yards (91 m) of water sources, on a case-by-case basis.

- Monitor non-native species within habitat for the Ash Meadows plants. Make treatment of incipient weed populations a high priority.

Ash Meadows Naucorid Measures

- Avoid or minimize, when avoidance is not possible, alterations of surface and subsurface hydrology to ensure habitat is maintained for the species.

- Utilize existing roads to access mines and other use areas to the maximum extent feasible to reduce new habitat disturbance. Roads that are no longer needed will be analyzed for closure and restoration.

Listed Fish Species Measures

- Avoid or minimize, when avoidance is not possible, alterations of available groundwater to ensure habitat is maintained for the species.

- Projects occurring in areas potentially occupied by listed fish will be required to have a qualified biologist, permitted by the Service and BLM, onsite to monitor project compliance. The biologist will coordinate with BLM wildlife staff to determine the level and intensity of monitoring required (full-time or spot checks).

- Use of any herbicides is prohibited within 25 ft of daily high water mark.

- Only use fish safe herbicides adjacent to the water or within the lower floodplain.

- Implement best management practices to prevent spills, drift, or erosion that will degrade habitat quality.

- Where fish monitoring studies indicate, install supplemental buffer structures (silt fences, straw wattles, etc.) on fuels treatment sites to remediate run-off effects.

- Do not allow competitive off-road vehicle events within 0.25 mi of natural water sources and associated riparian areas.

- Avoid or minimize, when avoidance is not possible, alterations of available groundwater to ensure habitat is maintained for the species.

- Utilize existing roads to access mines and other use areas to the maximum extent feasible to reduce new habitat disturbance. Roads that are no longer needed will be analyzed for closure and restoration.

- Implement best management practices to prevent spills, drift, or erosion that will degrade habitat quality.

Wild horse and Burro Management Measures

- Trap sites will be located in previously disturbed areas where possible. Any significant surface disturbance resulting from herd gathers will be restored to prevent continued public use.

- Only weed-free hay will be used if available and supplemental feeding is required.

Measures to Minimize Threat of Non-native Plants

- Rehabilitate, reclaim, or revegetate areas subjected to surface-disturbing activities where feasible. Habitat will be reclaimed so that pre-disturbance conditions can be reached within a reasonable time frame. Reclamation may include salvage and transplant of cacti and yucca, recontouring the area, scarification of compacted soil, soil amendments, seeding, vertical mulch, and transplant of seedling shrubs. If necessary, subsequent seeding or transplanting efforts may be required, should monitoring indicate that the original effort was not successful.

- Complete a Weed Risk Assessment for the proposed project prior to construction activities. This document will address the presence of any weeds; the potential for weeds within the project area to be spread to non-infested areas within the project area; the potential for introducing weeds into the project area via vehicles, equipment, fill material, and water brought in from an outside source; and minimization to reduce the potential for spreading weeds.

- If off-site fill material is used, survey the site where the fill source comes from for noxious plants. Only fill from non-contaminated sites will be used.

- Certify that all plant material including animal feed and material used for erosion control (straw, etc.) is weed-free.

- Clean all equipment of weed and grass seeds, stems, stalks, etc., prior to arrival and release from the project site. The washdown will concentrate on the undercarriage, with special emphasis on axles; crossmembers; motor mounts; and on and underneath steps, running boards, and front bumper and bushguard assemblies.

- Should there be concentrated areas of noxious weeds within the project area, additional spraying of equipment may be required to prevent the contamination of uninfested areas.

- Wash sites will be mapped for future monitoring of weed infestations.

- Mechanized treatments will not be conducted on slopes greater than 30 percent to minimize erosion.

- Treatments that compact and disturb the soil to the degree that runoff and erosion will be increased should be ripped and properly drained.

- Untreated islands of natural vegetation will be left to minimize negative impacts of the natural community.

- When herbicide use is approved by BLM and the Service, the applicant will follow information and guidelines provided on label and pesticide use permit.

- Use appropriate buffer strips when herbicide is applied near streams, lakes, and ponds. Buffer strip widths will be based on the chemical to be applied and determined specifically when future actions are proposed to be appended to this PBO.

- Implement water monitoring studies to ensure buffer strips and administrative controls were adequate to prevent water quality and aquatic environment impacts.

- Non-native weeds that were common in the project area prior to disturbance must be maintained at levels (cover and density) less than or equal to pre-disturbance conditions. Non-native weeds that were not found in the project area prior to disturbance will all be treated.

- Survey for, and apply treatment (herbicide) in newly disturbed ROW during biologically appropriate times and before noxious weeds and non-native weeds have gone to seed.

- Monitor and submit annual reports to BLM on non-native and noxious weeds occurrence, spread, and treatment for the lifetime of the ROW.

Fire Management Measures

- Recognizing the protection of human life and the safety of firefighters are the first priorities of wildland firefighting, the following minimization measures will be used to minimize impacts to threatened and endangered plants and wildlife present.

- Apply Minimum Impact Suppression Techniques (MIST) within riparian habitat. MIST includes the application of strategy and tactics that effectively meet suppression and resource objectives with the least environmental, cultural and social impacts.

- In riparian areas, prioritize suppression actions to minimize damage to native vegetation from wildfire or suppression operations.

- Fire suppression in riparian habitat will be coordinated with the approved resource advisor if the fire exceeds 10 ac in size. Resource advisors provide professional knowledge and expertise for the protection of natural, cultural, and special management areas.

- In riparian areas, use natural barriers or openings in riparian vegetation where possible as the easiest, safest method to manage a riparian wildfire. Where possible and practical, use wet firebreaks rather than constructing firelines by hand or with heavy equipment.

- Avoid burning out unburned islands whenever possible.

- Utilize firing tactics only if necessary to protect firefighter or public safety.

- Avoid surface-disturbing suppression activities in riparian areas whenever possible.

- Avoid dropping retardant within 300 ft of water sources, to the maximum extent feasible. Because of the extremely sensitive nature of aquatic ecosystems, any equipment used for water drops must be cleaned and disinfected by following the *Operational Guidelines for Aquatic Invasive Species Prevention and Equipment Cleaning* prior to arrival. Only municipal and designated water sources will be used for fire suppression activities in the Ash Meadows ACEC. Because of the potential to transmit non-native fishes and invertebrates, any water drops taken from Crystal Reservoir must be used 100 ft or more away from springs, streams or other water natural sources.

- Use of containment systems for portable pumps to avoid fuel spills in riparian or aquatic systems will be required.

- BLM will coordinate with the Service's Fire Management Officer and the Ash Meadows National Wildlife Refuge (NWR) Manager, Ash Meadows NWR biologist, or designee, for any fire within the Ash Meadows ACEC.

- The Incident Command (IC) will be required to call for a resource advisor for any fire in the Ash Meadows ACEC.

- No water flow from any spring or stream will be diverted from the existing water course unless specifically authorized by the Ash Meadows NWR Manager.

- Rare plant habitat in the Ash Meadows area appears barren and largely devoid of vegetation; to minimize potential impacts to rare plant habitat, the IC will coordinate the placement of staging areas, fire camps, and fire line with the resource advisor. To the extent practical, the staging areas, fire camps and other ground-disturbing activities will use the areas recommended and will avoid rare plant habitat.

- Unless otherwise required for safety and control concerns, islands of unburned vegetation or unburned fingers will not be burned out.

- The resource advisor will provide guidance to the IC to prevent the spread of noxious, invasive species. This may include the use of wash stations or other measures prior to arrival or departure from the incident.

- During Type I and Type II incidents, all incoming fire personnel will be briefed on listed species in the Ash Meadows area, their habitat, and impact minimize measures. Type I incidents are determined by higher complexity due to political issues, values at risk, proximity to cities, and multiple agencies involved, etc. and require national resources for safe and effective management and operation. Type II incidents extend beyond the capabilities for local control and are expected to go into multiple operational periods. A Type 2 incident may require the response of resources out of area, including regional and/or national resources, to effectively manage the operations, command, and general staffing.

- During the mopping up phase and prior to leaving an incident, a resource advisor will provide the IC with a list of post fire stabilization and rehabilitation actions needed to repair suppression impacts, such as obliterating overland vehicle tracks and installing vertical mulch and rocks to block access to temporary access roads and staging areas.

- On an annual basis, BLM renewable resources will provide awareness training to local fire personnel and IC staff regarding listed species. Natural resource protection awareness materials will be posted in local fire stations and in fire camps at larger incidents.

- BLM ESR program processes will be employed to evaluate potential treatments in a manner favorable to listed species.

- To the extent practical, BLM will monitor for newly introduced populations of weeds resulting from suppression activities.

- To the extent practical and within funding constraints, BLM will monitor long-term and cumulative fire effects on listed species.

Measures for fire suppression in the Virgin River, Muddy River, and Meadow Valley Wash

- All applicable measures above will be implemented.

- The resource management goal of fire suppression activities will be to minimize damage to stands of native vegetation and cultural resources from wildfire and fire suppression activities.

- The Virgin River above Halfway Wash and the Muddy River cannot be used as water sources for suppression activities (dip sites, pump drafting, etc.) without specific authorization from a resource advisor or biologist knowledgeable about listed species in the watershed, unless there is an imminent threat to human health and safety as determined by the IC.

- To avoid damage to biological resources, ground-disturbing activities will be minimized in riparian habitat and the adjacent river terraces. The IC will solicit guidance from resource advisors regarding placement of fire camps, staging areas, and other ground-disturbing activities.

- During Type I and Type II incidents, all incoming fire personnel will be briefed on listed species in the Virgin River, Muddy River, and Meadow Valley Wash; their habitat; and impact minimization measures, particularly those associated with vehicle use.

- On an annual basis, BLM renewable resources will provide awareness training to local fire personnel and IC staff regarding listed species in the Virgin River, Muddy River, and Meadow Valley Wash. Natural resource protection awareness materials will be posted in local fire stations.

Measures for wildfire suppression to minimize effects to the desert tortoise and its designated critical habitat

- All applicable measures above will be implemented.

- The IC will call for a resource advisor for all fires larger than 10 ac.

- Establish fire camps, staging areas, and helispots in previously disturbed areas outside of ACEC's and designated critical habitat units (CHU), where possible, in consultation with a qualified Resource Advisor.

- Provide all firefighters and support personnel with a briefing on desert tortoises and their habitat to minimize take, particularly those associated with vehicle use.

- BLM will give priority to keeping each wildfire in desert tortoise habitat to less than 50 ac in size.

- The IC will consider immediately the use of air attack resources (water and retardant drops) to limit fire spread in desert tortoise habitat.

- Fire in desert tortoise habitat will be fought to minimize the area burned. The IC will consider backfires and burnouts, off-road driving, or heavy equipment to construct fire line that may have substantial impacts, but may be justified in order to minimize acres burned.

- The IC will stop all habitat damaging tactics when they are no longer required to prevent a larger or more severe fire and switch to MIST as soon as possible.

- Where water drops may affect watersheds or have the potential to introduce non-native aquatic organisms into springs and wetlands, municipal water sources will be used for water drops [unless it results in a larger fire]. This will prevent spreading non-native organisms by following the *Operational Guidelines for Aquatic Invasive Species Prevention and Equipment Cleaning*.

- To the extent practical, fire camps, staging areas, and helispots will be placed in previously disturbed areas outside of ACECs and designated Critical Habitat Units.

- During Type I and Type II incidents all incoming fire personnel will be briefed on desert tortoises, their habitat, and impact minimize measures.

- Within 24 hours of containment, or when the IC determines it is safe, BLM will begin a post fire mortality and habitat damage assessment of fire suppression impacts.

- The ESR program will evaluate potential treatments in a manner favorable to the desert tortoise.

Hazardous Materials Measures

- Small hazmat sites of less than 0.25 ac in size will be cleaned up using hand tools, a Bobcat, or other heavy equipment.

- In non-emergency situations, if the site is suitable habitat for desert tortoise and it is located in the Las Vegas Valley, a tortoise survey will be done at the option of hazmat personnel. The individual or agency responsible for the incident will be required to pay appropriate fees. For those cases where the responsible party cannot be identified, payment of fees will be determined on a case-by-case basis. Tortoises injured or contaminated will be taken to a veterinarian for treatment.

- In non-emergency situations on sites located outside of the Las Vegas Valley, all sites, access routes, staging areas, etc., will be cleared by an authorized biologist before the start of removal or remediation in accordance with protocols listed above.

- In emergency situations in any location, the following minimization measures will be implemented, provided that implementation of these measures will not delay containment, cause risks to human life, cause substantial damage to property, or result in greater damage to natural resources:

- Vehicles will stay on existing roads to the extent practicable.

- An on-scene coordinator's representative will contact a BLM or Service biologist as soon as possible after notification of the event to obtain site-specific information and recommendations.

- Following containment, after-the-fact reports will be provided to the Service describing the situation and actions taken.

- If possible, overnight parking and storage of equipment and materials, including stockpiling, will be in previously disturbed areas within the designated area, which will be clearly delineated. If not possible, a qualified desert tortoise biologist will designate an area.

Section 5: Analytical Framework for the Service's Determinations

5.1 Jeopardy Determination

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq*.) requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed Federal action, and any cumulative effects, on the rangewide survival and recovery of the listed species. It relies on four components: (1) the Status of the Species, which describes the rangewide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and (4) the Cumulative Effects, which evaluates the effects of future non-Federal activities that are reasonably certain to occur in the action area on the species.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on October 28, 2019 [84 FR 44976]. This consultation was pending at that time, and we are applying the updated regulations to the consultation. As the preamble to the final rule adopting the regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." We have reviewed the information and analyses relied upon to complete this biological opinion in light of the updated regulations and conclude the opinion is fully consistent with the updated regulations.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of the species, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the species in the wild by reducing the reproduction, numbers, and distribution of that species.

5.2 Adverse Modification Determination

Section 7(a)(2) of the ESA requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat (CH). A final rule revising the regulatory definition of "destruction or adverse modification" was published on August 27, 2019 (84 FR 44976). The final rule became effective on October 28, 2019. The revised definition states:

"Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species."

The analysis of critical habitat in this biological opinion relies on four components: (1) the Status of Critical Habitat, which describes the rangewide condition of the CH in terms of the key components (i.e., essential habitat features, primary constituent elements, or physical and biological features) that provide for the conservation of the listed species, the factors responsible for that condition, and the intended value of the CH overall for the conservation/recovery of the listed species; (2) the Environmental Baseline, which analyzes the condition of the CH in the action area, the factors responsible for that condition, and the value of the CH in the action area for the conservation/recovery of the listed species; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the key components of CH that provide for the conservation of the listed species, and how those impacts are likely to influence the conservation value of the affected CH; and (4) Cumulative Effects, which evaluate the effects of future non-Federal activities that are reasonably certain to occur in the action area on the key components of CH that provide for the conservation of the listed species and how those impacts are likely to influence the conservation value of the affected CH.

Past designations of critical habitat have used the terms "primary constituent elements" (PCEs), "physical or biological features" (PBFs) or "essential features" to characterize the key components of critical habitat that provide for the conservation of the listed species. The new critical habitat regulations (81 FR 7414) discontinue use of the terms “PCEs” or “essential features,” and rely exclusively on use of the term “PBFs” for that purpose because that term is contained in the statute. However, the shift in terminology does not change the approach used in conducting a “destruction or adverse modification” analysis, which is the same regardless of whether the original designation identified PCEs, PBFs or essential features. For those reasons, in this biological opinion, references to PCEs or essential features should be viewed as synonymous with PBFs. All of these terms characterize the key components of critical habitat that provide for the conservation of the listed species.

For purposes of making the “destruction or adverse modification” determination, the Service evaluates if the effects of the proposed Federal action, taken together with cumulative effects, are likely to impair or preclude the capacity of CH in the action area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of CH for the conservation of the listed species. The key to making that finding is understanding the value (i.e., the role) of the CH in the action area for the conservation/recovery of the listed species based on the Environmental Baseline analysis.

Section 6: Status of the Species and Critical Habitat –Rangewide

6.1 **Desert Tortoise**

The Service listed the Mojave population of desert tortoise (all tortoises north and west of the Colorado River in Arizona, Utah, Nevada, and California) as threatened on April 2, 1990 [55 Federal Register (FR) 12178]. The Service issued an initial recovery plan (Service 1994) and a revised recovery plan (Service 2011a) for the desert tortoise. A five-year review was completed in 2010 (Service 2010a).

Species Biology and Life History (verbatim from Service 2010a. All references are in the 2010 document)

“The desert tortoise is a large, herbivorous reptile that reaches 20 to 38 centimeters (8 to 15 inches) in carapace (upper shell) length and 10 to 15 centimeters (4 to 6 inches) in shell height. Hatchlings emerge from eggs at about 5 centimeters (2 inches) in length. Adults have a domed carapace and relatively flat, unhinged plastrons (lower shell). Their shells are greenish-tan to dark brown in color with tan scute (horny plate on the shell) centers. Adult desert tortoises weigh 3.6 to 6.8 kilograms (8 to 15 pounds). The forelimbs have heavy, claw-like scales and are flattened for digging. Hind limbs are more elephantine (Ernst et al. 1994).

Desert tortoises are well adapted to living in a highly variable and often harsh desert environment. They spend much of their lives in burrows, even during their seasons of activity. In late winter or early spring, they emerge from overwintering burrows and typically remain active through fall. Activity does decrease in summer, but tortoises often emerge after summer rain storms to drink (Henen et al. 1998). Mating occurs both during spring and fall (Black 1976; Rostal et al. 1994). During activity periods, desert tortoises eat a wide variety of herbaceous vegetation, particularly grasses and the flowers of annual plants (Berry 1974; Luckenbach 1982; Esque 1994). During periods of inactivity, they reduce their metabolism and water loss and consume very little food. Adult desert tortoises lose water at such a slow rate that they can survive for more than a year without access to free water of any kind and can apparently tolerate large imbalances in their water and energy budgets (Nagy and Medica 1986; Peterson 1996a,b; Henen et al. 1998).

In drought years, the availability of surface water following rains may be crucial for desert tortoise survival (Nagy and Medica 1986). During these unfavorable periods, desert tortoises decrease surface activity and remain mostly inactive or dormant underground (Duda et al. 1999), which reduces water loss and minimizes energy expenditures (Nagy and Medica 1986). Duda et al. (1999) showed that home range size, number of different burrows used, average distances traveled per day, and levels of surface activity were significantly reduced during drought years.

The size of desert tortoise home ranges varies with respect to location and year (Berry 1986a) and also serves as an indicator of resource availability and opportunity for reproduction and social interactions (O'Connor et al. 1994). Females have long-term home ranges that may be as little or less than half that of the average male, which can range to 80 or more hectares (200 acres) (Burge 1977; Berry 1986a; Duda et al. 1999; Harless et al. 2009). Core areas used within tortoises' larger home ranges depend on the number of burrows used within those areas (Harless et al. 2009). Over its lifetime, each desert tortoise may use more than 3.9 square kilometers (1.5 square miles) of habitat and may make periodic forays of more than 11 kilometers (7 miles) at a time (Berry 1986a).

Tortoises are long-lived and grow slowly, requiring 13 to 20 years to reach sexual maturity, and have low reproductive rates during a long period of reproductive potential (Turner et al. 1984; Bury 1987; Germano 1994). Growth rates are greater in wet years with higher annual plant production (e.g., desert tortoises grew an average of 12.3 millimeters [0.5 inch] in an El Niño year compared to 1.8 millimeters [0.07 inches] in a drought year in Rock Valley, Nevada; Medica et al. 1975). The number of eggs as well as the number of clutches that a female desert tortoise can produce in a season is dependent on a variety of factors including environment, habitat, availability of forage and drinking water, and physiological condition (Turner et al. 1986, 1987; Henen 1997; McLuckie and Fridell 2002). The success rate of clutches has proven difficult to measure, but predation, while highly variable (Bjurlin and Bissonette 2004), appears to play an important role in clutch failure (Germano 1994)."

Recovery Plan

The Service issued an initial recovery plan (Service 1994) and a revised recovery plan (Service 2011a) for the desert tortoise. The 1994 recovery plan recommended that a scientifically credible monitoring plan be developed to determine that the population exhibit a statistically significant upward trend or remain stationary for at least 25 years and that enough habitat would be protected within a recovery unit or the habitat and populations be managed intensively enough to ensure long-term viability. Because both minimum population densities and minimum population numbers need to be considered to ensure recovery, the Service further recommended that reserves be at least 1,000 square miles. Smaller reserves that provide high-quality, secure habitat for 10,000 to 20,000 adult desert tortoises should provide comfortable persistence probabilities for the species well into the future when populations are well above minimum viable density (e.g., 30 or more adults per square mile) and population growth rates (lambda, λ) can be maintained (see page C54 of Service 1994). Conversely, populations with densities below approximately 10 adults per square mile (3.9 per square kilometer) are in danger of extinction (see page 32 of Service 1994).

"Adult" desert tortoise connotes reproductive maturity. Desert tortoises may become reproductive at various sizes. The Service based its 2010 survey protocol on the methodology used in range-wide sampling but erred in citing 160 millimeters (mm) as the size below which surveyors' ability to detect desert tortoises decreases. In range-wide sampling, the Service uses 180 mm as its cut-off length for counting desert tortoises, at least in part because the Styrofoam models used for training are 180 mm in length. The Service changed the survey protocol to use 180 mm in the revised version. We have used the term "adult" to indicate reproductive status and those animals larger than 180 mm to conform to the Service's protocols for range-wide sampling and pre-project surveys. We also use the terms "subadult" and "adult" to refer to all tortoises larger than 180 mm in this consultation.

The revised recovery plan for the desert tortoise (Service 2011a) lists three objectives and associated criteria to achieve delisting. The first objective is to maintain self-sustaining populations of desert tortoises within each recovery unit into the future; the criterion is that the rates of population change for desert tortoises are increasing (i.e., $\lambda > 1$) over at least 25 years (i.e., a single generation), as measured by extensive, range-wide monitoring across conservation areas within each recovery unit and by direct monitoring and estimation of vital rates (recruitment, survival) from demographic study areas within each recovery unit.

The second objective addresses the distribution of desert tortoises. The goal is to maintain well-distributed populations of desert tortoises throughout each recovery unit; the criterion is that the distribution of desert tortoises throughout each conservation area increase over at least 25 years.

The final objective is to ensure that habitat within each recovery unit is protected and managed to support long-term viability of desert tortoise populations. The criterion is that the quantity of desert tortoise habitat within each conservation area be maintained with no net loss until population viability is ensured.

The revised recovery plan (Service 2011a) also recommends connecting blocks of desert tortoise habitat, such as critical habitat units and other important areas to maintain gene flow between populations. Linkages defined using least-cost path analysis (Averill-Murray et al. 2013) illustrate a minimum connection of habitat for desert tortoises between blocks of habitat and represent priority areas for conservation of population connectivity. Figure 25 (Appendix B) illustrates that, across the range, desert tortoises in areas under the highest level of conservation and management remain subject to numerous threats, stresses, and mortality sources.

Threats

The threats described in the listing rule and both recovery plans (Service 1994, 2011a) continue to affect the species. The most apparent threats to the desert tortoise are those that result in mortality and permanent habitat loss across large areas, such as urbanization and large-scale renewable energy projects and those that fragment and degrade habitats, such as proliferation of roads and highways, off-highway vehicle (OHV) activity, wildfire, and habitat invasion by non-native invasive plant species.

We remain unable to quantify how threats affect desert tortoise populations. The assessment of the original recovery plan emphasized the need for a better understanding of the implications of multiple, simultaneous threats facing desert tortoise populations and of the relative contribution of multiple threats on demographic factors (i.e., birth rate, survivorship, fecundity, and death rate; Tracy et al. 2004).

To better understand the relationship of threats to populations of desert tortoises and the most effective manner to implement recovery actions, the Desert Tortoise Recovery Office developed a spatial decision support system that models the interrelationships of threats to desert tortoises and how those threats affect population change. The spatial decision support system describes the numerous threats that desert tortoises face, explains how these threats interact to affect individual animals and habitat, and how these effects in turn bring about changes in populations. For example, we have long known that the construction of a transmission line can result in the death of desert tortoises and loss of habitat. We have also known that common ravens, known predators of desert tortoises, use transmission line pylons for nesting, roosting, and perching and that the access routes associated with transmission lines provide a vector for the introduction and spread of invasive weeds and facilitate increased human access into an area. Increased human access can accelerate illegal collection and release of desert tortoises and their deliberate maiming and killing, as well as facilitate the spread of other threats associated with human presence, such as vehicle use, garbage and dumping, and invasive plants (Service 2011a). Changes in the abundance of native plants, because of invasive weeds, can compromise the physiological health of desert tortoises, making them more vulnerable to drought, disease, and predation. The spatial decision support system allows us to map threats across the range of the desert tortoise and model the intensity of stresses that these multiple and combined threats place on desert tortoise populations.

The following map (Figure 26 Appendix B) depicts the 12 critical habitat units of the desert tortoise, linkages between conservation areas for the desert tortoise and the aggregate stress that multiple, synergistic threats place on desert tortoise populations, as modeled by the spatial decision support system. Conservation areas include designated critical habitat and other lands managed for the long-term conservation of the desert tortoise (e.g., the Desert Tortoise Natural Area, Joshua Tree National Park, and the Desert National Wildlife Refuge).

Five-Year Review

Section 4(c)(2) of the Endangered Species Act requires the Service to conduct a status review of each listed species once every 5 years. The purpose of a 5-year review is to evaluate whether the species' status has changed since it was listed (or since the most recent 5-year review); these reviews, at the time of their completion, provide the most up-to-date information on the range-wide status of the species. For this reason, we are appending the 5-year review of the status of the desert tortoise (Service 2010a) to this biological opinion and are incorporating it by reference to provide most of the information needed for this section of the biological opinion. The following paragraphs provide a summary of the relevant information in the 5-year review.

In the 5-year review, the Service discusses the status of the desert tortoise as a single distinct population segment and provides information on the Federal Register notices that resulted in its listing and the designation of critical habitat. The Service also describes the desert tortoise's ecology, life history, spatial distribution, abundance, habitats, and the threats that led to its listing (i.e., the five-factor analysis required by section 4(a)(1) of the Endangered Species Act). In the 5-year review, the Service concluded by recommending that the status of the desert tortoise as a threatened species be maintained.

With regard to the status of the desert tortoise as a distinct population segment, the Service concluded in the 5-year review that the recovery units recognized in the original and revised recovery plans (Service 1994 and 2011a, respectively) do not qualify as distinct population segments under the Service's distinct population segment policy (61 FR 4722; February 7, 1996). We reached this conclusion because individuals of the listed taxon occupy habitat that is relatively continuously distributed, exhibit genetic differentiation that is consistent with isolation-by-distance in a continuous-distribution model of gene flow, and likely vary in behavioral and physiological characteristics across the area they occupy as a result of the transitional nature of, or environmental gradations between, the described subdivisions of the Mojave and Colorado deserts.

The Service summarizes information in the 5-year review with regard to the desert tortoise's ecology and life history. Of key importance to assessing threats to the species and to developing and implementing a strategy for recovery is that desert tortoises are long lived, require up to 20 years to reach sexual maturity, and have low reproductive rates during a long period of reproductive potential. The number of eggs that a female desert tortoise can produce in a season is dependent on a variety of factors including environment, habitat, availability of forage and drinking water, and physiological condition. Predation seems to play an important role in clutch failure. Predation and environmental factors also affect the survival of hatchlings. The Service notes in the 5-year review that the combination of the desert tortoise's late breeding age and a low reproductive rate challenges our ability to recover the species.

The 5-year review also notes that desert tortoises increase their reproduction in high rainfall years; more rain provides desert tortoises with more high quality food (i.e., plants that are higher in water and protein), which, in turn, allows them to lay more eggs. Conversely, the physiological stress associated with foraging on food plants with insufficient water and nitrogen may leave desert tortoises vulnerable to disease, and the reproductive rate of diseased desert tortoises is likely lower than that of healthy animals. Young desert tortoises also rely upon high-quality, low-fiber plants (e.g., native annual plants) with nutrient levels not found in the invasive weeds that have increased in abundance across its range (Oftedal et al. 2002; Tracy et al. 2004). Compromised nutrition of young desert tortoises likely represents an effective reduction in reproduction by reducing the number of animals that reaches adulthood. Consequently, although we do not have quantitative data that show a direct relationship, the abundance of weedy species within the range of the desert tortoise has the potential to affect the reproduction of desert tortoises and recruitment into the adult population in a negative manner.

The vast majority of threats to the desert tortoise or its habitat are associated with human land uses. Using captive neonate and yearling desert tortoises, Drake et al. (2015) found that individuals "eating native forbs had better body condition and immune functions, grew more, and had higher survival rates (>95%) than (desert) tortoises consuming any other diet"; health and body condition declined in individuals fed only grasses (native or non-native). Current information indicates that invasive species likely affect a large portion of the desert tortoise's range. Furthermore, high densities of weedy species increase the likelihood of wildfires; wildfires, in turn, destroy native species and further the spread of invasive weeds.

Drake et al. (2015) "compared movement patterns, home-range size, behavior, microhabitat use, reproduction, and survival for adult desert tortoises located in, and adjacent to, burned habitat" in Nevada. They noted that the fires killed many desert tortoises but found that, in the first five years post-fire, individuals moved deeper into burned habitat on a seasonal basis and foraged more frequently in burned areas (corresponding with greater production of annual plants and herbaceous perennials in these areas). Production of annual plants upon which desert tortoises feed was 10 times greater in burned versus unburned areas but was dominated by non-native species (e.g., red brome) that frequently have lower digestibility than native vegetation. During years six and seven, the movements of desert tortoises into burned areas contracted with a decline in the live cover of a perennial forage plant that rapidly colonizes burned areas. Drake et al. (2015) did not find any differences in health or survivorship for desert tortoises occupying either habitat (burned or unburned) during this study or in reproduction during the seventh year after the fire.

Various human activities have introduced numerous species of non-native invasive plants into the California desert. Routes that humans use to travel through the desert (paved and unpaved roads, railroads, motorcycle trails, etc.) serve as pathways for new species to enter habitat of the desert tortoise and for species that currently occur there to spread. Other disturbances of the desert substrate also provide invasive species with entry points into the desert. Figure 27 (Appendix B) depicts the potential for these species to invade habitat of the desert tortoise. The reproductive capacity of the desert tortoise may be compromised to some degree by the abundance and distribution of invasive weeds across its range; the continued increase in human access across the desert likely continues to facilitate the spread of weeds and further affect the reproductive capacity of the species.

Since the completion of the 5-year review, the Service has issued several biological opinions that affect large areas of desert tortoise habitat because of numerous proposals to develop renewable energy within its range. These biological opinions concluded that proposed solar plants were not likely to jeopardize the continued existence of the desert tortoise primarily because they were located outside of critical habitat and desert wildlife management areas. The proposed actions also included numerous measures intended to protect desert tortoise during the construction of the projects, such as translocation of affected individuals. In aggregate, these projects would result in an overall loss of approximately 48,041 acres of habitat of the desert tortoise. We also predicted that the project areas supported up to 4,363 desert tortoises; we concluded that most of these individuals were small desert tortoises, that most adults would likely be translocated from project sites, and that most mortalities would be small desert tortoises (< 180 mm) that were not detected during clearance surveys. To date, 660 desert tortoises have been observed during construction of solar projects (Table 9); most of these individuals were translocated from work areas, although some desert tortoises have been killed. The mitigation required by the BLM and California Energy Commission (the agencies permitting some of these facilities) resulted in the acquisition of private land and funding for the implementation of various actions that are intended to promote the recovery of the desert tortoise. These mitigation measures are consistent with recommendations in the recovery plans for the desert tortoise; many of the measures have been derived directly from the recovery plans and the Service supports their implementation. We expect that, based on the best available scientific information, they will result in conservation benefits to the desert tortoise; however, it is difficult to assess how desert tortoise populations will respond because of the long generation time of the species. Table 9 summarizes information regarding the solar projects that have undergone formal consultation with regard to the desert tortoise.

Table 9. Solar projects for which the Service has issued biological opinions or incidental take permits. References are in Literature Cited.

Project and Recovery Unit	Acres of Desert Tortoise Habitat	Desert Tortoises Estimated[1]	Desert Tortoises Observed[2]	Citations[3]
Eastern Mojave				
Ivanpah Solar Electric Generating System	3,582	1,136	175[7]	Service 2011b, Davis 2014
Stateline	1,685	947	55	Service 2013a, Ironwood 2014
Silver State North – NV	685	14[6]	7	Service 2010b, NewFields 2011
Silver State South – NV	2,427[4]	1,020[4]	152	Service 2013a, Cota 2014
Amargosa Farm Road – NV	4,350	4[6]	-	Service 2010f

Project and Recovery Unit	Acres of Desert Tortoise Habitat	Desert Tortoises Estimated[1]	Desert Tortoises Observed[2]	Citations[3]
Nevada Solar One - NV	400	[5]	[5]	Burroughs 2012, 2014
Copper Mountain North - NV	1,504	10[5]	3[5]	Service 2011c, 2013b; NewFields 2014
Copper Mountain - NV	380	[5]	[5]	Burroughs 2012, 2014
Townsite - NV	905	4[8]	-[5]	Service 2014a
Techren Boulder City - NV	2,291	15[9]	-[5]	Service 2012a
Valley Electric Association - NV	80	4	4[10]	Service 2015a
Western Mojave				
Mojave Solar, Abengoa Harper Lake	Primarily in abandoned agricultural fields	4[6]	-	Service 2011d
Chevron Lucerne Valley	516	10	-	Service 2010c
Cinco	500	53	2	Service 2015b, Daitch 2015
Soda Mountain	1,726	78	-	Service 2015c
Northeastern Mojave				
Res Americas Moapa Solar Energy Center - NV	951	95	-	Service 2014b
Moapa K Road Solar	2,141	186	177	Service 2012b, Cardno, Inc 2018
Playa Solar	1,538	258	77	Service 2015d, Ironwood Consulting 2016
Invenergy Harry Allen Solar	594	242	-	Service 2015d
NV Energy Dry Lake Solar Energy Center	751	45	-	Service 2015d
NV Energy Dry Lake Solar Energy Center at Harry Allen	55	15	-	Service 2015d
Aiya Solar	672	91	-	Service 2015e
Mountainview	146	[5]	[5]	Wise 2018
Colorado				
Genesis	1,774	8	0	Service 2010d, Fraser 2014a
Blythe	6,958	30	0	Service 2010e, Fraser 2014b
Desert Sunlight	4,004	56	7	Service 2011e, Fraser 2014a
McCoy	4,533	15	0	Service 2013c, Fraser 2014b
Desert Harvest	1,300	5	-	Service 2013d

Project and Recovery Unit	Acres of Desert Tortoise Habitat	Desert Tortoises Estimated[1]	Desert Tortoises Observed[2]	Citations[3]
Rice	1,368	18	1	Service 2011f, Fraser 2014a
Total	47,816	4,363	660	

[1]The numbers in this column are not necessarily comparable because the methodologies for estimating the numbers of desert tortoises occasionally vary between projects. When available, we included an estimate of the numbers of small desert tortoises.
[2]This column reflects the numbers of desert tortoises observed within project areas. It includes translocated animals and those that were killed by project activities. Project activities may result in the deaths of more desert tortoises than are found. Dashes represent projects for which we have no information at this point; some projects have not broken ground at the time of this biological opinion.
[3]The first citation in this column is for both the acreage and the estimate of the number of desert tortoises. The second is for the number of desert tortoises observed during construction of the project; where only one citation is present, construction has not begun or data are unavailable at this time.
[4]These numbers include Southern California Edison's Primm Substation and its ancillary facilities.
[5]These projects occurred under the Clark County Multi-species Habitat Conservation Plan; the provisions of the habitat conservation plan do not require the removal of desert tortoises. We estimate that all six projects combined will affect fewer than 50 desert tortoises.
[6]These estimates do not include smaller desert tortoises.
[7]In the table attached to the electronic mail, the number of desert tortoises translocated from the project site is represented by the total number of translocated animals minus the number of animals born in the holding pens.
[8]The estimate of the number of desert tortoises is from the portion of the project on BLM land (20.39 acres). The remaining lands are covered by the Clark County Multi-species Habitat Conservation Plan; see footnote 5.
[9]The estimate of the number of desert tortoises is from both BLM (104 acres) and private (2,200 acres) land. The remaining lands are covered by the Clark County Multi-species Habitat Conservation Plan; see footnote 5.
[10]Of the 80-acre project site, 76.4 acres were left intact (there was crushing and mowing of vegetation but no blading) with openings along the bottom of the fence for tortoise. After project completion, four tortoises were released back into the solar facility on September 25, 2017. Two adults have remained in the area and continued to enter the facility since it was completed.

In August 2016, the Service (2016a) issued a biological opinion to the BLM for a land use plan amendment under the Desert Renewable Energy Conservation Plan. The land use plan amendment addressed all aspects of the BLM's management of the California Desert Conservation Area; however, the Service and BLM agreed that only those aspects related to the construction, operation, maintenance, and decommissioning of renewable energy facilities were likely to adversely affect the desert tortoise. The land use plan amendment resulted in the designation of approximately 388,000 acres of development focus areas where the BLM would apply a streamlined review process to applications for projects that generate renewable energy; the BLM estimated that approximately 11,290 acres of modeled desert tortoise habitat within the development focus areas would eventually be developed for renewable energy. The BLM also adopted numerous conservation and management actions as part of the land use plan amendment to further reduce the adverse effects of renewable energy development on the desert tortoise.

The land use plan amendment also increased the amount of land that the BLM manages for conservation in California (e.g., areas of critical environmental concern, National Conservation Lands, etc.) from 6,118,135 to 8,689,669 acres (BLM 2015); not all of the areas subject to increased protection are within desert tortoise habitat. The BLM will also manage lands outside of development focus areas according to numerous conservation and management actions; these conservation and management actions are more protective of desert tortoises than direction contained in the previous land use plan. The Service (2016a) concluded that the land use plan amendment was not likely to jeopardize the continued existence of the desert tortoise and would benefit its recovery.

In addition to the biological opinions issued for solar development within the range of the desert tortoise, the Service (2012c) also issued a biological opinion to the Department of the Army (Army) for the use of additional training lands at Fort Irwin. As part of this proposed action, the Army translocated approximately 650 adult desert tortoises from 18,197 acres of the southern area of Fort Irwin, which had been off-limits to training, to lands south of the base that are managed by the BLM and the Army. The Army would also use an additional 48,629 acres that lie east of the former boundaries of Fort Irwin; much of this parcel is either too mountainous or too rocky and low in elevation to support numerous desert tortoises.

The Service also issued a biological opinion to the Department of the Navy (Navy) that considered the effects of the expansion of the Marine Corps Air Ground Combat Center at Twentynine Palms (Service 2017). We concluded that the Navy's proposed action, the use of approximately 167,982 acres of public and private land for training, was not likely to jeopardize the continued existence of the desert tortoise. Most of the expansion area lies within the Johnson Valley Off-highway Vehicle Management Area. As part of this proposed action, the Navy translocated 997 adult desert tortoises from the expansion area to four recipient sites to the north and east of the expansion area (Henen 2019). The Lucerne-Ord and Siberia sites are entirely within BLM-managed lands, and the Rodman-Sunshine Peak North and Cleghorn sites overlap BLM-managed lands and lands managed by the Navy. The Lucerne-Ord site lies within the Ord-Rodman desert tortoise critical habitat unit. The tortoises that were translocated by the Navy from the Johnson Valley Off-highway Vehicle Management Area were moved into populations that were below the Service's established minimum viable density, to attempt to augment these populations and make them more viable in the long-term.

The incremental effect of the larger actions (i.e., solar development, the expansions of Fort Irwin and the Marine Corps Air Ground Combat Center) on the desert tortoise is unlikely to be positive, despite the numerous conservation measures that have been (or will be) implemented as part of the actions. The acquisition of private lands as mitigation for most of these actions increases the level of protection afforded these lands; however, these acquisitions do not create new habitat and Federal, State, and privately managed lands remain subject to most of the threats and stresses we discussed previously in this section. Although land managers have been implementing measures to manage these threats and we expect, based on the best available scientific information, that such measures provide conservation benefits to the desert tortoise, we have been unable, to date, to determine whether the expected benefits of the measures have yet been realized, at least in part because of the low reproductive capacity of the desert tortoise. Therefore, the conversion of habitat into areas that are unsuitable for this species continues the trend of constricting the desert tortoise into a smaller portion of its range.

As the Service notes in the 5-year review (Service 2010a), "(t)he threats identified in the original listing rule continue to affect the (desert tortoise) today, with invasive species, wildfire, and renewable energy development coming to the forefront as important factors in habitat loss and conversion. The vast majority of threats to the desert tortoise or its habitat are associated with human land uses."

Another factor affecting the existence of the desert tortoise is climate change, which is likely to affect the prospects for the long-term conservation of the desert tortoise. For example, predictions for climate change within the range of the desert tortoise suggest more frequent and/or prolonged droughts with an increase of the annual mean temperature by 3.5 to 4.0 degrees Celsius. The greatest increases will likely occur in summer (June-July-August mean increase of as much as 5 degrees Celsius [Christensen et al. 2007]). Precipitation will likely decrease by 5 to 15 percent annually in the region; with winter precipitation decreasing by up to 20 percent and summer precipitation increasing by up to 5 percent. Because germination of the desert tortoise's food plants is highly dependent on cool-season rains, the forage base could be reduced due to increasing temperatures and decreasing precipitation in winter. Although drought occurs routinely in the Mojave Desert, extended periods of drought have the potential to affect desert tortoises and their habitats through physiological effects to individuals (i.e., stress) and limited forage availability. To place the consequences of long-term drought in perspective, Longshore et al. (2003) demonstrated that even short-term drought could result in elevated levels of mortality of desert tortoises. Therefore, long-term drought is likely to have even greater effects, particularly given that the current fragmented nature of desert tortoise habitat (e.g., urban and agricultural development, highways, freeways, military training areas, etc.) will make recolonization of extirpated areas difficult, if not impossible.

Core Criteria for the Jeopardy Determination

When determining whether a proposed action is likely to jeopardize the continued existence of a species, we are required to consider whether the action would "reasonably be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Although the Service does not explicitly address these metrics in the 5-year review, we have used the information in that document and more recent information to summarize the status of the desert tortoise with respect to its reproduction, numbers, and distribution.

Reproduction

In the 5-year review, the Service notes that desert tortoises increase their reproduction in high rainfall years; more rain provides desert tortoises with more high quality food (i.e., plants that are higher in water and protein), which, in turn, allows them to lay more eggs. Conversely, the physiological stress associated with foraging on food plants with insufficient water and nitrogen may leave desert tortoises vulnerable to disease (Oftedal 2002 in Service 2010a), and the reproductive rate of diseased desert tortoises is likely lower than that of healthy animals. Young desert tortoises also rely upon high-quality, low-fiber plants (e.g., native annual plants) with nutrient levels not found in the invasive weeds that have increased in abundance across its range (Oftedal et al. 2002; Tracy et al. 2004). Compromised nutrition of young desert tortoises likely represents an effective reduction in reproduction by reducing the number of animals that reaches adulthood; see previous information from Drake et al. (2015). Consequently, although we do not have quantitative data that show a direct relationship, the abundance of weedy species within the range of the desert tortoise has the potential to affect the reproduction of desert tortoises and recruitment into the adult population in a negative manner.

Various human activities have introduced numerous species of non-native invasive plants into the California desert. Routes that humans use to travel through the desert (paved and unpaved roads, railroads, motorcycle trails, etc.) serve as pathways for new species to enter habitat of the desert tortoise and for species that currently occur there to spread. Other disturbances of the desert substrate also provide invasive species with entry points into the desert. The reproductive capacity of the desert tortoise may be compromised to some degree by the abundance and distribution of invasive weeds across its range; the continued increase in human access across the desert likely continues to facilitate the spread of weeds and further affect the reproductive capacity of the species.

Numbers

In the 5-year review, the Service discusses various means by which researchers have attempted to determine the abundance of desert tortoises and the strengths and weaknesses of those methods. Due to differences in area covered and especially to the non-representative nature of earlier sample sites, data gathered by the Service's current range-wide monitoring program cannot be reliably compared to information gathered through other means at this time.

Data from small-scale study plots (e.g., one square mile) established as early as 1976 and surveyed primarily through the mid-1990s indicate that localized population declines occurred at many sites across the desert tortoise's range, especially in the western Mojave Desert; spatial analyses of more widespread surveys also found evidence of relatively high mortality in some parts of the range (Tracy et al. 2004). Although population densities from the local study plots cannot be extrapolated to provide an estimate of the number of desert tortoises on a range-wide basis, historical densities in some parts of the desert exceeded 100 adults in a square mile (38 per square kilometer; Tracy et al. 2004). The Service (2010a) concluded that "appreciable declines at the local level in many areas, which coupled with other survey results, suggest that declines may have occurred more broadly."

The range-wide monitoring that the Service initiated in 2001 is the first comprehensive attempt to determine the densities of desert tortoises in conservation areas across their range. The Desert Tortoise Recovery Office (Allison and McLuckie 2018) used annual density estimates obtained from this sampling effort to evaluate range-wide trends in the density of desert tortoises over time. (All references to the density of desert tortoises are averages. Some areas support higher densities and some lower; desert tortoises are not distributed in uniform densities across large areas.) This analysis indicates that densities in the Northeastern Mojave Recovery Unit have increased since 2004, with the increase apparently resulting from increased survival of adults and subadults moving into the adult size class. The analysis also indicates that the populations in the other four recovery units are declining; Table 10 depicts the estimated abundance of desert tortoises within the recovery units and the change in abundance. Surveys did not include the steepest slopes in these desert tortoise conservation areas; however, the model developed by Nussear et al. (2009) generally rates steep slopes as less likely to support desert tortoises.

Table 10. Tortoise estimates within recovery units and change in abundance (Allison and McLuckie 2018).

Recovery Unit	**Modeled Habitat (km^2)**	**2004 Abundance**	**2014 Abundance**	**Change in Abundance**
Western Mojave	23,139	131,540	64,871	-66,668
Colorado Desert	18,024	103,675	66,097	-37,578
Northeastern Mojave	10,664	12,610	46,701	+34,091
Eastern Mojave	16,061	75,342	24,664	-50,679
Upper Virgin River	613	13,226	10,010	-3,216
Total	68,501	336,393	212,343	-124,050

In the previous summary of the results of range-wide sampling (Service 2015f), we extrapolated the densities obtained within conservation areas (e.g., desert wildlife management area, Desert Tortoise Research Natural Area, Joshua Tree National Park) to all modeled habitat of the desert tortoise. This extrapolation may have exaggerated the number of desert tortoises because we applied the values for areas where densities are generally highest (i.e., the conservation areas) to areas where desert tortoises exist in very low densities (e.g., the Antelope Valley). We are also aware of a few areas where the density of desert tortoises outside of conservation areas is higher than inside.

To further examine the status of desert tortoise populations over time, we compared the densities of desert tortoises in the Western Mojave Recovery Unit between 2004 and 2014 (Service 2015f). In 2004, desert tortoise conservation areas surveyed in the Western Mojave Recovery Unit supported an average density of approximately 5.7 adults per square kilometer (14.8 per square mile). In contrast, surveys in the same areas in 2014 indicated that densities had decreased to 2.8 adults per square kilometer (7.3 per square mile). This decline in densities is consistent with decreases in density of populations in all recovery units over the same time period, with the exception of the Northeastern Mojave Recovery Unit. In fact, historical survey data from numerous plots in the Western Mojave Recovery Unit during the late 1970s and early 1980s suggest that adult desert tortoise densities ranged from 50 to 150 per square mile (19 to 58 per square kilometer; Tracy et al. 2004).

To further assess the status of the desert tortoise, the Desert Tortoise Recovery Office (Service 2015f) used multi-year trends from the best-fitting model describing loge-transformed density of adult animals per square kilometer. In 2014, 3 of the 5 recovery units supported densities below 3.9 adult animals per square kilometer [Western Mojave (2.8), Eastern Mojave (1.5), and Colorado Desert (3.7); see table 10 in Service 2015f], which is the minimum density recommended to avoid extinction in the 1994 recovery plan. The Northeastern Mojave Recovery Unit supported 4.4 adult desert tortoises per square kilometer and the Upper Virgin River

Recovery Unit, which is by far the smallest recovery unit, supported 15.3 adults per square kilometer.

Allison and McCoy (2014) evaluated changes in size distribution of desert tortoises since 2001. In the Western Mojave and Colorado Desert recovery units, the relative number of juveniles to adults indicates that juvenile numbers are declining faster than adults. In the Eastern Mojave, the number of juvenile desert tortoises is also declining, but not as rapidly as the number of adults. In the Upper Virgin River Recovery Unit, trends in juvenile numbers are similar to those of adults; in the Northeastern Mojave Recovery Unit, the number of juveniles is increasing, but not as rapidly as are adult numbers in that recovery unit. Juvenile numbers, like adult densities, are responding in a directional way, with increasing, stable, or decreasing trends, depending on the recovery unit where they are found.

In this context, we consider "juvenile" desert tortoises to be animals smaller than 180 mm in length. The Service does not include juveniles detected during range-wide sampling in density estimations because they are more difficult to detect and surveyors frequently do not observe them during sampling. However, this systematic range-wide sampling provides us with an opportunity to compare the proportion of juveniles to adults observed between years.

Distribution

Prior to 1994, desert tortoises were extirpated from large areas within their distributional limits by urban and agricultural development (e.g., the cities of Barstow and Lancaster, California; Las Vegas, Nevada; and St. George, Utah; etc.; agricultural areas south of Edwards Air Force Base and east of Barstow), military training (e.g., Fort Irwin, Leach Lake Gunnery Range), and off-road vehicle use (e.g., portions of off-road management areas managed by the BLM and unauthorized use in areas such as east of California City, California).

Urban development around Las Vegas has likely been the largest contributor to habitat loss throughout the range since 1994, but there are other large areas of habitat loss. Desert tortoises have essentially been removed from the 18,197-acre southern expansion area at Fort Irwin (Service 2012c). The development of large solar facilities has also reduced the amount of habitat available to desert tortoises. No solar facilities have been developed within desert tortoise conservation areas, such as desert wildlife management areas, although such projects have occurred in areas that the Service considers important linkages between conservation areas (e.g., Silver State South Project in Nevada).

In recognition of the absence of specific and recent information on the location of habitable areas within the Mojave Desert, especially at the outer edges, Nussear et al. (2009) developed a quantitative, spatial habitat model for the desert tortoise north and west of the Colorado River (Figure 28 Appendix B). The model incorporates environmental variables such as precipitation, geology, vegetation, and slope and is based on occurrence data of desert tortoises from sources spanning more than 80 years, including data from the 2001 to 2008 range-wide monitoring surveys. The model predicts the relative potential for desert tortoises to be present in any given location, given the combination of habitat variables at that location in relation to areas of known occupancy throughout the range; calculations of the amount of desert tortoise habitat in the 5-year review (Service 2010a); and the use of a threshold of 0.5 or greater predicted value for potential desert tortoise habitat in this biological opinion. The model does not account for anthropogenic effects to habitat and represents the potential for occupancy by desert tortoises absent these effects.

Table 11 and Figure 28 (Appendix B) depicts acreages of habitat (as modeled by Nussear et al. 2009, using only areas with a probability of occupancy by desert tortoises greater than 0.5 as potential habitat) within the recovery units of the desert tortoise and of impervious surfaces as of 2006 (Fry et al. 2011); calculations are by Darst (2014). Impervious surfaces include paved and developed areas and other disturbed areas that have zero probability of supporting desert tortoises. All units are in acres.

Table 11. Acres of desert tortoise habitat within recovery units.

Recovery Units	**Modeled Habitat**	**Impervious Surfaces (percentage)**	**Remaining Modeled Habitat**
Western Mojave	7,585,312	1,989,843 (26)	5,595,469
Colorado Desert	4,950,225	510,862 (10)	4,439,363
Northeastern Mojave	3,012,293	386,182 (13)	2,626,111
Eastern Mojave	4,763,123	825,274 (17)	3,937,849
Upper Virgin River	231,460	84,404 (36)	147,056
Total	20,542,413	3,796,565 (18)	16,745,848

The Service (2010a) concluded in its 5-year review that the distribution of the desert tortoise has not changed substantially since the publication of the original recovery plan in 1994 in terms of the overall extent of its range. Since 2010, we again conclude that the species' distribution has not changed substantially in terms of the overall extent of its range, although desert tortoises have been removed from several thousand acres because of solar development, military activities, and other project development.

6.2 Desert Tortoise Critical Habitat

The Service designated critical habitat for the Mojave desert tortoise in portions of California, Nevada, Arizona, and Utah in a final rule published February 8, 1994 (59 FR 5820). The Service designates critical habitat to identify the key biological and physical needs of the species and key areas for recovery and to focus conservation actions on those areas. Critical habitat is composed of specific geographic areas that contain the biological and physical features essential to the species' conservation and that may require special management considerations or protection. These features, which include space, food, water, nutrition, cover, shelter, reproductive sites, and special habitats, are called the physical and biological features of critical habitat. The specific physical and biological features of desert tortoise critical habitat are (1) sufficient space to support viable populations within each of the six recovery units and to provide for movement, dispersal, and gene flow; sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species; (2) suitable substrates for burrowing, nesting, and overwintering; (3) burrows, caliche caves, and other shelter sites; (4) sufficient vegetation for shelter from temperature extremes and predators; and (5) habitat protected from disturbance and human-caused mortality.

Critical habitat of the desert tortoise would not be able to fulfill its conservation role without each of the physical and biological features being functional. For example, critical habitat would not function properly if a sufficient amount of forage species were present but human-caused mortality was excessive. A second example is an area with sufficient space to support viable populations within each of the six recovery units and to provide for movement, dispersal, and gene flow would not function properly without adequate forage species.

The final rule for designation of critical habitat did not explicitly ascribe specific conservation roles or functions to the various critical habitat units. Rather, it refers to the strategy of establishing recovery units and desert wildlife management areas recommended by the recovery plan for the desert tortoise, which had been published as a draft at the time of the designation of critical habitat, to capture the "biotic and abiotic variability found in desert tortoise habitat" (59 FR 5820, see page 5823). Specifically, we designated the critical habitat units to follow the direction provided by the draft recovery plan for the establishment of desert wildlife management areas. The critical habitat units in aggregate are intended to protect the variability that occurs across the large range of the desert tortoise; the loss of any specific unit would compromise the ability of critical habitat as a whole to serve its intended function and conservation role.

Despite the fact that desert tortoises do not necessarily need to move between critical habitat units to complete their life histories, both the original and revised recovery plans discuss the importance of these critical habitat units and connectivity between them for the recovery of the species. Although it determined that linkages between critical habitat units did not meet the definition of critical habitat, the Service (1994) recommended the identification of buffer zones and linkages for smaller desert tortoise conservation areas to aid in overall recovery efforts; however, land management agencies have generally not established such areas.

We did not designate the Desert Tortoise Natural Area or Joshua Tree National Park in California or the Desert National Wildlife Refuge in Nevada as critical habitat because they are "primarily managed as natural ecosystems" (59 FR 5820, see page 5825) and provide adequate protection to desert tortoises. Since the designation of critical habitat, Congress increased the size of Joshua Tree National Park and created the Mojave National Preserve. A portion of the expanded boundary of Joshua Tree National Park lies within critical habitat of the desert tortoise; portions of other critical habitat units lie within the boundaries of the Mojave National Preserve.

Within each critical habitat unit, both natural and anthropogenic factors affect the function of the physical and biological features of critical habitat. As an example of a natural factor, in some specific areas within the boundaries of critical habitat, such as within and adjacent to dry lakes, some of the physical and biological features are naturally absent because the substrate is extremely salty; desert tortoises do not normally reside in such areas. Comparing the acreage of desert tortoise habitat as depicted by Nussear et al.'s (2009) model to the gross acreage of the critical habitat units demonstrates quantitatively that the entire area within the boundaries of critical habitat likely does not support the physical and biological features. In Table 12, the acreage for modeled habitat is for the area in which the probability that desert tortoises are present is greater than 0.5. The acreages of modeled habitat do not include loss of habitat due to human-caused impacts. The difference between gross acreage and modeled habitat is 653,214 acres; that is, approximately 10 percent of the gross acreage of the designated critical habitat is not considered modeled habitat. All units are acres.

Table 12. Acres of desert tortoise habitat within Critical Habitat Units.

Critical Habitat Unit	**Gross Acreage**	**Modeled Habitat**
Superior-Cronese	766,900	724,967
Fremont-Kramer	518,000	501,095
Ord-Rodman	253,200	184,155
Pinto Mountain	171,700	144,056
Piute-Eldorado	970,600	930,008
Ivanpah Valley	632,400	510,711
Chuckwalla	1,020,600	809,319
Chemehuevi	937,400	914,505
Gold Butte-Pakoon	488,300	418,189
Mormon Mesa	427,900	407,041
Beaver Dam Slope	204,600	202,499
Upper Virgin River	54,600	46,441
Totals	6,446,200	5,792,986

Human activities can have obvious or more subtle effects on the physical and biological features of critical habitat. The grading of an area and subsequent construction of a building removes physical and biological features; this action has an obvious effect on critical habitat. The revised recovery plan identifies human activities such as urbanization and the proliferation of roads and highways as threats to the desert tortoise and its habitat; these threats are examples of activities that have a clear effect on the physical and biological features of critical habitat.

Condition of the Physical and Biological Features of Critical Habitat

We have included the following paragraphs from the revised recovery plan for the desert tortoise (Service 2011a) to demonstrate that other anthropogenic factors affect the physical and biological features of critical habitat in more subtle ways. We have omitted some information from the revised recovery plan where the level of detail was unnecessary for the current discussion.

Surface disturbance from OHV vehicle activity can cause erosion and large amounts of dust to be discharged into the air. Recent studies on surface dust impacts on gas exchanges in Mojave Desert shrubs showed that plants encrusted by dust have reduced photosynthesis and decreased water-use efficiency, which may decrease primary production during seasons when photosynthesis occurs (Sharifi et al. 1997). Sharifi et al. (1997) also showed reduction in maximum leaf conductance, transpiration, and water-use efficiency due to dust. Leaf and stem temperatures were also shown to be higher in plants with leaf-surface dust. These effects may also impact desert annuals, an important food source for [desert] tortoises.

Off-highway vehicle activity can also disturb fragile cyanobacterial-lichen soil crusts, a dominant source of nitrogen in desert ecosystems (Belnap 1996). Belnap (1996) showed that anthropogenic surface disturbances may have serious implications for nitrogen budgets in cold desert ecosystems, and this may also hold true for the hot deserts that [desert] tortoises occupy. Soil crusts also appear to be an important source of water for plants, as crusts were shown to have 53 percent greater volumetric water content than bare soils during the late fall when winter annuals are becoming established (DeFalco et al. 2001). DeFalco et al. (2001) found that non-native plant species comprised greater shoot biomass on crusted soils than native species, which demonstrates their ability to exploit available nutrient and water resources. Once the soil crusts are disturbed, non-native plants may colonize, become established, and out-compete native perennial and annual plant species (D’Antonio and Vitousek 1992; DeFalco et al. 2001). Invasion of non-native plants can affect the quality and quantity of plant foods available to desert tortoises. Increased presence of invasive plants can also contribute to increased fire frequency.

Proliferation of invasive plants is increasing in the Mojave and Sonoran deserts and is recognized as a substantial threat to desert tortoise habitat. Many species of non-native plants from Europe and Asia have become common to abundant in some areas, particularly where disturbance has occurred and is ongoing. As non-native plant species become established, native perennial and annual plant species may decrease, diminish, or die out (D’Antonio and Vitousek 1992). Land managers and field scientists identified 116 species of non-native plants in the Mojave and Colorado deserts (Brooks and Esque 2002).

Increased levels of atmospheric pollution and nitrogen deposition related to increased human presence and combustion of fossil fuels can cause increased levels of soil nitrogen, which in turn may result in significant changes in plant communities (Aber et al. 1989). Many of the non-native annual plant taxa in the Mojave region evolved in more fertile Mediterranean regions and benefit from increased levels of soil nitrogen, which gives them a competitive edge over native annuals. Studies at three sites within the central, southern, and western Mojave Desert indicated that increased levels of soil nitrogen can increase the dominance of non-native annual plants and promote the invasion of new species in desert regions. Furthermore, increased dominance by non-native annuals may decrease the diversity of native annual plants, and increased biomass of non-native annual grasses may increase fire frequency (Brooks 2003).

This summary from the revised recovery plan (Service 2011a) demonstrates how the effects of human activities on habitat of the desert tortoise are interconnected. In general, surface disturbance causes increased rates of erosion and generation of dust. Increased erosion alters additional habitat outside of the area directly affected by altering the nature of the substrate, removing shrubs, and possibly destroying burrows and other shelter sites. Increased dust affects photosynthesis in the plants that provide cover and forage to desert tortoises. Disturbed substrates and increased atmospheric nitrogen enhance the likelihood that invasive species will become established and out-compete native species; the proliferation of weedy species increases the risk of large-scale fires, which further move habitat conditions away from those that are favorable to desert tortoises.

The following paragraphs generally describe how the threats described in the revised recovery plan affect the physical and biological features of critical habitat of the desert tortoise.

<u>Sufficient space to support viable populations within each of the six recovery units and to provide for movement, dispersal, and gene flow</u>.

Urban and agricultural development, concentrated use by off-road vehicles, and other activities such as development of transmission lines and pipelines completely remove habitat. Although we are aware of local areas within the boundaries of critical habitat that have been heavily disturbed, we do not know of any areas that have been disturbed to the intensity and extent that the function of this physical and biological feature has been compromised. To date, the largest single loss of critical habitat is the use of 18,197 acres of additional training land in the southern portion of Fort Irwin.

The widening of existing freeways likely caused the second largest loss of critical habitat. Despite these losses of critical habitat, which occur in a linear manner, the critical habitat units continue to support sufficient space to support viable populations within each of the six recovery units.

In some cases, major roads likely disrupt the movement, dispersal, and gene flow of desert tortoises. State Route 58 and Highway 395 in the Fremont-Kramer Critical Habitat Unit, Fort Irwin Road in the Superior-Cronese Critical Habitat Unit, and Interstate 10 in the Chuckwalla Critical Habitat Unit are examples of large and heavily travelled roads that likely disrupt movement, dispersal, and gene flow. Roads that have been fenced and provided with underpasses may alleviate this fragmentation to some degree; however, such facilities have not been in place for sufficient time to determine whether they will eliminate fragmentation.

The threats of invasive plant species described in the revised recovery plan generally do not result in the removal of this physical and biological feature because they do not convert habitat into impervious surfaces, as would urban development.

<u>Sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species</u>.

This physical and biological feature addresses the ability of critical habitat to provide adequate nutrition to desert tortoises. As described in the revised recovery plan and 5-year review, grazing, historical fire, invasive plants, altered hydrology, drought, wildfire potential, fugitive dust, and climate change/temperature extremes contribute to the stress of "nutritional compromise." Paved and unpaved roads through critical habitat of the desert tortoise provide avenues by which invasive native species disperse; these legal routes also provide the means by which unauthorized use occurs over large areas of critical habitat. Nitrogen deposition from atmospheric pollution likely occurs throughout all the critical habitat units and exacerbates the effects of the disturbance of substrates. Because paved and unpaved roads are so widespread through critical habitat, this threat has diminished the value of critical habitat for conservation of the desert tortoise throughout its range, to some degree. See Figure 27 in Appendix B that depicts the routes by which invasive weeds have access to critical habitat; the routes shown on the map are a subset of the actual number of routes that cross critical habitat of the desert tortoise.

<u>Suitable substrates for burrowing, nesting, and overwintering</u>.

Surface disturbance, motor vehicles traveling off route, use of OHV vehicles management areas, OHV events, unpaved roads, grazing, historical fire, wildfire potential, altered hydrology, and climate change leading to shifts in habitat composition and location, storms, and flooding can alter substrates to the extent that they are no longer suitable for burrowing, nesting, and overwintering. Erosion caused by these activities can alter washes to the extent that desert tortoise burrows placed along the edge of a wash, which is a preferred location for burrows, could be destroyed. We expect that the area within critical habitat that is affected by off-road vehicle use to the extent that substrates are no longer suitable is relatively small in relation to the area that desert tortoises have available for burrowing, nesting, and overwintering; consequently, off-road vehicle use has not had a substantial effect on this physical and biological feature.

Most livestock allotments have been eliminated from within the boundaries of critical habitat. Of those that remain, livestock would compact substrates to the extent that they would become unsuitable for burrowing, nesting, and overwintering only in areas of concentrated use, such as around watering areas and corrals. Because livestock grazing occurs over a relatively small portion of critical habitat and the substrates in most areas within livestock allotments would not be substantially affected, suitable substrates for burrowing, nesting, and overwintering remain throughout most of the critical habitat units.

<u>Burrows, caliche caves, and other shelter sites</u>.

Human-caused effects to burrows, caliche caves, and other shelter sites likely occur at a similar rate as effects to substrates for burrowing, nesting, and overwintering for the same general reasons. Consequently, sufficient burrows, caliche caves, and other shelter sites remain in the critical habitat units.

Sufficient vegetation for shelter from temperature extremes and predators.

In general, sufficient vegetation for shelter from temperature extremes and predators remains throughout critical habitat. In areas where large fires have occurred in critical habitat, many of the shrubs that provide shelter from temperature extremes and predators have been destroyed; in such areas, cover sites may be a limiting factor. The proliferation of invasive plants poses a threat to shrub cover throughout critical habitat as the potential for larger and more frequent wildfires increases.

In 2005, wildfires in Nevada, Utah, and Arizona burned extensive areas of critical habitat (Service 2010a). Although different agencies report slightly different acreages, Table 13 provides an indication of the scale of the fires.

Table 13. Acres of desert tortoise critical habitat burned within Critical Habitat Units.

Critical Habitat Unit	Total Area Burned (acres)	Percent of the Critical Habitat Unit Burned
Beaver Dam Slope	53,528	26
Gold-Butte Pakoon	65,339	13
Mormon Mesa	12,952	3
Upper Virgin River	10,557	19

The revised recovery plan notes that the fires caused statistically significant losses of perennial plant cover, although patches of unburned shrubs remained. Given the patchiness with which the physical and biological features of critical habitat are distributed across the critical habitat units and the varying intensity of the wildfires, we cannot quantify precisely the extent to which these fires disrupted the function and value of the critical habitat.

Habitat protected from disturbance and human-caused mortality.

In general, the Federal agencies that manage lands within the boundaries of critical habitat have adopted land management plans that include implementation of some or all of the recommendations contained in the original recovery plan for the desert tortoise (see pages 70 to 72 of Service 2010a). To at least some degree, the adoption of these plans has resulted in the implementation of management actions that are likely to reduce the disturbance and human-caused mortality of desert tortoises. For example, these plans resulted in the designation of open routes of travel and the closure (and, in some cases, physical closure) of unauthorized routes. Numerous livestock allotments have been relinquished by the permittees and cattle no longer graze these allotments. Because of these planning efforts, the BLM has proposed the withdrawal of some areas of critical habitat from mineral entry (79 FR 51190; the withdrawal of 10,094.03 acres of public lands within the Superior-Cronese Critical Habitat Unit). Because of actions on the part of various agencies, many miles of highways and other paved roads have been fenced to prevent desert tortoises from wandering into traffic and being killed. The Service and other agencies of the Desert Managers Group in California are implementing a plan to remove common ravens that prey on desert tortoises and to undertake other actions that would reduce subsidies (i.e., food, water, sites for nesting, roosting, and perching, etc.) that facilitate their abundance in the California Desert (Service 2008a). The BLM's (Service 2016a) land use plan amendment for the Desert Renewable Energy Conservation Plan increased the amount of land under protective status and adopted conservation and management actions that furthered the BLM's goals for these areas.

Despite the implementation of these actions, disturbance and human-caused mortality continue to occur in many areas of critical habitat (which overlap the BLM's areas of critical environmental concern for the most part and are the management units for which most data are collected) to the extent that the value of critical habitat for the conservation of the desert tortoise is, to some degree, diminished. For example, many highways and other paved roads in California remain unfenced. Hughson and Darby (2013) noted that as many as 10 desert tortoises are reported killed annually on paved roads within Mojave National Preserve. Because carcasses on roads are quickly removed by scavengers or destroyed by other vehicles, we expect that far more desert tortoises are killed on roads than are reported.

Unauthorized off-road vehicle use continues to disturb habitat and result in loss of vegetation within the boundaries of critical habitat; although we have not documented the death of desert tortoises as a direct result of this activity, it likely occurs. Additionally, the habitat disturbance caused by this unauthorized activity exacerbates the spread of invasive plants, which displace native plants that are important forage for the desert tortoise, thereby increasing the physiological stress faced by desert tortoises.

Finally, the BLM will not allow the development of renewable energy facilities on public lands within the boundaries of areas of critical environmental concern and National Conservation Lands (which largely correspond to the boundaries of critical habitat). Counties have not specifically restricted the development of renewable energy facilities on private lands within the boundaries of areas of critical environmental concern and National Conservation Lands. However, the checkerboard pattern of land ownership would likely necessitate that the BLM consider issuance of a right-of-way for such a facility, which likely decreases the potential for such proposals in the future.

Summary of the Status of Critical Habitat of the Desert Tortoise

As noted in the 5-year review and revised recovery plan for the desert tortoise (Service 2010a, 2011), critical habitat of the desert tortoise is subject to landscape-level impacts in addition to the site-specific effects of individual human activities. On the landscape level, atmospheric pollution is increasing the level of nitrogen in desert substrates; the increased nitrogen exacerbates the spread of invasive plants, which outcompete the native plants necessary for desert tortoises to survive. As invasive plants increase in abundance, the threat of large wildfires increases; wildfires have the potential to convert the shrubland-native annual plant communities upon which desert tortoises depend to a community with fewer shrubs and more invasive plants. In such a community, shelter and forage would be more difficult for desert tortoises to find.

Invasive plants have already compromised the value of critical habitat for the conservation of the desert tortoise to some degree with regard to the second physical and biological feature (i.e., sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species). These effects likely extend to the entirety of critical habitat, given the numerous routes by which invasive plants can access critical habitat and the large spatial extent that is subject to nitrogen from atmospheric pollution.

Land managers have undertaken actions to improve the status of critical habitat. For example, as part of its efforts to offset the effects of the use of additional training maneuver lands at Fort Irwin (Service 2004), the Department of the Army acquired the private interests in the Harper Lake and Cronese Lakes allotments, which are located within critical habitat in the Western Mojave Recovery Unit; as a result, cattle have been removed from these allotments. Livestock have been removed from numerous other allotments through various means throughout the range of the desert tortoise. The retirement of allotments assists in the recovery of the species by eliminating disturbance to the physical and biological features of critical habitat by cattle and range improvements.

The value of critical habitat has been diminished to some degree with regard to the last physical and biological feature (i.e., habitat protected from disturbance and human-caused mortality) as a result of the wide variety of human activities that continues to occur within its boundaries. These effects result from the implementation of discrete human activities and are thus more site-specific in nature.

Although the remaining physical and biological features have been affected to some degree by human activities, these impacts have not, to date, appreciably diminished the value of the critical habitat units for the conservation of the desert tortoise. We have reached this conclusion primarily because the effects are localized and thus do not affect the value of large areas of critical habitat for the conservation of the desert tortoise.

6.3 Southwestern Willow Flycatcher

The southwestern willow flycatcher was listed as endangered, without critical habitat on February 27, 1995 (60 FR 10694). A final recovery plan for the southwestern willow flycatcher was signed by the Region 2 Service Director and released to the public in March, 2003 (Service 2002). A 12-month finding on a petition to delist the flycatcher was found not warranted in 2017 (82 FR 61727, Service 2018c).

The southwestern willow flycatcher is a small grayish-green passerine bird (Family Tyrannidae) measuring approximately 5.75 inches. The song is a sneezy “fitz-bew” or a “fit-a-bew”, the call is a repeated “whit.” It is one of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). The southwestern willow flycatcher is an insectivore, foraging in dense shrub and tree vegetation along rivers, streams, and other wetlands. The bird typically perches on a branch and makes short direct flights, or sallies to capture flying insects. Drost et al. (1998) found that the major prey items of the southwestern willow flycatcher (in Arizona and Colorado), consisted of true flies (Diptera); ants, bees, and wasps (Hymenoptera); and true bugs (Hemiptera). Other insect prey taxa included leafhoppers (Homoptera: Cicadellidae); dragonflies and damselflies (Odonata); and caterpillars (Lepidoptera larvae). Non-insect prey included spiders (Araneae), sowbugs (Isopoda), and fragments of plant material.

Flycatchers employ various methods to catch their prey, including flying, hovering, gleaning, and "sit and wait" tactics (Prescott and Middleton 1988, Service 2002). Additional life history information is found in the revised recovery plan (Service 2002) and Sogge et al. (2010).

Southwestern willow flycatchers breed in dense riparian habitats from sea level in California to approximately 8,500 ft in Arizona and southwestern Colorado. Historical egg and nest collections and species' descriptions throughout its range describe the southwestern willow flycatcher's widespread use of willow (*Salix* spp.) for nesting (Phillips 1948, Unitt 1987). Currently, flycatchers primarily use Geyer willow (*Salix geyeriana*), coyote willow (*Salix exigua*), Goodding's willow (*Salix gooddingii*), boxelder (*Acer negundo*), tamarisk, Russian olive (*Elaeagnus angustifolia*), and live oak (*Quercus arifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush (*Cephalantha* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* spp.). Four basic vegetation communities provide flycatcher habitat: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native and exotic (Sogge et al. 1997).

Tamarisk is a significant component of the flycatcher's nesting, foraging, and migrating habitat throughout the bird's range. In 2006, 68 percent of known flycatcher nests in Arizona were built in a tamarisk tree (Graber et al. 2007). The value of tamarisk in providing quality flycatcher habitat is disputed in the scientific community. However, comparisons of flycatcher breeding in native versus non-native vegetation show no significant differences in reproductive performance (Service 2002), prey populations (Drost et al. 2001), or physiological conditions (Owen and Sogge 2002).

The introduced tamarisk leaf beetle was first detected affecting tamarisk within the range of the southwestern willow flycatcher in 2008 along the Virgin River in St. George, Utah. Initially, this insect was not believed to be able to move into or survive within the southwestern United States in the breeding range of the flycatcher. Along this Virgin River site in 2009, 13 of 15 flycatcher nests failed following vegetation defoliation (Paxton et al. 2010). As of 2012, the beetle has been found in southern Nevada/Utah and northern Arizona/New Mexico within the flycatcher's breeding range. It was detected along the Colorado River below Hoover Dam in 2012. Because tamarisk is a component of about 50 percent of all known flycatcher territories (Durst et al. 2008), continued spread of the beetle has the potential to significantly alter the distribution, abundance, and quality of flycatcher nesting habitat and impact breeding attempts.

While breeding areas can vary in patch size and vegetation composition, age, and configuration, slow-moving or standing water or saturated soils must be present in or adjacent to all nesting sites at least at the beginning of the nesting season. Oftentimes, nests are located in plants rooted or overhanging standing water. Without this water component, the habitat cannot be considered suitable and will not be occupied by breeding flycatchers.

Southwestern willow flycatcher territory size likely fluctuates with population density, habitat quality, and nesting stage. Territories are established within a larger patch of appropriate habitat sufficient to contain several nesting pairs of flycatchers. Cardinal and Paxton (2005) found that the home ranges of telemetered flycatchers at Roosevelt Lake, Arizona, varied from 0.37 to 890 acres. Birds were found using a variety of riparian habitat in a variety of conditions (open, young mature, exotic, mixed, etc.) and the distances moved indicate that birds can occupy a larger area and use more types of habitat than previously believed (Cardinal and Paxton 2005).

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of flycatcher territories and nests; flycatchers sometimes nest in areas where nesting substrates are in standing water (Sferra et al. 1997). Hydrological conditions at a particular site can vary remarkably in the arid Southwest within a season and among years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June).

Southwestern willow flycatchers typically reach their breeding grounds between early May and early June with males arriving first to establish territories (Service 2002). Flycatchers demonstrate strong fidelity to breeding areas although movement among sites within and between years has been documented (Service 2002). After a breeding territory is established, females take 4 to 7 days to build a small, open cup nest typically in a small-diameter fork of a tree. Average clutch sizes contain 3 to 4 eggs (Sogge et al. 2010, SWCA 2012). Incubation takes 12 to 13 days, and chicks fledge from the nest between 12 to 15 days of age. Adults continue to care for fledglings for approximately 2 weeks post fledging (Sogge et al. 2010). A second nest may be attempted following a successful nest or if a nest is lost or abandoned due to predation, parasitism, or disturbance. Nest and fledging success are highly variable between years and sites. The majority of nests are completed by mid-July. Flycatchers depart breeding areas from the end of July and August to migrate to southern Mexico, Central America, and northern South America for the winter. The entire breeding cycle, from egg laying to fledging, is approximately 28 days.

The flycatcher is a neotropical migrant that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948). The historical breeding range of the southwestern willow flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987). The flycatcher's distribution is confined to riparian areas along waterways within the range of the species.

Data from banding records of southwestern willow flycatchers indicate most flycatchers likely live 1 to 3 years, with many living 4 years, and some individuals surviving 5 to at least 8 years (E. Paxton and M. Whitfield, unpublished data in Service 2002). These estimates are similar to those documented in Nevada (SWCA 2012). Estimates of survivorship are challenging because they assume all living flycatchers are detected in a given year, and individuals not detected are assumed to have died, unless detected elsewhere. SWCA (2012) estimated flycatcher survivorship along the Lower Colorado River and its tributaries from 2010 to 2011 to be 57 percent for adults and 13 percent for juveniles.

The site and patch fidelity, dispersal, and movement behavior of adult, nestling, breeding, non-breeding, and migratory southwestern willow flycatchers are just beginning to be understood (Kenwood and Paxton 2001, Koronkiewicz and Sogge 2001). Most southwestern willow flycatchers return to former breeding sites, although flycatchers can regularly move among sites within and between years (Kenwood and Paxton 2001). Within-drainage movements are more common than between-drainage movements (Kenwood and Paxton 2001). Year-to-year movements of birds have been detected between the San Pedro/Gila river confluence and Roosevelt Lake, the Verde River near Camp Verde and Roosevelt Lake, and the Little Colorado River near Greer and Roosevelt Lake (Kenwood and Paxton 2001). Typical distances moved range from 1.2 to 18 miles. However, long-distance movements of up to 137 miles have been observed on the lower Colorado River and Virgin River (Braden and McKernan 2006). Breeding groups of southwestern willow flycatchers act as a metapopulation (Busch et al. 2000).

From 1993 to 2012, there were 308 known southwestern willow flycatcher breeding sites and an estimated 1,629 territories in California, Nevada, Arizona, Utah, New Mexico, and Colorado, where a resident willow flycatcher was detected (Durst 2017). The total number of flycatcher territories cannot be determined because not all sites are surveyed annually. Numbers have increased since the bird was listed, and some habitat remains unsurveyed; however, after nearly a decade of intense surveys, the existing numbers are just past the upper end of Unitt's (1987) estimate of 20 years ago (500–1,000 pairs). This increase may be due in part to increased survey efforts. About 70% of the 1,629 estimated territories throughout the subspecies' range are located at five general locations (Cliff/Gila Valley and Middle Rio Grande – New Mexico and Upper Gila River, Roosevelt Lake, San Pedro River/Gila River confluence – Arizona) (Durst 2017).

Historical distribution and status of the flycatcher in Nevada is not well known. Although accounts of breeding flycatcher locations date back to 1987, when Unitt reported flycatcher breeding at Indian Springs, Corn Creek, and the Colorado River, many areas with suitable breeding habitat for flycatchers were not surveyed until the early 2000s. Subsequent surveys have confirmed breeding at Ash Meadows NWR, the Lake Mead Delta, Meadow Valley Wash, the Muddy River, Pahranagat Valley, and the Virgin River. Many of these areas do not support breeding flycatchers on an annual basis, but sites in the Pahranagat Valley and at the Muddy River and Virgin River have remained relatively stable.

Unitt (1987) documented the loss of more than 70 southwestern willow flycatcher breeding locations rangewide estimating the rangewide population at 500 to 1000 pairs. Since 1993, a total of 122 sites once known to have breeding flycatchers are no longer occupied by nesting birds. Numbers have increased since the bird was listed and some habitat remains unsurveyed; however, after more than a decade of intense surveys, the existing known numbers are just past the upper end of Unitt's 1987 estimate.

The distribution of breeding groups is highly fragmented, often separated by considerable distance. In Arizona, about a 55-mile straight-line distance exists between breeding flycatchers at Roosevelt Lake and the next closest territories on the San Pedro River or Verde River. Long distances between breeding groups and small size of those populations reduces metapopulation stability and increases the risks of local extirpation due to stochastic events, predation, cowbird parasitism, and other factors (Service 2002). Conversely, having about 50 percent of the entire subspecies at four locations can also create instability should catastrophic events occur that would remove or significantly reduce habitat suitability at those places. The survival and recovery of the flycatcher is not dependent on having a few locations with large numbers of birds, but rather properly distributed populations throughout the subspecies' range placed close together (Service 2002).

Throughout the range of the flycatcher and since completion of the recovery plan, the overall abundance of flycatcher territories has increased, but not every Recovery Unit or Management Unit has increased (Table 14). Since 2002, the overall estimated number of flycatcher territories rangewide has increased from 986 to 1,629. In particular, there have been increases in the Gila and Rio Grande Recovery Units, but little change or declines in numbers within the Lower Colorado, Basin and Range, Upper Colorado River, and Coastal California Recovery Units. Tracking the distribution and abundance of the flycatcher has become more challenging due to the reduced amount of surveys.

Table 14. Estimated rangewide population for the southwestern willow flycatcher (SWFL) based on 1993 to 2012 survey data for Arizona, California, Colorado, New Mexico, Nevada, Utah, and Texas.[1]

State	Number of sites with SWFL territories 1993-12[2]	Percentage of sites with SWFL territories 1993-12	Number of territories[3]	Percentage of total territories
Arizona	133	43.1 %	679	41.7 %
California	97	31.5 %	115	7.1 %
Colorado	11	3.6 %	48	2.9 %
Nevada	15	4.9 %	75	4.6 %
New Mexico	49	15.9 %	702	43.1 %
Utah	3	1.0 %	10	0.6%
Texas	?	?	?	?
Total	308	100 %	1,629	100 %

[1] Durst 2017
[2] Site boundaries are not defined uniformly throughout the bird's range
[3] Total territory numbers recorded are based upon the most recent year's survey information from that site between 1993 and 2012

Declines in southwestern willow flycatcher populations have been attributed to loss, modification, and fragmentation of habitat, and brood parasitism by brown-headed cowbirds (Finch and Stoleson 2000 as cited in Service 2002, Whitfield and Sogge 1999).

Habitat loss has occurred through water management, land use practices, fire, and introduction of exotic species. Water management activities that have reduced suitable riparian habitat include dams or reservoirs, diversions, and groundwater pumping. Riparian habitat is reduced or modified by these management practices by alterations in flood frequency and duration, sediment and nutrition deposition, floodplain hydration, inundation period, and seed dispersal of riparian species. Land use practices have also reduced southwestern willow flycatcher habitat. Channelization can increase stream velocity and sediment deposition thereby raising streambeds above groundwater levels and preventing adequate water supply to the roots of riparian vegetation. Agricultural development has converted much riparian forest into farmland. Trampling by cattle may cause soil compaction, increasing runoff and erosion and decreasing dispersal and regeneration of vegetation. Livestock grazing may also affect the composition and density of riparian areas by the preferential removal of young, native, riparian vegetation. Recreation and urban development contribute to habitat loss through destruction of native vegetation, introduction of exotic species, increased fire risk, and soil compaction. The desiccation of riparian areas through water management practices, and the encroachment of human development have both greatly increased the risk of fire. Riparian vegetation is not fire-adapted, making fires in this habitat particularly destructive. A catastrophic fire in June of 1996, destroyed approximately a half mile of occupied tamarisk flycatcher nesting habitat on the San Pedro River in Pinal County. That fire resulted in the forced dispersal or loss of up to eight pairs of flycatchers (Paxton et al. 1996). Smaller fires have occurred along the upper most portion of the San Pedro River closer to the Mexico Border and another large fire occurred on the lower San Pedro River at the Nature Conservancy's San Pedro Preserve between Winkelman and Dudleyville in 2004. Recreationists cause over 95 percent of the fires on the lower Colorado River (Service 2002).

Areas that were historically dominated by riparian vegetation are often colonized after a burn by non-riparian species with faster recovery and regeneration times and adaptations to increased salinity and decreased moisture in soils. Lastly, exotic species are replacing native riparian vegetation along some waterways. These species often form monospecific stands that differ from native multistory and multispecies composition. Aggressive exotic species often out-compete the native willows and cottonwoods commonly used by willow flycatchers (Finch and Stoleson 2000 as cited in Service 2002).

Predation of adult flycatchers is not well understood, but predation of eggs and nestlings has been documented. Predators include snakes, raptors, corvids, small mammals, and mesocarnivores. Brown-headed cowbirds also function as predators when they remove flycatcher eggs during parasitism. Willow flycatcher nests are parasitized by brown-headed cowbirds, which lay their eggs in the host's nest. Cowbird parasitism reduces reproductive success of willow flycatchers by reducing fecundity and increasing likelihood of nest or brood abandonment. Brown-headed cowbird parasitism of southwestern willow flycatcher broods has been documented throughout its range (Whitfield 1990, Whitfield and Sogge 1999).

Where studied, high rates of cowbird parasitism have coincided with southwestern willow flycatcher population declines (Whitfield and Placer 1994, Whitfield and Strong 1995) or, at a minimum, resulted in reduced or complete nesting failure at a site for a particular year (Whitfield and Strong 1995).

Cowbird eggs hatch earlier than those of many passerine hosts, thus giving cowbird nestlings a competitive advantage (Bent 1960). Flycatchers can attempt to renest, but it often results in reduced clutch sizes, delayed fledging, and reduced nest success. Whitfield and Strong (1995) found that flycatcher nestlings fledged after July 20th had a significantly lower return rate and cowbird parasitism was often the cause of delayed fledging. After implementing a cowbird trapping program, the parasitism rate dropped to an all-time low of 37.5 percent and the nest success increased to 44 percent (Whitfield and Placer 1994).

Many activities continue to adversely affect the distribution and extent of all stages of flycatcher habitat throughout its range (development, urbanization, grazing, recreation, native and non-native habitat removal, dam operations, river crossings, ground and surface water extraction, etc.). Stochastic catastrophic events also continue to change the distribution, quality, and extent of flycatcher habitat.

Recovery Needs

There are no extensive records for the actual causes of adult southwestern willow flycatcher mortality. Incidents associated with nest failures, human disturbance, and nestlings are typically the most often recorded due to the static location of nestlings, eggs, and nests. As a result, nestling predation and brood parasitism are the most commonly recorded causes of southwestern willow flycatcher mortality. Band returns at Roosevelt Lake determined that the average adult return rate from 1998 to 2004 was 60 percent with survivorship estimated at 65 percent (Newell et al. 2005). From 1998 to 2004, the average nestling return rate was 28 percent and survivorship estimated at 35 percent (Newell et al. 2005).

Intensive nest monitoring efforts in California, Arizona, and New Mexico have shown that cowbird parasitism and predation can result in the following: failure of the nest; reduced fecundity in subsequent nesting attempts; delayed fledging; and reduced survivorship of late-fledged young. The probability of a southwestern willow flycatcher successfully fledging its own young from a cowbird parasitized nest is low (i.e., <5 percent). Also, nest loss due to predation appears consistent from year to year and across sites, generally in the range of 30 to 50 percent.

Recovery of the southwestern willow flycatcher, as identified in the Service's 2002 recovery plan, will entail maintaining a total known population of 1,950 territories (approximately 3,900 individuals) that are geographically distributed to allow proper function of a metapopulation (see

Table 10; Service 2002) and creating and securing sufficient habitat to ensure maintenance of these populations and habitats over time (Service 2002).

Recovery objectives include but are not limited to: (1) increasing and improving occupied, suitable, and potential breeding habitat; (2) improving demographic parameters; (3) minimizing threats to wintering and migration habitat; (4) surveying and monitoring populations; (5) conducting research; and (6) providing public education and outreach (Service 2002).

Within the analysis area, the main conservation needs for the flycatcher are to maintain, improve, and increase the quantity of nesting habitat. In addition, monitoring of breeding flycatchers should continue in breeding sites within the Pahranagat Valley, Muddy River, Virgin River, and Meadow Valley Wash to estimate abundance and determine nest success and location of territories.

Conservation measures associated with some consultations and Habitat Conservation Plans have helped to acquire lands specifically for flycatchers on the San Pedro, Verde, and Gila rivers in AZ and the Kern River in CA. Additionally, along the lower Colorado River, the U.S. Bureau of Reclamation is currently attempting to establish riparian vegetation to expand and improve the distribution and abundance of nesting flycatchers. A variety of Tribal Management Plans in CA, AZ, and NM have been established to guide conservation of the flycatchers. Additionally, during the development of the critical habitat rule, management plans were developed for some private lands along the Owens River in CA and Gila River in NM. These are a portion of the conservation actions that have been established across the subspecies' range.

A five-year review and a 12-month finding on a petition to de-list the flycatcher was completed in December 2017 by the Arizona Ecological Services Field Office and is posted on the Field Office's web site (http://www.fws.gov/southwest/es/arizona/Southwes.htm).

6.4 Southwestern Willow Flycatcher Critical Habitat

On July 22, 1997, the Service published a final critical habitat designation for the flycatcher along 964 river kilometers (km) (599 river miles) in Arizona, California, and New Mexico (62 FR 39129). We published a correction notice on August 20, 1997, on the lateral extent of critical habitat (62 FR 44228).

On May 11, 2001, the 10th circuit court of appeals set aside designated critical habitat in those states under the 10th circuit's jurisdiction (New Mexico). The Service decided to set aside critical habitat designated for the southwestern willow flycatcher in all other states (California and Arizona) until it could re-assess the economic analysis.

On October 19, 2005, the Service re-designated critical habitat for the southwestern willow flycatcher (70 FR 60886). A total of 737 river miles (1,186 km) across southern California, Arizona, New Mexico, southern Nevada, and southern Utah were included in the final designation. The lateral extent of critical habitat includes areas within the 100-year floodplain. River segments were designated as critical habitat in 15 of the 32 management units described in the recovery plan for the flycatcher (Service 2002).

On August 15, 2011, the Service proposed a revision to the critical habitat designation, identifying stream segments in each of the 29 management units where there are recovery goals (76 FR50542). These segments totaled 2,090 stream miles. Similar to the 2005 rule, the lateral extent of critical habitat includes only the riparian areas within the 100-year floodplain. About 790 stream miles were identified as areas we will consider for exclusion from the final designation under section 4(b)(2) of the Act.

On January 3, 2013, the Service completed its flycatcher critical habitat revision (Service 2013e) by designating approximately 1,227 stream miles as critical habitat. These areas are designated as stream segments, with the lateral extent including the riparian areas and streams that occur within the 100-year floodplain or flood-prone areas encompassing a total area of approximately 208,973 acres. About 948 stream miles of proposed critical habitat were excluded from the final revised designation. This revised designation included 180.9 km (112.3 mi) of stream in Nevada.

Condition of the Physical and Biological Features of Critical Habitat

For inclusion in the designation of critical habitat for the southwestern willow flycatcher, the Service included those areas that contain the physical or biological features essential to the conservation of the species. These areas contribute to the conservation of the flycatcher by supporting metapopulation stability, population connectivity, and gene flow and protecting against catastrophic loss of populations. Using our current knowledge of the life history, biology, and ecology of the subspecies and the requirements of the habitat to sustain the essential life history functions, we determined the following to be the physical or biological features of southwestern willow flycatcher habitat:

<u>Riparian vegetation</u>

Riparian habitat in a dynamic river or lakeside, natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Goodding's willow, coyote willow, Geyers willow, arroyo willow, red willow, yewleaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash (*Fraxinus velutina*), poison hemlock, blackberry, seep willow, oak (*Quercus* spp.), rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of

(a) Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 m (about 6 to 98 ft). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests; or
(b) Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy; or
(c) Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); or

(d) Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac).

Since the 2005 designation and 2013 revision of flycatcher critical habitat, some proposed projects were anticipated to result in local permanent and/or temporary losses of designated critical habitat. However, of all the projects evaluated for their effects on flycatcher critical habitat, none resulted in an adverse modification determination under section 7 (Service 2014c).

Effects to designated critical habitat still occur throughout the range. Recreation can be concentrated in riparian areas because of the presence of shade, water, activities, and aesthetic values (Service 2002). Effects from recreation may include reduction in vegetation through trampling, clearing, woodcutting, and preventing seedling germination due to soil compaction; bank erosion; increased incidence of fire; and promoting invasion by exotic plant species (Service 2002).

Fires are also a threat to designated critical habitat that are typically catastrophic, causing immediate and drastic changes in riparian plant density and species composition (Service 2002). In recent years riparian wildfires destroyed occupied southwestern willow flycatcher sites on the Rio Grande in New Mexico, the San Pedro and Gila rivers in Arizona, and in the Escalante Wildlife Area in Colorado (Service 2002).

Exotic species have become established in critical habitats, with tamarisk widespread and often dominant in riparian ecosystems. In contrast to original perceptions, tamarisk was found to be widely used by nesting flycatchers without negative impacts (Service 2014c). Along with the increase in tamarisk has come the spread of tamarisk leaf beetles. Introduced tamarisk eating leaf beetles were not anticipated to persist within the range of the southwestern willow flycatcher. However, they were detected within the breeding habitat (and designated critical habitat) of the flycatcher in 2008 along the Virgin River near the Town of St. George, Utah. In 2009, beetles were also known to have been detected defoliating habitat within the range of flycatcher habitat in southern Nevada, and along the Colorado River in the Grand Canyon and near Shiprock in Arizona. As of 2018, beetles occur along the length of the Rio Grande in New Mexico and expanded south along the Colorado River (along the AZ/CA border) below the Bill Williams River and through the Bill Williams drainage into the Big Sandy and Santa Maria Rivers in AZ. Despite a moratorium on the beetle program and ongoing litigation, efforts to move beetles across southern California are ongoing. Stochastic events also continue to change the distribution, quality, and extent of flycatcher habitat.

A southern-adapted tamarisk leaf beetle was released along the Rio Grande in TX that is more adapted to the arid southwestern desert environments of southern AZ and NM and is now moving north, farther into the flycatcher’s breeding range. It is now believed that the beetle is capable of spreading and defoliating tamarisk throughout the full breeding range of the flycatcher, which include critical habitat (Service 2014c).

Livestock grazing can also impact critical habitat by altering riparian habitat. Effects of grazing may include altering the plant community, species composition, and stream channel morphology (Service 2014c).

Insect prey populations

A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (*Hymenoptera*); dragonflies (*Odonata*); flies (*Diptera*); true bugs (*Hemiptera*); beetles (*Coleoptera*); butterflies, moths, and caterpillars (*Lepidoptera*); and spittlebugs (*Homoptera*).

Summary of the Status of Critical Habitat

As noted in the recovery plan and 5-year review for the southwestern willow flycatcher (Service 2002, 2014c), critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Landscape-level impacts include fire, non-native species (i.e., tamarisk), and the tamarisk leaf beetle. Individual impacts are localized, and their impacts are not as widespread as landscape-level impacts. These impacts include recreation and grazing.

The value of critical habitat has been diminished for the riparian vegetation physical and biological feature. The tamarisk leaf beetle is still expanding its range and removing adequate flycatcher nesting habitat. Land managers have taken actions to improve the status of critical habitat through restoration programs to remove tamarisk and plant native riparian vegetation that flycatchers require.

6.5 Yellow-Billed Cuckoo

The Service published a 12-month finding in the Federal Register on July 25, 2001, that described the distributional extent of the western distinct population segment (DPS) of the yellow-billed cuckoo and found that the listing of the western DPS was warranted but precluded by other higher priority listing actions. The yellow-billed cuckoo western DPS was subsequently placed on the candidate species list for future consideration for listing as a threatened or endangered species under the Act.

The cuckoo was listed as threatened without critical habitat on October 3, 2014 (79 FR 59992). Critical habitat was proposed on August 15, 2014 (79 FR 48547) but has not yet been designated. A final recovery plan for the cuckoo has not yet been completed.

The yellow-billed cuckoo is a medium-sized bird with an average length of 30.5 centimeters (12 in) and weighs about 57 grams (2 ounces). The cuckoo has a slender tail and a fairly stout and slightly down-curved bill which is blue-black with yellow on the base of the lower mandible. Plumage is grayish-brown above and white below with rufous primary flight feathers. The tail feathers are boldly patterned with black and white below, giving the appearance of large white spots. The legs are short and bluish-gray, and adults have a narrow yellow eye ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may lack yellow coloring.

In arid regions, the yellow-billed cuckoo establishes nesting sites in river bottoms, swampy areas, and damp thickets with relatively high humidity. Depending on the location, vegetation in the cuckoo's habitat can include cottonwoods, mesquite (*Prosopis* spp.), and willows (Halterman 1991). Sites with less than 40% canopy cover are unsuitable, those with 40% to 65% are marginal to suitable, and those with greater than 65% canopy cover are optimal (Halterman 1991).

Yellow-billed cuckoos have a varying patch size from upwards of 50 acres to sometimes approaching 100 acres (Laymon and Halterman 1987). The western population breeds June through August, with peak occurring mid-July to early-August. Cuckoos have a relatively short brooding period, from 9 to 11 days (Potter 1980, Potter 1981, Hamilton III and Hamilton 1965). Males incubate the eggs at night, and both sexes alternate incubation and nestling care during the day (Halterman et al. 2015). The growth rate of young is extremely rapid, with 17 days from start of incubation to fledgling. At 8 days old, chicks are fully feathered and able to move away from the nest easily, flying to nearby perches when necessary (Preble 1957, Hamilton III and Hamilton 1965, Potter 1980, Potter 1981). Males appear to be the primary caregiver of the young post-fledging (Halterman et al. 2015).

The yellow-billed cuckoo forages mainly in open areas, woodland, orchards, and adjacent streams. During breeding season, foraging areas of nesting pairs my overlap (Laymon 1980). Cuckoos primarily glean large insects such as caterpillars, grasshoppers, and crickets (Laymon 1980).

The yellow-billed cuckoo is a Neotropical migrant bird that winters in South America and breeds in North America. Yellow-billed cuckoos spend the winter in South America, east of the Andes, primarily south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina. The breeding range of the entire species formerly included most of North America from southeastern and western Canada (southern Ontario, Quebec, and southwestern British Columbia) south throughout the continental United States to the Greater Antilles and northern Mexico. Currently, the species no longer breeds in western Canada or the northwestern continental United States (Washington, Oregon, and Montana). The geographical breeding range of the yellow-billed cuckoo in western North America includes suitable habitat within the low- to moderate-elevation areas west of the crest of the Rocky Mountains in Canada, Mexico, and the United States, including the upper and middle Rio Grande, the Colorado River Basin, the Sacramento and San Joaquin River systems, the Columbia River system, and the Fraser River. In Mexico, the range includes the Cape Region of Baja California Sur, and river systems in the Mexican States of Sonora, Sinaloa, western Chihuahua, and northwestern Durango (Service 2001).

Western yellow-billed cuckoos breed in large blocks of dense riparian habitats, most often including woodlands with tall cottonwoods and willows. Dense understory foliage may be an important factor in nest site selection, and cottonwoods may provide important foraging habitat.

Home ranges are typically about 25 acres in size but may be as large as 99 acres. Cuckoos west of the Continental Divide nest almost exclusively near water (Service 2001).

The available data suggest that the yellow-billed cuckoo's range and population numbers have declined substantially across much of the western United States over the past 50 years. Based on historic accounts, the species was widespread and locally common in California and Arizona, locally common in a few river reaches in New Mexico, common very locally in Oregon and Washington, generally local and uncommon in scattered drainages of the arid and semiarid portions of western Colorado, western Wyoming, Idaho, Nevada, and Utah, and probably uncommon and very local in British Columbia (Service 2001). Arizona probably contains the largest remaining yellow-billed cuckoo population among States west of the Rocky Mountains. The species was historically widespread and locally common.

Surveys have been completed in yellow-billed cuckoo habitat by Southern Sierra Research Station since 2008. In 2012, 49 sites were surveyed from Pahranagat NWR in Nevada south along the Lower Colorado River to Yuma, Arizona, and a total of 279 cuckoos were detected over 5 survey periods (McNeil et al. 2013). Habitat use at Lower Colorado River Multi-Species Conservation Program (LCR MSCP) restoration areas exceeded use at non-LCR MSCP restoration and natural areas. The LCR MSCP habitat restoration efforts have thus far been successful in attracting high cuckoo densities (McNeil et al. 2013).

The decline of the western yellow-billed cuckoo is primarily the result of riparian habitat loss and degradation. Within the three States with the highest historical number of western yellow-billed cuckoo pairs, past riparian habitat losses are estimated to be about 90 to 95 percent in Arizona, 90 percent in New Mexico, and 90 to 99 percent in California. Many of these habitat losses occurred historically, and although habitat destruction continues, many past impacts have subsequent ramifications that are ongoing and are affecting the size, extent, and quality of riparian vegetation within the range of the western yellow-billed cuckoo. These adverse impacts to the western yellow-billed cuckoo's habitat including habitat loss and degradation are occurring now and are anticipated to continue for decades.

Principal causes of riparian habitat destruction, modification, and degradation in the range of the western yellow-billed cuckoo have occurred from alteration of hydrology due to dams, water diversions, management of riverflow that differs from natural hydrological patterns, channelization, and levees and other forms of bank stabilization that encroach into the floodplain. These losses are further exacerbated by conversion of floodplains for agricultural uses, such as crops and livestock grazing. In combination with altered hydrology, these threats promote the conversion of existing primarily native habitats to monotypic stands of non-native vegetation, which reduce the suitability of riparian habitat for the western yellow-billed cuckoo. Other threats to riparian habitat include wildfire, pesticide effects on prey species, long-term drought, climate change, and small and widely separated habitat patches.

Recovery Needs

Western yellow-billed cuckoos require relatively large (>20 hectares [>50 ac]), contiguous patches of multilayered riparian habitat for nesting. The multilayered canopy provides shade and traps moisture to create the relatively cooler and more humid streamside conditions which are believed to be important for nesting success. They are also known to nest in early to mid-successional native riparian habitat. Migration and wintering habitat needs are not well known, although they appear to include a relatively wide variety of conditions. Migrating yellow-billed cuckoos have been found in coastal scrub, second-growth forests and woodlands, hedgerows, forest edges, and in smaller riparian patches than those used for breeding. Wintering yellow-billed cuckoos generally use woody lowland vegetation near fresh water.

While a recovery plan has not yet been completed, general recovery actions include habitat preservation, habitat restoration, and a reduction in the threats to riparian habitat.

6.6 Yuma Clapper Rail

The Yuma clapper rail was listed as an endangered species on March 11, 1967, under endangered species legislation enacted in 1966 (Public Law 89-669). Only populations found in the United States were listed as endangered; those in Mexico were not listed under the 1966 law or the subsequent Act of 1973. Critical habitat has not been designated for the Yuma clapper rail. The Yuma Clapper Rail Recovery Plan was issued in 1983 (Service 1983). A draft revised recovery plan was made available in 2010, but was not finalized (Service 2010g). More information was made available, including an amendment to the range to include Mexico, in 2016. A second revision of the recovery plan is currently being developed.

The taxonomic status of the Yuma clapper rail was clarified with field work beginning in 1970 (Service 1983). Banks and Tomlinson (1974) identified three separate and distinct subspecies, including Yuma clapper rail (*Rallus longirostris yumanensis*), based on plumage and wing configurations and distribution patterns. Based upon genetic testing among rail species, the Yuma clapper rail underwent a name change. In 2014, this bird became known as Yuma Ridgway's rail (*Rallus obsoletus yumanensis*). Until the List of Threatened and Endangered Wildlife is revised (50 CFR 17.11), we refer to what is now commonly recognized as the Yuma Ridgway's rail (R. o. yumanensis) as Yuma clapper rail. When the Service periodically updates and revises the List, the changes are announced in the Federal Register.

The Yuma clapper rail is a small marsh bird (about 20 centimeters [8 in] tall) with a long, down-curved beak. Both sexes are slate brown above, with light cinnamon underparts and barred flanks. The Yuma clapper rail is distinguished from other clapper rail subspecies using distributional data, plumage color, and wing configurations. The Yuma clapper rail is a secretive species and is not often seen in the wild. It has a series of distinctive calls that are used to identify birds in the field. The call is sharp with a series of "kek" or "clack" notes. Frequency of calls or responsiveness to taped calls varies seasonally. Their diet includes crustaceans (usually crayfish), insects, small fish, and seeds.

Yuma clapper rails are active most of the daylight hours, with little to no activity after dark (Eddleman 1989). Daily movement was lowest during the late breeding period (May-July) and highest during the late winter (January-February) (Conway et al. 1993).

Yuma clapper rails begin breeding in March and April after breeding territories have been established. Nests are constructed in dense marsh vegetation among low growing riparian plants at the edge of the water or on the top of dead cattails remaining from the previous year's growth. Mature cattail and bulrush stands provide materials for nest building and cover for their nests. Sometimes nests are placed in the forks of small shrubs that lie just above moist soil or above water that is up to two feet deep. One egg is laid per day, with approximately 8 to 10 eggs per clutch. Incubation begins after last egg is laid and lasts approximately 21–23 days. Hatching generally begins during the first week of June, and all eggs are hatched within a 24-hour period. Young are precocial and follow the adults through the marsh within 48 hours of hatching. Adults lead the young to productive feeding areas where they quickly learn to feed on their own (Service 1983, Todd 1986). Young clapper rails experience high mortality within their first month of life due to predation. Young clapper rails are capable of flight at approximately 9-10 weeks of age. Chicks become independent around 35 to 42 days after hatching, with first flight occurring at 63 to 70 days old. The Yuma clapper rail feeds on fish, frogs, insects, aquatic plant seeds, bird eggs, and introduced crayfish (Anderson and Ohmart 1985, Adams and Quay 1958, Zembal and Fancher 1988).

Habitat for the Yuma clapper rail is freshwater marshes with dense vegetation, dominated by cattails (*Typha* spp.) and bulrushes that include both mats of old material and more open stands. The most productive areas consist of uneven-aged stands of cattails interspersed with open water of variable depths (Conway et al. 1993). Other important factors in the suitability of habitat include the presence of vegetated edges between marshes and shrubby riparian vegetation and the amount and rate of water level fluctuations within the habitat. Water flow in the open channels within the marsh is desirable. Yuma clapper rails will use quiet backwater ponds, flowing stream or riverside areas, irrigation canals and drainage ditches, reservoirs and small lakes, or other small marshlands where cattail habitat is available. Natural and artificially constructed marshes can provide suitable habitat.

Yuma clapper rails occur most often in large, extensive patches of emergent marsh vegetation (hundreds of acres in size). Gould (1975) recorded 57 percent of all rail occurrences within patches of marsh greater than 20 acres in size in Imperial County, California. However, Gould (1975) also found clapper rails in marshes as small as 0.5 acre. Todd (1986) found clapper rails in marsh patches as small as 0.3 acre. Mean density of Yuma clapper rails on the lower Colorado during the breeding season was 0.1 per acre, but ranged as high as 0.32 per acre (Anderson and Ohmart 1985). These data suggest that a 10-acre patch of marsh habitat may support one or two pairs of clapper rails.

Yuma clapper rails were previously believed to be highly migratory (with most birds thought to spend the winter in Mexico). However telemetry data showed that most rails (over 70 percent) do not migrate (Eddleman 1989). Very little is known about the dispersal of adult or juvenile birds, but evidence indicates that Yuma clapper rails can effectively disperse to new habitats provided that habitat corridors exist between the old and new sites (Rosenberg et al. 1991). Rosenberg et al. (1991) speculated that Yuma clapper rails are recent invaders (since 1900) to the northern portions of the lower Colorado River basin after extensive damming of the river in the early 1900's. The dams created relatively stable water benefiting marshland habitats suitable for rails.

In 2018, 30 transmitters were attached to Yuma clapper rails throughout the U.S. range of the species (Harrity and Conway 2018). Eight rails moved southward, including six rails that moved into Mexico, showing movements of 225 to 1050 km (140 to 652 mi; Harrity and Conway 2018). This study will continue into 2019.

The present range of the Yuma clapper rail in the U.S. includes portions of Arizona, California, and Nevada. Occupied habitats exist in the lower Colorado River (LCR) from the Southerly International Boundary with Mexico to the upper end of Lake Mead at the Grand Canyon, the Virgin River (a tributary to Lake Mead) in Nevada, the lower Gila River from its confluence with the LCR to the vicinity of the Phoenix metropolitan area in Arizona, and the Imperial Valley and Salton Sea area in California.

The Yuma clapper rail has two major population centers in the United States; the Salton Sea and surrounding wetlands in California, and the LCR marshes from the border with Mexico to Havasu NWR. Smaller numbers of rails are found along the lower Gila River in Yuma County, the Phoenix metropolitan area (including portions of the Gila, Salt, and Verde rivers) in Maricopa County, Roosevelt Lake in Gila County, Picacho Reservoir in Pinal County, and the Bill Williams River in La Paz County, Arizona (Service annual survey data). Yuma clapper rails have also been documented in southern Nevada in Ash Meadows NWR, Pahranagat NWR, Overton WMA, the Las Vegas Wash, and Key Pittman WMA; and in the Virgin River in Washington County, Utah; Clark County, Nevada, and Mohave County, Arizona.

Standardized surveys were included in the 1983 recovery plan for sites on the LCR and Salton Sea generally using the routes identified in the pre-1981 surveys. Additional routes were added over time. The concept for the annual surveys continued to be a "census" covering as much habitat as possible to obtain a count of the minimum number of rails present (the report recorded the maximum number of rails detected, which corresponds to the minimum number of rails present). During 1983–1999, at least one, and more likely two, different call broadcast tapes were used (one with continuous calls and one with calls and silence alternating every two minutes). In 2000, a broadcast tape and associated play-back protocol was developed to standardize the survey effort. This was used from 2000–2005. Beginning in 2006, survey data were collected using the USFWS National Marsh Bird Survey Protocol (Conway 2005). The National Marsh Bird Survey Protocol has since been updated (Conway 2009). The one constant over the 1969–2018 periods of rail surveys is that the annual report has always reflected the minimum number of rails present in the habitat. Table 15 shows the rail survey data from 2006–2018.

Table 15. Compiled survey data from 2006–2018 for Yuma clapper rail (actual counts of rails recorded on survey routes).

Location	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017***	**2018**
Mohave Div: Big Bend CA	NS	NS	NS	NS	NS	0	0	0	0	1	0	0	0
Havasu NWR													
Topock Marsh	46	42	31	45	42	42	33	26	40	45	3	36	NS
Topock Gorge	31	61	58	57	59	76	54	62	82	109	70	81	54
Beal Lake CA						NS	2	0	3	1	4	2	9
Willow Marsh							0	0	0	1	1	*	
Havasu Division	0	0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Bill Williams River NWR	14	7	6	11	17	15	11	11	9	7	7	13	NS
Parker Division	0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Palo Verde Div	0	NS	NS	NS	NS	NS	NS	NS	3	NS	NS	NS	NS
Cibola NWR	42	33	17	34	6	45	20	25	13	42	60	72	97
Hart Mine CA						7	4	6	7	18			
Imperial Division	29	11	23	26	17	8	17	20	1	67	48	39	25
Imperial NWR	47	21	19	43	23	34	16	30	29	49	40	46	53
Laguna Division	91	95	83	106	90	96	65	58	37	96	147	132	113
Hidden Shores	17	29	40	27	34	26	11	8	4	9	7	10	15
River Channels	12	3	7	7	9	12	15	16	11	31	46	34	31
Mittry Lake	8	7	8	12	4	14	4	1	5	15	14	10	21
Teal Alley	21	27	14	16	11	18	16	14	6	11	29	25	20
YPG Slough	33	29	14	34	32	36	19	19	11	30	51	50	22
Yuma Division	0	1	2	1	3	1	0	2	1	0	0	0	1
Yuma East Wetlands CA	0	1	0	3	5	5	4	3	6	2	9	5	5
Limitrophe Div	0	NS	NS	NS	0	NS	0	NS	NS	NS	NS	NS	NS
Hunters Hole CA									1	NS			
Lower Gila River	23	13	23	24	20	18	13	11	13	22	26	13	9
Phoenix Area	23	37	26	28	15	16	6	17	9	24	15	18	10
Picacho Res	NS	NS	0	NS	NS	1	NS	NS	NS	NS	NS	NS	NS
Imperial Wildlife Area	310	398	226	191	132	111	101	57	67	59	56	106	97
Salton Sea NWR	95	102	126	96	135	84	72	90	75	65	39	86	197
Salton Sea area	2	0	1	0	0	NS	NS	NS	NS	NS	NS	NS	NS
Southern Nevada	NS	1	4	6	6	6	4	13	13	1	9	20*	30*
Imperial Irrigation District										14	21	71	64
US TOTAL	**753**	**823**	**645**	**671**	**570**	**565**	**432**	**432**	**409**	**623**	**555**	**740**	**764**

*2017 added Overton and Key Pittman Wildlife Management Areas (WMA) and Las Vegas Wash to Southern Nevada to this summary as well as calculating Topock Marsh as a combination of sites on Havasu NWR (Goose Lake, Glory Hole 1&2, South Dike 1&2, North Dike, Lower Marsh, Willow Marsh, and Whiskey Slough).
**Numbers are calculated by taking the highest number detected at a route (not the sum of the route), and adding it to the highest numbers for the remaining routes for the location. The numbers are not an average or a statistical representation of the population, totals only offer a rough estimate.
NS= Not Surveyed
All data from Arizona Ecological Services Office in Phoenix, AZ (Fitzpatrick and Engelmann)

Threats to the Yuma clapper rail and its habitat are interrelated and are primarily a result of the alteration of rivers in the southwest. Water management projects within the lower Colorado

River basin have both destroyed and created Yuma clapper rail habitat. Dams constructed in the Colorado River altered natural flows regimes, inundated habitats, and created backwaters that developed extensive marshlands. Channel dredging, bank stabilization, water diversions, other channel maintenance activities, and development in the flood plain can potentially destroy large areas of marsh habitat and disturb birds, especially during nesting. Cattails and clapper rails are rather tolerant of water level fluctuations, as long as cattail habitats are not dried out completely thereby reducing the availability of prey, and water levels do not rise rapidly during the nesting season (flooding during breeding and nesting season can cover nesting and foraging areas). The birds can adjust nest height if waters rise slowly and do not overtop the emergent vegetation (Eddleman 1989).

Specific threats include development for industrial, agricultural, and urban uses; construction of dams and reservoirs; diversions and groundwater pumping; channelization and bank stabilization; and environmental contaminants. The ultimate effect of these threats is increased loss, modification, and degradation of marsh habitat due to the direct removal of marsh vegetation and the alteration of river and stream hydrology, water availability, and water table levels.

Recent environmental contaminant studies on the Colorado River have reported high levels of selenium (a trace metalloid) both in tissues of the Yuma clapper rails and their eggs and in crayfish, the rail's primary prey. Similar concentrations of selenium found in other species have resulted in metabolic problems and reduced reproductive success. No adverse impacts from selenium have been observed in the Yuma clapper rail. However, due to the rail's secretive nature, nests are difficult to find, young birds are hard to observe, and reproductive success is difficult to monitor.

Predation from coyotes (*Canis latrans*), great horned owls (*Bubo virginianus*), northern harriers (*Circus cyanus*), and Harris hawks (*Parabuteo unicinctus*) is another threat to Yuma clapper rails (Eddleman 1989).

Further information on the status of this species is summarized on the internet at: http://www.fws.gov/southwest/es/arizona/Yuma_Rail.htm. If you do not have access to the internet or cannot otherwise access the information, please contact the Southern Nevada Fish and Wildlife Office.

Recovery Needs

The Service completed a recovery plan for the rail in 1983 (Service 1983) and a 5-year review in 2006. The Service concluded in the 5-year review that continuing threats warranted maintaining the endangered status of the rail. Because of the age of the original recovery plan and the abundance of new information since completion of the plan, the Service decided to revise the recovery plan; the revised recovery plan remains in draft form at this time (Service 2010g).

The Yuma clapper rail requires marsh habitat with dense vegetation with mats of decadent vegetation and open stands and open water. Rails require sufficient prey including crayfish and other invertebrates. Habitat with acceptable levels of selenium should also be available to rails in the action area. Rails require area protected from human activities including development, groundwater pumping and diversions; and environmental contaminants that contribute to alteration of river and stream hydrology, water availability, and water table levels.

The draft revised recovery plan (Service 2010g) addressed the need to maintain rail habitat in current core population areas and also allow for dispersal among populations in the U.S. and Mexico. The general criteria proposed for reclassifying the rail from endangered to threatened includes (1) a stable or increasing population based on a minimum of 824 rails in the U.S., (2) management plans for all Federal and State-owned areas with rail habitat, and (3) securing an adequate long-term water supply for conserved rail habitats at the Salton Sea. The proposed criteria for delisting the species includes (1) a stable or increasing population for a minimum of ≥10 years based on a desired population of 824 rails, (2) securing the amount of habitat needed to maintain a minimum population size (see previous criterion), (3) an assessment of threat from contaminants, (4) an evaluation of dispersal pathways to provide for connectivity between core habitat areas, and (5) securing an adequate long-term water supply to maintain habitat at the Cienega de Santa Clara.

6.7 Virgin River Chub

The Virgin River chub was proposed for listing as endangered, with critical habitat, on August 23, 1978 (43 FR 37668). On September 30, 1980, the proposal was withdrawn because the 1978 amendments to the Act required that all proposals pending for more than 2 years be withdrawn (45 FR 64853). The Virgin River chub was re-proposed as endangered, with critical habitat, on June 24, 1986 (51 FR 22949). On August 24, 1989, the Virgin River chub was listed as endangered (54 FR 35305) throughout its entire range (50 CFR 17.11), but critical habitat was not designated at that time. When the Virgin River chub was listed, it was considered a subspecies of roundtail chub (*Gila robusta*) and its taxonomic classification was *Gila robusta seminuda*. DeMarais et al. (1992) asserted that full species status was warranted for the Virgin River chub and reclassified it as *Gila seminuda*. On July 24, 1995, a proposed rule was published (60 FR 37866) proposing a change in rank from subspecies to species as the Virgin River chub, and proposing a change in the status of the Virgin River population of Virgin River chub from a subspecies to a vertebrate population segment. The latter action was necessary because DeMarais' work concluded that the Muddy (=Moapa) River Virgin River chub was the same species as the Virgin River chub in the Virgin River, and only the Virgin River population was included for listing in the final rule. That proposed rule has not been finalized.

The Virgin River chub is a subspecies of *Gila robusta* of the Cyprinidae family, and is considered the rarest native fish in the Virgin River. It is a silvery, medium-sized minnow that averages about 20 cm in length but can grow to a length of 45 cm (Service 1995). The Virgin River chub is most often associated with deep runs or pool habitats of slow to moderate velocities with large boulders or instream cover such as root snags. Adults and juveniles are often associated together within these habitats; however, the larger adults are collected most often in the deeper pool habitats within the river. Virgin River chub were most often collected in depths ranging from 0.6 to 3.0 ft in velocities ranging from 0.0 to 2.5 cubic ft per sec (cfs) and associated with sand substrates with boulders or instream cover (Service 1995). Schumann (1978) and Deacon et al. (1987) found that the final adult thermal preference was approximately

75 °F. The Virgin River chub is omnivorous, showing considerable dietary shifts with age. Young fish feed almost entirely on macro-invertebrates while adults feed almost exclusively on algae and debris. Spawning is known to occur in the spring, and ripe females have been reported during the months of April, May, and June (Hickman 1987). Hickman (1987) also noted that good spawning years coincided with good spawning years for woundfin.

The Virgin River chub is endemic to 134 miles of the Virgin River in southwest Utah, northwest Arizona, and southeast Nevada. Historically, the Virgin River chub is believed to have occurred throughout most of the Virgin River from its original confluence with the main stem Colorado upstream to La Verkin Creek, near the town of Hurricane, Utah.

Virgin River chub historically were collected within the Muddy River in Nevada and within the mainstem Virgin River from Pah Tempe Springs (also called La Verkin Springs), Utah, downstream to the confluence with the Colorado River in Nevada (Service 1995). It is likely that Virgin River chub historically occurred well above Pah Tempe Springs.

At present, the Virgin River chub occurs within the Muddy River and within the mainstem Virgin River from Pah Tempe Springs downstream to the Mesquite Diversion. Virgin River chub have not been collected below this point, except for a few individuals, since the late 1970's (Virgin River Fishes Data Base). Virgin River chub also occur within the Muddy River in Nevada. A captive population of Virgin River chub is currently maintained at the Dexter National Fish Hatchery and Technology Center as a refugium population and for propagation studies.

The abundance and distribution of Virgin River chub have significantly declined due to impacts from water diversions and the introduction of non-native species, particularly red shiner (*Cyprinella lutrensis*) and large predaceous non-native species such as catfish (*Ictalurus punctatus*) and bass (*Micropterus*) species. Virgin River chub remain extant in the Virgin River in Arizona, particularly in the lower Gorge and the river upstream of Littlefield. The section of Virgin River most negatively impacted by the invasion of red shiner is from Lake Mead in Nevada upstream to the Washington Fields Diversion in Utah. Prior to invasion by red shiner, the fish population in this reach was composed almost exclusively of native fish. For example, at one of the standard Virgin River Fishes Recovery Team monitoring sites within this reach, Atkinville Wash in Utah, fish composition in September 1984, just prior to discovery of the first red shiner, was woundfin (57 percent), desert sucker (27 percent), speckled dace (10 percent), Virgin River chub (4 percent), and flannelmouth sucker (2 percent). Since 1999, Virgin River chub have been nearly absent from samples taken at this and other sample sites between the Gorge and the Washington Fields Diversion. In 1988, attempts to chemically eradicate red shiner from the reach of the river between the Gorge and the Washington Fields Diversion began with the treatment of the reach between the Washington Fields and Johnson diversions. Successive treatments have focused on treating additional reaches in each year. Prior to all treatments, an extensive salvage operation is conducted, with native fish moved to habitat above the Washington Fields Diversion.

As a result of the treatments, the red shiner has been eliminated from the Atkinville Wash and Twin Bridges sites down to the Stateline Fish Barrier. However, the numbers of Virgin River chub are also low due to the previous overwhelming numbers of red shiner previous to salvage efforts, inadvertent mortality during treatment, and fish kills resulting from flood events with poor water quality. Above the Washington Fields Diversion, populations of Virgin River chub have not been impacted by red shiner (red shiner were noted in 2002 within the reach, but not since) and the fish community is composed primarily of native fish (Fridell et al. 2005). Virgin River chub populations in this reach declined in 2002 and 2003 due to low flow, low turbidity, and high water temperatures. Populations rebounded dramatically in 2005 due to higher flow levels and lower water temperatures. A return to persistent long-term drought conditions in 2006 and 2007 lowered all native fish populations, including Virgin River chub, back to critical levels. Lethal dissolved oxygen levels were noted throughout most of the upper portion of critical habitat for Virgin River chub (above Washington Fields Diversion) during two back-to-back flood events in late July and early August 2007. Close to 90 percent of the remaining native fish population, including Virgin River chub were lost from La Verkin Creek to Washington Fields Diversion. Sampling from within this reach by Utah Division of Wildlife Resources in autumn 2007 and spring 2008 indicates that the populations of native fish within this reach were extremely low. Recently, Virgin River chub and other native species have been reintroduced from upstream and off channel areas, as well as hatcheries, in the hopes of reestablishing a larger, more stable native fish population in this reach.

The Virgin River chub is a rare species and difficult to estimate statistically. Perhaps one of the biggest limitations to accurate population estimates are the low recapture rates experienced during the mark-recapture efforts (Kegerries et al. 2015). With a recapture rate of only 7.8% in 2012, the Virgin River Chub population was estimated at 3,706 individuals. Although the 2013 estimate was much higher at 6,007, the recapture rate was only 2.6%. Because only one individual was recaptured in 2014, and the recapture rate was so low, a population estimate was not calculated for that year. Population estimates were not possible in 2015, but a total of 1,237 Virgin River chub were captured and measured in the lower Virgin River (Kegerries et al. 2018).

The preservation of Virgin River chub in the lower Gorge and in the Littlefield reach in Arizona is very important to ensure the species' survival into the future in the event of another loss of Virgin River chub in Utah. Preservation of the chub population in this reach is also important in the event of a situation where Virgin River chubs currently held at Dexter National Fish Hatchery and Technology Center (Dexter) were lost or, due to disease or invasive species concerns, were barred from stocking in the Virgin River in the future. The 2010 documentation of largemouth bass (*Micropterus salmoides*) virus at Dexter is an example of a situation where stocking actions can be affected in this way. Due to increasing concerns about the spread of quagga mussels in the Colorado River drainage including the Virgin River, after this salvage event, Dexter will not transfer any additional Virgin River fish to that facility to avoid the risk of contamination.

In Arizona, Virgin River chub are found through the Gorge and downstream to Nevada, although most are found in areas upstream of the Arizona-Nevada boundary. Non-native fish species including red shiner, largemouth bass, tilapia (*Oreochromis aurea*), and channel catfish are present and have effects on Virgin River chub through predation and competition. Predatory non-native fish are an important threat to the species that enter the Virgin River from Lake Mead. Streamflows through the Gorge vary seasonally, while the flows from springs in the lower Gorge and at Littlefield maintain a higher baseflow in the river at least to the first significant water diversion at Mesquite. Below the Mesquite Diversion, there are other diversions and return flows which affect the amount of water present to support Virgin River chub, and non-native fish populations are very high.

A 5-year review was completed for Virgin River chub (Service 2008b), and we determined that, based on the review of threats to the Virgin River chub and in consideration of 30+ years (1976-2006) of monitoring information, there was no basis for a change in the listing status of endangered. Virgin River chub are long-lived, which likely explains the relative stability of their populations. Though there are negative interactions with non-native species, primarily red shiner, Virgin River chub have persisted, albeit at relatively low abundances.

The Recovery Team recognizes the primary threats to the Virgin River Fishes as competition and predation from non-native species (primarily red shiner) and degraded habitat conditions (reduced flow and high temperatures). The recovery plan was revised in 1995, at which time only 16 miles of critical habitat above the Washington Field Diversion in Utah were free of red shiner. At that time, significant effort (mechanical and chemical) had been expended to protect these upper reaches of critical habitat. Since that time, maintenance of the 16-mile red shiner free zone has required monumental efforts and the threat of red shiner expansion remains as prevalent today as it was in the late 1980s when red shiner became established in the upper river. Red shiner must be eliminated from each portion of its range before any change in status would be considered. Habitat conditions throughout critical habitat, with the possible exception of two short stretches (1. between the Quail Creek Reservoir release point and the Washington Fields Diversion in Utah and 2. the portion of the lower river influenced by the spring flow near Littlefield, AZ) are compromised during the summer months in most years, but particularly during low water years. Critical and behavioral thermal maxima are exceeded for varying periods of time in most years. The Virgin River Program(s) will need to find a reliable means of ameliorating these stressful conditions or the ability to recover these species will remain compromised.

Recovery Needs

The Service completed a recovery plan for the Virgin River fishes in 1979, a revised plan approved in 1985, and the most recent recovery plan completed in 1995 (Service 1995). As of 1995, delisting criteria for the Virgin River chub had not yet been determined.

Recovery actions addressing threats include:

1. Maintain and enhance native fish communities of the Virgin River chub.
2. Protect and enhance habitat for the native Virgin River fish communities.
3. Establish additional populations of Virgin River chub within their historic range.
4. Determine ecological requirements of native Virgin River fishes with emphasis on Virgin River chub.
5. Develop and implement educational and informational programs highlighting recovery needs and ongoing efforts for Virgin River fishes.

6.8 Woundfin

The woundfin was federally listed as endangered on October 13, 1970, (35 FR 16047). The woundfin is a small streamlined silvery minnow with a flattened head and belly, and a conspicuous, sharp dorsal spine, from which its common name was derived. The woundfin is the most silvery of all American minnows (Miller and Hubbs 1960), reflecting blue in bright sunlight. The species rarely achieves a standard length of more than 3 inches. Woundfin are omnivorous, feeding on aquatic insects, algae, and detritus.

Woundfin occupy turbid runs and quiet waters adjacent to riffles, usually with sand or small gravel substrates. Larvae and juveniles are found in shallow backwaters or slow moving water along the stream margin. It has been reported that when water temperatures approach 86 °F, the woundfin leave shallow water areas and congregate to deeper, cooler portions of the stream (Service 1995). Deacon et al. (1987) reported that the preferred water temperature for adults was approximately 64 °F. Woundfin have adapted to survive in a highly dynamic and turbid system.

Ripe females have been collected from March to May, with spawning occurring from April to August, and larvae present in May through August. Spawning occurs during April to July, depending on the timing of the snow melt runoff. Late summer spawning in August has also been observed (Hickman 1987). The reproductive cycle of the woundfin appears to be initiated by some combination of increasing water temperatures, lengthening daylight, and declining spring runoff (Service 1995).

In addition to their presence in the Virgin River, woundfin historically occurred from near the junction of the Salt and Verde rivers at Tempe, Arizona, to the mouth of the Gila River at Yuma, Arizona (Gilbert and Scofield 1898). Woundfin also likely occurred in the mainstream of the Colorado River from Yuma (Jordan and Evermann 1896, Meek 1904) upstream to the Virgin River in Nevada, Arizona, and Utah, and into La Verkin Creek, a tributary to the Virgin River in Utah (Gilbert and Scofield 1898, Snyder 1915, Miller and Hubbs 1960). Historically, woundfin may have occurred further upstream on the Verde, Salt, and Gila rivers in Arizona (Service 1995).

Woundfin have been extirpated from almost all of their historical range except the mainstem of the Virgin River. Predatory non-native fish are an important threat to the species that enter the Virgin River from Lake Mead. The present range now occurs from Pah Tempe Springs on the mainstream of the Virgin River and the lower portion of La Verkin Creek in Utah, downstream to Lake Mead (Service 1995). A single specimen was taken from the middle Muddy (= Moapa) River, Clark County, Nevada, in the late 1960s (Deacon and Bradley 1972) but none have been collected since, and the species is extirpated from this river.

In 2007, 6,700 young woundfin from the Services' Dexter National Fish Hatchery and Technology Center near Roswell, N. M. were released into the Virgin River. Thousands more were also released in 2008.

In 1993, BIO-WEST began studies on the distribution and abundance of native fishes (including woundfin and Virgin River chub) in the lower Virgin River. By 1996, BIO-WEST had sampled most of the Virgin River between Beaver Dam Wash, Arizona, and the confluence with Lake Mead. Since 1996, BIO-WEST has created three long-term monitoring reaches in the lower Virgin River [Beaver Dam Wash (RM 72-68.5), Mesquite, Nevada (RM 58-54.5), and Riverside, Nevada (RM 49-45.5)], which are monitored several times a year to establish trends in native fish populations (Golden and Holden 2004). Results from these studies suggested that a self-sustaining population of woundfin was present near Riverside, Nevada.

Woundfin have experienced continuing significant population declines in both occupied range and abundance. An examination of long-term sampling data from stations in Utah, Arizona and Nevada documented declines between 1976 and 1993 (Holden et al. 1996). Sampling efforts since 1994 continue to show this decline (Virgin River Fishes Recovery Team, unpublished data). These declines have been linked to the spread of red shiners into and up the Virgin River from the Lake Mead area in the 1970's through today. In Arizona and Nevada, ongoing work stocking hatchery produced young woundfin in the Mesquite to Bunkerville reach is combined with mechanical removal of red shiner in researching this as a management option.

A 5-year review was completed for woundfin in 2008, and we determined that, based on the review of threats to woundfin and in consideration of 30+ years (1976-2006) of monitoring information, there was no basis for a change in the listing status of endangered. Over the course of the past 30 years, woundfin have generally declined throughout their occupied range and critical habitat. They have been extirpated from the Lower Virgin River (i.e., from Beaver Dam Wash, perhaps from the Utah/Arizona stateline, downstream to Lake Mead). Populations in Utah, particularly those upstream of the influence of red shiner (i.e., upstream of the Washington Fields Diversion), have persisted better than anywhere else. Preventing the spread of red shiner upstream of Washington Fields Diversion has been a constant effort. Without it, it is assumed that the entire wild population of woundfin would have been lost.

Reduced base flows are of equal concern and likely threaten woundfin to varying degrees throughout critical habitat. The effects of reduced flows, exacerbated by the severe and persistent drought in recent times (the lowest Virgin River flows on record occurred in 2002), have negatively affected woundfin and other native species throughout the Virgin River, including the population upstream of Washington Fields Diversion. Fortunately, the wild population of woundfin upstream of the Washington Fields Diversion appears to have been sufficiently resilient to exhibit a strong reproductive response during 2005, when wetter conditions prevailed. However, reproduction occurred late that year therefore resource managers are uncertain if the positive population response witnessed in 2005 will have a lasting effect.

The Recovery Team recognizes the primary threats to the Virgin River Fishes as competition and predation from non-native species (primarily red shiner) and degraded habitat conditions (reduced flow and high temperatures). The recovery plan was revised in 1995, at which time only 16 miles of critical habitat above the Washington Field Diversion in Utah were free of red shiner. At that time, significant effort (mechanical and chemical) had been expended to protect these upper reaches of critical habitat. Since that time, maintenance of the 16-mile red shiner free zone has required monumental efforts and the threat of red shiner expansion remains as prevalent today as it was in the late 1980s when red shiner became established in the upper river. Red shiner and woundfin cannot co-exist. Red shiner must be eliminated from each portion of its range before any change in status would be considered. Habitat conditions throughout critical habitat, with the possible exception of two short stretches (1. between the Quail Creek Reservoir release point and the Washington Fields Diversion in Utah and 2. the portion of the lower river influenced by the spring flow near Littlefield, AZ) are compromised during the summer months in most years, but particularly during low water years. Critical and behavioral thermal maxima are exceeded for varying periods of time in most years. The Virgin River Program(s) will need to find a reliable means of ameliorating these stressful conditions or the ability to recover this species will remain compromised.

Recovery Needs

The Service completed a recovery plan for the Virgin River fishes in 1979, a revised plan approved in 1985, and the most recent recovery plan completed in 1995. The woundfin may be downlisted to threatened status when (1) Virgin River flows essential to survival of all life stages are protected, (2) degraded Virgin River habitat from Pah Tempe Springs (also called La Verkin Springs) to Lake Mead is upgraded and maintained to allow continued existence of all life stages at viable population levels, and (3) barriers to upstream migration of introduced fishes are established, red shiner (Notropis lutrensis) is eliminated, and other non-native species which present a major threat to the continued existence of the fish community are reduced.

Recovery actions addressing threats include:

1. Maintain and enhance native fish communities of woundfin.
2. Protect and enhance habitat for the native Virgin River fish communities.
3. Establish additional populations of woundfin within their historic range.
4. Determine ecological requirements of native Virgin River fishes with emphasis on woundfin.
5. Develop and implement educational and informational programs highlighting recovery needs and ongoing efforts for Virgin River fishes.

6.9 Virgin River Chub and Woundfin Critical Habitat

On January 26, 2000, (65 FR 4140), 87.5 mi of the Virgin River and its associated 100-year floodplain was federally designated as critical habitat for the Virgin River chub and woundfin (50 CFR §17.95). This area extends from the confluence of LaVerkin Creek, Utah, downstream to Halfway Wash, Nevada.

Condition of the Physical and Biological Features of Critical Habitat

The physical and biological features of critical habitat determined essential to the conservation of the woundfin and Virgin River chub are water, physical habitat, and biological environment (65 FR 4140). The desired conditions for each of these elements are further detailed below and in the final rule designating critical habitat.

Water

Water includes sufficient quantity and quality of water (i.e., temperature, dissolved oxygen, contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is identified for the particular life stage for each species. This includes the following:

- Water quality characterized by natural seasonally variable temperature, turbidity, and conductivity.
- Hydrologic regime characterized by the duration, magnitude, and frequency of flow events capable of forming and maintaining channel and instream habitat necessary for particular life stages at certain times of the year.
- Flood events inundating the floodplain necessary to provide the organic matter that provides or supports the nutrient and food sources for the listed fishes.

Reducing the threat from critical maximum temperatures requires water management strategies. In 2004, the Washington County Water Conservancy District released approximately 10 cfs of cool water from their Kolob Reservoir from July 20 through the end of August (Service 2008b). The flows entered the river a short distance upstream of critical habitat. The Utah Water Research Lab has provided preliminary design analyses on use of a flow back pipeline from Sand Hollow Reservoir to the confluence area that would extend the area of beneficial thermal influence now confined to the river below Stratton Pond (Service 2008b).

Physical habitat

Physical habitat includes areas of the Virgin River that are inhabited or potentially habitable by a particular life stage for each species, for use in spawning, nursing, feeding, and rearing, or corridors between such areas:

Woundfin

- River channels, side channels, secondary channels, backwaters, springs, and other areas that provide access to these habitats.
- Areas inhabited by adult and juvenile woundfin include runs and pools adjacent to riffles that have sand and sand and gravel substrates.
- Areas inhabited by juvenile woundfin are generally deeper and slower. When turbidity is low, adults also tend to occupy deeper and slower habitats.
- Areas inhabited by woundfin larvae include shoreline margins and backwater habitats associated with filamentous algae.

Virgin River Chub

- River channels, side channels, secondary channels, backwaters, and springs, and other areas which provide access to these habitats.
- Areas with slow to moderate velocities, within deep runs or pools, with predominately sand substrates, particularly habitats which contain boulders or other instream cover.

The Virgin River Conservation Partnership has over 20 organizations in southern Nevada and northern Arizona and represents the diverse interests in the lower Virgin River and adjacent areas who are working together to strike a balance between conservation and growth in the Virgin River corridor. Their mission is to balance conservation and restoration of the Virgin River ecosystem with economic development while promoting ecological sustainability, economic viability, responsible use, stewardship, and long-term community benefit.

Biological environment

Food supply, predation, and competition are important elements of the biological environment and are considered components of this physical or biological feature. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to non-native fish species in many areas. Fourteen introduced species compete with or prey upon the woundfin. Of these, the red shiner is the most numerous and has been the most problematic for the listed fishes. Components of this physical or biological feature include the following:

- Seasonally flooded areas that contribute to the biological productivity of the river system by producing allochthonous (humus, silt, organic detritus, colloidal matter, and plants and animals produced outside the river and brought into the river) organic matter which provides and supports much of the food base of the listed fishes.
- Few or no predatory or competitive non-native species in occupied Virgin River fishes' habitats or potential reestablishment sites.

Summary of the Status of Critical Habitat

As noted in the recovery plan and 5-year review for the woundfin and Virgin River chub (Service 1995, 2008a), critical habitat is subject to numerous impacts including reduced quantity and quality of water, lack of physical habitat, and competition. Recommended future actions in the 5-year review (Service 2008b) include habitat restoration, non-native fish control, and implementing new policy.

6.10 Moapa Dace

The Moapa dace was federally listed as endangered under the Endangered Species Preservation Act of 1966 on March 11, 1967 (32 FR 4001), and has been protected under the Act since its inception in 1973. Critical habitat has not been designated for the Moapa dace.

The Moapa dace was first collected in 1938 and was described by Hubbs and Miller (1948). Key identification characteristics are a black spot at the base of the tail and small, embedded scales that create a smooth leathery appearance. Coloration is olive-yellow above with indistinct blotches on the sides and a white belly. A diffuse, golden-brown stripe is also present. Maximum size is approximately 4.7 inches in fork length. The oldest known specimen on record is over four years old (Scoppettone et al. 1992). Visual observations of Moapa dace have revealed that they are omnivores, feeding primarily on drift items, but adults forage from the substrate as well.

Larval dace feed on plankton in the upper water column, in areas with little or no current, and juveniles feed at mid-water (Service 1996).

The Moapa dace is a member of the North American minnow family, *Cyprinidae*. The genus *Moapa* is regarded as being most closely related to the dace genera *Rhinichthys* (speckled dace) and *Agosia* (longfin dace) (Coburn and Cavender 1992). These three dace genera, along with the genera *Gila* (chub), *Lepidomeda* (spinedace), *Meda* (spikedace), and *Plagopterus* (woundfin), developed from a single ancestral type (monophyletic) and are only associated with the Colorado River Basin (Service 1996).

The Moapa dace typically occur in waters ranging from 78.8 to 89.6 °F (Hubbs and Miller 1948); however, one individual was collected in water temperatures of 67.1 °F (Ono et al. 1983). Although Rinne and Minckley (1991) rarely found the species below 86º F, Deacon and Bradley (1972) indicated that the species reaches its greatest abundance at warmer temperatures between 82.4 and 86.0º F.

Reproduction occurs year-round and is confined to the upper, spring-fed tributaries where the water temperatures vary from 84.2 to 89.9 °F and dissolved oxygen concentrations vary between 4.1 and 6.2 parts per million (Scoppettone et al. 1992). Juveniles occur almost exclusively in the spring-fed tributaries, whereas adults occur in the mainstem of the Muddy River (Scoppettone et al. 1992). Adults show the greatest tolerance to cooler water temperatures, which appears to be 78.8 °F (Scoppettone 1993). Given the species temperature tolerances and cooling pattern of the river (in a downstream direction), its range appears to be restricted to the warmer waters of the upper springs and tributaries of the Warm Springs area (Deacon and Bradley 1972, Cross 1976, Scoppettone et al. 1992).

Moapa dace larvae have been observed year-round, indicating year-round reproduction; however, peak spawning activity likely occurs in the spring, with lesser activity in autumn, probably linked to food availability (Scoppettone et al. 1992). Sexual maturity occurs at one year of age, at approximately a 1.6- to 1.8-inch fork length (Hubbs and Miller 1948; Scoppettone et al. 1987, 1992). Fecundity is related to fish size; egg counts range from 60 eggs in a 1.77-inch fork length dace to 772 eggs in a 3.5-inch fork length dace (Scoppettone et al. 1992).

Although Moapa dace have never been observed spawning, Scoppettone et al. (1992) observed recently emerged larvae within 492 ft of the warm water spring discharge, over sandy silt bottoms in temperatures ranging from 86 to 89.6°F, and dissolved oxygen levels of 3.8 to 7.3 ppm. Sexually mature Moapa dace must migrate upstream from the Muddy River into thermal tributaries to spawn successfully (Scoppettone et al. 1987). Several depressions in the sand were similar to "redds" described by Minckley and Barber (1971) for longfin dace (*Agosia chrysogaster*). Depth and velocity at the suspected redds were representative of the outflow channel and similar to other suspected spawning areas in the Warm Springs (Scoppettone et al. 1992). Redds were in sandy-silt substrate at depths of 5.9 to 7.5 inches, water velocities near the nesting redds ranged from 0.12 to 0.24 feet per second (fps), and mean water column velocities from 0.5 to 0.6 fps (Scoppettone et al. 1992).

The duration of egg incubation is unknown, but is likely relatively short due to the high water temperatures (Service 1996). Emigration of young-of-the-year Moapa dace from the Refuge Stream is believed to peak in May (Scoppettone et al. 1987), and dispersal is likely similar in other tributaries with comparable water temperatures. Mortality rates for Moapa dace have been estimated to be 68 percent of the first year (juveniles) and 65 percent in the second year (adults) (Scoppettone et al. 1987).

The Moapa dace is thermophilic and endemic to the headwaters of the Warm Springs area in Clark County, Nevada. Moapa dace surveys have been conducted throughout the upper Muddy River system. The 2007 survey data indicate that there were approximately 1,172 fish in the population that occurred throughout 5.6 mi of habitat in the upper Muddy River system. Approximately 97 percent of the total population occurred within one major tributary that included 1.78 mi of spring complexes that emanate from the Pedersen, Plummer, and Apcar spring complexes on the Moapa Valley NWR and their tributaries (upstream of the gabion barrier). The highest densities of Moapa dace occurred on the Plummer and Pedersen units within the Moapa Valley NWR.

The Warm Springs Natural Area and the Moapa Valley NWR encompass about 20 springs that form the headwaters of the Muddy River. The springs and their outflows onto the Warm Springs Natural Area are home to the majority of the Moapa dace population. BLM land surrounds the distribution of the species.

In February 2006, the Secretary of the Interior approved funding through the Southern Nevada Public Lands Management Act for SNWA to purchase land historically known as the Warm Springs Ranch, located in the Moapa Valley. In September 2007, the Southern Nevada Water Authority (SNWA) purchased 1,179 ac of private property that encompasses several springs in the Muddy River headwaters area, including the former Warm Springs Ranch. The property includes 3.8 miles of the mainstream Muddy River. The Warm Springs Natural Area is managed as a nature preserve for protection of Moapa dace and restoration and management of the areas as an ecological reserve.

In 1983, the Service prepared a recovery plan for Moapa dace which was updated in 1996, and identified various tasks to guide recovery (Service 1996). The Service assigned the Moapa dace the highest recovery priority because: it is the only species within the genus *Moapa*; the high degree of threat to its continued existence; and the high potential for its recovery (Service 1996). A final recovery plan was approved by the Service in 1996 (Service 1996).

Moapa dace will be considered for reclassification from endangered to threatened when: (1) Existing instream flows and historical habitat in three of the five occupied spring systems (Apcar, Baldwin, Cardy Lamb, Muddy Spring, Refuge) and the upper Muddy River have been protected through conservation agreements, easements, or fee title acquisitions; (2) 4,500 adult Moapa dace are present among the five spring systems and the upper Muddy River; and (3) the Moapa dace population is comprised of three or more age classes, and reproduction and recruitment are documented from three spring systems.

Moapa dace will be considered for delisting provided that all reclassification criteria have been met and when: (1) 6,000 adult Moapa dace are present among the five spring systems and the upper Muddy River for 5 consecutive years; (2) 75 percent of the historical habitat in the five spring systems and the upper Muddy River provides Moapa dace spawning, nursery, cover, and/or foraging habitat; and (3) non-native fishes and parasites no longer adversely affect the long-term survival of Moapa dace. These recovery criteria are preliminary and may be revised on the basis of new information (including research specified as recovery tasks).

Actions Needed:

1. Protect instream flows and historical habitat within the upper Muddy River and tributary spring systems.
2. Conduct restoration/management activities.
3. Monitor Moapa dace population.
4. Research population health.
5. Provide public information and education.

Non-native fishes are a threat to the Moapa dace. It is believed that the first non-native, mosquitofish (*Gambusia affinis*) became established in the Muddy River by 1938 (Hubbs and Miller 1948). A decline in the abundance of Moapa dace was first noted in the 1960s, shortly after the introduction of non-native shortfin mollies (*Poecilia mexicana*) (Deacon and Bradley 1972, Cross 1976). The concurrent decline in the abundance of Moapa dace was likely related in part to interactions between these two species. Habitat use by mollies is similar to that of larval and juvenile Moapa dace (Deacon and Bradley 1972, Scoppettone et al. 1987), and laboratory experiments have demonstrated that shortfin mollies are predators of fish larvae (Scoppettone 1993). Together, these species have introduced fish parasites into the ecosystem, including tapeworms (*Bothriocephalus acheilognathi*), nematodes (*Contracaecum* spp.), and anchor worms (*Lernaea* spp.), which have negatively impacted native fishes of the Muddy River, including Moapa dace (Wilson et al. 1966, Heckman 1988).

The blue tilapia is the only non-native fish to become established in the Warm Springs Area since the introduction of the shortfin molly (Scoppettone et al. 1998). With the exception of waters on the Moapa Valley National Wildlife Refuge (MVNWR), Apcar, and Refuge streams, tilapia occur in the Warm Springs' tributaries and have had devastating effects on Moapa dace and other native fish populations. The Moapa dace population has declined dramatically since the invasion of tilapia. The tilapia is detrimental to native fish species in a number of ways. Shortly after the invasion of tilapia into the Warm Springs Area, most of the aquatic vegetation disappeared. This vegetation provided habitat for invertebrates that Moapa dace rely upon as a food resource. Analysis of tilapia stomach contents revealed the presence of Moapa dace and Moapa White River springfish, indicating that tilapia further degrade native fish populations through predation. Additionally, tilapia significantly altered the streambed through the creation of nesting areas.

The introduction and establishment of tilapia and other non-native fishes have been a major factor in the deterioration of the Muddy River as habitat for native fishes (Deacon and Bradley 1972). Currently, the springs and streams on the MVNWR and Apcar and Refuge streams are the only Muddy River tributaries free of non-native, blue tilapia. Therefore, invasion of tilapia, first detected in the Warm Springs Area in 1997, has relegated Moapa dace to habitats without the tilapia. The occurrence of tilapia is likely the primary cause for reductions in Moapa dace populations in the South Fork, North Fork, and Muddy River tributaries (Scoppettone et al. 1998). Deacon and Bradley (1972) stated "The marked decrease in abundance of native fishes that follows establishment of a non-native species could conceivably carry a native species to the point of extinction." In 2006, BLM finished construction of a fish barrier on the Muddy River near the Warm Springs Road bridge to prevent further immigration of tilapia and other non-native fish into the upper Muddy River. With this barrier in place, non-native eradication treatments can be conducted to remove non-native fish from the upper reaches of the river.

The Muddy River is a unique system because its headwaters emanate from warm-water springs, including the Warm Springs Area. The water does not get warmer as it travels downstream like most riverine systems, but rather cools as it travels downstream. While the species has always had a natural thermal barrier due to the warm spring water cooling as it travels downstream, the tail of the temperature threshold can fluctuate due to reduced flows in the system. Thermal losses can occur as a result of decreasing flows from warm water springs, water diversion structures, and/or surface sheet flow (water that flows freely out of stream banks across the land). With the potential loss of these warmer waters contributing to the overall decrease in thermal load in the system, the Muddy River cools more rapidly, thus decreasing the distribution potential for the species. Since the Moapa dace is a thermally restricted species, water temperatures that drop below the preference range would not provide sufficient habitat for spawning, foraging, or shelter.

When it was described by Eakin (1964), the Muddy River at the Moapa gage had an average annual discharge of 46.5 cfs and temperatures ranging from 87.8 to 89.6 °F at its sources. Flows have declined over the last 40 years to about 35 cfs due to a combination of surface water diversions and groundwater pumping. Although the flow in the headwaters is nearly constant seasonally, flow in the mainstem of the Muddy River varies with precipitation events, seasonal water diversions, groundwater recharge, vegetation transpiration, evaporation, and irrigation return flows.

Physical alteration of Moapa dace habitats in the Warm Springs Area, initially for irrigation purposes, began even before the species was discovered in 1938 (Scrugham 1920). These habitats have since been developed for recreational, industrial, and municipal uses. Spring orifices and outflow streams have been dug out, lined with concrete and/or gravel, mechanically and/or chemically treated to eliminate aquatic vegetation, and chlorinated to create private and public swimming pools. Several springs are capped and piped directly from the sources for municipal use, desiccating associated outflow streams. Chlorination and agricultural activities in the Warm Springs have decreased in recent years, but some spring outflow to streams continue to flow through culverts and/or dirt and cement irrigation ditches. Historically, irrigation return flows and runoff from pasture land and alfalfa fields carried significant quantities of sediment in the upper Muddy River.

The upper Muddy River has also been subjected to various physical perturbations. In 1944, the Bureau of Reclamation constructed a 10-foot-high Cipoletti weir gaging station at the Warm Springs Road Bridge. The U.S. Geological Survey (USGS) took ownership of the gage in 1948 and continues to measure flows at this gaging station. This concrete dam impounds approximately 150 ft of riverine habitat. Although the structure serves as a barrier to fish migration upstream during normal flows, it also hinders movement of Moapa dace from accessing the upstream spawning tributaries or escaping turbid river conditions. The structure also cools the river water as it cascades over the structure to a temperature below that preferred by Moapa dace (Deacon and Bradley 1972).

Another threat to the Moapa dace is fire. In June of 1994, a flash fire swept through the upper Refuge Stream that either killed or displaced individual Moapa dace that were occupying affected stream reaches. Surveys conducted post-fire in 1994, indicated that only 34 Moapa dace survived on the MVNWR (Scoppettone et al. 1998), and subsequent surveys indicated an overall decline in the total population of Moapa dace. Given the restricted range of the species, and the associated mortality from the fire, it is apparent that the species is vulnerable to catastrophic events.

Since the PBO was issued in 2006, a major wildfire occurred on July 1, 2010, affecting the Moapa dace. According to population survey data, up to 60 percent of the existing Moapa dace occurred within the action area at the time the fire started. Post-fire survey data indicate that most dace within the affected area quickly moved to safer areas in response to the fire. Although the number of dace that were lost during the fire is unknown, the Service estimates that less than 50 individuals were lost during the event and in the immediate aftermath.

Between 1933 and 1950, Moapa dace were abundant in the Muddy River and were estimated to inhabit as many as 25 individual springs and up to 10 miles of stream habitat (Ono et al. 1983). La Rivers (1962) considered the species "common" until at least 1950. However, by 1983, the species only occurred in springs and 2 miles of spring outflows (Ono et al. 1983). The species appears to have declined since 1938, when Hubbs and Miller (1948) considered the species "rather common" in all warm water habitats in the headwaters of the Moapa River (Muddy River), including spring pools, small creeks, and the mainstem.

During 1984-87, the Service's Seattle National Fisheries Research Center, now part of the USGS-Biological Resources Division (BRD), extensively surveyed Moapa dace habitats and estimated the adult Moapa dace population to be between 2,600 and 2,800 individuals (Scoppettone et al. 1992). These areas were re-surveyed by USGS-BRD in August 1994, when approximately 3,841 Moapa dace were recorded (Scoppettone et al. 1996). There was a substantial reduction in the number of individuals counted in 1997, with less than 1,600 adult Moapa dace observed, which was believed to be a result of the introduction of non-native fishes (Scoppettone et al. 1998). In January 2001, a total of 934 Moapa dace were recorded by a consortium of agencies, including the NDOW, USGS-BRD, SNWA, and the Service. In February 2002 and 2003, annual surveys enumerated approximately 1,085 and 907 individuals, respectively. The 2005 survey data indicate that there are approximately 1,300 fish in the population that occur throughout 5.6 miles of habitat in the upper Muddy River system.

In 2008, the number of Moapa dace declined approximately 60 percent, from 1,172 fish in 2007 to 459 in 2008. Most of this decline is due to large changes in the numbers of dace in the Pederson, Plummer, and Ash Meadows NWR Stream areas which supported more than 92 percent of the population in 2007. The cause of the population decline is currently unknown, although beavers have recently changed stream characteristics in the Ash Meadows NWR Stream and vegetation management occurred along the Pederson Unit.

On July 17, 2008, the Service issued a biological opinion (84320-2008-F-0417) to the U.S. Army Corps of Engineers for their proposed issuance of a permit to SNWA for habitat restoration, establishment, and enhancement activities in the Lower Pederson Stream of the Warm Springs Natural Area. The permit allowed SNWA to restore part of the lower Pederson channel to a pre-modified alignment and construct an artificial channel connecting the stream to the channel. Incidental take of all Moapa dace in the project area occurred during the course of activities, which is estimated to be approximately 100 fish. An additional 20 Moapa dace could have been injured or killed during the course of salvage activities. An unknown number of Moapa dace eggs or larvae may have been harmed during the course of activities due to desiccation of approximately 3,229 mi of sheet flow.

Habitat restoration projects have also been implemented in the Pederson and Plummer units of the Moapa Valley NWR, restoring the streams to a more natural state. Moapa dace counts from February 2008 through February 2012 ranged from 462 to 697 fish. Count data for August 2011 (713 fish) and August 2012 (1,181 fish) indicate an increasing population trend. Surveys in August 2015 counted 2,182 Moapa dace, 1,635 in August 2016, and 1,533 in August 2017 in all reaches by direct count method (Muddy River Biological Advisory Committee 2017).

Restored areas continued to show increasing or stable numbers of Moapa dace (upper Apcar, lower Pederson, Goodchild [Little] Spring). The largest concentration of Moapa dace continued to be on the upper Plummer springbrooks on the Moapa Valley NWR which supported about 29 percent of all Moapa dace observed in August 2011. An unusual concentration of Moapa dace observed in the upper Plummer springbrook about a month after the July 2010 wildfire was not observed in 2011. The number of Moapa dace observed in 2011 is similar to all other estimates observed in the area over the past decade. Moapa Valley NWR continued to support about 53 percent of the Moapa dace observed in August 2011. Recent small-scale habitat improvements in the lower Apcar area may have begun a resurgence of Moapa dace in the area. Moapa dace continued to be absent from most of the areas previously occupied by tilapia (reaches 11-16) with the exception of a single Moapa dace that was observed in Muddy Creek (reach 14). Tilapia appeared to be absent from most of the tilapia-infested area (reaches 10-15) due to chemical eradication efforts in late 2010 and early 2011. Seventeen tilapia of different sizes were found in reach 16 (South Fork) both above (n=15) and below (n=2) the gabion barrier. All reaches that have been free of tilapia for many years supported dace in August 2012. Efforts to control and monitor tilapia are currently underway.

Memorandum of Agreement

On July 14, 2005, a Memorandum of Agreement (MOA) was signed by SNWA, Meadow Valley Water District (MVWD), Coyote Springs Investment (CSI), Tribe, and the Service, regarding groundwater withdrawal of 16,100 acre feet per year (afy) from the regional carbonate aquifer in Coyote Spring Valley and California Wash Basins that included conservation measures for the Moapa dace. The MOA outlined specific conservation actions that each party would complete in order to minimize potential impacts to the Moapa dace should water levels decline in the Muddy River system as a result of the cumulative withdrawal of 16,100 afy of groundwater from two basins within the regional carbonate aquifer system. The MOA includes the following conservation measures:

1. Provide funding toward restoration of Moapa dace habitat on the Apcar Unit of the Moapa Valley NWR;
2. Develop a Recovery Implementation Program which will be used to effectuate the goals of the MOA by implementing measures necessary to accomplish the protection and promote the recovery of the Moapa dace, as well as, outline the development of regional water facilities and include additional parties as appropriate. The Recovery Program will be developed for the purposes of continuing to identify the key conservation actions that, when implemented, would continue to contribute to off-set any pumping impacts that may result from groundwater pumping;
3. Assist in developing an ecological model to investigate the effects of habitat change on the ecology of the Moapa dace;
4. Construct fish barriers in order to prevent additional non-native fishes from migrating into Moapa dace habitat;
5. Eradicate non-native fish, such as tilapia from the historic range of Moapa dace;
6. Restore habitat necessary for the Moapa dace, and take other steps to protect and recover the dace;
7. Provide the use of the Tribal greenhouse to cultivate native plants for restoration actions in the Muddy River area;
8. Provide access to Tribal lands for the construction and maintenance of at least one fish barrier;
9. Dedicate the existing Jones Spring water right (MVWD) with a flow rate of 1.0 cfs towards establishing and maintaining in-stream flows in the Apcar tributary system that empties into the Muddy River; and
10. Dedicate 460 afy of Coyote Springs Investment (CSI) appropriated water rights to the survival and recovery of the Moapa dace, in perpetuity through a conservation easement to the Nevada State Engineer.
11. Establish a Hydrologic Review Team to develop and coordinate regional monitoring efforts of the groundwater pumping proposed under the MOA. Team members discuss and perform analyses of groundwater pumping effects and natural climatic variation on the Muddy River and Muddy Springs.
12. Develop the Muddy River Recovery Implementation Program to provide a comprehensive program for water resource management in the Coyote Spring Valley,

Warm Springs, and Muddy River areas, while working toward recovery of the Moapa dace.

On January 30, 2006, the Service issued a non-jeopardy intra-Service PBO for the Proposed Muddy River MOA (1-5-05-FW-536, Service 2006). The Service estimated the incidental take of Moapa dace at the programmatic level for the cumulative actions of parties to the MOA to be a 22 percent loss in riffle habitat and 16 percent loss in pool habitat. Should flows at the Warm Springs West gage decline to a flow below 2.78 cfs, the amount of incidental take for any project-specific action under the MOA would be exceeded for the Moapa dace.

Seven projects have been proposed under the PBO, six of which have moved forward and have been tiered to the PBO: (1) Tier 1- issuance of a Section 404 permit under the Clean Water Act of 1972, as amended, for the CSI residential development project; (2) Tier 2- a ROW to SNWA to construct a water conveyance pipeline, (3) Tier 3- construction of a water pipeline from an existing well on the Moapa River Indian Reservation to the Moapa Valley of Fire Travel Plaza requiring 7 afy of groundwater; (4) Tier 5- a lease approved by the BIA for construction and operation of the KRoad Moapa Solar Project on the Moapa River Indian Reservation, (5) Tier 6- a lease approved by the BIA for construction and operation of the Res Americas Moapa Solar Energy Project on the Moapa River Indian Reservation, and (6) Tier 7- a lease approved by BLM for construction and operation of the Playa Solar Project within BLM’s Solar Energy Zone. Tier 4 was the proposed cement plant, which was withdrawn without a biological opinion being issued. Tiers 1, 2, 5, 6, and 7 are major projects and are discussed in detail below.

- **Tier 1:** CSI proposes to withdraw their 4,600 afy of state-appropriated water from two well locations in Coyote Spring Valley in order to help meet the water demands of its proposed residential community. Monitoring of surface flows and groundwater levels is required by the State Engineer as a condition of CSI’s groundwater permits in Coyote Spring Valley. This monitoring will provide necessary information to assess long-term impacts to the aquifer and down-gradient flows (Resource Concepts Incorporated 2005). Currently, SNWA monitors eight carbonate wells in the Coyote Spring Valley hydrographic basin on a continuous basis and one carbonate well and four alluvial wells on a monthly basis.

- **Tier 2:** This consultation involves a BLM ROW for SNWA to construct a pipeline to convey groundwater withdrawals from potentially three carbonate wells located in the Coyote Spring Valley. SNWA participates in a regional carbonate aquifer system study ordered by the Nevada State Engineer (Order 1169) to evaluate how groundwater withdrawals in the Coyote Spring Valley will impact the carbonate aquifer system and adjacent Muddy River ecosystem. The Order requires pumping at least 8,150 afy, from the Coyote Spring Valley for two consecutive years. In order to meet the requirements of the Order, SNWA is pumping 9,000 afy of groundwater from the regional carbonate system. Any unused water will empty into the Reed Bowman Reservoir. Should the reservoir reach full capacity, flows will continue into the lower Muddy River. Upon completion of the study, the pipeline system would convey permitted water rights to beneficial uses. Should the results of the study indicate that water rights in the Coyote

Spring Valley are fully allocated then SNWA would use the proposed pipeline to transfer their permitted water rights from other areas outside of Coyote Spring Valley. The project would also provide a means to convey 724 afy of SNWA's permitted Coyote Spring groundwater rights to MVWD. This would facilitate the dedication by MVWD of its existing 1.0 cfs Jones Spring water right for the purpose of providing in-stream flows that will be beneficial to the Moapa dace.

- **Tier 5:** The Band and KRoad propose to construct, maintain, and operate a 350 MW solar project on the Moapa River Indian Reservation. The proposed project would require approximately 380 acre feet (AF) of groundwater during the proposed 5-year construction phase (72 afy for 5 years) and up to 40 afy for operation and maintenance after construction. The Band is allotted 2,500 afy as stated in the PBO.

The Service reviewed the updated monitoring information including instream flow criteria established in the MOA. The minimum instream flow criteria measured at the Warm Springs West Flume determine thresholds that would trigger certain conservation actions including reductions in groundwater pumping. The first instream flow to trigger an automatic groundwater reduction is 3.0 cfs. According to monitoring data, the current instream flow at the Warm Springs West Flume is 3.5 cfs. The 3.5 cfs is a reduction of 0.1 cfs from before pumping was initiated. Therefore, based on the monitoring information provided, we have not reached any instream flow trigger points analyzed in the biological opinion. If instream flows reach 3.2 cfs at the Warm Springs West Flume, the signatories to the MOA will meet to discuss, compare, and evaluate the hydrology data.

As predicted in the PBO, higher elevation springs (e.g., Pederson and Pederson East Springs) would be impacted first. Flows in these two springs have been reduced by 35 to 40 percent. This reduction in flow has occurred despite withdrawal of groundwater below allowable levels. In addition, groundwater withdrawals have not been consistent since the testing period started on November 15, 2010. The variance between modeled and actual results will be evaluated further as pumping tests continue. The reduction in flows at these two springs could affect Moapa Dace, which was not anticipated fully through the modeling efforts used in the PBO.

- **Tier 6:** The Band and Moapa Solar LLC propose to construct, maintain, and operate a 200 MW solar project on the Moapa River Indian Reservation. The proposed project would require approximately 100 AF of groundwater during the proposed 2-year construction phase (50 afy for 2 years) and up to 30 afy for operation and maintenance after construction. Consultation was reinitiated on October 21, 2014, for the project because of changes in the locations of several project features, including the gen-tie line and access road located on BLM land, and the water pipeline located on Reservation lands. Additionally, the BIA proposed to increase the amount of water used for the project to 375 afy during the expected 2-year construction of the project. The Band is allotted 2,500 afy as stated in the PBO.

- **Tier 7:** The BLM proposes to construct, maintain, and operate a 200 MW PV solar project on 1,521 acres of BLM lands within the Dry Lake Solar Energy Zone (SEZ) and 3.67 acres of private land. Other facilities include access roads, a 230-kV gen-tie line, a distribution power line, a fiber-optic communications cable, a well, and a pipeline. The project would require up to 1,350 AF of water for construction and operations and would be obtained from the Garnet Valley groundwater basin as part of the Southern Nevada Water Authority's (SNWA) 9,000 afy allocation.

The Service reviewed the updated monitoring information including instream flow criteria established in the MOA. The minimum instream flow criteria measured at the Warm Springs West Flume determine thresholds that would trigger certain conservation actions including reductions in groundwater pumping. The first instream flow to trigger an automatic groundwater reduction is 3.0 cfs. According to monitoring data, the current instream flow at the Warm Springs West Flume is 3.5 cfs. The 3.5 cfs is a reduction of 0.1 cfs from before pumping was initiated. Therefore, based on the monitoring information provided, we have not reached any instream flow trigger points analyzed in the biological opinion. If instream flows reach 3.2 cfs at the Warm Springs West Flume, the signatories to the MOA will meet to discuss, compare, and evaluate the hydrology data.

As predicted in the PBO, higher elevation springs (e.g., Pederson and Pederson East Springs) would be impacted first. Flows in these two springs have been reduced by 35 to 40 percent. This reduction in flow has occurred despite withdrawal of groundwater below allowable levels. In addition, groundwater withdrawals have not been consistent since the testing period started on November 15, 2010. The variance between modeled and actual results will be evaluated further as pumping tests continue. The reduction in flows at these two springs could affect Moapa Dace which was not anticipated fully through the modeling efforts used in the PBO.

6.11 Ash Meadows Species

The Ash Meadows species occur entirely or mostly within the Ash Meadows National Wildlife Refuge (NWR). Ash Meadows NWR encompasses over 23,000 ac of spring-fed wetlands and alkaline desert uplands. The Ash Meadows NWR is a major discharge point for a vast underground carbonate aquifer system stretching 100 miles. The carbonate aquifer system is hydrologically connected to the Amargosa Desert Hydrographic Basin, covering an area of 2,593 square miles (mi^2), which is part of the Death Valley Hydrographic Region.

Most of the springs are created by groundwater discharge from the carbonate aquifer system along the Ash Meadows fault system (Denny and Drewes 1965). Other seeps and springs discharge from saturated valley-fill sediments which overlie and are supplied by the carbonate aquifer system. The total annual discharge of Ash Meadows seeps and springs is an estimated 17,000 afy (Walker and Eakin 1963, Laczniak et al. 1999).

Devils Hole is a collapsed depression (opening) to the same carbonate aquifer system which supplies springs on Ash Meadows NWR within a 40-ac detached unit of Death Valley National Park located within Ash Meadows NWR. Devils Hole was established in 1952 and added to the then Death Valley National Monument by presidential proclamation, in which it was recognized for its uniqueness, scientific value, and for the endemic pupfish living within it (17 FR 691). BLM determined that no proposed action would result in effects to the Devils Hole pupfish.

Since the early 1950s, extensive investigations have been conducted to evaluate the water resources potential of the Death Valley Hydrographic Region, which include the impacts of groundwater pumping, information on groundwater recharge from wash infiltration, evaluation and characterization of regional groundwater flow, and other water resources in the area. A series of extensive hydrological monitoring infrastructure has resulted in the accumulation of over 40 years of water level monitoring and water chemistry analysis in the region.

From 1969 to 1977, water pumping in the vicinity of Ash Meadows NWR reduced water levels in Devils Hole (Bedinger and Harrill 2006). In 1973, groundwater pumping in the vicinity of Ash Meadows NWR and Devils Hole was limited by an injunction issued by the U.S. District Court in Nevada to restore the water level of the pool in Devils Hole to 3 ft below a reference point on the rock wall to protect the Devils Hole pupfish living in the pool. This decision eventually led to the U.S. Supreme Court's decision in *Cappaert v. United States* (426 U.S. 128 1976), which held that the 1952 proclamation establishing Devils Hole as part of Death Valley National Monument reserved that amount of water necessary to preserve the scientific interests associated with the pool. The consequence of this decision is that groundwater pumping is now limited and a minimum water level of 32.4 inches below the reference point was established with the goal of protecting the endangered Devils Hole pupfish. The water level rebounded from a historic low in 1972, with the maximum level in 1988 (USGS 2010). However, from 1988 to 2004, Devils Hole water level measurements declined approximately 1.2 in (USGS 2010).

From 1983 to 1988, Ash Meadows NWR spring discharge declined 0.3 cfs at Fairbank Spring (USGS 2010). However, discharge records for Ash Meadows NWR springs are inconsistent due to operational changes related to restoration activities. For instance, Five Springs well, the only monitoring well at the Ash Meadows NWR completely in the carbonate aquifer (the source of the Ash Meadows NWR springs), declined 0.06 m (2.4 in) from 1992 to 2004 (USGS 2010); however, the record is incomplete prior to 1992. From late 1980s to 2004, water levels also declined in two carbonate monitoring wells located between the Ash Meadows NWR and Army 1 Water Well. Army 1 Water Well is located 18 mi to the northeast of Devils Hole within Hydrographic Basin 230 (Amargosa Desert).

Bedinger and Harrill (2006) used multiple regression analyses to examine these changes in water level in Devils Hole between 1963 and 2002 and concluded that the declines were due to pumping, not climatic factors (reductions in precipitation and groundwater recharge). They suggested that the water level declines in Devils Hole were primarily due to pumping that occurred between 1969 to 1977 at Ash Meadows and Amargosa Farms area. Secondarily, declines were a result of pumping that began in the 1950s and 1960s at a Department of Energy water supply well located at the south end of the Nevada Test Site (Army 1 Water Well, USGS site 363530116021401).

At this time, it is difficult to predict local climate change impacts to the Ash Meadows species. Information indicates that climate change has the potential to affect and threaten the Ash

Meadows ecosystem in the long-term, but there is much uncertainty regarding the attributes that could be affected and their timing, magnitude, and rate of change. Environmental changes including increased temperatures and decreased precipitation may result in lowered groundwater levels and increased evapotranspiration rates. Such environmental changes may result in loss of individual plants or populations.

The status of each Ash Meadows species is described below.

Spring-loving Centaury

The spring-loving centaury was listed as federally threatened with critical habitat on May 20, 1985 (50 FR 20777) and as critically endangered by the State of Nevada in 1982. The spring-loving centaury is also protected under NRS 527.260-300.

Reveal, Broome, and Beatley described the spring-loving centaury in 1973, although Coville and Funston had collected it as early as 1891 (Reveal et al. 1973). A member of Gentianaceae (gentian family), the spring-loving centaury is an upright, glabrous, annual forb that measures 17.5 inches tall with many branches that bear flowers measuring approximately 0.3 to 0.5-inch diameter (Reveal et al. 1973; Mozingo and Williams 1980). The flower is tubular with 0.2 to 0.3-inch long petals (Reveal et al. 1973; Mozingo and Williams 1980). Petals are deep rose-pink with a yellowish throat and five dark purple spots below the point at which the adjacent petals attach to the body of the flower (Reveal et al. 1973). The stamens are conspicuously exerted, and after pollen release, the yellow anthers become twisted (Reveal et al. 1973). The spring-loving centaury flowers from June to September with flowers developing into narrow, linear seed capsules (Reveal et al. 1973; Pavlik and Moore 2010). The range of spring-loving centaury encompasses the Ash Meadows NWR, the adjacent BLM ACEC, and private lands. It is the only listed plant in Ash Meadows that is not endemic to Ash Meadows.

Studies have been conducted on phenology, breeding system, and seed biology (seed output, germination) of 71 spring-loving centaury plants (Pavlik and Moore 2010). Inflorescences that developed earlier in the season produced significantly heavier seed than those that originated later in the season (Pavlik and Moore 2010). Plants produced approximately 27.2 floral buds that each yielded approximately 23 seeds (Pavlik and Moore 2010). The spring-loving centaury has a facultative autogamous breeding system: it is capable of self-fertilization, but probably benefits from outcross pollen and increased pollen loads provided by insect pollinators (Pavlik and Moore 2010).

There is no data on germination events for the spring-loving centaury. Monitoring capable of providing insight into population trend and demographic structure has not been conducted. The seed bank buffers against environmental stochasticity and extinction in desert plants; nothing is known about the longevity of spring-loving centaury seeds in the seed bank. Germination trials of spring-loving centaury seeds have not been conducted due to the robust nature of this species' reproduction (i.e., large number of seeds per bud, buds per plant) and the extremely small size of the seeds (Pavlik and Moore 2010). Transplanting and translocation studies have not been conducted.

The wet meadow ecosystem occupied by spring-loving centaury is typically dominated by saltgrass (*Distichlis spicata*) with scattered velvet ash screwbean mesquite (*Prosopis pubescens* Benth). Other associates of saltgrass meadows include yerba mansa (*Anemopsis californica*) and Ash Meadows gumplant. On drier sites, common associates include Tecopa bird's beak *(Cordylanthus tecopensis* Munz & Roos) and Ash Meadows ivesia (Reveal et al. 1973; Morefield 2001).

At the time of listing, a population estimate of spring-loving centaury was unknown. Knight and Clemmer (1987) reviewed the available data on the rare plants of Ash Meadows and identified general areas from which spring-loving centaury had been reported. In 1998, surveys were targeted on the seven general areas identified by Knight and Clemmer (1987) and the total population was estimated to be about 175,000 plants on 522 ac (BLM and Service 2000). Results from the 2008-2009 Ash Meadows NWR-wide rare plant surveys (BIO-WEST 2011) estimate that 4,593,971 individuals are present on the Ash Meadows NWR in 33 minimum scale occurrences (0.1 mi separation distance) or 2 maximum scale occurrences (0.1 mi separation distance) on a total of 527.2 ac. Estimates of spring-loving centaury individuals on the BLM ACEC and private lands within the Ash Meadows NWR boundary do not exist.

The spring-loving centaury grows between 2,070 and 2,320 ft above mean sea level and is widespread across the Ash Meadows NWR in seeps, wet meadows, and spring channel banks (Morefield 2001; BIO-WEST 2011). The species is adapted to alkaline clay soils of the Ash Meadows area, and it appears that any location on the Ash Meadows NWR that contains surface or near-surface water at any time during the year could produce a spring-loving centaury community (BIO-WEST 2011).

The primary threats to spring-loving centaury included in the final listing rule were groundwater withdrawal; road construction; trampling and overgrazing by cattle and wild and free-roaming horses; and inadequate regulatory mechanisms. Threats identified since listing include non-native plant species, wildfire, and surface mining. Endemism and limited geographic distribution will continue to threaten spring-loving centaury due to the vulnerability of small populations to a range of environmental, demographic, and stochastic factors.

Historically, the elimination of riparian habitat was a major factor in the reduction of spring-loving centaury populations. A significant portion of habitat for native species in Ash Meadows was altered in the 1960's when the Carson Slough was drained to facilitate peat mining. Following the cessation of peat mining, plowing for large-scale farming removed most of the native plants in the northern-portion of Ash Meadows and destroyed much of the habitat of the spring-loving centaury. Ground water depletion, water diversion, spring alteration, land development for agriculture and municipal facilities, as well as the introduction of exotic species (Service 1990) have also contributed to the reduction of riparian habitat in this area.

Threats to the continued existence of spring-loving centaury include ground water depletion (leading to decreases in spring discharge) and road construction through riparian areas. Urban growth demands for water have increased, and more locally, the dairy directly north of the Ash Meadows National Wildlife Refuge continues to expand. These and other similar activities may result in future lowering of the water table in the Ash Meadows area (Baldino 2012, pers. comm.).

Establishment of the Ash Meadows NWR in 1984 secured the land for listed plant species by removing threats from agriculture, wild and free-roaming horses, livestock and ranching, and residential development. The creation of the BLM ACEC in 1998 added additional protections to species whose range extends past the Ash Meadows NWR boundary. Habitat for the spring-loving centaury is almost entirely protected from development (except on private inholdings) and new mineral entry (for 20 years) within the Ash Meadows NWR and BLM ACEC. Private inholdings still exist within the Ash Meadows NWR boundaries. OHV activity is periodically a threat to spring-loving centaury within the Ash Meadows NWR boundary, due to downed sections of fencing and lack of law enforcement presence (Baldino 2012, pers. comm.). In addition, OHV activity is confined to existing trails, roads, and dry washes within the BLM ACEC, and there are no signs and fences that would inform the OHV community of its special designation. Non-native plant species could spread in spring-loving centaury habitat, increase fire frequency, and threaten natural vegetation corridors needed for gene flow and dispersal in this species.

A 5-year review was completed for spring-loving centaury in 2009 that concluded that the spring-loving centaury continues to meet the definition of a threatened species. The status of the spring-loving centaury dramatically improved since it was petitioned for listing in 1983. When it was listed, spring-loving centaury was known from 17 occurrences in the Ash Meadows area, all threatened by on-going and proposed agriculture, urban development, and groundwater pumping. Presently the species is known to occupy at least 3,000 ac (1,214 ha), and the population was estimated to exceed 4,000,000 individuals in 2008. Nearly all spring-loving centaury habitat and the surface water rights that support it are now under Service and BLM ownership and are managed as special resource areas, including the Refuge and BLM Ash Meadows ACEC. Both groundwater pumping and surface mining remain a threat of uncertain significance to spring-loving centaury in the foreseeable future.

Non-native species are managed in a way that they no longer threaten the spring-loving centaury. Managing invasive species is a priority for the National Wildlife Refuge System and, in recent years, the Refuge has made significant strides in addressing and managing this potential threat. The distribution of the spring-loving centaury occurs across a broad enough area and in a diverse range of conditions that the species is not threatened by environmental stochasticity. The perennial nature and underlying geology of the aquifer that sustains the spring-loving centaury and Ash Meadows ecosystem is such that the potential effects of climate change are unknown; however, continued groundwater monitoring will identify if it becomes a threat in the future.

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the spring-loving centaury. Although many recovery objectives described in the recovery plan for this species have largely been achieved or are no longer relevant, uncertainties remain regarding the potential significance of groundwater pumping and surface mining.

Delisting of the spring-loving centaury will be considered when the following criteria are met for a five year period:

1. Secure, protect, and maintain in natural vegetation, corridors, and adjacent buffer areas for gene flow and dispersal of listed plant species within the essential habitat.
2. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
3. Listed plant species are present in all the sites that they have historically occupied and within each critical habitat unit, the listed plant has a frequency value equal to or greater than the frequency value determined by Task number 644 needed as an indicator of a self-sustaining plant population.

Spring-loving Centaury Critical Habitat

Critical habitat for spring-loving centaury was designated on Federal and private land on May 20, 1985, in three township and range units totaling 1,840 ac.

Condition of the Physical and Biological Features of Critical Habitat

The physical and biological features for these areas are moist to wet clay soils along banks of streams or seepage areas (50 FR 20777). Critical habitat areas are as follows:

- Township 17 South, Range 50 East, Sections 21, 23, 28, 34, and 35
- Township 18 South, Range 50 East, Sections 1, 2, 3, 7, 23, and 24
- Township 18 South, Range 51 East, Sections 7, 18, 19, 20, 29, and 30

The portion of critical habitat located in Township 18 south, Range 50 east, Section 7 occurs outside of the Ash Meadows NWR within the BLM ACEC and private inholdings and has not been surveyed. It is unknown if this habitat is occupied. The portions of critical habitat located in Township 17 south, Range 50 east, Section 23 and Section 28 and Township 18 south, Range 51 east, Section 20 and Section 29 are not occupied. All other portions of critical habitat are occupied.

The five-year review (Service 2009b) analyzed that about ten percent of the critical habitat is threatened by non-native plant species. To address this threat, the wildlife refuge has completed an Integrated Pest Management Plan and has been treating and monitoring non-native species through a Southern Nevada Public Land Management Act grant.

Establishment of the Refuge and BLM Ash Meadows ACEC added new layers of federal protection not present at the time critical habitat was designated. The Service manages National Wildlife Refuges in accordance to the National Wildlife Refuge System Improvement Act of 1997. This act establishes the protection of biodiversity as the primary purpose of the National Wildlife Refuge System. According to the Service's 1984 Environmental Assessment: Proposed Acquisition to Establish Ash Meadows National Wildlife Refuge, the purpose of the acquisition was " ... to protect the endemic, endangered, and rare organisms (plants and animals) found in Ash Meadows ... " Continued protection and management of the spring-loving centaury are central to the Refuge mission and will continue independent of protection under the Act.

In 1998, BLM established the Ash Meadows ACEC on public lands surrounding the Refuge. BLM's Las Vegas District RMP guides management of the ACEC. Management directions for the ACEC include closing the area to livestock grazing; limiting vehicles to existing roads and trails; closing the area to locatable, salable, and leasable minerals; and closing the area to geothermal prospecting and leasing (BLM 1998). The area has also been designated a right-of-way avoidance area except within designated corridors. BLM has closed the area to livestock and limits vehicles to existing roads and trails.

Summary of the Status of Critical Habitat

As noted in the recovery plan and 5-year review for the spring-loving centaury (Service 1990, 2009b), critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to spring-loving centaury include groundwater withdrawal, surface disturbance, non-native species, and climate change.

The ownership and management of spring-loving centaury habitat is primarily Federal, consisting within the Refuge boundary of approximately 50 percent on Service land, 45 percent on BLM land, and 5 percent on private lands. These mechanisms provide protections for critical habitat.

Ash Meadows Sunray

The Ash Meadows sunray was federally listed as threatened with critical habitat on May 20, 1985 (50 FR 20777) and as critically endangered by the State of Nevada in 1987. The Ash Meadows sunray is also protected under NRS 527.260-300.

The Ash Meadows sunray was first collected in 1966 by Arthur Cronquist (1972). It is a perennial forb in Asteraceae (sunflower family) that forms clumps 3.9 to 15.7 inches high that rise from a stout, woody root-stock (Mozingo and Williams 1980). The varietal name *corrugata* refers to leaf margins that are strongly ruffled-corrugate, especially towards the margins (Cronquist 1972; Mozingo and Williams 1980). The ray flowers are yellow and number 11 to 23 per inflorescence. Inflorescence buds begin developing in February and flowers open from late March to late May (Mozingo and Williams 1980; Pavlik and Moore 2010). The Ash Meadows sunray is endemic to the Ash Meadows area of Nye County, Nevada. The Ash Meadows sunray range encompasses the Ash Meadows NWR, adjacent areas within the BLM ACEC, and private lands.

Studies on phenology, breeding system, and seed biology (seed output, germination) of 60 Ash Meadows sunray plants have been conducted (Pavlik and Moore 2010). In this study, inflorescences that developed earlier in the season produced significantly more seeds than those developing later (Pavlik and Moore 2010). Plants produced 17.4 mature seeds per bud (Pavlik and Moore 2010). An examination of the seed-to-ovule ratio of mature fruits suggests that this taxon's breeding system exemplifies facultative xenogamy (i.e., predominantly outcrosses, but selfing is possible) (Pavlik and Moore 2010). Ash Meadows sunray flowers can attract at least 21 floral visitors, 19 which are bee taxa (BIO-WEST 2009). Ash Meadows sunray is important to the nectiferous insect community at the Ash Meadows NWR because it provides pollen and nectar early in the growing season (BIO-WEST 2009).

There are no data on germination events nor have seedlings been observed in the Ash Meadows sunray. Monitoring that could provide insight into population trend and demographic structure has not been conducted. The seed bank buffers against environmental stochasticity and extinction in desert plants; nothing is known about the longevity of Ash Meadows sunray seeds in the seed bank. Attempts to germinate 120 Ash Meadows sunray seeds with and without scarification were unsuccessful, with only two seeds breaking dormancy and then failing to survive when transferred to native soil (Pavlik and Moore 2010). Transplanting and translocation studies have not been conducted.

The Ash Meadows sunray occurs between 2,200 and 2,360 ft above mean sea level and occurs across a broad range of habitats including open, hard, whitish alkaline soils often on or near calcareous outcrops, occasionally moist alkaline soils, spring and seep areas, and dry desert washes (Morefield 2001; BIO-WEST 2011). Based on superficial observation of its habitat, it was assumed initially that the Ash Meadows sunray was a xerophyte, adapted to hard, alkaline soils of upland topography (Knight and Clemmer 1987; Service 1990). However, this characterization may be misleading because it is based on observations made during summer months (Jensen 2010 pers. comm.). During winter months, landtypes considered "upland" (i.e., hard, whitish, and alkaline soil areas not directly affiliated with a spring system) are saturated at or near the surface (Jensen 2010 pers. comm.). Further, about 14 percent of Ash Meadows sunray populations occur on a landtype with a hydric character (hydric marl or sandstone and moderately-deep (hydric) alluvium from marl or clay) that is saturated to the surface by groundwater during the winter months of average precipitation years (Jensen 2010 pers. comm.; White Horse Associates 2010). Other plant species associated with Ash Meadows sunray include: desert bearpoppy (*Arctomecon merriamii*), Ash Meadows milkvetch, shadscale (*Atriplex confertifolia*), basin yellow cryptantha (*Cryptantha confertifolia*), alkali goldenbush (*Isocoma acradenia*), and Ash Meadows blazingstar (*Mentzelia leucophylla*) (Mozingo and Williams 1980; Knight and Clemmer 1987).

The Ash Meadows sunray only exists within Ash Meadows NWR and the closely surrounding area. The largest occurrences of Ash Meadows sunray on the Ash Meadows NWR are at Jackrabbit Spring Road, Collins Ranch, Warm Springs, and Cold Spring. Estimates of Ash Meadows sunray individuals on the BLM ACEC and private lands within the Ash Meadows NWR boundary do not exist.

At the time of listing, a population estimate of the Ash Meadows sunray was unknown (50 FR 20777). In 2001, the Ash Meadows sunray population on the Ash Meadows NWR was estimated at 1,849 individuals in 15 minimum scale occurrences (0.1 mi separation distance) or 11 maximum scale occurrences (0.6 mi separation distance) (Morefield 2001). Results from the 2008-2010 Ash Meadows NWR-wide rare plant survey (BIO-WEST 2011) estimate that 79,508 individuals are present on the Ash Meadows NWR in 30 minimum scale occurrences (0.1 mi separation distance) or 1 maximum scale occurrence (0.6 mi distance) on a total of 216.1 ac. Trend data for demographic structure and recruitment events is nonexistent and nothing is known about the longevity of Ash Meadows sunray seeds in the seed bank.

The primary threats to the Ash Meadows sunray included in the final listing rule were groundwater withdrawal, road construction, OHV activity, trampling by wild and free-roaming horses, inadequate regulatory mechanisms, and trampling by cattle and feral horses. Threats identified since listing include non-native plant species, wildfire, surface mining, and predation and herbivory. Non-native species are known to alter fire regimes and are a threat to biodiversity in the Mojave Desert (Brooks et al. 2004). In Ash Meadows sunray habitat, red brome has the potential to colonize previously undisturbed habitat and facilitate the spread of fire by increasing fuel loads where previously there was mostly bare ground.

Ash Meadows remained largely intact until 1967 when an out-of-state corporation purchased large tracts (approximately 20 square miles) in the northern and eastern regions. In an attempt to farm the land, this corporation plowed large areas of land and installed pumps at the springs. These alterations virtually obliterated the natural features of the area including Carson Slough and its surrounding vegetation. This attempt at agriculture failed and was abandoned in 1975. Subsequently, the corporation was able to launch a cattle-feeding project, which further exploited the water resources of Ash Meadows. Though Ash Meadows is not subject to high visitation, impacts from off-road vehicles have become a concern.

Today Ash Meadows sunray is threatened primarily by the large-scale destruction of the native flora over large portions of Ash Meadows caused by agricultural development, road construction, utility development, and off-road vehicle activity. This species' distribution appears to be limited to a particular edaphic condition (Monzingo and Williams 1980) in washes and weathered saline soils. Any further loss of its habitat would probably be detrimental to the species' survival.

In addition, water draw down is a threat to Ash Meadows sunray. Urban growth demands for water have increased, and more locally, the dairy directly north of the Ash Meadows National Wildlife Refuge continues to expand. These and other similar activities may result in future lowering of the water table in the Ash Meadows area (Baldino 2012 pers. comm.).

Endemism and limited geographic distribution will continue to threaten the Ash Meadows sunray due to the vulnerability of small populations to a range of environmental, demographic, and stochastic factors. Climate change may result in effects to the species as discussed previously for all Ash Meadows species.

Establishment of the Ash Meadows NWR in 1984 secured the land for federally-listed plant species by removing threats from agriculture, wild and free-roaming horses, livestock and ranching, and residential development. The creation of the BLM ACEC in 1998 added additional protections to species whose range extended past the Ash Meadows NWR boundary. Habitat for the Ash Meadows sunray is almost entirely protected from development (except on private inholdings) and new mineral entry (for 20 years) within the Ash Meadows NWR and BLM ACEC. Private inholdings still exist within the Ash Meadows NWR boundaries. OHV activity is periodically a threat to the Ash Meadows sunray within the Ash Meadows NWR boundary, due to downed sections of fencing and lack of law enforcement presence (Baldino 2012 pers. comm.). In addition, though OHV activity is confined to existing trails, roads and dry washes within the BLM ACEC, there are no signs and fences that would inform the OHV community of its special designation. Non-native plant species could spread into Ash Meadows sunray habitat, increase fire frequency, or both, any or all of which would threaten the natural vegetation corridors needed for gene flow and dispersal in this taxon.

Recent observations of herbivory and predation upon Ash Meadows sunray could negatively affect gene flow and dispersal by disrupting reproduction and seed bank recharge. The hydrologic impacts to Ash Meadows from development are unknown, but fluctuations in water levels in the Amargosa Desert Hydrographic Basin have been tied directly to groundwater pumping (Bedinger and Harrill 2006). Exploration into detailed hydrologic habitat requirements of the Ash Meadows sunray has begun (Jensen 2012 pers. comm.; White Horse Associates 2010; BIO-WEST 2011). More information is needed on the potential effects of changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry upon patterns of gene flow and dispersal in the Ash Meadows sunray.

A 5-year review was completed (Service 2011g) on the status of the Ash Meadows sunray. Based on the analysis, Ash Meadows sunray faces a moderate level of threat due to groundwater withdrawal and the indirect effects of solar development in the already over-appropriated Amargosa Desert Hydrographic Basin. More information is needed on the effects of Ash Meadows sunray gene flow and dispersal from changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry. Grant funding for treatment of non-native species has been exhausted. Non-native plant species could spread again into Ash Meadows sunray habitat and increase fire frequency, which would threaten natural vegetation corridors. Recently observed herbivory and insect predation on Ash Meadows sunray may be negatively affecting gene flow and dispersal by disrupting reproduction and seed bank recharge. Exploration into detailed habitat requirements of Ash Meadows sunray has recently been initiated, but basic life history and biology of the plant are not understood. Information lacking on species biology could easily be addressed if recovery funds were available to conduct studies on population trend, demographic structure, and seed longevity. Despite the moderate level of threat, the establishment of the Refuge and BLM ACEC secured the majority of the habitat and removed threats from agriculture, livestock, ranching, road construction, and residential development, thus allowing for high recovery potential. The final recommendation in the 5-year review, therefore, was that the recovery priority number be changed from a 15 (low degree of threat, high recovery potential) to a 9 (moderate degree of threat, high recovery potential).

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Ash Meadows sunray.

Delisting of the Ash Meadows sunray will be considered when the following criteria are met for a five year period:

1. Secure, protect, and maintain in natural vegetation, corridors, and adjacent buffer areas for gene flow and dispersal of listed plant species within the essential habitat.
2. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
3. Listed plant species are present in all the sites that they have historically occupied and within each critical habitat unit, the listed plant has a frequency value equal to or greater than the frequency value determined by Task number 644 needed as an indicator of a self-sustaining plant population.

Ash Meadows Sunray Critical Habitat

Critical habitat for the Ash Meadows sunray was designated on 1,760 acres of Federal and private land on May 20, 1985, in four township and range units.

Condition of the Physical and Biological Features of Critical Habitat

The physical and biological features of designated critical habitat consist of the biological and physical attributes essential to the species' conservation within those areas. The physical and biological features for sunray critical habitat are dry washes or whitish saline soil associated with outcrops of pale whitish limestone (50 FR 20777). The distribution and ecological requirements of the Ash Meadows milkvetch were poorly understood when the Service designated critical habitat; consequently, some areas of designated as critical habitat may no longer provide suitable habitat for the species, while other areas not designated as critical habitat support large numbers of the species.

Critical habitat areas are as follows:

- Township 17 South, Range 50 East, Sections 15, 21, 22, 34, and 35
- Township 17 South, Range 51 East, Section 20
- Township 18 South, Range 50 East, Sections 1, 2, 12, and 13
- Township 18 South, Range 51 East, Sections 7 and 18

The portion of critical habitat located in Township 18 south, Range 51 east, Section 20 occurs outside of the Ash Meadows NWR, within the BLM ACEC and has not been surveyed. It is unknown if this habitat is occupied. The portions of critical habitat located in Township 17 south, Range 50 east, Section 15 and Section 22 are not occupied. All other portions of critical habitat are occupied.

The 1990 recovery plan listed non-native plant species as a major threat to sunray habitat. To address this threat, the wildlife refuge has completed an Integrated Pest Management Plan and has been treating and monitoring non-native species through a Southern Nevada Public Land Management Act grant.

Establishment of the Refuge and BLM Ash Meadows ACEC added new layers of federal protection not present at the time critical habitat was designated. The Service manages National

Wildlife Refuges in accordance to the National Wildlife Refuge System Improvement Act of 1997. This act establishes the protection of biodiversity as the primary purpose of the National Wildlife Refuge System. According to the Service's 1984 Environmental Assessment: Proposed Acquisition to Establish Ash Meadows National Wildlife Refuge, the purpose of the acquisition was " ... to protect the endemic, endangered, and rare organisms (plants and animals) found in Ash Meadows ... " Continued protection and management of the Ash Meadows sunray are central to the Refuge mission and will continue independent of protection under the Act.

In 1998, BLM established the Ash Meadows ACEC on public lands surrounding the Refuge. BLM's Las Vegas District Resource Management Plan (RMP) guides management of the ACEC. Management directions for the ACEC include closing the area to livestock grazing; limiting vehicles to existing roads and trails; closing the area to locatable, salable, and leasable minerals; and closing the area to geothermal prospecting and leasing (BLM 1998). The area has also been designated a right-of-way avoidance area except within designated corridors. BLM has closed the area to livestock and limits vehicles to existing roads and trails.

Summary of the Status of Critical Habitat

As noted in the recovery plan and 5-year review for the Ash Meadows sunray (Service 1990, 2011g), critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to Ash Meadows sunray include groundwater withdrawal, surface disturbance, non-native species, and climate change.

The ownership and management of Ash Meadows sunray habitat is primarily Federal, with the majority within the Refuge boundary on Service land and additional populations on BLM land and private lands. These mechanisms provide protections for critical habitat.

Ash Meadows Milkvetch

The Ash Meadows milkvetch was federally listed as threatened on May 20, 1985 (50 FR 20777) and as critically endangered by the State of Nevada in 1979. The Ash Meadows milkvetch is also protected under NRS 527.260-300.

Rupert Barneby formally described the Ash Meadows milkvetch in 1970, although partial specimens were collected as early as 1898 by Carl Anton Purpus (Barneby 1970). The Ash Meadows milkvetch is a long-lived, perennial forb in Fabaceae (pea family) that develops into low, spreading mounds that can reach 5.5 inches high and 19.5 inches in diameter (Reveal 1978). The specific name, *phoenix*, refers to being born of ashes and is descriptive of the plant’s dense, ashen mound of leaves partly covered over with fine, white soil (Mozingo and Williams 1980). One to three, 0.5- to 1.0-inch pink-purple, pea-like flowers are borne on tiny erect stems from February to early May (Reveal 1978; Pavlik and Moore 2010). Dense, grayish white hairs cover the finely divided (pinnately compound), 0.5- to 1.5-inch long leaves and 0.25-inch pea-pod-like fruits (Reveal 1978).

Studies on phenology, breeding system, and seed biology (seed output, germination) of 60 Ash Meadows milkvetch plants have been conducted (Pavlik and Moore 2010). The Ash Meadows milkvetch is the first rare taxa at the Ash Meadows NWR to develop floral buds, which can develop as early as February (Pavlik and Moore 2010). Severe herbivory by lagomorphs has been previously documented and can cause an 80 to 90 percent reduction in Ash Meadows milkvetch reproductive output (Pavlik et al. 2006; Pavlik and Stanton 2008). In this study, Ash Meadows milkvetch plants were caged so that study objectives could be met. Caged plants bore 50 to several hundred flowers each whereas un-caged plants averaged 13 flowers. An examination of the seed-to-ovule ratio of mature fruits suggests that this taxon has a xenogamous, nearly obligate breeding system (i.e., requires cross-pollination) (Pavlik and Moore 2010). The Ash Meadows milkvetch attracts one floral visitor, *Anthophora porterae*, a bee which is a known milkvetch specialist (BIO-WEST 2009). It appears that *A. porterae* more than compensates for the lack of other floral visitors due to tenacious and aggressive pollen and nectar collection behaviors. It is likely that *A. porterae* is a vital pollinator of the Ash Meadows milkvetch (BIO-WEST 2009).

Germination events and seedling observations of Ash Meadows milkvetch are rare (Reveal 1978, Pavlik et al. 2006). Pavlik et al. (2006) did not observe germination or seedlings in five subpopulations during a year with 162 percent above average precipitation. Pavlik et al. (2006) hypothesized that either the soil seed bank was depleted or that the species was dependent on the most extreme and infrequent precipitation events. In a demographic analysis, Pavlik et al. (2006) determined only two out of five subpopulations studied had "recent" germination and establishment events, perhaps during the 1997-1998 growing season which had 211 percent of average precipitation. They determined that small plants, (i.e., those less than 7.7 in^2 in diameter) were completely absent from one subpopulation and comprised less than 5 percent of the sampled plants at all populations (Pavlik et al. 2006). In addition, attempts to germinate 170 *A. phoenix* seeds with and without scarification were successful, with scarification doubling the germination response, but no seedlings survived when transplanted into any medium (Pavlik and Moore 2010). Transplanting and translocation studies have not been conducted. This strongly suggests that establishment of Ash Meadows milkvetch is sporadic and unlikely in most years, and that population persistence depends heavily on the longevity of individual plants which must, therefore, tolerate unpredictable environmental variations through time (Pavlik et al. 2006).

The lifespan of individual Ash Meadows milkvetch plants is not known, but we believe that they are relatively long-lived, with the largest plants, which can form mounds up to 20 inches across, likely exceeding 10 years or more in age. Studies using caged and un-caged plants have shown that some plants can grow in diameter by as much as 1.6 inches and 0.8 inches per year, respectively (Pavlik and Stanton 2008). Although the relationship between growth rate and diameter is unlikely to be linear, this suggests that a plant could reach 20 inches within as little as 12.5 years if growth is not hindered by herbivory. The actual growth rate, especially in the presence of herbivory, is likely to be much slower and individual plants could take decades to reach their maximum size.

Nothing is known about the longevity of Ash Meadows milkvetch seeds in the seed bank. Recent observations of herbivory and predation suggest that the intensity of herbivory on Ash Meadows milkvetch is unacceptably high and is disrupting reproduction and seed bank recharge (Pavlik and Moore 2010). Exploration into detailed hydrologic habitat requirements of Ash Meadows milkvetch has begun (White Horse Associates 2010). More information is needed on the potential effects of changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry upon patterns of gene flow and dispersal in Ash Meadows milkvetch. The Ash Meadows milkvetch occurs between 2,200 and 2,350 ft above mean sea level and occurs in areas with sparse herbaceous cover within alkali shrub-scrub and alkali meadow habitats that often have depressional areas with mesic conditions where water might collect following rain (Morefield 2001; BIO-WEST 2011). Based on superficial observation of its habitat, it was assumed initially that *A. phoenix* was a xerophyte, adapted to hard, dry, alkaline soils of upland topography (Knight and Clemmer 1987; Service 1990). However, Pavlik et al. (2006) suggests that this characterization may be misleading and based on observations made during low rainfall years. During a high precipitation year, Pavlik et al. (2006) observed the species growing directly in channels with running and slow moving water. Further, about 16 percent of *A. phoenix* populations occur on a landtype with a hydric character (hydric marl or sandstone) that is saturated to the surface by groundwater during the winter months of average precipitation years (White Horse Associates 2010). Other plant species associated with the Ash Meadows milkvetch include: shadscale, saltgrass, Ash Meadows sunray, alkali goldenbush, and Ash Meadows blazingstar.

Ash Meadows milkvetch is endemic to the Ash Meadows area of Nye County, Nevada. The range of the species encompasses the Ash Meadows NWR, adjacent areas within the BLM ACEC, and private lands. Recent, comprehensive, baseline surveys on public land have added new known populations; there are now 12 occurrences (0.1 mi minimum scale) made up of 15,606 individuals on 73 ac within Ash Meadows NWR boundaries (BIO-WEST 2011). The little trend data that is available suggests that establishment of Ash Meadows milkvetch is sporadic and unlikely in most years, and that population persistence depends heavily on the longevity of individual plants which must, therefore, tolerate unpredictable environmental variations through time.

At the time of listing, Ash Meadows milkvetch was known only from four sites on the Ash Meadows NWR and was estimated to be made up of 1,000 individuals (Reveal 1978). Knight and Clemmer (1987) reviewed the available data on the rare plants of the Ash Meadows area and identified six general areas (Rogers Spring, Cold Spring, South of Longstreet Spring, Collins Ranch, Jackrabbit Spring, and Spring Meadows Road South) from which Ash Meadows milkvetch had been reported. In 2001, the Ash Meadows milkvetch population was estimated to be about 1,943 individuals in 13 minimum scale occurrences (0.1 mi (0.16 km) separation distance) or 10 maximum scale occurrences (0.6 mi separation distance) on 9.1 ac (Morefield 2001). Results from the 2008-2010 Ash Meadows NWR-wide rare plant survey (BIO-WEST 2011) estimate that 15,606 individuals are present on the Ash Meadows NWR in 12 minimum scale occurrences (0.1 mi separation distance) or 2 maximum scale occurrence (0.6 mi distance) on a total of 73 ac. The largest occurrences of Ash Meadows milkvetch on the Ash Meadows NWR are at Spring Meadows road south, Jackrabbit Spring road, Cold Spring, and Collins Ranch south. Estimates of Ash Meadows milkvetch individuals on the BLM ACEC and private lands within the Ash Meadows NWR boundary do not exist.

The primary threats to the Ash Meadows milkvetch included in the final listing rule were groundwater withdrawal, road construction, surface mining, trampling by wild and free-roaming horses, inadequate regulatory mechanisms, and trampling by cattle and feral horses. Threats identified since listing include non-native plant species, wildfire, OHV activity, and predation and herbivory. Endemism and limited geographic distribution will continue to threaten Ash Meadows milkvetch due to the vulnerability of small populations to a range of environmental, demographic, and stochastic factors. Climate change may result in effects to the species as discussed previously for all Ash Meadows species, but there is much uncertainty regarding the attributes that could be affected and their timing, magnitude, and rate of change.

Today Ash Meadows milkvetch is threatened primarily by the large-scale destruction of the native flora over large portions of Ash Meadows caused by such man-made disturbances as agricultural development, road construction and off-road vehicle use (50 FR 20777). This species appears to be sensitive to disturbance and habitat alteration (Mozingo and Williams 1980). Seed production by this milkvetch is relatively low, with fewer than a dozen pods produced per year per individual plant. Therefore any further loss of its habitat would probably be detrimental to the species survival.

Threats to Ash Meadows milkvetch also include alterations of storm drainage patterns by road construction activities, mining (including zeolite, potassium, and clay mining), nearby farming operations which causes erosion and siltation in areas outside the boundaries of the Ash Meadows National Wildlife Refuge, and elimination during planned road construction (50 FR 20777). Because so few individuals of this species are known to exist (50 FR 20777), Ash Meadows milkvetch is potentially threatened by over-collecting of botanical specimens and other types of research activity. Increased grazing rabbits and off-road vehicle impact are also potential future threats (50 FR 20777).

In addition, water drawdown is a threat to Ash Meadows milkvetch. Urban growth demands for water have increased, and more locally, the dairy directly north of the Ash Meadows National Wildlife Refuge continues to expand. These and other similar activities may result in future lowering of the water table in the Ash Meadows area (Baldino 2012 pers. comm.).

Establishment of the Ash Meadows NWR in 1984 secured the land for federally-listed plant species by removing threats from agriculture, wild and free-roaming horses, livestock and ranching, and residential development. The creation of the BLM ACEC in 1998 added additional protections to species whose range extended past the Ash Meadows NWR boundary. Habitat for Ash Meadows milkvetch is almost entirely protected from development (except on private inholdings) and new mineral entry for 20 years (i.e., until 2029) within the Ash Meadows NWR and BLM ACEC. Private inholdings still exist within the Ash Meadows NWR boundaries. OHV activity is periodically a threat to Ash Meadows milkvetch within the Ash Meadows NWR boundary, due to downed sections of fencing and lack of law enforcement presence (Baldino 2012 pers. comm.). In addition, though OHV activity is confined to existing trails, roads and dry washes within the BLM ACEC, there are no signs and fences that would inform the OHV community of its special designation. Non-native plant species could spread into Ash Meadows milkvetch habitat and increase fire frequency, which would threaten the natural vegetation corridors needed for gene flow and dispersal in this taxon.

A 5-year review was completed for the Ash Meadows milkvetch in 2009 that concluded that the Ash Meadows milkvetch continues to meet the definition of a threatened species. The status of the Ash Meadows milkvetch substantially improved since it was petitioned for listing in 1983. When it was listed, Ash Meadows milkvetch was known from six general sites in the Ash Meadows area, all threatened by ongoing and proposed agriculture, urban development, and groundwater pumping. Viable populations of the species remain at all six sites and the threats posed by wild horse trampling, OHV use, and invasive species are no longer considered to be significant. Recent surveys have expanded the boundaries of all known populations. Nearly all Ash Meadows milkvetch habitat and the surface water rights that support it are now under Service and BLM ownership and are managed as special resource areas, including the Refuge and BLM Ash Meadows ACEC. Both groundwater pumping and surface mining remain a threat of uncertain significance to Ash Meadows milkvetch in the foreseeable future. In addition, rabbit herbivory of flowers and fruits has been documented as a potentially significant threat to its long-term viability.

Ash Meadows milkvetch occurs in several populations scattered in suitable habitat across a broad enough area and in a diverse range of conditions that the species is likely not threatened by environmental stochasticity. The potential effects of climate change on the Ash Meadows milkvetch and the Ash Meadows ecosystem are uncertain but are not likely to pose a significant threat in the foreseeable future.

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Ash Meadows milkvetch. Although many recovery objectives described in the recovery plan for this species have largely been achieved or are no longer relevant, uncertainties remain regarding the potential significance of groundwater pumping, surface mining, and herbivory.

Delisting of the Ash Meadows milkvetch will be considered when the following criteria are met for a five year period:

1. Secure, protect, and maintain in natural vegetation, corridors, and adjacent buffer areas for gene flow and dispersal of listed plant species within the essential habitat.
2. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
3. Listed plant species are present in all the sites that they have historically occupied and within each critical habitat unit, the listed plant has a frequency value equal to or greater than the frequency value determined by Task number 644 needed as an indicator of a self-sustaining plant population.

Ash Meadows Milkvetch Critical Habitat

Critical habitat for the Ash Meadows milkvetch was designated on 1,200 acres of Federal and private land on May 20, 1985, in three township and range units (50 FR 20777).

Condition of the Physical and Biological Features of Critical Habitat

The physical and biological features of designated critical habitat consist of the biological and physical attributes essential to the species' conservation within those areas. For the Ash Meadows milkvetch, physical and biological features described in the final listing rule include dry, hard, white, barren, saline, clay flats, knolls, and slopes. The distribution and ecological requirements of the Ash Meadows milkvetch were poorly understood when the Service designated critical habitat; consequently, some areas of designated as 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 at all. While a considerable amount of information 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.

The critical habitat designation includes 1,200 ac (485.6 ha) of dry, hard, white, barren, saline, clay flats, knolls, and slope at Ash Meadows NWR, BLM Area of Critical Environmental Concern (ACEC), and private inholdings. Critical habitat areas are as follows:

- Township 17 South, Range 50 East, Sections 14, 21, 22, and 26
- Township 18 South, Range 50 East, Sections 1, 12, 13, and 24
- Township 18 South, Range 51 East, Sections 7, 18, and 19

The portion of critical habitat located in Township 17 south, Range 50 east, Section 26 occurs outside of the Ash Meadows NWR on the BLM ACEC and private land and has not been surveyed. It is unknown if this habitat is occupied. The portion of critical habitat in Township 17 south, Range 50 east, Section 22 occurs on a private inholding within the Ash Meadows NWR and has not been surveyed. It is unknown if this habitat is occupied. The portion of critical habitat located in Township 17 south, Range 50 east, Section 14 is not occupied. All other portions of critical habitat are occupied.

The 1990 recovery plan listed non-native plant species as a major threat to milkvetch habitat. To address this threat, the wildlife refuge has completed an Integrated Pest Management Plan and has been treating and monitoring non-native species through a Southern Nevada Public Land Management Act grant.

An investigation in 2006 (Pavlik et al. 2006) identified rabbit herbivory as a potential limiting factor to Ash meadow milkvetch reproduction. In 2007, the Service funded the installation of rabbit exclosures and continued population monitoring to investigate the potential effects on seed production.

Establishment of the Refuge and BLM Ash Meadows ACEC added new layers of federal protection not present at the time critical habitat was designated. The Service manages National Wildlife Refuges in accordance to the National Wildlife Refuge System Improvement Act of 1997. This act establishes the protection of biodiversity as the primary purpose of the National Wildlife Refuge System. According to the Service's 1984 Environmental Assessment: Proposed Acquisition to Establish Ash Meadows National Wildlife Refuge, the purpose of the acquisition was " ... to protect the endemic, endangered, and rare organisms (plants and animals) found in Ash Meadows ... " Continued protection and management of the Ash Meadows milkvetch are central to the Refuge mission and will continue independent of protection under the Act.

In 1998, BLM established the Ash Meadows ACEC on public lands surrounding the Refuge. BLM's Las Vegas District Resource Management Plan (RMP) guides management of the ACEC. Management directions for the ACEC include closing the area to livestock grazing; limiting vehicles to existing roads and trails; closing the area to locatable, salable, and leasable minerals; and closing the area to geothermal prospecting and leasing (BLM 1998). The area has also been designated a right-of-way avoidance area except within designated corridors. BLM has closed the area to livestock and limits vehicles to existing roads and trails.

Summary of the Status of Critical Habitat

As noted in the 1990 recovery plan and the 2009 5-year review for the Ash Meadows milkvetch, critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to Ash Meadows milkvetch include groundwater withdrawal, surface disturbance, non-native species, herbivory, and climate change.

The ownership and management of Ash Meadows milkvetch habitat is primarily Federal, with the majority within the Refuge boundary on Service land and additional populations on BLM land and private lands. These mechanisms provide protections for critical habitat.

Ash Meadows Ivesia

The Ash Meadows ivesia was federally listed as threatened with critical habitat on May 20, 1985 (50 FR 20777). The Ash Meadows ivesia also was listed as critically endangered by the State of Nevada in 1987 and is also protected under NRS 527.260-300.

The Ash Meadows ivesia was first described by Coville and Funston in 1891 (Knight and Clemmer 1987). It is a prostrate perennial forb in the Rosaceae (rose family) that grows between 7.5 to 15 inches tall from an erect, thick, woody root that bears a basal tuft of grayish, pubescent leaves that can reach a length of 5.2 inches (13 cm) (Mozingo and Williams 1980; Knight and Clemmer 1987). Each pinnately (i.e., leaflets arranged on opposite sides of an elongated axis) compound leaf bear up to 60 pairs of 0.08- to 0.1-inch wide leaflets (Mozingo and Williams 1980). The inflorescence is a cyme that bears a few, small, five petaled white flowers (Mozingo and Williams 1980; Knight and Clemmer 1987). Plants bud, flower, and fruit continuously from June to October (Pavlik and Moore 2010). The Ash Meadows ivesia is endemic to the Ash Meadows area of Nye County, Nevada. The range of Ash Meadows ivesia encompasses the Ash Meadows NWR, adjacent areas within the BLM ACEC, and private lands.

Studies on phenology, breeding system, and seed biology (seed output, germination) of 60 Ash Meadows ivesia plants have been conducted (Pavlik and Moore 2010). The average individual bears 6.3 inflorescences, but since flowering and seed dispersal is so rapid, it is impossible to estimate the number of successful flowers produced by each inflorescence (Pavlik and Moore 2010). Due to rapid development and dispersal, the seed-to-ovule ratio of mature fruits was not calculated for the Ash Meadows ivesia. However, inflorescences that were excluded from pollinators still produced fully formed seeds with weights equal to those from non-excluded inflorescences, which strongly suggests that Ash Meadows ivesia has an autogamous (i.e., self-fertilizing) breeding system (Pavlik and Moore 2010). Further supporting its autogamous breeding system, Ash Meadows ivesia infrequently attracts floral visitors (BIO-WEST 2009).

There are no data on germination events nor have seedlings been observed in Ash Meadows ivesia. Monitoring that could provide insight into population trend and demographic structure has not been conducted. The seed bank buffers against environmental stochasticity and extinction in desert plants; nothing is known about the longevity of Ash Meadows ivesia seeds in the seed bank. Germination trials of 60 Ash Meadows ivesia seeds that developed with and without pollinator exclusion showed similar results with only 30 percent germinating. Seeds that germinated were readily grown in native soil under greenhouse conditions (Pavlik and Moore 2010). Transplanting and translocation studies have not been conducted.

The Ash Meadows ivesia occurs between 2,150 and 2,350 ft above mean sea level and occurs on mesic, intermittently flooded to saturated alkali seeps, wet meadows, alkali meadows, and the edges of alkali shrub-scrub. Soils are saturated to moist clay with an alkali crust (Morefield 2001, BIO-WEST 2011). The Ash Meadows ivesia populations are often located in areas with shallow groundwater or saturated soils such as topographic contour breaks and depressional areas where groundwater seeps to the surface. These habitats are sparsely vegetated due to the high level of soil alkalinity (BIO-WEST 2011). Other plant species associated with Ash Meadows ivesia include: shadscale, saltgrass, alkali goldenbush, Baltic rush (*Juncus balticus*), cordgrass (*Spartina*), and spring-loving centaury (Mozingo and Williams 1980; Morefield 2001).

Ash Meadows ivesia occurs within Ash Meadows NWR and closely surrounding areas, including BLM and private lands. The largest occurrences of Ash Meadows ivesia on the Ash Meadows NWR are at Spring Meadows road, Collins Ranch south, Marsh Spring, Crystal Reservoir east, and Lower Crystal marsh.

At the time of listing, a population estimate of Ash Meadows ivesia was unknown (50 FR 20777). Knight and Clemmer (1987) reviewed the available data on the rare plants of Ash Meadows and identified general areas from which Ash Meadows ivesia had been reported. In 2001, the Ash Meadows ivesia population on the Ash Meadows NWR was estimated at 3,862 individuals in 9 minimum scale occurrences (0.1 mi separation distance) or 8 maximum scale occurrences (0.6 mi separation distance) (Morefield 2001). Results from the 2008-2010 Ash Meadows NWR-wide rare plant survey (BIO-WEST 2011) estimate that 510,744 individuals are present on the Ash Meadows NWR in 19 minimum scale occurrences (0.1 mi separation distance) or 2 maximum scale occurrence (0.6 mi distance) on a total of 116.14 ac. Estimates of Ash Meadows ivesia individuals on the BLM ACEC and private lands within the Ash Meadows NWR boundary do not exist.

Recent, comprehensive, baseline surveys on public land have added new populations; there are now 19 occurrences (0.1 mi minimum scale) made up of 510,744 individuals on 116.14 ac within

Ash Meadows NWR boundaries (BIO-WEST 2011). Nothing is known about the longevity of Ash Meadows ivesia seeds in the seed bank.

The primary threats to Ash Meadows ivesia included in the final listing rule were groundwater withdrawal, agricultural development, road construction, grazing by cattle and feral horses (predation), inadequate regulatory mechanisms, and trampling by cattle and feral horses. Threats identified since listing include non-native plant species, wildfire, surface mining, and OHV activity. Endemism and limited geographic distribution will continue to threaten Ash Meadows ivesia due to the vulnerability of small populations to a range of environmental, demographic, and stochastic factors. Climate change may result in effects to the species as discussed previously for all Ash Meadows species, but there is much uncertainty regarding the attributes that could be affected and their timing, magnitude, and rate of change.

Establishment of the Ash Meadows NWR in 1984 secured the land for federally listed plant species by removing threats from agriculture, wild and feral horses, livestock and ranching, and residential development. The creation of the BLM ACEC in 1998 added additional protections to species whose range extended past the Ash Meadows NWR boundary. Habitat for Ash Meadows ivesia is almost entirely protected from development (except on private inholdings) and 20-year new mineral entry within the Ash Meadows NWR and BLM ACEC. Private inholdings still exist within the Ash Meadows NWR boundaries. OHV activity is periodically a threat to Ash Meadows ivesia within the Ash Meadows NWR boundary, due to downed sections of fencing and lack of law enforcement presence. In addition, though OHV activity is confined to existing trails, roads and dry washes within the BLM ACEC, there are no signs and fences that would inform the OHV community of its special designation (Baldino 2012 pers. comm.). Non-native plant species could spread into Ash Meadows ivesia habitat, increase fire frequency, or both, any or all of which would threaten the natural vegetation corridors needed for gene flow and dispersal in this taxon.

Predation pressure from cattle and feral horses has been removed, but insect seed predation has recently been observed on Ash Meadows ivesia, which could negatively affect gene flow and dispersal by disrupting reproduction and seed bank recharge (Pavlik and Moore 2010). Increasing the demand for already limited water resources can have severe direct and indirect consequences on the persistence of Ash Meadows ivesia. More information is needed on the potential effects of changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry upon patterns of gene flow and dispersal in Ash Meadows ivesia.

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Ash Meadows ivesia.

Delisting of the Ash Meadows ivesia will be considered when the following criteria are met for a five year period:

1. Secure, protect, and maintain in natural vegetation, corridors, and adjacent buffer areas for gene flow and dispersal of listed plant species within the essential habitat.
2. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
3. Listed plant species are present in all the sites that they have historically occupied and within each critical habitat unit, the listed plant has a frequency value equal to or greater than the frequency value determined by Task number 644 needed as an indicator of a self-sustaining plant population.

Ash Meadows Ivesia Critical Habitat

Critical habitat for the Ash Meadows ivesia was designated on Federal and private lands on May 20, 1985, in two township and range units (Township 17 south, Range 50 east and Township 18 south, Range 50 east) totaling 880 ac (356.1 ha).

Condition of the Physical and Biological Features of Critical Habitat

The physical and biological features for these areas are saline seep areas of light colored clay uplands (50 FR 20777). Critical habitat areas are as follows:

- Township 17 South, Range 50 East, Sections 21 and 35
- Township 18 South, Range 50 East, Sections 1, 2, 3, 12, 23, and 24

The portions of critical habitat located Township 17 south, Range 50 east, Section 21 and Township 18 south, Range 50 east, Section 12 are not occupied. All other portions of critical habitat are occupied.

Establishment of the Refuge and BLM Ash Meadows ACEC added new layers of federal protection not present at the time critical habitat was designated. The Service manages National Wildlife Refuges in accordance to the National Wildlife Refuge System Improvement Act of 1997. This act establishes the protection of biodiversity as the primary purpose of the National Wildlife Refuge System. According to the Service's 1984 Environmental Assessment: Proposed Acquisition to Establish Ash Meadows National Wildlife Refuge, the purpose of the acquisition was " ... to protect the endemic, endangered, and rare organisms (plants and animals) found in Ash Meadows ... " Continued protection and management of the Ash Meadows ivesia are central to the Refuge mission and will continue independent of protection under the Act.

In 1998, BLM established the Ash Meadows ACEC on public lands surrounding the Refuge. BLM's Las Vegas District Resource Management Plan (RMP) guides management of the ACEC. Management directions for the ACEC include closing the area to livestock grazing; limiting vehicles to existing roads and trails; closing the area to locatable, salable, and leasable minerals; and closing the area to geothermal prospecting and leasing (BLM 1998). The area has also been designated a right-of-way avoidance area except within designated corridors. BLM has closed the area to livestock and limits vehicles to existing roads and trails.

Summary of the Status of Critical Habitat

Ash Meadows ivesia critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to Ash Meadows ivesia include groundwater withdrawal, surface disturbance, non-native species, and climate change.

The ownership and management of Ash Meadows ivesia habitat is primarily Federal, with approximately 45 percent within the Refuge boundary on Service land and additional populations on BLM land and private lands. These mechanisms provide protections for critical habitat.

Ash Meadows Gumplant

The Ash Meadows gumplant was federally listed as threatened with critical habitat on May 20, 1985 (50 FR 20777). The Ash Meadows gumplant was listed as critically endangered by the State of Nevada in 1982 and is also protected under NRS 527.260-300. Although the species is not listed by the State of California, it is on the California Native Plant Society's "List 1B," this designation indicates the species qualifies for state listing and must be considered during review of proposed projects under the California Environmental Quality Act (CEQA).

Reveal and Beatley described the Ash Meadows gumplant in 1971, although Beatley had collected it as early as 1965 (Reveal and Beatley 1971). The Ash Meadows gumplant is an erect biennial or more commonly a perennial forb in Asteraceae (sunflower family) reaching 25 to 40 inches (63.5 to 101.6 cm) in height with 1 to 3 stems arising from a woody root stock (Mozingo and Williams 1980). The stems are glaboruous and contain leathery, dark green leaves that are dotted with resinous glands. The inflorescence is open with individual, resinous heads measuring 0.31 to 0.39 inches (8 to 10 mm) across. Ray flowers number 13 per head, are golden to lemon yellow, and are 0.12 to 0.16 inches (3 to 4 mm) long; the disk flowers are golden yellow and 0.16 to 0.2 inches (4 to 5 mm) long (Mozingo and Williams 1980). The Ash Meadows gumplant flowers from June to October (Mozingo and Williams 1980; Pavlik and Moore 2010).

Studies on phenology, breeding system, and seed biology (seed output, germination) of 60 Ash Meadows gumplant plants have been conducted (Pavlik and Moore 2010). In this study, plants averaged 57.8 inflorescences on 2.9 main stems. Seeds that were produced in the early to mid-growing season were significantly heavier than those produced later in the season. In addition, pollinator exclusion significantly reduced seed count, but did not affect seed weight (Pavlik and Moore 2010). An examination of the seed-to-ovule ratio of mature fruits suggests that this taxon's breeding system exemplifies facultative xenogamy (i.e., predominantly outcrosses, but selfing is possible) (Pavlik and Moore 2010). The Ash Meadows gumplant flowers attract at least five floral visitors, but visits are made so rapidly, making insect collections and observations is difficult (BIO-WEST 2009).

There are no data on germination events nor have seedlings been observed in Ash Meadows gumplant. Monitoring that could provide insight into population trend and demographic structure has not been conducted in Nevada. In 2003, transects were used to develop a population estimate for the California population (see below). The seed bank buffers against environmental stochasticity and extinction in desert plants; nothing is known about the longevity of Ash Meadows gumplant seeds in the seed bank. Attempts to germinate 160 Ash Meadows gumplant seeds collected in 2008 under three different germination trials were low, with only 13 to 20 percent germinating. Stratification of seeds improved the germination response, but not significantly. No seedlings survived more than 2 weeks after transplantation to any medium (Pavlik and Moore 2010). Transplanting and translocation studies have not been conducted.

The Ash Meadows gumplant occurs between 2,070 and 2,320 ft above mean sea level and occurs in seasonally flooded to mesic alkali meadows and wet meadows with moist clay soils that are sometimes dark in color (Morefield 2001; BIO-WEST 2011). Ash Meadows gumplant populations are also located in additional habitats such as the edges of Ash communities, in alkali shrub-scrub, and in some alkali seeps (BIO-WEST 2011). On the basis of isotopic analysis, Hasselquiest and Allen (2009) found that Ash Meadows gumplant uses surface water or soil moisture near the soil surface in early spring, but switches to utilizing groundwater during the drier summer months likely due to its dimorphic root system. Other plant species associated with the Ash Meadows gumplant in its wet meadow habitat include: yerba mansa, shadscale, Emory's Baccharis (*Baccharis emoryi),* saltgrass, alkali goldenbush (*Isocoma acradenia*), alkali sacaton (*Sporobolus* airoides), tamarisk, and spring-loving centaury (Mozingo and Williams 1980; Morefield 2001).

The Ash Meadows gumplant is endemic to Nye County, Nevada and Inyo County, California. The range of Ash Meadows gumplant in Nevada is the Ash Meadows NWR, adjacent areas within the BLM ACEC, and on private lands, and in California it is found approximately 1 mi past the California and Nevada state line on BLM land.

Recent, comprehensive, baseline surveys on public land have added new known populations; there are now 23 occurrences (0.1 mi minimum scale) made up of 656,890 individuals on 136.3 ac within Ash Meadows NWR boundaries (BIO-WEST 2011). In addition, there is an estimated 241,514 ± 69,660 plants on 88.3 ac in California (Service 2007a). Nothing is known about the longevity of Ash Meadows gumplant seeds in the seed bank. Predation pressure from cattle and feral horses has been removed, but recent observation of herbivory (i.e., lagomorphs – likely black-tailed jackrabbits) and insect seed predation upon Ash Meadows gumplants could negatively affect gene flow and dispersal by disrupting reproduction and seed bank recharge (Pavlik and Moore 2010).

At the time of listing, the Ash Meadows gumplant was known from 13 occurrences and was estimated to be made up of 10,000 to 13,000 individuals (Cochrane 1981). Knight and Clemmer (1987) reviewed the available data on the rare plants of the Ash Meadows area and identified nine general areas that contained Ash Meadows gumplants. In 2001, Ash Meadows gumplant population was estimated to be about 13,000 individuals in 16 minimum scale occurrences (0.1 mi separation distance) or 14 maximum scale occurrences [0.6 mi separation distance) 15.1 ac (Morefield 2001). Results from the 2008-2010 Ash Meadows NWR-wide rare plant survey estimate that 656,890 individuals are present on the Ash Meadows NWR in 23 minimum scale occurrences (0.1 mi [0.16 km] separation distance) or one maximum scale occurrence (0.6 mi distance) on a total of 136.3 ac (BIO-WEST 2011). The largest occurrences of Ash Meadows gumplant on the Ash Meadows NWR are at Spring Meadows road, Ash Meadows road, northeast of Crystal Reservoir and in between Crystal Reservoir and Lower Crystal Marsh (BIO-WEST 2011). Estimates of individual Ash Meadows gumplants on the BLM ACEC and private lands within the Ash Meadows NWR boundary do not exist.

Based on a 2003 survey on the California population, which used transects to develop a population estimate, there are 241,514 (± 69,660 within 95 percent confidence interval) Ash Meadows gumplant plants within 88.3 ac (Johnston and Zink 2004). Although sampling occurred in an area of fairly uniform distribution, large portions of the area were still devoid of plants. The highly dependent nature of the plant to water made for dense occurrence along slough channels followed by gaps between channels that were essentially devoid or sparsely populated. The gradient distribution of plant numbers in relation to the waterways of the slough may account for the high standard deviation (Johnston and Zink 2004).

The primary threats to Ash Meadows gumplant included in the final listing rule were groundwater withdrawal, surface mining, road construction, trampling and grazing by wild and free-roaming horses, agricultural development, inadequate regulatory mechanisms, and trampling by cattle and feral horses. Threats identified since listing include non-native plant species, wildfire, OHV activity, and herbivory. Endemism and limited geographic distribution will continue to threaten Ash Meadows gumplant due to the vulnerability of small populations to a range of environmental, demographic, and stochastic factors. Climate change may result in effects to the species as discussed previously for all Ash Meadows species, but there is much uncertainty regarding the attributes that could be affected and their timing, magnitude, and rate of change.

Establishment of the Ash Meadows NWR in 1984 secured the land for federally-listed plant species by removing threats from agriculture, wild and feral horses, livestock and ranching, and residential development. The creation of the BLM ACEC in 1998 added additional protections to species whose range extended past the Ash Meadows NWR boundary. Habitat for Ash Meadows gumplant is almost entirely protected from development (except on private inholdings) and new mineral entry (for 20 years) within the Ash Meadows NWR and BLM ACEC. Private inholdings still exist within the Ash Meadows NWR boundaries. OHV activity is periodically a threat to Ash Meadows gumplant within the Ash Meadows NWR boundary, due to downed sections of fencing and lack of law enforcement presence. In addition, increased OHV activity has been reported in the Carson Slough (Baldino 2012 pers. comm.). Non-native plant species could spread into Ash Meadows gumplant habitat and increase fire frequency, which would threaten the natural vegetation corridors needed for gene flow and dispersal in this taxon.

Demand for already limited water resources can have severe direct and indirect consequences on the persistence of Ash Meadows gumplants. Increasing groundwater pumping will lower the water table and directly prevent Ash Meadows gumplants from accessing a reliable water source during dry months. More information is needed on the potential effects of changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry upon patterns of gene flow and dispersal in Ash Meadows gumplant.

A 5-year review was completed for Ash Meadows gumplant in 2007 that concluded that a change in status was not warranted. Many threats to the Ash Meadows gumplant discussed in the original listing, including groundwater extraction on the Ash Meadows NWR, grazing and trampling by cattle and wild horses, and OHV activity, have largely been addressed through landscape-level conservation measures. These measures include the designation of Ash Meadows as a National Wildlife Ash Meadows NWR, by the purchase of land and water rights for the Ash Meadows NWR, and through BLM activities on the Ash Meadows ACEC, such as fencing and wild horse removal.

Two threats, surface mining and invasive non-native species, continue to be the most important obstacles to long-term protection and delisting. Prior to a change in status, both threats to the Ash Meadows gumplant must be managed. The threat posed by invasive non-native species is high and non-imminent, and the threat posed by surface mining is low and non-imminent. A third threat, the loss of habitat due to groundwater pumping, has not been abated but is currently being monitored and legal protection for the Devils Hole pupfish appears sufficient to protect the Ash Meadows gumplant.

The location of six new sites in 1998 suggests the range of the species could be expanding within the Ash Meadows NWR. Anecdotal observations also suggest populations have increased largely due to natural recovery after groundwater pumping and disturbances (agriculture, wild horse grazing, and OHV activity) were discontinued on the Ash Meadows NWR. However, there are no data or information to quantify Ash Meadows gumplant population increases. As described in the recovery plan, Ash Meadows gumplant populations should be mapped and demographic population data collected. An understanding of population demographics and population trends for the Ash Meadows gumplant is necessary before conclusions regarding recovery can be made.

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Ash Meadows gumplant.

Delisting of the Ash Meadows gumplant will be considered when the following criteria are met for a five year period:

1. Secure, protect, and maintain in natural vegetation, corridors, and adjacent buffer areas for gene flow and dispersal of listed plant species within the essential habitat.
2. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
3. Listed plant species are present in all the sites that they have historically occupied and within each critical habitat unit, the listed plant has a frequency value equal to or greater than the frequency value determined by Task number 644 needed as an indicator of a self-sustaining plant population.

Ash Meadows Gumplant Critical Habitat

Critical habitat for the Ash Meadows gumplant was designated on Federal and private land on May 20, 1985, in four township range units totaling 1,986 ac.

Condition of the Physical and Biological Features of Critical Habitat

The physical and biological features for these areas are saltgrass meadows along streams and pools or drier areas with alkali clay soils (50 FR 20777). Critical habitat areas are as follows:

<u>Inyo County, California</u>

- Township 26 North, Range 6 East, Section 30

<u>Nye County, Nevada</u>

- Township 17 South, Range 50 East, Sections 26, 33, and 35
- Township 18 South, Range 50 East, Sections 1, 2, 3, 4, 5, 7, 10, 11, 14, 20, 23, 24, and 29
- Township 18 South, Range 51 East, Section 18

The portion of critical habitat located in Township 18 south, Range 50 east, Section 5; Section 20; and Section 29 occur outside of the Ash Meadows NWR, within the BLM ACEC and have not been surveyed. The portion of critical habitat located in Township 18 south, Range 50 east, Section 7 occurs outside of the Ash Meadows NWR on private land and has not been surveyed. It is unknown if these habitats are occupied. The portions of critical habitat located in Township 17 south, Range 50 east, Section 26; Section 33; and Section 35 are not occupied. In addition, the portions of critical habitat located in Township 18 south, Range 50 east, Section3; Section 4; and Section 14 are not occupied. All other portions of critical habitat are occupied.

The 1990 recovery plan listed non-native plant species as a major threat to gumplant habitat. To address this threat, the wildlife refuge has completed an Integrated Pest Management Plan and has been treating and monitoring non-native species through a Southern Nevada Public Land Management Act grant.

Establishment of the Refuge and BLM Ash Meadows ACEC added new layers of federal protection not present at the time critical habitat was designated. The Service manages National Wildlife Refuges in accordance to the National Wildlife Refuge System Improvement Act of 1997. This act establishes the protection of biodiversity as the primary purpose of the National Wildlife Refuge System. According to the Service's 1984 Environmental Assessment: Proposed Acquisition to Establish Ash Meadows National Wildlife Refuge, the purpose of the acquisition was " ... to protect the endemic, endangered, and rare organisms (plants and animals) found in Ash Meadows ... " Continued protection and management of the Ash Meadows gumplant are central to the Refuge mission and will continue independent of protection under the Act.

In 1998, BLM established the Ash Meadows ACEC on public lands surrounding the Refuge. BLM's Las Vegas District Resource Management Plan (RMP) guides management of the ACEC. Management directions for the ACEC include closing the area to livestock grazing; limiting vehicles to existing roads and trails; closing the area to locatable, salable, and leasable minerals; and closing the area to geothermal prospecting and leasing (BLM 1998). The area has also been designated a right-of-way avoidance area except within designated corridors. BLM has closed the area to livestock and limits vehicles to existing roads and trails.

Summary of the Status of Critical Habitat

As noted in the 1990 recovery plan and the 2007 5-year review for the Ash Meadows gumplant (Service 2007a), critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to Ash Meadows gumplant include groundwater withdrawal, surface disturbance, non-native species, and climate change.

The ownership and management of Ash Meadows gumplant habitat is primarily Federal, with approximately 45 percent within the Refuge boundary on Service land and additional populations on BLM land and private lands. These mechanisms provide protections for critical habitat.

Amargosa Niterwort

The Amargosa niterwort was federally listed as endangered on May 20, 1985 (50 FR 20777). The Amargosa niterwort was listed as critically endangered by the State of Nevada in 1986 and is also protected under NRS 527.260-300. In 1979, the species was also listed as endangered under the California Endangered Species Act.

The Amargosa niterwort was first collected in 1954 by Philip Munz and John Roos in open flats of the Amargosa Desert in Inyo County, California and discovered in 1984 on the Ash Meadows NWR in Nevada (Knight and Clemmer 1987). The Amargosa niterwort is an erect, perennial forb in Amaranthaceae (Amaranth; formally in the Chenopodiaceae (goosefoot family)) that grows up to 4 inches tall (Knight and Clemmer 1987). Vegetative growth of shoots from ramets (rhizomes) is probably the principle mean of colonization and persistence. Flowers are small, less than 0.2 inches (4 mm) in diameter, perfect, and cluster in groups of 1 to 3 in the upper leaf axils. The sepals are rose-colored when fresh, but turn tan or whitish and somewhat papery when dry. There is one, round, shiny black seed per fruit (Knight and Clemmer 1987; Pavlik and Moore 2010). The Amargosa niterwort flowers from late April to July, with fruiting starting in June and lasting into September (Pavlik and Moore 2010). The Ash Meadows niterwort is endemic to the Carson Slough area in Nevada and adjacent Inyo County, California. The range of the Amargosa niterwort in Nevada is the Ash Meadows NWR, adjacent areas within the BLM ACEC, and on private lands, and on adjacent BLM and private lands in Inyo County, California near Death Valley Junction and Tecopa Hot Springs. Studies on phrenology, breeding system, and seed biology (seed output, germination) of 90 Amargosa niterwort plants have been conducted (Pavlik and Moore 2010). The Amargosa niterwort was studied on the Ash Meadows NWR at Crystal Reservoir and Soda Springs. Ramets at Fairbanks were, on average, half as tall as those at Crystal Reservoir (20.6 mm versus 46.7 mm) and produced fewer sexual reproductive structures (1.9 sexual reproductive structures per mm verses 2.5 sexual reproductive structures per mm) (Pavlik and Moore 2010). The seed-to-ovule ratio of mature fruits was not calculated for the Amargosa niterwort because treatments were conducted on whole ramets and it was not possible to assess the number of seeds produced per ramet due to rapid seed dispersal (Pavlik and Moore 2010). Pollinator exclusion studies were conducted, though ants were occasionally seen entering cages and climbing ramets, and the Amargosa niterwort was still able to produce seeds suggesting an autogamous (i.e., self-fertilization) breeding system, though this does not rule out the possibility that this species is cleistogamous (i.e., a flower that doesn't open and is self-fertilized in the bud) (BIO-WEST 2009; Pavlik and Moore 2010).

There are no data on germination events in the Amargosa niterwort. Monitoring that could provide insight into population trend and demographic structure has not been conducted in Nevada. In 2003, 2010, and 2011 at the Death Valley Junction populations in California, transects were used to develop a population estimate. The seed bank buffers against environmental stochasticity and extinction in desert plants; nothing is known about the longevity of Ash Meadows niterwort seeds in the seed bank. Attempts to germinate 60 Amargosa niterwort seeds were unsuccessful and no seeds germinated; after 4 weeks exposure to dark, moist, and warm conditions; the seed coat remained largely intact (Pavlik and Moore 2010). Transplanting and translocation studies have not been conducted.

The Amargosa niterwort occurs between 2,100 and 2,160 ft above mean sea level and occurs most commonly in alkali seep and alkali meadow habitat in open areas with saturated or moist to clay to gravelly-sandy soils and a prominent alkali crust (Morefield 2001; BIO-WEST 2011). In a few instances, Amargosa niterwort individuals were observed occupying intermittent drainages with remnant alkali crust between upland mesic to mesic alkali shrub-scrub habitat (BIO-WEST 2011). On the basis of isotopic analysis, Hasselquiest and Allen (2009) found that the Amargosa niterwort uses surface water and soil moisture near the soil surface (depths 1 ft from the ground surface). Soil moisture below Amargosa niterwort was two times greater than below Ash Meadows gumplant, which is also affiliated with wetter environments, especially near the soil surface. Higher soil moisture below Amargosa niterwort may in part be explained by groundwater upwelling or the movement of deep groundwater upward in the soil profile (Hasselquist and Allen 2009). But at the Crystal Reservoir population of Amargosa niterwort, ramets were found about 0.3 to 0.5 ft below ground and roots were developed and growing to depths greater than 0.3 to 1 ft, suggesting that this species may also be able to utilize groundwater (Willoughby 2011). Other plant species associated with the Amargosa niterwort in its alkali seep and meadow habitat include: shadscale, shortstalk stinkweed (*Cleomella brevipes*), and saltgrass (Knight and Clemmer 1987; Morefield 2001).

At the time of listing, the Amargosa niterwort was only known from one location, the south end of the Carson Slough on both sides of the Nevada and California border. Knight and Clemmer (1987) reviewed the available data on the rare plants of the Ash Meadows area and identified two general areas that contained Amargosa niterwort: Central Carson Slough in Nevada and South Carson Slough in California. The largest occurrences of Amargosa niterwort on the Ash Meadows NWR are concentrated around Crystal Reservoir, Horseshoe Marsh, and Soda Spring (BIO-WEST 2011). Estimates of ramets on the BLM ACEC and private lands do not exist. There are three occurrences of the Amargosa niterwort in California: two occurrences in critical habitat near Death Valley junction that occur on BLM land and one occurrence at Tecopa Hot Springs that occurs on BLM and private land.

In 2001, three occurrences of Amargosa niterwort were mapped and the population was estimated to be 13,000 individuals on approximately 229 ac (Morefield 2001). Results from the 2008-2010 Ash Meadows NWR-wide rare plant survey estimate that 58,292 aboveground ramets are present on the Ash Meadows NWR in 11 minimum scale occurrences (0.1 mi separation distance) or 2 maximum scale occurrence (0.6 mi distance) on a total of 21.4 ac (BIO-WEST 2011).

In 2003, the two occurrences near Death Valley junction were surveyed using transects and macroplots to develop a population estimate. It was estimated that Occurrence 1 contains 243,478 ± 69.337 ramets (± 95 percent confidence interval) within 10 ac (4.08 ha) and Occurrence 2 contains 28,951 ± 20,372 ramets (± 95 percent confidence interval) within 418.5 ac (Johnston and Zink 2004). In 2010-2011, Occurrence 1 in California was re-surveyed using transects and five macroplots in an effort to establish a permanent monitoring protocol for Amargosa niterwort. The estimates for the number of rooted stems in the combined area of the macroplots in Occurrence 1 were 59,540 ± 24,782 in 2010 and 58,431 ± 21,541 in 2011 (± 95 percent confidence interval) (Willoughby 2011). The slightly lower estimate for 2011 was not statistically significant. Because of problems inherent in accurately counting rooted stems (i.e., where stems were solitary or few there was no problem counting rooted stems but, where stems were very clumped it was impossible to accurately count rooted stems without damaging plants), these numbers are not considered to accurately track Ash Meadows niterwort abundance between years. Rooted stems will be dropped as a measured attribute in future years and clump estimates will be used instead. Both the estimated number of clumps (i.e., single plants or groups of plants separated by at least 0.8 in from each other from the place they are rooted) and frequency were greater in 2011 than in 2010. Clump numbers were estimated to be 33,309 ± 12,895 in 2011, about twice as many as 16,712 ± 5,938 estimated for 2010, a difference that was statistically significant. The 2011 frequency of 0.088 (± 0.027) was significantly greater than the 2010 frequency of 0.061 (± 0.015) (Willoughby 2011). Total growing season precipitation was about the same for the 2 years, the higher Amargosa niterwort abundance observed in 2011 appears to have resulted from a better distribution of precipitation during the hotter months, which is supported by groundwater levels measured in a piezometer immediately adjacent to the Amargosa niterwort at Lower Carson Slough (Willoughby 2011). Occurrence 3, on BLM lands near Tecopa Hot Springs, was surveyed in 2005 and was estimated to contain thousands of individuals (Caicco 2005). An estimate of Amargosa niterwort ramets on the private land near Tecopa Hot Springs does not exist.

Recent comprehensive baseline surveys on public land have added new known populations; there are now 11 occurrences (0.1 mi minimum scale) made up of 58,292 above ground ramets on 21.4 ac (8.7 ha) within Ash Meadows NWR boundaries (BIO-WEST 2011). In addition, there is an estimated 33,309 ± 12,895 clumps in Occurrence 1 in California as of 2011(Willoughby 2011) and 28,951 ± 20,372 ramets in Occurrence 2 in California as of 2003 (Johnston and Zink 2004). Occurrence 3, on BLM lands near Tecopa Hot Springs was estimated to contain 1,000s of individuals (Caicco 2005). An estimate of Amargosa niterwort ramets on the private land near

Tecopa Hot Springs does not exist. Nothing is known about the longevity of Amargosa niterwort seeds in the seed bank.

The primary threats to the Amargosa niterwort included in the final listing rule were groundwater withdrawal, OHV activity, surface mining, inadequate regulatory mechanism, and trampling by cattle and feral horses. Threats identified since listing include non-native plant species and wildfire. Endemism and limited geographic distribution will continue to threaten the Amargosa niterwort due to the vulnerability of small populations to a range of environmental, demographic, and stochastic factors. Climate change may result in effects to the species as discussed previously for all Ash Meadows species, but there is much uncertainty regarding the attributes that could be affected and their timing, magnitude, and rate of change.

Establishment of the Ash Meadows NWR in 1984 secured the land for federally listed plant species by removing threats from agriculture, wild and feral horses, livestock and ranching, and residential development. The creation of the BLM ACEC in 1998 added additional protections to species whose range extended past the Ash Meadows NWR boundary. Habitat for the Amargosa niterwort is almost entirely protected from development (except on private inholdings) and new mineral entry within the Ash Meadows NWR and BLM ACEC. Private inholdings still exist within the Ash Meadows NWR boundaries. OHV activity is periodically a threat to the Amargosa niterwort within the Ash Meadows NWR boundary, due to downed sections of fencing and lack of law enforcement presence. In addition, increased OHV activity has been reported in the Carson Slough (Baldino 2012 pers. comm.). Non-native plant species could spread into Ash Meadows niterwort habitat, increase fire frequency, or both, any or all of which would threaten the natural vegetation corridors needed for gene flow and dispersal in this taxon.

Increasing the demand for already limited water resources can have severe direct and indirect consequences on the persistence of the Amargosa niterwort. Increasing groundwater pumping will lower the water table and indirectly affect the amount of groundwater being forced to the surface, which may affect the growing conditions of the Amargosa niterwort. More information is needed on the potential effects of changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry upon patterns of gene flow and dispersal in the Amargosa niterwort.

A 5-year review was completed for Amargosa niterwort in 2007 (Service 2007b) that concluded that a change in status was not warranted. The discovery of new populations on and near the Ash Meadows NWR expands the known distribution (area occupied) of the Amargosa niterwort by approximately 5 percent. The very restricted distribution of the Amargosa niterwort, with roughly 95 percent of the population in a single 10-acre population, makes the species particularly vulnerable to threats. The threat of loss of habitat from groundwater extraction and vulnerability to stochastic events has the highest magnitude. The threat posed by wild horses and OHV activity has been largely abated and is considered to have a lower magnitude. New threats have been identified, including hydrologic changes associated with Ash Meadows Road and a potential failure of Crystal Spring Dam.

Establishment of the Ash Meadows NWR and the purchase of water rights were believed to have abated the threat from groundwater extraction. However, in 2003, groundwater pumping was 200 percent of the sustainable yield. Loss of hydrologic functioning will likely continue to manifest slowly. Water levels in Devils Hole are being monitored and should provide an indication of the state of the Ash Meadows aquifer. Given our understanding of the population distribution of this species, and our understanding of the groundwater dynamics that support the species, the magnitude and imminence of this threat are considered high. This situation could become extreme in the near future if current groundwater pumping is not returned to a sustainable level.

Fencing the Ash Meadows NWR has reduced wild horse and OHV impacts and has indirectly benefited the Lower Carson Slough population by curtailing cross-country OHV travel through the area. Fencing along Ash Meadows Road by BLM has directly reduced OHV impacts to the Lower Carson Slough population, but disrepair of the fence in Nevada could threaten progress. Salt cedar is known to be a significant threat to wetlands in the vicinity. However, salt cedar does not currently appear to be a problem in either the Lower Carson Slough or below Crystal Reservoir areas. The Ash Meadows NWR has an active program to remove salt cedar.

The most important new threat identified in the 5-year review is increased vulnerability of the Lower Carson Slough population to flash flooding as compounded by the hydrologic modifications associated with Ash Meadows Road. It is not clear what effect the new raised road will have on the Lower Carson Slough population as no assessments of this risk have been completed. During a high flow event, it is likely the new raised road could act as a berm, causing sediment to bury an unknown extent of this important population of Amargosa niterwort.

A second new threat identified in the 5-year review is the potential failure of Crystal Spring Dam from a catastrophic flash flood or earthquake. Failure of the dam would affect both the Lower Carson Slough and Crystal Reservoir populations. These populations combined make up 98 percent of the known Amargosa niterwort distribution and population. Given the severity of a potential impact, the magnitude of this threat is considered high. However, given the infrequent nature of catastrophic flash flooding and earthquakes in the vicinity that could cause the failure of Crystal Spring Dam, the imminence of this threat is low.

The Amargosa niterwort occurs within an extremely restricted range containing roughly 56 acres of occupied habitat. Roughly 98 percent of the population and distribution occurs at two sites. Loss of either the Crystal Reservoir or Lower Carson Slough population would be significant. Flash flooding, a failure of Crystal Reservoir and/or groundwater extraction all pose significant risks to both populations.

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Amargosa niterwort.

Delisting of the Amargosa niterwort will be considered when the following criteria are met for a five year period:

1. Secure, protect, and maintain in natural vegetation, corridors, and adjacent buffer areas for gene flow and dispersal of listed plant species within the essential habitat.
2. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
3. Listed plant species are present in all the sites that they have historically occupied and within each critical habitat unit, the listed plant has a frequency value equal to or greater than the frequency value determined by Task number 644 needed as an indicator of a self-sustaining plant population.

Amargosa Niterwort Critical Habitat

Critical habitat for the Amargosa niterwort was designated on May 20, 1985 and consists of 1,040 acres in Inyo County, California (T25N, R6E, Sections 5, 6, 7, and 8).

Condition of the Physical and Biological Features of Critical Habitat

Critical habitat areas include salt encrusted alkaline flats. Due to high soil salinity and alkalinity, no other plant species occupy this habitat in many locations.

Summary of the Status of Critical Habitat

As noted in the 1990 recovery plan and the 2007 5-year review for the Amargosa niterwort (Service 2007b), critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to Amargosa niterwort include groundwater withdrawal, surface disturbance, non-native species, and climate change.

The ownership and management of Amargosa niterwort critical habitat is on Federal BLM lands in California, which provides protections for critical habitat.

Ash Meadows Naucorid

On May 20, 1985, the Service determined the Ash Meadows naucorid (naucorid) to be threatened and concurrently designated critical habitat (50 FR 20777).

The naucorid is an Ash Meadows endemic aquatic insect. The naucorid is a small, flattened, ovate aquatic insect which ranges in size from a mode of 0.07 inches (nymphal instar I) to 0.19 inches (nymphal instar V), with adults averaging 0.24 inches. It is univoltine (one generation per year), and produces a few (probably seven) large eggs per year. Eggs are stalked and laid on a variety of substrates, with the exception of fines and substrate larger than small cobble (Parker et al. 2000). Eggs hatch within approximately 1 month and juveniles mature to adulthood in approximately 2 months (Polhemus 1994). Naucorids are active ambush predators with main prey being amphipods (*Hyalella azteca*).

This species was listed in part due to severe habitat destruction within its historic range. From previous investigations regarding the naucorid, it has been suggested that habitat for this species has gradually degraded due to habitat disturbance and water diversion. Generally, the lack of natural maintenance flows through the habitat has prevented proper substrate from occurring. Habitat where the naucorid was most numerous was gravel-pebble substrate (size which averaged between 0.78 and 1.6 inches), as well as submerged roots of vegetation. They also occur on larger substrate, but this does not provide as much surface area for prey species. During habitat restoration activities at Point of Rocks, habitat where the naucorid was historically present was observed to be overgrown by grasses and other vegetation. In addition, the spring that contained the known bulk of the species was impacted by public use and water diversion to supply the Point of Rocks Devils Hole pupfish refugium which is no longer used. This resulted in reduced water flow since the refugia's inception as well as vegetation encroachment and a continual source of disturbance to the substrates. This problem was described by Polhemus in 1994 correspondence (Polhemus 1994), who stated that the species was in a period of decline due to altered habitat, an issue which potentially dates back to the early 1980s.

The naucorid occurs only within thermal springs of the Point of Rocks area of Ash Meadows NWR. The populations of naucorids in the Point of Rocks area were surveyed by Southern Oregon University and USGS during 1997 and 1998, and were determined to fluctuate in abundance depending on the season; however, they were at relatively low abundance due to restricted and poor habitat (Parker et al. 2000). A total of 39 individuals were transferred to the restored King's Spring outflow during the late summer and fall of 1997, where they increased exponentially (figuratively) in numbers (10,000+; Parker et al. 2000). Incidental surveys during 2003 and 2004 of the King's outflow suggested that this large population was subsequently lost due to an unknown reason, potentially the increase of cattails within the system and crayfish predation (Parker 2008). Numbers of naucorids were significantly greater in suitable substrate and flows, preferring pebbles and fast current velocity (Parker et al. 2000). Surveys from 1998 to 2008 documented an increase from 730 naucorids to 2,912 (Service 2008c).

<u>Recovery Needs</u>

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Ash Meadows naucorid.

Delisting of the Ash Meadows naucorid will be considered when the following criteria are met for a five year period:

1. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
2. The listed Ash Meadows naucorid, the two candidate aquatic insects, and 13 candidate snails are present in all the locales that they have historically occupied.

Ash Meadows Naucorid Critical Habitat

Critical habitat for the Ash Meadows naucorid was designated on 10 acres on May 20, 1985, (50 FR 20777).

Condition of the Physical and Biological Features of Critical Habitat

Physical and biological features for the Ash Meadows naucorid are flowing warm water over rock and gravel substrate. The critical habitat of this species is currently being manipulated for restoration purposes, and existing habitat quality is excellent throughout its range. Future restoration may improve suitability of the critical habitat immediately under or adjacent to the boardwalk.

Summary of the Status of Critical Habitat

As noted in the 1990 recovery plan and the draft 5-year review (Service 2008c) for the Ash Meadows naucorid, critical habitat is subject to impacts from groundwater withdrawal and the susceptibility to decline from a single event disturbing its habitat.

The ownership and management of spring-loving centaury habitat is entirely within the Refuge boundary on Service land, which provides protections for critical habitat.

Ash Meadows Amargosa Pupfish

The Ash Meadows Amargosa pupfish was listed as endangered with critical habitat on September 2, 1983 (48 FR 40178). The species is considered threatened by the State of Nevada and is protected under NAC 503.065.

The Ash Meadows Amargosa pupfish (Eigenmann and Eigenmann 1889) was first described in 1889 and belongs to the Family Cyprinodontidae. The Ash Meadows Amargosa pupfish is a morphologically variable species of pupfish, but can be defined by the following combination of characters: scale surface deeply reticulate, circuli without obvious spine-like projections; scales large, usually 25 to 26 in lateral series; central cusp of tricuspid teeth narrower than outer cusps; and breeding color of males deep blue and without yellow color (Miller 1948; Moyle 2002). The Ash Meadows Amargosa pupfish subspecies differs by scale and finray counts lower than average for the species; a reduced body size; a short, deep, and slab-sided body with a greatly arched and compressed predorsal profile; and a very long head and opercle. Generally, the pupfish is less than 2 inches long.

Spawning peaks in the spring, but occurs from April to October, and the size of each population fluctuates throughout the course of a year (Soltz and Naiman 1978), which also adds a variable to population estimates. Although significantly regulated by diel light cycles and partially by water temperature, spawning likely occurs year-round, especially in warmer habitat. Pupfish reproduce in waters of 77 to 88 °F (Gerkin and Lee 1983). The individuals in the springs and stable habitats likely have a different reproductive strategy than at the spring outflows with harsher, variable conditions or in ephemeral habitats, where population numbers likely fluctuate greatly depending on conditions. Population stability is also relative to predation, and presence of non-native predatory fish has been demonstrated to nearly extirpate populations.

The Ash Meadows Amargosa pupfish is endemic to the Ash Meadows area in Nye County, Nevada. Distribution of this species includes nearly all of the surface waters within the Refuge, inholdings, and adjacent land in the Amargosa Valley, with the exception of Devils Hole, the

Warm Springs Complex, Crystal Reservoir, reservoirs or other sites with poor water quality, and isolated springs and seeps with no historic connection or which are seasonal. The Ash Meadows Amargosa pupfish is fairly widespread occurring in suitable springs and their outflows and marsh areas at Ash Meadows NWR (Scoppettone et al. 1995). Soltz and Naiman (1978) indicate that most pupfish occur downstream in outflow and marsh habitats; sites that have not been surveyed. Observations throughout the Ash Meadows NWR suggest that in fact Ash Meadows Amargosa pupfish are frequently very abundant in outflows and flooded sites (Scoppettone et al. 1995), which cannot be effectively censused using conventional methods.

Several factors affect abundance and variability. Pupfish in lotic habitats, as opposed to lentic (predominantly spring pool) fish, are highly variable in population size, changing 10 to 20 times magnitude over the course of a year. Population abundance may also be affected by behavior and habitat use (Soltz and Naiman 1978). Pupfish change habitat use depending on time of day, and may migrate to cooler waters during the hotter portions of the day. This behavior may be localized at extreme conditions at sites such as with other subspecies, such as *C. nevadensis* at Tecopa. Recent survey data for Ash Meadows Amargosa pupfish is found in Table 16.

Table 16. Seasonal catches of Ash Meadows Amargosa pupfish in Ash Meadows springs (Scoppettone et al. 2012).

System	Season	Dace Numbers
Fairbanks spring-pool	Fall 2010	426
	Winter 2011	272
	Spring 2011	417
Fairbanks stream	Fall 2010	1,264
	Winter 2011	880
	Spring 2011	2,491
Soda spring-pool	Fall 2010	3
	Spring 2011	12
Soda stream	Fall 2010	251
	Winter 2011	417
	Spring 2011	363
Roger spring-pool	Fall 2010	125
	Winter 2011	213
	Spring 2011	227
Roger stream	Fall 2010	14
	Winter 2011	58
	Spring 2011	32
Longstreet spring-pool	Fall 2010	319
	Winter 2011	599
	Spring 2011	79
Longstreet stream	Fall 2010	27
	Winter 2011	19
	Spring 2011	17
Carson Slough	Fall 2010	157
	Winter 2011	1,449
	Spring 2011	312
Five Springs spring-pool	Fall 2010	24
	Spring 2011	12
Five Springs stream	Fall 2010	6
	Spring 2011	10
Peterson reservoir	Fall 2010	29
	Spring 2011	8
Peterson stream	Spring 2011	124
Cold stream	Fall 2010	1
	Spring 2011	1

The primary threats to the Ash Meadows Amargosa pupfish included in the 1983 emergency and final rules include agricultural and municipal development of habitat (groundwater use), the introduction of exotic fish and other aquatic prey species that compete with or prey upon native fishes, inadequacy of existing regulatory mechanisms, and the extremely small range and habitat requirements which makes the species vulnerable to stochastic (demographic and environmental) threats. Of these threats, non-native fishes and prey species are the most serious remaining threats to the Ash Meadows Amargosa pupfish as it is likely the non-natives suppress the overall population size of the pupfish.

Recently, fire within riparian habitat has been identified as a threat to the species when riparian habitat is dominated by non-native species. Native plants may be adapted to frequent, low-intensity fire. In 2005, the Jackrabbit Fire burned within occupied habitat. The fire was high-intensity with high fuel loads of tamarisk. The heat of the fire raised the water temperature above the thermal tolerance of the species. As a result, in some stretches of the Jackrabbit Spring outflow there was 100 percent mortality of all native fishes.

Establishment of the Ash Meadows NWR and the subsequent purchase of water rights and private lands containing habitat, removed many of the threats facing the Ash Meadows Amargosa pupfish. After groundwater pumping was ceased on the Ash Meadows NWR, it began to increase in the Amargosa Valley, located about 10 miles northwest of the Ash Meadows NWR. In 1987, groundwater pumping in the Amargosa Valley was estimated to be 5,670 afy (USGS 2005). In 2003, groundwater pumping was estimated to have increased to 13,518 afy (USGS 2005). Most groundwater monitoring wells in the Amargosa Valley have shown a significant decline in water levels since 1992 (USGS 2003), and groundwater pumping is currently occurring in some areas of the basin at about twice the rate predicted to be sustainable (USGS 2005).

Disruptions to the surface and subsurface hydrology are particularly important threats to the species, and all known populations of the pupfish face this threat. Habitat restoration and invasive species management also have improved overall population numbers; however, many local populations are at risk of extirpation due to the unlawful introduction of game fish such as largemouth bass by the public. The current rangewide trend for the species is generally thought to be stable.

A 5-year review was completed for Ash Meadows Amargosa pupfish in 2010 that concluded that a change in status was not warranted. Many threats to the Ash Meadows Amargosa pupfish including local groundwater extraction on the Ash Meadows NWR, habitat destruction by cattle and wild horses, and OHV activity, have largely been addressed by the designation of Ash Meadows as a National Wildlife Ash Meadows NWR, purchase of land and water rights, and through BLM activities such as wild horse removal.

Habitat degradation and invasive non-native species, continue to be the most important obstacles to long-term protection and delisting of the pupfish. One threat, the off-refuge development of groundwater from the carbonate and basin-fill aquifers that supply Ash Meadows, has the potential of seriously limiting available habitat. Prior to a change in status, these threats to the pupfish must be managed. The threat posed by groundwater withdrawal is high and non-imminent, the threat posed by aquatic invasive non-native species is high and the immediacy is imminent, and the threat posed by surface mining is of low magnitude and non-imminent immediacy. The decline in groundwater levels due to groundwater pumping has not been abated but is currently being monitored, and legal protection for the water that supports the Devils Hole pupfish appears sufficient to protect the Ash Meadows Amargosa pupfish; however, additional monitoring of springflow and groundwater needs to be implemented and contingency plans should be developed. Anecdotal observations suggest the pupfish is a pioneer species, and populations increased largely due to natural recovery after groundwater pumping and disturbances (agriculture, wild horse grazing, and OHV activity) were discontinued on the Ash Meadows NWR.

The threat posed by invasive species presents a major challenge. Non-native plant and animal species pose a threat to the pupfish through direct predation, competition, exclusion, by changing ecosystem processes such as fire, and simplifying allochthonous inputs. Fire fueled by non-native plant species is a new threat to the pupfish not described in the 1983 listing rule. Non-native species previously confined to abandoned agricultural fields now appear to be moving out into riparian habitat. The Ash Meadows NWR is making significant strides in addressing the threat posed by non-native species, including the recent completion of an integrated pest management plan and securing short-term funding for salt cedar and other non-native species removal. However, these activities have only recently been initiated, there are no tangible on-the-ground results that demonstrate the threat to the pupfish has been reduced, and there is no long-term funding in place to ensure progress can continue after initial efforts.

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Ash Meadows Amargosa pupfish.

Delisting of the Ash Meadows Amargosa pupfish will be considered when the following criteria are met for a five year period:

1. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
2. Each individual spring or stream population of Ash Meadows Amargosa pupfish have sex ratios and juvenile-to-adult ratios that support self-sustaining populations.

Ash Meadows Amargosa Pupfish Critical Habitat

Critical habitat for the Ash Meadows Amargosa pupfish was designated on September 2, 1983 (48 FR 40178-40186). Designated critical habitat for the Ash Meadows Amargosa pupfish is each of the following springs and outflows plus surrounding land areas for a distance of 164 ft from these springs and outflows: (1) Fairbanks Spring and its outflow to the boundary between Sections 9 and 10, T17S, R50E; (2) Rogers Spring and its outflows to the boundary between Sections 15 and 16, T17S, R50E; (3) Longstreet Spring and its outflow to the boundary between Sections 15 and 22, T17S, R50E; (4) three unnamed springs (currently named “Five Springs”) in the northwest corner of Section 23, T17S, R50E and each of their outflows for a distance of 246 ft from the spring; (5) Crystal Pool and its outflow for a distance of 1,312 ft from the pool; (6) Bradford Springs in Section 11, T18S, R50E, and their outflows for a distance of 984 ft from the springs; (7) Jackrabbit Spring and its outflow flowing southwest to the boundary between Section 24 in T18S, R50E and Section 19, T18S, R51E; (8) Big Spring and its outflow to the boundary between Section 19 T18S, R51E and Section 24, T18S, R50E; and (9) Point of Rocks Springs and their entire outflows within Section 7, T18S, R51E.

Condition of the Physical and Biological Features of Critical Habitat

The designation of critical habitat for the Ash Meadows Amargosa pupfish occurred prior to the requirement for identification of physical and biological features that are essential for the conservation of the listed species; therefore, the best available scientific and commercial data is utilized to determine these habitat qualities. The habitat qualities of critical habitat determined necessary for conservation of the pupfish are the following:

Water

Water required is a sufficient quantity and quality of water (i.e., temperature, dissolved oxygen, contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is identified for the particular life stage for the pupfish.

Physical habitat

Physical habitat is areas of the springs and their outflows that are inhabited or are potentially habitable by a particular life stage of the pupfish, for use in spawning, feeding, and rearing, or corridors between such areas.

Biological environment

Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the pupfish. Predation and competition, although considered normal components of this environment, are out of balance due to non-native fish species in many areas.

The Refuge is restoring springs and their outflows to more natural conditions and eliminating invasive species where possible to enhance habitat for pupfish and other endemic species. The outflow channels of Fairbanks and Soda springs, the first springs to feed into the Carson Slough, and the lower third of the combined Rogers and Longstreet spring outflows were restored in 2010. The upper sections of Rogers Spring and Longstreet Spring outflows are still largely in irrigation ditches and restoration is planned.

Summary of the Status of Critical Habitat

As noted in the 1990 recovery plan (Service 1990) and the draft 5-year review for the Ash Meadows Amargosa pupfish, critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to Ash Meadows Amargosa pupfish include groundwater withdrawal, surface disturbance, non-native species, and climate change.

The ownership and management of Ash Meadows Amargosa pupfish is entirely on Federal lands, within the Refuge boundary of approximately on Service land and on BLM lands. These mechanisms provide protections for critical habitat.

Ash Meadows Speckled Dace

The Ash Meadows speckled dace was listed as endangered with critical habitat on September 2, 1983 (48 FR 40178).

Speckled dace are members of the minnow family of fishes (Cyprinidae); various forms of speckled dace occur in river basins throughout western North America (Lee and Gerking 1980, Moyle 2002). The original description and diagnosis of this subspecies of speckled dace is described by Gilbert (1893) (summarized by La Rivers 1962). Typically the body is fusiform, albeit more robust than other dace and with a broad, large head. Scales are irregular and difficult to enumerate. Body coloration varies widely within a population. Generally, the dorsum is olive-gray blending ventrally to golden. Black spots frequently cover the body and there may be one or two distinct, black lateral stripes. It reaches a maximum length of approximately 3.9 inches and may live as long as 4 years (John 1964). Intestines are short, approximately half the body length (La Rivers 1962), suggesting a carnivorous diet. Speckled dace generally prefer flowing streams where they feed on drifting insects (Moyle 2002). Spawning occurs primarily during the spring and summer over stream riffles (Mueller 1984). Cooler springs and spring channels with water temperatures between 17-24°C that contain gravel substrate may provide potential spawning sites for the Ash Meadows speckled dace (Otis Bay 2012).

Hydrographically isolated basins that speckled dace occupy in southern Nevada include the Amargosa River, White River, Meadow Valley Wash, Moapa River, and Colorado River (Miller 1984). The Ash Meadows speckled dace species only occurs within the Ash Meadows NWR.

Threats to Ash Meadows speckled dace include its limited distribution and the presence of introduced predatory and competing species (La Rivers 1962, Williams and Sada 1985, Service 1990). Collection records show that the speckled dace once shared many of the same springs and outflows that the Ash Meadows pupfish inhabits. Currently, stable populations of speckled dace occur in Bradford and Jackrabbit Springs. Speckled dace were introduced into Forest and Point of Rocks Springs in 2003 (Scoppettone et al. 2012). Red swamp crayfish, western mosquitofish, and sailfin molly may have prevented the fish from establishing strong reproductive populations. Red swamp crayfish and mosquito fish also decreased recruitment of Ash Meadows speckled dace in Bradford Springs (Scoppettone et al. 2012). After red swamp crayfish and mosquito fish were aggressively removed from Bradford Springs 1 and 2 in 2009, speckled dace populations increased substantially (Otis Bay 2012).

Prior to spring system restoration, the outflows of the Northern Ash Meadows Springs were all earthen ditches conveying water for irrigation. Over time, water conveyance channels had become clogged with emergent vegetation causing channels to overflow, creating marsh lands within several hundred meters of spring discharge points. Restoration of the Northern Springs was targeted toward conveying spring discharge within a well-defined channel mimicking the historical course. In phase 1, completed in March 2010, a stream channel was constructed from

Fairbanks spring-pool to 2.5 mi (4 km) downstream and its discharge formed a shallow marsh (Scoppettone et al. 2012). In phase, 2 completed in November 2010, Fairbanks Spring was connected with a well-defined channel to Longstreet and Rogers Springs. The reach of stream receiving water from Longstreet and Rogers Springs and southward to join Fairbanks Springs and extending to Peterson Reservoir was renamed as “Carson Slough.” In phase 1, this reach received water only from Longstreet and Rogers Springs, drained from a common marsh. In phase 2, Carson Slough also received water from Fairbanks Spring at about the slough’s midpoint. In addition to changing stream courses, the Fairbanks Spring system received 98 Ash Meadows speckled dace on April 14–15, 2010, and another 20 dace on August 19, 2010 (Scoppettone et al. 2012).

Soda Spring also was restored. Prior to restoration, the outflow was marsh habitat discharging into Fairbanks Spring, and after restoration, a well-defined channel approximately 984 ft (300 m) in length discharged into a shallow marsh south of the Soda spring-pool. A total of 21 speckled dace were introduced between April 3 and 18, 2011 (Scoppettone et al. 2012). Several hundred young of year speckled dace were introduced into the combined outflow of the Point of Rocks springs in 2004 and 2005, and into Forest Spring in 2006. Loss of faster-flowing, cool water due to habitat alteration, and introduced non-native aquatic species, has prevented the reintroduction of the Ash Meadows speckled dace into most of its historical habitat.

Recent survey data for Ash Meadows speckled dace is found in Table 17.

Table 17. Seasonal catches of Ash Meadows speckled dace in Ash Meadows springs (Scoppettone et al. 2012).

System	Season	Dace Numbers
Fairbanks stream	Fall 2010	120
	Winter 2011	236
	Spring 2011	166
Longstreet stream	Spring 2011	1
Carson Slough	Winter 2011	13
	Spring 2011	3
Peterson stream	Spring 2011	2
Point of Rocks Stream	Fall 2010	3
Bradford 1 spring-pool	Fall 2010	145
	Spring 2011	161
Bradford 2 spring-pool	Spring 2011	5
Bradford 2 stream	Fall 2010	16
	Spring 2011	13
Tubbs spring-pool	Fall 2010	1
Jackrabbit spring-pool	Fall 2010	3
	Spring 2011	10
Jackrabbit stream	Fall 2010	623
	Spring 2011	528

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Ash Meadows speckled dace.

Delisting of the Ash Meadows speckled dace will be considered when the following criteria are met for a five year period:

1. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
2. Each individual spring or stream population of Ash Meadows speckled dace have sex ratios and juvenile-to-adult ratios that support self-sustaining populations.

Ash Meadows Speckled Dace Critical Habitat

Critical habitat for the Ash Meadows speckled dace was designated on September 2, 1983, (48 FR 40178). Designated critical habitat includes the following springs and outflows plus surrounding land areas for a distance of 164 ft (50 m) from these springs and outflows: (1) Bradford Springs in Section 11, T18S, R50E, and their outflows for a distance of 984 ft (300 m) from the springs; (2) Jackrabbit Spring and its outflow flowing southwest to the boundary between Section 24 in T18S, R50E and Section 19, T18S, R51E; (3) Big Spring and its outflow to the boundary between Section 19 T18S, R51E and Section 24, T18S, R50E.

Condition of the Physical and Biological Features of Critical Habitat

The designation of critical habitat for the Ash Meadows speckled dace occurred prior to the requirement for identification of physical and biological features that are essential for the conservation of the listed species; therefore, the best available scientific and commercial data is utilized to determine these habitat qualities. The habitat qualities of critical habitat determined necessary for conservation of speckled dace are water, physical habitat, and biological environment. The desired conditions for each of these elements are summarized below.

Water

Water required is a sufficient quantity and quality of water (i.e., temperature, dissolved oxygen, contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is identified for the particular life stage for the speckled dace.

Physical habitat

Physical habitat is areas of the springs and their outflows that are inhabited or are potentially habitable by a particular life stage of the speckled dace, for use in spawning, feeding, and rearing, or corridors between such areas.

Biological environment

Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the speckled dace. Predation and competition, although considered normal components of this environment, are out of balance due to the presence of non-native fish species in many areas.

Restoration of critical habitat is discussed in the Ash Meadows speckled dace status of the species.

Summary of the Status of Critical Habitat

As noted in the 1990 recovery plan and draft 5-year review for the Ash Meadows speckled dace, critical habitat is subject to landscape-level impacts in addition to the site-specific effects of individual or local activities. Threats to Ash Meadows speckled dace include groundwater withdrawal, surface disturbance, non-native species, and climate change.

The ownership and management of Ash Meadows speckled dace habitat is primarily Federal, consisting within the Refuge boundary of approximately 50 percent on Service land, 45 percent on BLM land, and 5 percent on private lands. These mechanisms provide protections for critical habitat.

Warm Springs Pupfish

The Warm Springs pupfish was listed as endangered on October 13, 1970 (35 FR 16047). No critical habitat has been designated for the species; however, essential habitat was identified during the listing. The species is considered endangered by the State of Nevada and is protected under NAC 503.065.

The Warm Springs pupfish is a morphologically variable species of pupfish, but can be defined by several morphological features of the scales and teeth (Miller 1943). The Warm Springs pupfish is the smallest of the *Cyprinodon nevadensis* subspecies and can be distinguished from the other forms by its shorter, deeper body and more numerous pectoral fin rays (La Rivers 1962). Albeit variable based on habitat conditions, breeding males are similar to the Ash Meadows Amargosa pupfish (*C. n. amargosae*), but with a pronounced yellow tint on the nape (Soltz and Naiman 1978).

Minimal life history information has been gathered for the Warm Springs pupfish; however, a significant body of literature exists on *Cyprinodon* physical tolerances in general due to the harshness of the habitats in which they live. Genetic work has been completed on this genus in part to understand intraspecific relationships, habitat tolerance, principles of speciation due to biogeography, and to ascertain pathways of aquatic species movement over geologic time. Given the nature of the existing body of literature, generalizations must be used by comparing the Warm Springs pupfish to other subspecies or closely related pupfish such as the Ash Meadows Amargosa pupfish.

Warm Spring pupfish is highly eurythermal (McCauley and Thomson 1988; Brown and Feldmeth 1971; Otto and Gerking 1973), i.e., the species can tolerate a wide variety of temperatures ranging from 35.6 to 111.2 °F. In the laboratory, Hirshfield et al. (1980) determined Ash Meadows Amargosa pupfish taken from the Big Springs pool and acclimatized to standard temperature and oxygen levels to have a thermal minimum of approximately 36.8 °F and a maximum of approximately 107.0 °F which was significantly less variable than the Amargosa River pupfish that is adapted to a more variable habitat. These thermal limits are the extremes for survival that were developed in a closed tank, and tolerances for oogenesis and egg development are much narrower (Shrode and Gerking 1977). Also, activities such as feeding or breeding would likely not occur at the extreme temperatures. Hirshfield et al. (1980) reported critical oxygen minima to be 1.66 parts per million; however, these fish were also acclimatized, originated from the stable Big Spring pool, and the minima is likely higher relevant to development and other activities such as sustained feeding or breeding.

Most of the spring systems within the Mojave Desert are alkaline, and pupfish are susceptible to low pHs. Lee and Gerking (1980) determined critical minima and effects of low pH on the Ash Meadows Amargosa pupfish. Lee and Gerking also found that larvae were less tolerant to pH stress than were adults. Pupfish in general have a very wide tolerance to salinity, and pupfish from within the Colorado River and Death Valley system have been maintained and reproduced in water ranging from distilled water to a salinity 2.5 times saltier than seawater (with some fish surviving in water up to 3.7 times saltier) (Soltz and Naiman 1978). This is due to their unique ability to rapidly adjust serum osmotic concentration of ions, preventing water loss.

Pupfish are relatively short-lived species, with a life span estimated to be 2 to 4 years (Scoppettone et al. 1995). Soltz and Naiman (1978) provide a summary of life history and growth traits of pupfish, including *C. nevadensis*. Longevity is relative to water temperature, and is a function of metabolism. Typically pupfish living in the warm waters reach maturity at 2 to 4 months, and then live 6 to 9 months as an adult. In colder waters, such as spring outflow tailwaters or marshes, pupfish may go dormant during winter, ultimately extending their lives to approximately 3 years. As with most species, pupfish in harsher environments have more drastic survivorship curves for juveniles than fish in stable environments. The highest death rate occurs during juvenile and early adolescent life stages in unstable, harsh environments, and for juvenile and adults in a stable environment. Pupfish mature very quickly, and grow about 9 percent of their body mass per day as opposed to 1 percent for adults, depending upon available resources and physical habitat. Growth is highly dependent on environmental temperature, and fish in constant warm water grow year-round whereas fish in variable cooler waters grow at lower rates.

All pupfish have similar diets, essentially being omnivores and detritivores (Soltz and Naiman 1978). The primary food for the pupfish is periphyton and algae, but they also consume invertebrates, detritus, and diatoms (Naiman 1979; Scoppettone et al. 1995).

The Warm Springs pupfish is an endemic species restricted to six springs and their outflows in a 0.77 mi^2 (2 km^2) area within the Warm Springs Complex in Ash Meadows NWR. All of these springs are small (discharge less than 1.7 gallons (6.4 liters) per second (Dudley and Larson 1976)), and some have no source pool. Physiology of the fish allows for a wide range of suitable habitats, and fish may occur in nearly all habitats present within the Warm Springs; however, some fish may be limited by upper thermal constraints, especially during spawning. This discourages use of extreme upper portions of the springs, especially during times with high air temperatures and increased solar inputs. Gravel substrate is critical for establishment of endemic invertebrates, which form an important forage resource for the pupfish.

All of the springs have been altered by diversion into earthen channels, impoundment, livestock trampling, drying due to pumping of local groundwater, or elimination of desirable native riparian vegetation. School Springs and North and South Indian springs have been restored and crayfish and non-native fish have been eradicated. Crayfish are absent from Marsh Spring and North Indian Spring.

Like other members of *Cyprinodon nevadensis,* the Warm Springs pupfish spawn throughout the year with a peak in the spring. Local environmental conditions also influence fecundity, life history, and mortality, subsequently the population fluctuates throughout the course of a year. The number of individuals in the population likely peaks in fall, but dies back in the winter. Recent efforts to develop a standardized survey protocol would allow for use of historic data as indices of stability.

The primary threats to the species are its small population size, vulnerability to habitat alteration, and the presence and introduction of predatory or competing nonnative species such as mosquito fish (*Gambusia affinis*), crayfish, and bullfrogs (*Lithobates catesbeiana*). Crayfish appear to currently occur only in the South Scruggs system, but due to the proximity of all of the springs in the Warm Springs Complex, the chance of the other systems being invaded or re-invaded is extremely high. Aquifer depletion and global warming have recently been suggested as causes for declining amount of habitat. Genetic bottlenecks and recent isolation of populations due to shrinking habitat are also threats that are currently being investigated.

Since the species was listed, populations have improved. In 1984, the Ash Meadows NWR was established to protect threatened and endangered species in the area. Establishment of the Ash Meadows NWR and the subsequent purchase of water rights reduced some of the threats facing the Warm Springs pupfish. Several populations are at risk of extirpation due to the presence of mosquitofish and crayfish and due to habitat degradation from unstable hydrology. Habitat restoration activities have been completed at School, North Indian, and South Indian springs.

Recent survey data for Warm Springs pupfish is found in Table 18.

Table 18. Seasonal catches of Warm Springs pupfish in Ash Meadows springs (Scoppettone et al. 2011, 2012).

System	Season	Pupfish Numbers
North Scruggs spring-pool	Spring 2008	7
	Summer 2008	16
North Scruggs stream	Fall 2007	86
	Winter 2008	84
	Spring 2008	81

System	Season	Pupfish Numbers
	Summer 2008	115
	Fall 2010	95
	Spring 2011	58
South Scruggs spring-pool	Fall 2007	17
	Spring 2008	4
	Summer 2008	2
	Fall 2010	1
South Scruggs stream	Fall 2007	40
	Winter 2008	57
	Spring 2008	52
	Summer 2008	51
	Fall 2010	120
	Spring 2011	93
Marsh spring-pool	Spring 2008	1
Marsh stream	Fall 2007	168
	Winter 2008	171
	Spring 2008	141
	Summer 2008	152
	Fall 2010	64
	Spring 2011	123
North Indian spring-pool	Winter 2008	1
	Spring 2008	1
	Summer 2008	1
North Indian stream	Fall 2007	79
	Winter 2008	34
	Spring 2008	35
	Summer 2008	32
School spring-pool	Fall 2007	19
	Winter 2008	4
	Summer 2008	6
	Fall 2010	13
	Spring 2011	2
School ponds	Fall 2007	294
	Winter 2008	267
School stream	Fall 2007	62
	Winter 2008	116
	Summer 2008	177
	Fall 2010	252
	Spring 2011	329

Recovery Needs

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada, including the Warm Springs pupfish.

Delisting of the Warm Springs pupfish will be considered when the following criteria are met for a five year period:

1. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
2. Each individual spring or stream population of Warm Springs pupfish have sex ratios and juvenile-to-adult ratios that support self-sustaining populations.

Section 7: Environmental Baseline

Environmental baseline refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

7.1 Action Area

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 CFR § 402.02). While the definition of the action area includes mention of direct and indirect effects, the updated Endangered Species Act regulations (84 FR 44976) combine these into "all effects." Even though we discuss separate categories of effects, this biological opinion complies with the new regulations. Subsequent analyses of the environmental baseline, effects of the action, cumulative effects, and levels of incidental take are based upon the action area as determined by the Service. Regulations implementing the Act define the environmental baseline as the past and present effects of all Federal, State, or private actions and other human activities in the action area (50 CFR § 402.02). Also included in the environmental baseline are the anticipated effects of all proposed Federal projects in the action area that have undergone section 7 consultation, and the effects of state and private actions that are contemporaneous with the consultation in progress.

The action area includes all land managed by the SNDO and other lands if a nexus to BLM is established with BLM oversight. The action area is located in southern Nevada and is bordered on the north by Lincoln County, Nevada; on the east by Mohave County, Arizona; and on the west and southwest by San Bernardino and Inyo counties, California. Elevations within Clark County range from 450 ft above mean sea level along the Colorado River to 11,900 ft at Charleston Peak. Ash Meadows NWR is included in the action area because many Ash Meadows species may be directly or indirectly affected by BLM actions that may occur as a result of ROWs, surface water or groundwater use, or various fire and resources-related activities.

Much of the district remains remote and rural, with the human population distributed over large areas or clustered in small communities. Public uses of these resources involve scenic, recreational, mineral, archeological, wilderness, wildlife, and vegetative activities. Communities and developments such as Laughlin are expanding along the Colorado River, providing jobs and recreational opportunities in previously undeveloped areas.

The Las Vegas Valley portion of the district is a major topographic feature, trending north-south through the middle of the planning area. This valley has a burgeoning metropolitan area, consisting of the cities of Las Vegas, North Las Vegas, Henderson, and Boulder City. Las Vegas Valley is home to the majority of the state's population (68 percent in 2007). In 2018, the city of Mesquite had a population of 19,079, which is a 24.9 percent increase since 2010.

The 2018 population of Clark County was 2.23 million. The majority of that county's population resides within Las Vegas Valley. Except for the Las Vegas Valley, Boulder City, and Mesquite, the remainder of the county is sparsely populated and similar in character to the rural southern portion.

Nye County, located in south central Nevada, is the largest county in Nevada and one of the largest in the U.S. with over 11 million acres. It is bordered by eight other Nevada counties and California. Southern Nye County is dominated by the Nevada Test and Training Range. Nye County is predominately rural and sparsely populated. U.S. Highway 95 crosses through southern Nye County. Local trucking companies move much of the freight through Nye County, and there is no railroad access. There are two airplane runways located in the action area within Nye County at Beatty and Pahrump. None of these are commercial airports.

With an estimated population of 45,346 in 2018 and a total area of 18,147.2 mi^2, population density for Nye County is about 2.5 persons per mi^2. Federal ownership of land within Nye County totals 8,560,733 ac, or nearly 74 percent of the land base. Approximately 700,000 acres are managed by the SNDO. Pahrump is primarily a residential rural community.

The service industries are the single most important employers and income producers for the two counties, with Federal and State government providing the second largest source of income for Clark County and the third most important source for Nye County. The high incidence of mining in Nye County makes mineral production the county's second most important source of income and its third most important employer. The predominance of service industries is explained primarily by gaming employment in Clark County. In Nye County, the service industry is attributed to civilian employment of private firms providing contractual services to the U.S. military facilities. Approximately 38.85 million visitors came to Las Vegas in 2018 (https://www.lvcva.com/stats-and-facts/visitor-statistics/).

The Nye County economy is based on Federal employment (e.g., Nevada National Security Site), mining, recreation, tourist highway travelers, and retiree income (BLM 1998). The service industry is the number one employer and income producer in both Pahrump and Amargosa Valley. In Pahrump, the service industry is followed by the retail trade and manufacturing industries in producing income and employment. Due to its reputation as a retirement center and its close proximity to Las Vegas, Pahrump is expected to continue attracting new residents. In Amargosa Valley, the service industry is followed by mining, retail trade, and agriculture in producing income and employment (BLM 1998).

Biological Opinion for the Mesquite Land Act

On July 3, 2002, the Service issued a biological opinion to the BLM Las Vegas Field Office on their proposed sale of 10,620 ac of BLM land to the City of Mesquite, Nevada. The proposed land sale would adversely affect the woundfin and its critical habitat, Virgin River chub and it critical habitat, southwestern willow flycatcher, Yuma clapper rail, and desert tortoise. The BLM committed to the following conservation measures in the biological opinion:

- BLM will ensure the City’s ordinance number, 270, will be in place prior to issuance of the land patent to the City. The ordinance will include specific conservation measures designed to protect federally-listed species, including the City’s participation in a hydrologic monitoring and mitigation plan and pursuing an amendment of the MSHCP to cover the Virgin River Species. If that amendment is denied, the City will develop and apply for an individual Habitat Conservation Plan (HCP) to cover the identified federally-listed species not currently covered under the MSHCP.

- BLM will actively participate on the Virgin River Recovery Implementation Team. This team is responsible for development and implementation of the Lower Virgin River Recovery and Implementation Program. The goal of this plan is to develop a strategy and secure funding for the long-term conservation and eventual recovery of listed species within the Virgin River flood plain by focusing on elimination of threats and restoration of habitat.

- BLM will commit to participating in the development and implementation of the Hydrologic Monitoring and Mitigation Plan for the Lower Virgin River Basin, as it relates to actions authorized or taken on public lands, and will employ best efforts to achieve the goals of the Lower Virgin River Recovery and Implementation Program.

- BLM will continue to participate with the Service, The Nature Conservancy, and Clark County in developing and implementing the Mormon Mesa and Gold Butte Conservation Management Plans.

7.2 Desert Tortoise

Status of the Desert Tortoise in the Action Area

The action area lies mostly within the Northeastern and Eastern Mojave Recovery Units, with a small portion within the Colorado Desert Recovery Unit. They are described in the revised desert tortoise recovery plan (Service 2011a). Desert tortoise surveys were not conducted in support of this PBO; therefore, project-level analysis will include relevant survey data when projects are proposed to occur under this PBO. The status of the desert tortoise in the action area for this PBO is based on a landscape-level assessment and existing data as described below.

Population Monitoring Data in the Action Area

In 1999, the Desert Tortoise Management Oversight Group endorsed the use of line distance sampling as the most appropriate method for estimating rangewide desert tortoise density. Fifteen monitoring strata were established which approximate the boundaries of the CHUs.

Desert tortoise population monitoring began rangewide in 2001. Long-term monitoring of desert tortoise population growth and distribution, habitat quality and quantity, and the presence and intensity of threats to the desert tortoise are recovery actions identified in the revised recovery plan (Service 2011a).

Desert tortoise density estimates are generated separately for each monitoring stratum, then weighted by stratum area to arrive at average density in the monitored area of each recovery unit. When the annual estimates are imprecise, it should not be expected that there will be a close match from one year to the next. Over a period of many years, however, any underlying trend in the number of tortoises should be obvious.

Service (2016b, 2018a) desert tortoise monitoring data included the five strata in the action area, Beaver Dam Slope, Coyote Spring Valley, Gold Butte-Pakoon Clark, Mormon Mesa, and Piute-Eldorado. The monitoring strata approximate the CHUs and desert tortoise ACECs and represent the 1994 delineation of recovery units which would not include the Colorado Desert Recovery Unit. The results are provided in Table 19. For additional or updated information on desert tortoise population monitoring, visit the Desert Tortoise Recovery Office website at: https://www.fws.gov/nevada/desert_tortoise/dtro/dtro_monitor.html

Table 19. Desert tortoise density estimates for strata in the action area (Service 2016b, 2018a).

Recovery Unit	Stratum	Area Sampled (mi^2/km^2)	Number Transects	Total Transect Length (mi/km)	No. Tortoises Observed	Density Estimate (mi^2/km^2)
NE Mojave	Beaver Dam Slope	320/828	33	227/365	3	3.4/1.3

Recovery Unit	Stratum	Area Sampled (mi^2/km^2)	Number Transects	Total Transect Length (mi/km)	No. Tortoises Observed	Density Estimate (mi^2/km^2)
	Coyote Springs Valley*	396/1,025	54	368/593	26	10.9/4.2
	Gold Butte-Pakoon	763/1,977	72	439/706	8	4.9/1.9
	Mormon Mesa*	374/968	42	285/458	7	5.5/2.1
Eastern Mojave	Eldorado Valley	445/1,153	86	584/940	38	14.6/5.6

*Data is from Service 2016b. The remaining data is from Service 2018a.

Factors Affecting the Desert Tortoise in the Action Area

Before the 84320-2010-F-0365 PBO was issued for the action area, the Service issued the biological opinions identified in Appendix C to Federal agencies for projects or actions that resulted in substantial desert tortoise effects (e.g., more than 100 ac habitat disturbance). The resulting effects to the environmental baseline for the desert tortoise expressed in acreage of habitat disturbance are discussed by programs below. The number of desert tortoises killed or injured as a result of the projects or actions covered under the biological opinions is given as reported for each project. The reported numbers may not be precise, though, due to the difficulty in locating desert tortoises, particularly hatchlings and juveniles. The Service often relies on desert tortoise density estimates and habitat disturbance as a surrogate for mortality take, particularly for large disturbances. For information on the environmental baseline prior to November 1997, refer to the previous PBOs: 1-5-96-F-023, 1-5-97-F-251, and 1-5-98-F-053.

NLAA Boundary

BLM completed an informal not likely to adversely affect (NLAA) consultation (08ENVS00-2017-I-0132) with the Service on an inner boundary within the larger disposal boundary (Figure 29 Appendix B). This inner boundary evaluated 6,228 acres of land identified to be disposed of through R&PP leases and land sales. Parcels inside this boundary vary in size, are heavily impacted due to their proximity to human development, and are surrounded by an urban complex of roads, housing, and infrastructure. The proposed parcels display widespread habitat degradation from the edge effects of being in close proximity to urban areas and show heavy signs of use from pets, walking, hiking, biking, off road vehicle use, and illegal dumping. Furthermore, parcels are cutoff from contiguous desert tortoise habitat by urbanization with no possibility of having connectivity restored.

BLM proposes to continue to dispose of lands as outlined in the RMP within the NLAA inner boundary and will track and include the numbers of acres disposed of in the annual report, but under this informal consultation project. These acres are not included in this PBO. Local governments and non-profit organizations lease land for appropriate facilities such as schools, parks, police stations, and churches. Once the facilities are constructed, the land can be patented to the entity with a reversionary interest to the United States. Lands leased under the authority of the R&PP Act remain under the jurisdiction of the BLM until a patent is issued. The BLM authorizes ROWs on BLM lands for a variety of uses including, but not limited to, roads, electrical transmission lines, telephone and fiber optic lines, sewer lines, water lines, natural gas pipelines, communication sites, flood control, electrical power plants and substations, and related power distribution lines.

Land Sales and Conveyance

The SNDO authorized approximately 21 land disposal (sale) actions totaling approximately 6,511 ac within non-critical desert tortoise habitat from 2013 through 2018. These lands are no longer managed in accordance with Federal policy unless a nexus is established to a Federal action (e.g., a permit proposed to be issued by the Corps of Engineers under section 404 of the Clean Water Act). The effects to the desert tortoise and incidental take exemption would typically fall under purview of section 10 of the Act.

Tule Springs Land Bill

On February 23, 2016, the Tule Springs Land Bill was appended to the PBO for the disposal of 4,698.91 acres. Bill H.R. 3979, was enacted as Public Law 113–291 on December 19, 2014. Section 3092 of the public law states that BLM must convey the following:

- approximately 42.03 acres to the Nevada System of Higher Education, Board of Regents, for construction of a College of Southern Nevada
- approximately 274.43 acres of public land to the Nevada System of Higher Education for construction of a college campus in Pahrump, Nevada
- approximately 640 acres to the City of Las Vegas for a Job Creation Zone
- approximately 2030 acres to the Board of Regents for construction of a University of Las Vegas North Campus
- approximately 669.17 acres to the City of North Las Vegas for a Job Creation Zone
- approximately 960 acres to Clark County for an Off-Highway Vehicle Park
- approximately 83.28 acres to Las Vegas Metropolitan Police Department for Police Shooting Range

As the actions that will directly impact the desert tortoise and their habitat will occur on private lands, all direct effects will be minimized and mitigated under the purview of the Clark County MSHCP and an associated Section 10(a)(1)(B) permit.

Leases and Patents

The SNDO authorized approximately 30 R&PP actions totaling 640 ac within non-critical desert tortoise habitat from 2013 through 2018. Lands leased under the authority of the

R&PP Act remain under the jurisdiction of BLM and section 7 consultation requirements until a patent is issued.

Other Land-Use Authorizations

Other land-use authorizations encompass various activities including research projects, field trips, class use, and apiary sites. The SNDO authorized approximately 14 actions totaling 5 acres of new disturbance within non-critical desert tortoise habitat from 2013 through 2018.

Rights-of-Way

From 2013-2017, the SNDO authorized approximately 347 linear ROWs and 44 site-type ROWs actions totaling 2,776 acres of new disturbance within non-critical desert tortoise habitat for the construction or expansion of buried natural gas or water pipelines, sewers, power, fiber-optic cables, or roadways.

Major transportation facilities that transect tortoise habitat in the action area include: Interstates 15, 215, and 515; U.S. Highways 93 and 95; SR 160, 161, 163, 164, 165, 168, and 169; and the Union Pacific Railroad. Other paved and unpaved roads form a network of roads and public access into desert tortoise habitat.

The Las Vegas RMP (1998) established a limitation for vehicular travel within all ACECs within Clark County to protect the desert tortoise and its critical habitat. In this plan, vehicle use within the four desert tortoise ACECs was limited to designated roads and trails. BLM identified new illegal roads and trails created in all these ACECs. Efforts are underway to inventory existing roads and trails and complete the designation of roads. The inventory of 906 mi of routes and 1,724 features was completed in 2007. BLM designated 812 mi of roads as open and 94 mi of roads as closed on July 15, 2008. Following road designation, BLM began signing the open routes and signing and restoring closed road segments including restoration of habitat damage created by vehicles traveling off designated roads.

<u>Desertlink (Southern Nevada Intertie Project)</u>

On November 7, 2014, the Service appended the Desertlink Project (previously Southern Nevada Intertie Project [SNIP]; 84320-2015-F-0034) to the PBO. The project involved a BLM ROW grant to construct, operate, and maintain a 60-mile, 500-kilovolt power transmission line between Harry Allen and Eldorado substations resulting in approximately 652 acres of desert tortoise habitat disturbance. The Service concluded that during construction two adult or subadult and three juvenile desert tortoises may be killed or injured; 45 desert tortoises captured and moved; and five desert tortoises could be temporarily penned. During operation and maintenance, the Service concluded one adult or subadult may be killed or injured for the life of the project; one juvenile may be killed or injured per year; five adult, subadult, or juveniles may be captured and moved; and one desert tortoise could be temporarily penned. On June 23, 2017, the biological opinion was amended to reduce the new tower construction from 60 linear miles to 42 miles (84320-2015-F-0034.AMD1).

Temporary disturbance was reduced from 407.3 acres to 363.4 acres and permanent disturbance was reduced from 227.4 acres to 184.3 acres. On June 18, 2019, the Service reinitiated consultation to implement new and revised minimization measures and increase incidental take to five for juveniles during construction (84320-2015-F-0034.R001). On November 13, 2019, the Service reinitiated consultation for a second time to implement new and revised minimization measures and increase incidental take to 12 for juveniles during construction (84320-2015-F-0034.R002).

The Eastern Nevada Transmission Project

The Eastern Nevada Transmission Project (ENTP; 84320-2015-F-0386) includes the construction, operation, and maintenance of a 230-kilovolt transmission line consisting of 21 miles of above-ground transmission line stretching from the western terminus at the Gemmill substation near Coyote Springs to the eastern terminus at the Tortoise substation near Moapa and 33 miles of above-ground transmission line stretching from the northern terminus at the Silverhawk substation near Apex to the Newport substation near Henderson. The project would occur on land administered by the BLM, Bureau of Reclamation (BOR), and on private lands. Construction is anticipated to take approximately 24 months.

In its entirety, the project would include approximately 54 miles of new and upgraded 10-foot-wide roads; approximately 350 structure bases with structure work areas, each 100 by 200 feet; 350 counterpoise ground trenches, each 1 by 200 feet; 28 wire-pulling and tensioning sites, each 130 by 500 feet; and 5 construction yards, each 5 acres. For the Gemmill to Tortoise segment, these project features would result in the disturbance of approximately 58.4 acres of designated desert tortoise critical habitat and 61.0 acres of non-critical habitat. For the Silverhawk to Newport segment, the features would result in the disturbance of only non-critical desert tortoise habitat with approximately 129.1 acres occurring on BLM-managed land, 29.22 acres on BOR-managed land, and 18.0 acres on private lands.

The Service concluded that during construction one adult or subadult and one juvenile desert tortoise may be killed or injured; 25 desert tortoises captured and moved; and five desert tortoises could be temporarily penned. During operation and maintenance, the Service concluded one adult, subadult, or juvenile may be killed or injured for the life of the project; five adult, subadult, or juveniles may be captured and moved per year; and one desert tortoise could be temporarily penned per year. Construction has not yet started.

ON Line / Southwest Intertie Project

The ON Line/ Southwest Intertie Project (1-5-93-F-91, 1-5-94-F-28R, 84320-2008-F-0066, 84320-2010-F-0391.AMD, 84320-2013-F-0138.R5) is a 500-kilovolt (kV) transmission line from a new substation at the southern terminus of the project in Dry Lake Valley in Clark County, north to the northern extent of desert tortoise habitat in Lincoln County. The proposed project would result in the removal and disturbance of 676 acres of desert tortoise non-critical habitat in Clark and Lincoln Counties.

The Service concluded that during all project activities no adult or subadult tortoises and six juvenile desert tortoises may be killed or injured and 50 adults, subadults, or juveniles may be captured and moved. A project completion report submitted on December 3, 2015, documented 471 acres of actual project disturbance (179 acres of non-critical habitat and 292 acres of critical habitat). The report also documented the observance of 227 tortoises, 42 tortoises were captured and moved out of harm's way and 2 tortoises were killed by vehicles.

Transwest Express Transmission Line Project

The Transwest Express Project (TWE; 06E13000-2014-F-0052a and 84320-2015-F-0610) includes the construction, operation, and maintenance of approximately 728 miles of new 600-kV direct current (DC) transmission line within a 250-foot right-of-way (ROW) that will deliver approximately 3,000 megawatts of electric power from renewable and non-renewable energy sources in south-central Wyoming near Sinclair, Wyoming to the Eldorado Valley south of Boulder City in southern Nevada. The TWE Project also includes the construction of a northern and southern terminal, construction and improvement of access roads, and installation of ancillary facilities including 12 to 15 fiber optic communication and regeneration facilities and two ground electrode systems. The TWE Project includes pre-construction activities, environmental surveys, engineering surveys, geotechnical investigations, and construction activities of the towers and ancillary facilities, operations and maintenance, and decommissioning.

The proposed project would result in the removal and disturbance of desert tortoise designated critical habitat and non-critical habitat in Clark and Lincoln Counties. Approximately 364 acres of designated critical habitat for desert tortoise would be disturbed during construction of the TWE transmission line and its associated facilities, 292 acres in the Mormon Mesa CHU and 72 acres in the Beaver Dam Slope. Approximately 1,382 acres of non-critical desert tortoise habitat would be disturbed during construction of the proposed project (for all landowners in Clark and Lincoln counties). Total BLM SNDO acres of disturbance include 183 acres of designated critical habitat and 782 acres of non-critical habitat.

The Service concluded that during construction no adults or subadults and four juvenile desert tortoises may be killed or injured and 47 adults or subadults may be captured and moved. During operation and maintenance, the Service concluded that no adults or subadults and one juvenile tortoise may be killed or injured in one calendar year or three juvenile tortoises for all activities during the life of the project. Construction has not yet started.

Sheep Mountain Parkway

The Service appended the Sheep Mountain Parkway project to the PBO on February 11, 2014 (84320-2014-F-0090). The project is for construction of a paved roadway to connect the 215 Beltway with Kyle Canyon Road. The project was reinitiated on January 11, 2018 (84320-2014-F-0090.R001) to include more acres. The total project will disturb 202.07 acres of non-critical habitat. A tortoise translocation plan is required for this project. The Service concluded that during construction two adults or subadults and four juvenile desert tortoises may be killed or injured and 39 adult or subadult desert and 20 juvenile tortoises may be captured and moved. Construction has not yet begun.

Renewable Energy

To date, the Service has issued biological opinions to BLM for ROWs to construct, operate, and maintain an energy storage project and solar energy projects in the action area. The Service also issued a PBO to BLM for proposed solar energy development within Solar Energy Zones (SEZ), two of which occur within the action area.

ARES Regulation Energy Management Facility

The Advanced Rail Energy Storage Nevada, LLC project (ARES; 84320-2016-F-0010) includes the construction, operation, and maintenance of a regulation energy management facility. The project would disturb 106 acres of non-critical tortoise habitat. The Service concluded that during construction no adults, subadults, or juveniles may be killed or injured and 11 adults, subadults, or juveniles may be captured and moved. During operation and maintenance, the Service concluded that no adults, subadults, or juvenile tortoises may be killed or injured during the life of the project and one adult, subadult, or juvenile tortoise may be captured and moved per year for the life of the project. Construction has not yet started.

There are two SEZs for solar energy development within the action area: Dry Lake SEZ and Amargosa SEZ. The USGS desert tortoise model (Nussear et al. 2009) identifies the entire Dry Lake SEZ as having overall high habitat suitability for desert tortoise (suitability score greater than or equal to 0.5 out of 1.0). On the basis of surveys conducted in the adjacent Mormon Mesa CHU, the Dry Lake SEZ may support up to 213 desert tortoises. The Amargosa SEZ is located in the Amargosa Desert. The Amargosa SEZ includes a variety of land use types such as secondary and unimproved roads, trails, pipelines, electrical transmission lines, utility corridors, and other facilities developed around the Amargosa Farms community. Much of the habitat within the SEZ is considered to be highly suitable for desert tortoise (suitability score greater than or equal to 0.5 out of 1.0). There has been no construction in the Amargosa SEZ.

NV Energy Dry Lake Solar Energy Center

On May 1, 2015, the Service issued a biological opinion (84320-2015-F-0161; Service 2015d) to the BLM for the NV Energy Dry Lake Solar Energy Center Project. The project involves the construction, operation and maintenance, and decommissioning of a 130 MW PV solar project on 751 acres of BLM lands within the SEZ. Other facilities include an access road and gen-tie line pads, construction areas, and pull sites.

Desert tortoise pre-project surveys documented four adult and subadult desert tortoises on 945 acres and the 55 acres for the Dry Lake Solar Energy Center at Harry Allen Project. The biological opinion identified a threshold of six adult and subadult and 39 hatchling and juvenile desert tortoises could be taken by capture within this area of the project. Incidental take for mortality or injury was identified as no more than one adult during construction and no more than one adult per year or three adults over the lifetime of the project.

On October 18, 2018, the Service amended consultation (84320-2015-F-0161.AMD1) to reduce the acres of project disturbance from 751 acres to 660 acres. This project has not yet been constructed.

NV Energy Dry Lake Solar Energy at Harry Allen

On May 1, 2015, the Service issued a biological opinion (84320-2015-F-0162; Service 2015d) to the BLM for the NV Energy Dry Lake Solar Energy Center at Harry Allen Project. The project involves the construction, operation and maintenance, and decommissioning of a 20 MW PV solar project on 155 acres of BLM lands within the SEZ. One hundred acres are previously disturbed and fenced, leaving 55 acres of new disturbance for the project.

Desert tortoise pre-project surveys completed for the Dry Lake Solar Energy Center Project included the acres for this project and documented one adult tortoise on the 55 acres. The biological opinion identified a threshold of two adult and subadult and 13 hatchling and juvenile desert tortoises could be taken by capture within this area of the project. Incidental take for mortality or injury was identified as no more than one adult during construction and no more than one adult per year or two adults over the lifetime of the project.

On June 28, 2018, the BLM informed the Service that the project will be reducing the acres of disturbance from 55 to zero, as no disturbance will occur on lands that are not previously disturbed. Based on this information, the Service considers the project to be completed.

Invenergy Harry Allen Solar Energy

On May 1, 2015, the Service issued a biological opinion (84320-2015-F-0163; Service 2015d) to the BLM for the Invenergy Harry Allen Solar Energy Project. The project involves the construction, operation and maintenance, and decommissioning of a 112 MW PV solar project on 594 acres of BLM lands within the SEZ. Other facilities include an access road and gen-tie line pads, construction areas, and pull sites.

Desert tortoise pre-project surveys documented 17 adult and subadult desert tortoises on 725 acres. The biological opinion identified a threshold of 32 adult and subadult and 210 hatchling and juvenile desert tortoises could be taken by capture within this area of the project. Incidental take for mortality or injury was identified as no more than one adult during construction and no more than one adult per year or three adults over the lifetime of the project.

On July 5, 2018, the Service amended consultation (84320-2015-F-0161.AMD1) to increase the project size from 594 to 640 acres. All 640 acres were surveyed during pre-project surveys, so incidental take was not changed from the original. This project has not yet been constructed.

Playa Solar 1 & 2

On May 1, 2015, the Service issued a biological opinion (84320-2015-F-0139; Service 2015d) to the BLM for the Playa Solar Project under the intra-Service PBO for the Proposed Muddy River MOA (1-5-05-FW-536, Tier 7). The project involves the construction, operation and maintenance, and decommissioning of a 200 MW PV solar project on 1,521 acres of BLM lands within the Dry Lake Solar Energy Zone (SEZ) and 3.67 acres of private land. Other facilities include access roads, a 230-kV gen-tie line, a distribution power line, a fiber-optic communications cable, a well, and a pipeline. The project would require up to 1,350 acre feet of water for construction and operations.

Desert tortoise pre-project surveys documented 18 adult and subadult desert tortoises on 2,150 acres. The biological opinion identified a threshold of 34 adult and subadult and 224 hatchling and juvenile desert tortoises could be taken by capture within this area of the project. Incidental take for mortality or injury was identified as 3 for adults and subadults during construction and no more than 2 adults per year or 6 over the lifetime of the project.

On March 16, 2016, the Service reinitiated consultation (84320-2015-F-0139.R001) and included amendments for the project because of changes in several project features: issuing two ROW grants to establish a Playa 1 (625 acres) and Playa 2 (959 acres), adding a temporary aboveground waterline from the well site on Reservation land to the Playa Solar construction site, increasing disturbance from 1,521 acres to 1,538 acres, and expanding the translocation site by 2,867 acres. The groundwater required for the projects was reduced from 1,350 to 675 acre feet. New site access from US Highway 93 was also requested.

The incidental take threshold for desert tortoise injury and mortality increased from 34 to 44 adult tortoises for construction. Incidental take for operation and maintenance was split between Playa 1 and Playa 2. Playa 1 injury and mortality take was identified as no more than one adult tortoise per year or two adults over the lifetime of the project, and Playa 2 take was identified as no more than one adult tortoise per year or three adults over the lifetime of the project.

On April 27, 2016, the Service amended the reinitiation of consultation for the project (84320-2015-F-0139.R001.AMD1) due to the expansion of the translocation recipient area to 2,867 acres. The amendment modified and replaced the language in the reinitiation to specify and confirm health assessments of resident tortoises in the expansion area. The Service estimated that 60 adult tortoises may occur in the expanded area based on the estimate of 13.5 tortoises per square mile.

The Playa Solar Project has been constructed and a final project report was submitted on October 15, 2016. There were 77 tortoises translocated (42 adults and 35 juveniles). Two mortalities were documented outside of the project area and were not project related.

<u>K Road Moapa Solar Energy Project</u>

In 2012, the Service issued a biological opinion (84320-2011-F-0430) to the Bureau of Indian Affairs (BIA) for the K Road Moapa solar energy project under the intra-Service PBO for the Proposed Muddy River MOA (1-5-05-FW-536, Tier 5). The project involved the Tribe leasing land to a private applicant for the construction of a PV solar generating station 30 miles northeast of Las Vegas in Clark County. The BIA approvals included the lease of Tribal land and grant of easement for ROW for the access road, 12-kV transmission line, and water pipeline. The BLM issued ROW grants for an up to 500-kV transmission line and improvement of an existing access road. The project area is located on approximately 2,241 acres of land within the Reservation and 12 acres on BLM land within the utility corridor (total of 2,153 acres). All components, with the exception of power transmission lines, access roads, firebreak and water pipeline, will be developed within the fenced 2,000-acre solar facility. Power and water transmission lines include an approximate 5.5-mile electric transmission line corridor (200 feet wide), an approximate one-mile water pipeline corridor (25 feet wide), and an approximate three-mile 12-kV transmission line (25 feet wide) to the Moapa Travel Plaza. The project also includes a 6,000-acre conservation site to receive displaced tortoises and two additional evaluation areas for short-term use (5 years or less) associated with translocation of the tortoises. The Tribe will conserve the established home ranges of most translocated tortoises, up to 6,000 acres, at least until the lease on the 2,000-acre solar site ends.

Desert tortoise pre-project surveys estimated that 25 to 103 adult and subadult desert and 20 to 83 hatchling and juvenile tortoises would occur in the 2,000-acre K Road solar facility boundary; thus, the biological opinion identified a threshold of 103 adult and subadult and 83 hatchling and juvenile desert tortoises could be taken by capture within this area of the project. On April 13, 2013, the BIA reinitiated consultation for the project because 98 of the 103 subadult and adult desert tortoises had been captured in the solar facility boundary, and the final capture number was anticipated to exceed the identified 103 threshold. Based on the information in the reinitiation request, the Service revised the incidental take threshold and identified that no more than 120 adult and subadult tortoises would be captured and translocated from the solar facility boundary (File No. 84320-2011-F-0430.R001). As reported on June 1, 2018, final project incidental take resulted in the capture of 117 adults and subadults and 60 hatchlings and juveniles.

Vegetation Management

The Mojave Desert Burned Area Restoration of desert tortoise habitat (08ENVS00-2016-F-0069) includes actions to revegetate, recover, and reduce future fire risk to previously burned desert tortoise habitat within areas that burned in the 2005 Southern Nevada Complex Fire in tortoise habitat within Red Rock Canyon National Conservation Area and Southern Nevada District Office. Acres of treatment within the Southern Nevada District Office include 271.5 acres of designated critical habitat and 452.5 acres of non-critical tortoise habitat. Planting and herbicide actions started in summer and fall of 2017, respectively.

Mining Activities

In 2009, BLM withdrew approximately 944,343 ac of public lands in the action area from settlement, sale, location, entry, or patent under the United States mining law. This important conservation achievement reduced the threat to desert tortoises as a result of mining including direct mortality, injury, habitat loss and degradation, environmental contaminants, non-native plants, and road effects. The SNDO authorized approximately 47 actions totaling 812 ac of disturbance within non-critical desert tortoise habitat for permits, leases, or contracts within the mineral management program from 2013 through 2018.

Recreation and Roads

Annually, the SNDO issues approximately 60 SRPs for various uses. Permitted uses range from speed-based OHV races to non-speed organized group activities including tours and rocket launches. The SNDO has authorized approximately 161 recreation actions totaling 26 acres of disturbance from 2013 through 2018 within non-critical desert tortoise habitat.

An extensive road network exists in the action area ranging from two-track routes to major interstate highways. Roads provide access to large tracts of public land for recreational use. Desert tortoise injuries and mortalities occur throughout the action area as a result of vehicle encounters that mostly go undetected.

In 1994, BLM began to inventory and designate roads on public lands in Clark County (Figure 30 Appendix B). In 2003-2005, BLM completed an inventory of all roads and trails in the following ACECs: Coyote Spring, Gold Butte (all 7 ACECs), Mormon Mesa, and Virgin River totaling 981 mi. In 2007-2008, BLM completed an inventory of roads and trails over 1.8 million ac within Clark County totaling 9,228 mi mapped and 899 mi digitized from satellite imagery. In 2011, BLM began inventory of routes in Nye County which will continue when funding is available.

It is estimated that the BLM SNDO contains approximately 812 miles of open roads and trails in ACECs, 5,000 miles of open roads and trails within the district outside of ACECs, and 4,000 miles of motorcycle trails.

On January 28, 2011, BLM published the Notice of Intent for Recreation Area Management Plans and Comprehensive Transportation and Travel Management plans. This effort will result in route designations for motorized and non-motorized recreation throughout Clark County outside the ACECs listed above.

Livestock Grazing

The SNDO currently administers five active grazing allotments (Figure 24 Appendix B), three of which are currently grazed (Table 20). There are four additional allotments managed by the Arizona BLM Field Office that partially cross into eastern Nevada, near Mesquite and are not considered in this consultation.

Table 20. Active grazing allotments in the action area.

Allotment	Acres	Number of Cattle
Flat Top Mesa (actively grazed)	3,850	4 horses
Muddy River	27,282	0
Lower Mormon Mesa (actively grazed)	48,010	50 cattle
Hidden Valley (actively grazed)	56,202	80 cattle
Wheeler Wash	64,303	0

Fire Management and Wildfire

BLM manages fire on approximately 3,332,000 ac of public land. Since 2013, the SNDO has not implemented or authorized any actions with new disturbance within non-critical desert tortoise habitat. Between 1980 and 2003, approximately 63,000 ac of BLM-managed land burned within the SNDO planning area. The largest fire recorded was 12,050 ac (4,876 ha). In 2005, a total of eight fires in the Southern Nevada Complex Fire Incident (seven ignited by lightning and one by humans) burned approximately 103,328 ac within the SNDO planning area. Five of these occurred in desert tortoise critical habitat (see biological opinion 1-5-05-F-526).

Emergency consultation was completed for the White Rock fire in 2013 (84320-2013-F-0277). One hundred acres of tortoise designated critical habitat in Gold Butte Part A ACEC were backburned to contain the wildfire and prevent additional habitat from burning.

BLM and USGS in Nevada have also implemented emergency rehabilitation projects after wildfires (DeFalco et al. 2007). Because natural plant succession is variable over time subsequent to disturbance, land managers and researchers attempt to facilitate revegetation of disturbed sites and typically observe mixed results (Ostler et al. 2002; Abella et al. 2007; DeFalco et al. 2007). Site treatment, soil amendments, timing of the projects, and the environmental conditions all work to influence effectiveness of these efforts.

Desert Tortoise Training and Research Center

The 222-acre facility provides a site for desert tortoise training, temporary tortoise holding and health assessments, research, headstarting, and support for population augmentation. Ill or injured tortoises may be rehabilitated then returned to the wild, which includes tortoises taken as a result of BLM actions within the scope of this PBO.

Habitat Conservation Plans and Associated Incidental Take Permits

Since the Mojave population of the desert tortoise was first listed under the Act in 1989, three regional-level habitat conservation plans (HCPs) have been implemented for development of desert tortoise habitat in Clark County, Nevada. Approximately 89 percent of

Clark County includes public lands administered by the Federal government, thereby providing little opportunity for mitigation for the loss of desert tortoise habitat under an HCP on non-Federal lands. Alternatively, funds are collected under HCPs and spent to implement conservation and recovery actions on Federal lands as mitigation for impacts that occur on non-Federal lands. Lands administered by BLM are included in these areas where mitigation funds are used to promote recovery of the desert tortoise.

On July 11, 1995, the Service issued a section 10(a)(1)(B) incidental take permit (PRT-801045) under the Act to Clark County, Nevada, including cities within the county and the Nevada Department of Transportation (NDOT). The permit became effective August 1, 1995, and allowed the incidental take of desert tortoises for a period of 30 years on 111,000 ac of non-Federal land in Clark County and approximately 2,900 acres associated with NDOT activities in Clark, Lincoln, Esmeralda, Mineral, and Nye counties, Nevada. The Clark County Desert Conservation Plan (DCP) served as the permittees' HCP and detailed their proposed measures to minimize, monitor, and mitigate the effects of the proposed take on the desert tortoise (RECON 2000). The permittees imposed, and NDOT paid, a fee of $550 per ac of habitat disturbance to fund these measures. The permittees expended approximately $1.65 million per year to minimize and mitigate loss of desert tortoise habitat. The majority of these funds were used to implement minimization and mitigation measures, such as increased law enforcement; construction of highway barriers; road designation, signing, closure, and rehabilitation; and tortoise inventory and monitoring within the lands initially conserved during a preceding short-term HCP, and other areas being managed for desert tortoise recovery. The benefit to the species, as provided by the DCP, minimized and mitigated some adverse effects to the desert tortoise within the permit area and contributed to recovery of the desert tortoise. Actions funded by the DCP that provided the most benefit to the desert tortoise include the purchase of livestock grazing allotments, desert tortoise translocation projects, and construction of tortoise barriers along highways.

On November 19, 2000, the Service issued the Intra-Service Biological and Conference Opinion on Issuance of an Incidental Take Permit to Clark County, Nevada for a MSHCP (1-5-00-FW-575). On November 22, 2000, the Service issued an incidental take permit (TE-034927) to Clark County, Nevada, including NDOT ROWs and cities within Clark County. This HCP is the only regional HCP in place that overlaps the action area. The incidental take permit allows incidental take of desert tortoise and other covered species for a period of 30 years on 145,000 ac of non-Federal land in Clark County, and within NDOT's ROWs, south of the 38th parallel in Nevada. The MSHCP and EIS (RECON 2000) serve as the permittees' HCP and details their proposed measures to minimize, mitigate, and monitor the effects of covered activities.

As partial mitigation under the MSHCP, the County purchased a conservation easement from Boulder City in 1994. The term of the Boulder City Conservation Easement (BCCE) is 50 years and will be retained in a natural condition for recovery of the desert tortoise and conservation of other species in the area. Certain uses would be prohibited within the BCCE including motor vehicle activity off designated roads, livestock grazing, and any activity that is inconsistent with the purposes of the BCCE. Much of the BCCE also is designated desert tortoise critical habitat. Within the boundary of the BCCE, Boulder City reserved a SEZ for energy development projects in addition to adjacent energy generation facilities described previously.

A HCP for the Valley Electric Association Solar project was completed in August 2015. The project is on 80 acres of private land in southern Nye County. The project is a 15 MW fixed panel photovoltaic solar power generation plant. The project has 76 acres that are mowed, trimmed, or crushed, leaving habitat in place. This area was fenced with openings every 260 feet along the bottom to allow tortoises to remain using the habitat after project installation. The remaining 4 acres was disturbed for permanent infrastructure. Project construction began in 2016. Four tortoises were within the project footprint and moved into holding pens off site. After project completion in 2017, the tortoises were transmittered and released back into the project area. All four tortoises were found both within and outside of the fenced project area in 2018. Two of those tortoises were found using the site in 2019.

A HCP for the Canyon Mesa Solar project was signed in September 2019 and is on 165.6 acres of private land in southern Nye County east of Pahrump. The project is an 18 MW photovoltaic solar power generation plant with integrated battery storage systems and single axis tracking panels. The project will have 88.3 acres that are mowed, clipped, or crushed, leaving tortoise habitat in place. This area will be fenced with openings along the bottom to allow tortoises to remain using the habitat after project installation. The remainder of the project contains 35.7 acres that are previously disturbed and not tortoise habitat, 6.6 acres that will be temporarily disturbed, and 35 acres that will permanently disturbed by project construction. Tortoise surveys completed found no live tortoises, 14 burrows, and two carcasses. Any tortoises found within the construction area will be moved to the closest adjacent habitat area within 300 meters of the project boundary. The incidental take permit estimates that two tortoises may be captured and moved during construction and that two tortoises may be killed or injured within the solar facility in any calendar year and no more than five during the lifetime of the project. This project has not yet been constructed.

Subsidized Desert Tortoise Predators

The metropolitan areas of Las Vegas and Henderson, Mesquite, Pahrump, Boulder City, Searchlight, and Laughlin communities and the casino industry locations at Jean and Primm provide subsidized resources for desert tortoise predators. These areas are adjacent to BLM lands. Esque et al. (2010) found that predation rates were higher near human population concentrations, at lower elevation sites, and for smaller tortoises and females. In 2008, elevated mortality (as high as 43 percent) occurred throughout the range of the Mojave desert tortoise. Esque et al. (2010) hypothesize that low population levels of typical coyote prey (i.e., jackrabbits and other small animals) due to drought conditions influenced high predation rates in previous years. Predation may have been exacerbated in areas with high levels of subsidized predators. Many historical reports of increased predation may indicate that high predation rates are more common than generally considered and may impact recovery of the desert tortoise throughout its range.

As the human presence in the action area increases, the incidence of unrestrained domestic or feral dogs in tortoise habitat may subsequently increase. Predation appears to play an important role in clutch failure (Germano et al. 1994). Bjurlin and Bissonette (2004) found that nest predation was highly variable which may increase due to regular presence of humans, particularly researchers.

Climate Change

The following information concerning climate change is summarized from the revised recovery plan for the desert tortoise (Service 2011a).

Global climate change and drought are potentially important long-term considerations with respect to recovery of the desert tortoise. Recent climatic changes have affected a broad range of organisms with diverse geographical distributions (Walther et al. 2002). Although we do not have information regarding specific direct effects of climate change on the desert tortoise or its habitat, the Intergovernmental Panel on Climate Change has suggested a 6.3 to 7.2 °F increase in annual mean temperature, with the greatest increases occurring in summer (June-July-August mean up to 9 ºF increase; Christensen et al. 2007). Precipitation likely will decrease by 5 to 15 percent annually in the region, with winter precipitation decreasing in the range of 5 to 20 percent (Christensen et al. 2007).

Because germination of the desert tortoise's food plants is highly dependent on stable winter precipitation and temperature, the forage base could be reduced due to increasing temperatures and decreasing or unreliable precipitation during critical winter months. Winter precipitation in the Mojave Desert is much more reliable than the summer rains. One potential scenario is that the winter precipitation would shift to the north over time, leading to drier winters in the Mojave Desert, negatively impacting the growth of the spring annual plants. Spring annual plants, which are dependent on winter precipitation, provide essential forage for the desert tortoise. However, rainfall patterns may change in unpredictable ways, some areas may get wetter and other areas drier, with both situations altering desert tortoise habitat. Areas with increased rainfall would likely have increased growth of non-native, invasive species, altering the mixture of plants available for desert tortoise forage and changing the fire regime. Therefore, desert tortoise habitat may potentially change over the life of the proposed action due to climate change. Further predictions need to be developed specifically for the desert tortoise to help inform recovery efforts.

Climate change may exacerbate insufficient connectivity among tortoise populations, given that future temperatures generally are expected to rise; the effects of climate change on rainfall are less predictable at this time (Christensen et al. 2007). A future rise in temperature would increase environmental variability. Because of its habitat requirements and life history traits, the desert tortoise is considered to be highly vulnerable to the effects of climate change. The combination of increased environmental variability and decreased genetic variation in desert tortoise populations would lead to a higher likelihood of extirpation in linkage areas due to stochastic factors and human-related activities. Thus, landscape-scale redundancy in core habitat-linkage reserve design is an important principle in conservation strategies for widely distributed species like the desert tortoise (Service 1994, 2011a).

Status and Factors Affecting Desert Tortoise Critical Habitat in the Action Area

Desert tortoise critical habitat is composed of specific geographic areas that contain the physical or biological features (PBFs) essential to the species' conservation within those areas. Below are the specific PBFs of desert tortoise critical habitat.

PBF 1: Sufficient space to support viable populations within each of the six [five per the revised recovery plan] recovery units, and to provide for movement, dispersal, and gene flow.
PBF 2: Sufficient quality and quantity of forage species and the proper soil conditions to for the growth of these species.
PBF 3: Suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites.
PBF 4: Sufficient vegetation for shelter from temperature extremes and predators.
PBF 5: Habitat protected from disturbance and human-caused mortality.

The action area includes four desert tortoise CHUs described below. Desert tortoise recovery actions completed by BLM since 1997 that affect critical habitat include mineral withdrawal from desert tortoise ACECs in 2009, and road closures and designations, including habitat restoration.

The 1998 RMP limited vehicular travel within all ACECs in the action area to designated roads and trails. Following 1998, BLM identified that new illegal roads and trails were being created in all ACECs. A road inventory was completed for Coyote Spring, Gold Butte, and Mormon Mesa ACECs in 2007 which identified 906 mi of roads and trails and 1,724 other disturbances. On July 15, 2008, BLM designated 812 mi of roads as open and 94 mi of roads as closed in ACECs. Following road designation, BLM began signing the open routes and signing and restoring closed road segments and habitat damage created by vehicles travelling off designated roads.

From 1994 to 1996, BLM designated routes in the Piute-Eldorado ACEC resulting in approximately 466 mi of open roads and 135 mi of road closed encompassing 328,235 ac. In 2001, BLM designated approximately 43 mi of open roads in the Rainbow Gardens ACEC encompassing 38,766 ac. In 2008, BLM designated routes in 10 additional ACECs including Coyote Springs, Gold Butte, Mormon Mesa, and Virgin River ACECs:

- **Mormon Mesa ACEC** - approximately 149,254 ac with approximately 193 mi of open roads and 13 mi closed
- **Coyote Springs ACEC** - approximately 51,530 ac with approximately 120 mi of open roads and 19 mi closed
- **Gold Butte ACEC, Part A** - approximately 186,565 ac with approximately 250 mi of open roads and 30 mi closed. This part of Gold Butte includes popular destinations

like Whitney Pockets, Falling Man, Black Butte, and the Virgin Mountains. Adverse effects to the desert tortoise in this area are largely tied to vandalism and OHV use.

The 1998 RMP established a limitation for vehicular travel within all ACECs in the action area to conserve desert tortoise critical habitat. Vehicle use within the four desert tortoise ACECs and Rainbow Gardens ACEC was limited to designated roads and trails. In recognition of the importance of roads and their potential effects to the desert tortoise and other BLM sensitive species, BLM conducted road monitoring activities in 2010-2011 within ACECs in Clark County (BLM 2011). As part of road monitoring, BLM collected data on condition and use of non-paved roads. The project covered six ACECs within Clark County including more than 740,000 ac of desert tortoise critical habitat and 200,000 ac outside critical habitat. Road monitoring produced 561 point features representing incidents of various sizes and types throughout the project area. Sign damage was the most common type of incident documented. Illegal vehicle incursions accounted for approximately 75.5 mi of disturbance and 20 percent of all incidents documented. Documentation of 44.6 ac of disturbance among 70 sites was attributed to casual use and other recreational activities. Of the all the data collected for area disturbances, 70 percent consisted of sites that receive regular use from different types of users.

Mormon Mesa Critical Habitat Unit

The Mormon Mesa CHU is dominated by a flat landscape and a series of washes. The dominant plant community is Mojave Desert scrub with patches of Joshua tree and blackbrush. The CHU has a relatively large edge effect due to its shape. The Mormon Mesa CHU is contiguous with the Beaver Dam Slope ACEC to the east and Desert NWR to the west.

The Union-Pacific railroad, US 93, and I-15 restrict tortoise movement within and adjacent to the CHU by creating barriers and compromising habitat connectivity. US 93 bisects the western section of the Mormon Mesa CHU. In 2010, NDOT installed approximately 19 mi of desert tortoise exclusionary fencing along both sides of US 93 with culverts to allow tortoise movement underneath the highway and reduce habitat fragmentation. Unfenced SR 168 intersects US 93 and crosses east-west through the western central portion of the CHU. The Sheep Range, Meadow Valley Mountains, Mormon Mountains, and Arrow Canyon Range form barriers to east-west tortoise movement and habitat connectivity. The railroad affects connectivity between the eastern and western portions of the CHU.

Traffic counter data collected and analyzed by BLM, January through June 2011 on two roads adjacent to US 93 in Coyote Springs ACEC portion of the Mormon Mesa CHU indicate 1,091 vehicles entered the western portion of the ACEC in 2011 and 4,635 vehicles entered the east side of the ACEC in 2011.

Ongoing and proposed development by Coyote Springs Investment (CSI) substantially affect critical habitat in the western section of the CHU. CSI constructed a golf community on the property and plans for additional development. The CSI property is generally bounded on the south by SR 168, on the north by the Clark-Lincoln county line, on the east by Pahranagat Wash, and on the west by US 93. The entire project area comprises approximately 13,100 ac, of which 6,881 ac are planned for residential and commercial development and 6,219 ac are planned as a natural reserve that will ultimately be named the Coyote Springs Resource Management Area. As partial mitigation, CSI will pay $750,000 to fund research and conservation measures for the desert tortoise in the Mormon Mesa CHU.

Three major pipelines cross the Mormon Mesa CHU, two of which are Kern River natural gas transmission pipelines constructed in 1991 and 2002-2003; and the third is the Utah-Nevada (UNEV) petroleum fuel pipeline constructed in 2011-2012. The three pipelines cross the southern and eastern portions of the Mormon Mesa CHU and were constructed mostly parallel to one another. The pipeline ROWs cross approximately 23 mi of the Mormon Mesa CHU.

BLM designated ROW corridors through the Mormon Mesa CHU along US 93 and north of I-15 in the Las Vegas RMP (BLM 1998). The ON Line/Southwest Intertie electric power transmission line project disturbed 375 ac of the Mormon Mesa CHU along US 93 in Clark and Lincoln counties (84320-2010-F-0391) which contributes to fragmentation of the western section of the CHU.

Numerous wildfires occurred in desert tortoise habitat across the range of the desert tortoise in 2005, due to abundant fuel from the proliferation of non-native plant species after a very wet winter. Approximately three percent of the Mormon Mesa CHU burned as a result of these fires. Although it is known that desert tortoises were burned and killed by the wildfires, desert tortoise mortality estimates are not available. Recovery of these burned areas will likely require decades.

The Mormon Mesa CHU continues to provide sufficient space, forage and soil conditions, substrates and shelter sites, and vegetation (PBFs 1-4) for the desert tortoise. Non-native plants, including Sahara mustard, contribute to habitat degradation and affect the PBF for forage (PBF 2) and vegetation (PBF 4). Overall, PBF 5 continues to function through important habitat protections. The CHU is mostly protected from livestock grazing, speed-based OHV events, and land disposal; and the potential habitat loss due to mining has been reduced through the 2009 mineral withdrawal; however, habitat may be adversely affected by future ROWs, particularly major linear ROWs. The existing degree of habitat disturbance, degradation, and fragmentation in the CHU has affected all PBFs but not to the extent that the CHU no longer serves its role for recovery of the species.

Gold Butte-Pakoon Critical Habitat Unit

Approximately 186,500 ac of the CHU occurs within the action area with the remaining 298,000 ac in Arizona. Tortoises in the CHU are essentially isolated from other tortoise populations by the Virgin Mountains and Grand Wash Cliffs to the east, the Colorado River to the south, and I-15 and Virgin River to the north and west. Habitat within the CHU is mostly contiguous with minimal fragmentation.

Wildfire is likely the most important threat to critical habitat in this CHU. Approximately 13 percent of the Gold Butte-Pakoon CHU burned as a result of the 2005 fires. A network of unpaved roads occur across much of the CHU but most of the area, especially south of the Virgin Mountains, is relatively inaccessible to casual vehicular use. Recreational use at Lake Mead National Recreation Area has caused some illegal OHV use and habitat disturbance. Traffic counter data collected and analyzed by BLM, January through June 2011 on SR 170/Gold Butte Byway, indicate 8,245 vehicles entered the Gold Butte area in 2011. The Gold Butte-Pakoon CHU is the least impacted CHU in the action area. All five PBFs continue to function in the CHU and provide for recovery of the species.

Piute-Eldorado, Nevada Critical Habitat Unit

The Piute-Eldorado CHU in Nevada is contiguous with the 453,800-ac Piute-Eldorado (Fenner) CHU in California. The Nevada portion is approximately 328,235 acres. The northern half of the Piute-Eldorado CHU in Nevada occurs within the Northeastern Mojave Recovery Unit and the other contiguous critical habitat occurs in the Colorado Desert Recovery Unit. The diverse topography and vegetation provide opportunities for desert tortoise populations to survive climate change (Service 1994). The CHU surrounds the city of Searchlight and includes two large valleys, Piute and Eldorado. Historic mining produced many old corrals and mining sites. The surrounding ranges provide abundant drainages with desert wash habitat dominated by catclaw acacia (*Acacia greggii*) communities.

The BCCE includes a portion of the northern CHU in Eldorado Valley and provides additional protection. The term of the BCCE is for 50 years and will be retained in a natural condition with the purpose for recovery of the desert tortoise and conservation of other species in the area. Certain uses would be prohibited within the BCCE including motor vehicle activity off designated roads, livestock grazing, and any activity that is inconsistent with the purposes of the BCCE.

Highway US 95 bisects the CHU, fragmenting critical habitat into eastern and western areas. Other sources of habitat fragmentation include SR 163, SR 164, and SR 165. Several years ago, US 95 was widened through the CHU with desert tortoise exclusionary fencing and culvert underpasses to protect tortoises and allow some degree of tortoise movement access across the highway. Although habitat fragmentation occurred as a result of the fencing, the recovery value of the critical habitat along the highway was substantially increased. Tortoise exclusionary fencing has also been installed along SR 163, SR 164, and SR 165.

Much of Piute Valley has been degraded by OHV use, mining, utility corridors, and grazing. An extensive network of dirt roads exists. The communities of Searchlight, Boulder City, Cal-Nev-Ari, Nelson, and Laughlin are adjacent to critical habitat. Residents and visitors use the CHU for recreation and other purposes. Visitors to Lake Mead National Recreation Area use US 95 and connected roads for access. No road traffic data was collected in 2011 for the Piute-Eldorado CHU.

No major wildfires have occurred within the CHU in recent years. Currently, the most important impact to the Piute-Eldorado CHU is habitat fragmentation, degradation, and disturbance associated with casual OHV use, utility corridors, and transportation routes. Nelson Hills in Eldorado Valley, east of US 95, has historically been used for casual and organized OHV events.

The Piute-Eldorado CHU continues to provide sufficient space, forage and soil conditions, substrates and shelter sites, and vegetation (PBFs 1-4) for the desert tortoise. Non-native plants contribute to habitat degradation and affect the PBF for forage (PBF 2) and vegetation (PBF 4). Overall, PBF 5 continues to function through important habitat protections including the BCCE. The CHU is mostly protected from livestock grazing, speed-based OHV events, land disposal, and the potential habitat loss due to mining has been reduced through the 2009 mineral withdrawal; however, habitat may be adversely affected by casual OHV use and future ROWs, particularly major linear ROWs. The existing degree of habitat disturbance, degradation, and fragmentation in the CHU has affected all PBFs but not to the extent that the CHU no longer serves its role for recovery of the species.

7.3 Southwestern Willow Flycatcher

Status of the Southwestern Willow Flycatcher in the Action Area

Accounts of breeding flycatcher locations date back to 1987 when Unitt reported flycatcher breeding at Indian Springs, Nevada; Corn Creek, Desert NWR; and the Colorado River (Unitt 1987), but many areas with suitable breeding habitat for flycatchers were not surveyed until the early 2000s.

Suitable habitat for foraging and migrating southwestern willow flycatchers exists in small patches of riparian habitat along the Muddy and Virgin Rivers, some of which are owned and managed by BLM. Thorough assessment of these areas has not been completed. The majority of foraging and migratory habitat and suitable breeding and occupied habitat for flycatchers occurs along the Virgin River and the headwaters of the Muddy River and its confluence with Lake Mead. This habitat occurs in Mesquite, Overton Wildlife Management Area, and Warm Springs Natural Area, which are owned and managed by NDOW and SNWA, respectively. Additional breeding sites occur in Ash Meadows NWR. Many of these areas do not support breeding flycatchers on an annual basis, but sites in the Muddy River and Virgin River have remained relatively stable over the last 5 years. Flycatchers have also been documented at the Las Vegas Wash, but breeding has not been confirmed.

The status of the southwestern willow flycatcher in the action area is updated using data from 2017 and 2018 surveys completed by SWCA Environmental Consultants, NDOW, SNWA, and the Service.

Overton Wildlife Management Area

The site consists of two disjunct polygons along the Muddy River. The northern polygon is 50 to 70 m wide by 550 m long and is bisected by the Muddy River. This portion of the site is dominated by very dense tamarisk 6 to 8 m in height with canopy closure ranging from 50 to 90%. Vegetation is tallest on the eastern bank of the river channel, reaching 8 m in height.

Vegetation height, density, and canopy closure decrease with increasing distance from the channel. Many of the tamarisk were noted in previous years as heavily damaged from defoliation, and the tops of many trees were dead. Photos taken in 2017 show that the tops of some tamarisk are still leafless. The result of damage is that the upper level of the canopy is ragged and height is not uniform in any part of the site. Several small patches of coyote willows 4 to 5 m in height with 80 to 90% canopy closure are present on the eastern bank of the river near the southern end of this portion of the site. Two stretches of the channel of the Muddy River within this portion of the site were dredged with heavy equipment over the 2007–08 winter, resulting in a cleared swath 10 to 15 m wide on the western bank of the river. This swath is now thickly vegetated with quailbush (*Atriplex lentiformis*), willow baccharis (*Baccharis salicina*), and tamarisk 2 to 3 m in height. Canopy closure in this area is as low as 20%. Tamarisk beetles were seen on green tamarisk in mid-May, and most of the vegetation was yellow in mid-June. Defoliation continued through mid-July but occurred mostly north of the occupied territories and, therefore, did not affect the active nest. The river channel in the northern portion of the site is incised 2 to 3 m below the surrounding land surface and contained flowing water when site descriptions were recorded in May, June, and July. Although flow rates in the Muddy River fluctuated regularly throughout the season, only one heavy precipitation event in late July caused the water level to top the river banks. Flooding occurred for a brief period in an area north of the active nest. Through the rest of the season, water remained confined to the channel, and soils outside the channel were dry.

The southern polygon consists of a 125 by 275 m stand of mixed-exotic vegetation along an old channel of the river. This portion of the site is dominated by a stand of Goodding's willow 8 to 15 m in height with a tamarisk understory 4 to 6 m in height. Many of the Goodding's willows have fallen over or lost limbs, creating gaps in the canopy. Within areas dominated by Goodding's willows, canopy closure ranges from 60% in areas with large gaps to 90% in the few areas of denser vegetation. Several open areas with dead cattails are scattered throughout this portion of the site. Some willow and baccharis are present in the southwestern corner of this portion of the site. A 25 by 20 m patch of coyote willows up to 5 m in height with 90% canopy closure is present near the center of this portion of the site. The densest, most suitable vegetation in this portion of the site is located between the center, near the coyote willows, and the southern edge of the site. The far eastern end of this portion of the site is primarily 3 to 6 m tall tamarisk with 85 to 95% canopy closure. The Muddy River flows into the northern end of this portion of the site and then splits into two channels, one of which runs through the site and another that skirts the southwestern edge of the site. The channel that runs through the site was dredged in 2005 as part of the efforts at the Overton Wildlife Management Area to repair flood damage to the water control system.

This dredged channel carried water through the southern part of the site in subsequent years but slowly filled in with sediment and cattails. The channel that runs through the site has been dry since 2013, and the river has flowed only in the channel along the southwestern boundary of the site. As is the case in the northern portion of the site, this channel is incised 2 to 3 m below the surrounding soil surface, and only the channel contained surface water when site descriptions were recorded in May, June, and July. As noted above, river depth fluctuated regularly, but soils away from the channel were dry throughout the survey season, except immediately following the rain event in July.

There were 3 pairs of flycatchers, no unpaired resident flycatchers, 5 non-resident flycatchers, and one fledgling detected during 2017 surveys (SWCA 2017) and one pair, one unpaired resident, and one migrant flycatcher during 2018 surveys (Van Dooremolen 2018 pers. comm.).

Mesquite

The Mesquite study area is in the floodplain of the Virgin River near Mesquite and Bunkerville, Nevada. This area has been defoliated annually by tamarisk leaf beetles since 2010, and the tamarisk has been damaged extensively by repeated defoliation. Most tamarisk trees are over 50% dead, and canopy closure is greatly reduced. Surveys are limited to areas that contain native vegetation. The mixed native-exotic survey sites contain tamarisk, Goodding's willows, coyote willows, cottonwoods, and baccharis, along with a minor component of Russian olive, screwbean mesquite, and velvet ash trees.

There were 15 breeding adult flycatchers, one unpaired resident flycatcher, two unpaired non-resident flycatchers, and four fledglings detected during 2017 surveys (Klinger 2018a pers. comm.). One pair, one unpaired resident, and one non-resident flycatcher were detected by SNWA in 2018 (Van Dooremolen 2018 pers. comm.) and seven flycatchers were detected by SWCA in 2018 (SWCA 2018).

Mormon Mesa

For approximately 15 km upstream of its confluence with the Muddy River, the Virgin River flows through a one km wide floodplain with a mosaic of habitats, including cattail marshes and tamarisk and willow forest. Much of the area is typically seasonally inundated from snowmelt in the spring and monsoon rains in mid and late summer, and the entire study area experienced severe flooding over the 2004–2005 and 2010–2011 winters. All areas surveyed at Mormon Mesa are at least 10 km upstream of the Muddy River confluence. Tamarisk at Mormon Mesa is typically defoliated by summer and most of the tamarisk plants are heavily damaged from these defoliation events, with a reduction in live canopy by up to 75%. Surveys are limited to areas that contain native vegetation. The mixed native-exotic survey sites contain mostly tamarisk and Goodding's willows.

There were 6 breeding adult flycatchers, two unpaired resident flycatchers, and no fledglings detected during 2017 surveys (Klinger 2018a pers. comm.) and 6 breeding adults and one unpaired male detected during 2018 surveys (Klinger 2018b pers. comm.).

Warm Springs Natural Area

There are two survey sites within the Warm Springs Natural Area at the headwaters of the Muddy River. Surface water occurs in the study area in several incised stream channels and some low-lying areas. The streams are perennial, but there is an obvious seasonal drying trend in the intermittently wet, low-lying areas.

The survey site known as Muddy Mac is near the head of Apcar Stream and is bordered by a grassy field to the west and a small cattail marsh to the east and south. The northern half of the site was heavily damaged in the 2010 fire, with the overstory being completely killed. Dense basal regeneration of the velvet ash has occurred, resulting in dense clusters of stems, and this half of the site was again included in surveys starting in 2016. The majority of the site is vegetated with velvet ash 5 to 15 m in height. In the northern half of the site, the velvet ash is 8 m in height in the middle and 5 m in height along the edges with 85–95% canopy closure. The understory structure is relatively open, despite the dense canopy closure, as each tree comprises a cluster of narrow stems spaced relatively far from the next cluster. A few emergent cottonwoods and palm trees (*Washingtonia* species) are scattered in this portion of the site. The southeastern quarter of the survey site consists of closely spaced, small-diameter (5 to 8 cm), single stems of velvet ash 6 to 7 m in height with no understory and 80 to 90% canopy closure. The close spacing of the stems creates a stand that feels very dense, yet the canopy of each tree in this portion of the site is relatively sparse, resulting in lower canopy closure than in the northern half. The southwestern quarter of the site is dominated by sparse velvet ash 12 to 15 m in height with 60 to 70% canopy closure. An understory layer exists in this portion of the site and consists of sparsely distributed regenerating 4 to 5 m tall velvet ash, some tamarisk, and a few honey mesquite (*Prosopis glandulosa*), with thick grasses and yerba mansa forming a dense groundcover in areas without an understory. Approximately 10% of the tamarisk in the area had yellow leaves in June, and 50% were brown or defoliated by July. The area immediately south of the site has been cleared as part of a restoration effort.

The survey site known as Muddy Stringer 01 is approximately 100 m north of the main stem of the Muddy River and contains two distinct portions: a narrow, linear northern arm and a bulbous southern end. A narrow stringer of 10 to 15 m tall palm trees runs the entire length of the site along an irrigation canal. The northern arm of the site is dominated by the palm tree stringer, which consists of widely spaced single trees. The understory of the northern arm contains scattered clumps less than 5 by 5 m in size of tamarisk or velvet ash no more than 2 m tall and several stands of arrowweed. Areas in the northern arm lacking woody vegetation are covered by dense yerba mansa. Canopy closure in the northern stringer reaches 25%. Near the very northern end of the site is a small patch of coyote willows approximately 5 by 20 m in size, reaching 5 m in height and 60 to 80% canopy closure. The southern end of the site is vegetated with two distinct vegetation types. The western half of the southern end is vegetated with 4 to 6 m tall coyote willows with 80 to 95% canopy closure, a dense groundcover of yerba mansa, and a relatively open midstory. The eastern half of the southern end is vegetated in a more heterogeneous mix of 5 to 8 m tall velvet ash and 5 m tall tamarisk on either side of the palm tree stringer. Approximately 5% of the tamarisk within the site was yellow in July, although all the tamarisk in the surrounding area were yellow or defoliated. Some honey mesquite and cattails are also scattered throughout the eastern half. Canopy closure in the eastern half of the southern end ranges from 40 to 95%.

There were 2 pairs of flycatchers, 1 unpaired resident flycatcher, 2 non-resident flycatchers, and 5 fledglings detected during 2017 surveys (SWCA 2017) and 3 pairs, 5 unpaired resident, and 1 non-resident flycatcher in 2018 (Van Dooremolen 2018 pers. comm.).

Las Vegas Wash

Riparian vegetation in the study area consists of both native and non-native species. Native tree species primarily include Goodding's willow, sandbar willow (a.k.a. coyote willow), cottonwood (*Populus fremontii*), and seep willow (*Baccharis salicifolia*). Tamarisk is the dominant non-native species. Understory species include common reed (*Phragmites australis*), cattails (*Typha domingensis*), and a variety of shrubs.

Four survey routes cover all potentially suitable habitat within the Wash. The routes are adjusted each year to accommodate changes in habitat and access due to construction and other factors.

In 2018, Route 1 encompassed the Wetlands Park Nature Preserve (Preserve). Native-dominated riparian habitat rings constructed wetland ponds, which include the upper pond, three middle ponds, and Vern's Pond. It also lines the channels that run between them. Emergent vegetation – cattails, common reed, and bulrush (*Schoenoplectus* spp.) – occurs in the wetter portions of the understory. The densest and widest riparian patches occur along the channels; the density and width of the habitat ringing the ponds themselves is generally thinner. A grove of cottonwoods just south of the middle ponds transitions to an overstory of Goodding willows with a few cottonwoods interspersed and a dense understory of sandbar willow and willow baccharis. The patches of riparian habitat are connected by patches of honey and screwbean mesquite. Both species of mesquite occur either with quailbush and willow baccharis in the understory or in thickets. Mesquite trees of various maturity with a saltgrass understory cover the site west of the main survey area to the West 80. In the West 80, which was constructed several years after the area to the east, the riparian zone along the feeder channels and ponds is generally much thinner than in the older portions of the Nature Preserve, limiting its potential suitability to southwestern willow flycatcher. A portion of Monson Channel bordering the preserve is also included in this site, as are small patches upstream and downstream of Upper Diversion Weir. Vegetation on Monson Channel is dominated by tamarisk, and there is one small patch of tamarisk adjacent to Vern's Pond. These areas are only potentially suitable for the flycatcher. The route covers 20 acres.

Routes 2 and 3 are located along the Las Vegas Wash. Potentially suitable habitat along the Wash begins just upstream of Pabco Road Weir and continues downstream to Rainbow Gardens Weir for the flycatcher. Several weirs have been constructed along the Wash and significant revegetation has occurred and matured. Stringers of native riparian habitat run along either side of the channel, consisting of cottonwood, Goodding and sandbar willows, and some seep willow and willow baccharis. Cattails, common reed, and to a lesser extent bulrush occur in the wetter portions of the understory, and patches of mesquite, both screwbean and honey (often with quailbush or baccharis in the understory) connect the riparian habitat. Little tamarisk remains. The majority of the habitat is concentrated from just upstream of Pabco Road Weir to upstream of Calico Ridge Weir. Habitat further downstream is limited to a few small patches above Rainbow Gardens Weir that only have potential for flycatcher. Routes 2 and 3 cover about 22 acres of potentially suitable habitat.

Route 4 includes patches of tamarisk along Duck Creek near Sam Boyd Stadium. Field crews surveyed less than 3 acres of potentially suitable habitat.

There were two non-resident flycatchers detected during 2017 surveys (SNWA 2017a) and one migrant flycatcher detected in 2018 (Van Dooremolen 2018 pers. comm.).

Ash Meadows

Dominant tree and shrub species in habitat patches include coyote willow, leather-leaf ash *(Fraxinus velutina* var. *coriacea),* honey mesquite, screw bean mesquite, and Emory's baccharis. There are currently four survey sites in Ash Meadows. Bradford spring is predominantly comprised of coyote willow. The spring was dewatered and restored for Ash Meadows speckled dace in 2009. Ash Grove is mostly made up of leather-leaf ash trees and stays relatively wet throughout the year. Habitat within Horseshoe is mostly coyote willows and was burned in 2010 and 2011 during prescribed burns. It had experienced dry conditions with changes in hydrology, but it now has water flowing to the original drainage to the north of the reservoir. Forrest spring is also mostly coyote willows with a small mesquite component.

There was one non-resident flycatcher detected during 2017 surveys (Tomlinson 2018 pers. comm.), and no surveys were completed in 2018 as surveys are on a three-year rotation.

Factors Affecting the Southwestern Willow Flycatcher in the Action Area

Invasive Species Management and Fire Management

BLM will continue fuel treatments along the Virgin River started in 1998 to reduce threats to the communities of Mesquite, Bunkerville, and Riverside (previously described in informal consultations 1-5-98-I-316, 1-5-03-I-438, 1-5-03-I-510, and 1-5-03-I-535). The Virgin River riparian corridor has converted to a dense tamarisk stand that contains a large fuel load that, if it ignites, would create a hot fast fire that would threaten adjacent communities. BLM has rehabilitated parcels burned in 1998 and 2003 and treated additional stretches of BLM lands on the river to reduce tamarisk.

BLM has also removed and treated tamarisk along the Muddy River under informal consultation 84320-2014-I-0111.

Recreation

Currently, the SNDO planning area is open to OHV cross-country travel. While noise and vibration may affect flycatchers, it is not known to what extent.

Status and Factors Affecting the Southwestern Willow Flycatcher Critical Habitat in the Action Area

Southwestern willow flycatcher critical habitat within the action area occurs along the Virgin River from the Nevada-Arizona border northeast of Mesquite to the confluence with Lake Mead and within Ash Meadows NWR. They include areas suitable for breeding, foraging, and migrating flycatchers.

Effects to the physical and biological features of critical habitat within the action area are the same as those discussed in the rangewide status section, except for the following.

Invasive Species Management

Removal of salt cedar has previously occurred along the Virgin River on BLM lands. Such treatments may continue along the Virgin River if necessity and funding allow.

Tamarisk Leaf Beetle

Tamarisk leaf beetles were first detected in the action area in 2008 (https://riversedgewest.org/sites/default/files/files/2008_Tamarisk_Leaf_Beetle_Distribution.pdf) and have expanded their range since. They have been found along the Muddy River, Virgin River, Las Vegas Wash, and even within urban Las Vegas. The spread of the tamarisk leaf beetle from 2008 through 2018 can be found on the Rivers Edge West website (https://riversedgewest.org/events/tamarisk-beetle-maps).

7.4 Yellow-Billed Cuckoo

Status of the Yellow-Billed Cuckoo in the Action Area

Suitable habitat for foraging and migrating yellow-billed cuckoos exists in small patches of riparian habitat along the Muddy and Virgin Rivers, some of which is owned and managed by BLM. Thorough assessment of these areas has not been completed. The majority of foraging and migratory habitat for cuckoos occurs along the Virgin River and the headwaters of the Muddy River and its confluence with Lake Mead. This habitat occurs in Overton Wildlife Management Area and Warm Springs Natural Area, which are owned and managed by NDOW and SNWA, respectively. Additional potential habitat sites occur in Mesquite, Ash Meadows NWR, and the Las Vegas Wash. Breeding has not been confirmed at these sites.

Very few yellow-billed cuckoos have been documented in the planning area. The status of the yellow-billed cuckoo in the action area is updated using data from 2016, 2017, and 2018 surveys completed by SWCA Environmental Consultants, NDOW, SNWA, and the Service.

Overton Wildlife Management Area

The site consists of two disjunct polygons along the Muddy River. The northern polygon is 50 to 70 m wide by 550 m long and is bisected by the Muddy River. This portion of the site is dominated by very dense tamarisk 6 to 8 m in height with canopy closure ranging from 50 to 90%. Vegetation is tallest on the eastern bank of the river channel, reaching 8 m in height. Vegetation height, density, and canopy closure decrease with increasing distance from the channel. Many of the tamarisk were noted in previous years as heavily damaged from defoliation, and the tops of many trees were dead. Photos taken in 2017 show that the tops of some tamarisk are still leafless. The result of damage is that the upper level of the canopy is ragged and height is not uniform in any part of the site. Several small patches of coyote willows 4 to 5 m in height with 80 to 90% canopy closure are present on the eastern bank of the river near the southern end of this portion of the site. Two stretches of the channel of the Muddy River within this portion of the site were dredged with heavy equipment over the 2007–08 winter, resulting in a cleared swath 10 to 15 m wide on the western bank of the river. This swath is now thickly vegetated with quailbush, willow baccharis (*Baccharis salicina*), and tamarisk 2 to 3 m in height. Canopy closure in this area is as low as 20%. Tamarisk beetles were seen on green tamarisk in mid-May, and most of the vegetation was yellow in mid-June. Defoliation continued through mid-July but occurred mostly north of the occupied territories and therefore did not affect the active nest. The river channel in the northern portion of the site is incised 2 to 3 m below the surrounding land surface and contained flowing water when site descriptions were recorded in May, June, and July. Although flow rates in the Muddy River fluctuated regularly throughout the season, only one heavy precipitation event in late July caused the water level to top the river banks. Flooding occurred for a brief period in an area north of the active nest. Through the rest of the season, water remained confined to the channel, and soils outside the channel were dry.
The southern polygon consists of a 125- by 275-m stand of mixed-exotic vegetation along an old channel of the river. This portion of the site is dominated by a stand of Goodding's willow 8 to 15 m in height with a tamarisk understory 4 to 6 m in height. Many of the Goodding's willows have fallen over or lost limbs, creating gaps in the canopy. Within areas dominated by Goodding's willows, canopy closure ranges from 60% in areas with large gaps to 90% in the few areas of denser vegetation. Several open areas with dead cattails are scattered throughout this portion of the site. Some willow baccharis is present in the southwestern corner of this portion of the site. A 25- by 20-m patch of coyote willows up to 5 m in height with 90% canopy closure is present near the center of this portion of the site. The densest, most suitable vegetation in this portion of the site is located between the center, near the coyote willows, and the southern edge of the site. The far eastern end of this portion of the site is primarily 3- to 6-m-tall tamarisk with 85 to 95% canopy closure. The Muddy River flows into the northern end of this portion of the site and then splits into two channels, one of which runs through the site and another that skirts the southwestern edge of the site. The channel that runs through the site was dredged in 2005 as part of the efforts at the Overton Wildlife Management Area to repair flood damage to the water control system.

This dredged channel carried water through the southern part of the site in subsequent years but slowly filled in with sediment and cattails. The channel that runs through the site has been dry since 2013, and the river has flowed only in the channel along the southwestern boundary of the site. As is the case in the northern portion of the site, this channel is incised 2 to 3 m below the surrounding soil surface, and only the channel contained surface water when site descriptions were recorded in May, June, and July. As noted above, river depth fluctuated regularly, but soils away from the channel were dry throughout the survey season, except immediately following the rain event in July.

There was one individual cuckoo heard during 2016 surveys, no cuckoos detected during 2017 surveys (SWCA 2017b), and one detection during 2018 surveys (Van Dooremolen 2018 pers. comm.).

Mesquite

The Mesquite study area is in the floodplain of the Virgin River near Mesquite and Bunkerville, Nevada. This area has been defoliated annually by tamarisk leaf beetles since 2010, and the tamarisk has been damaged extensively by repeated defoliation. Most tamarisk trees are over 50% dead, and canopy closure is greatly reduced. Surveys are limited to areas that contain native vegetation. The mixed native-exotic survey sites contain tamarisk, Goodding's willows, coyote willows, cottonwoods, and baccharis, along with a minor component of Russian olive, screwbean mesquite, and velvet ash trees.

While no cuckoos were detected during protocol cuckoo surveys in 2016 or 2017, two cuckoos were heard incidentally in 2016 and one in 2017 during southwestern willow flycatcher surveys (Klinger 2018a pers. comm.). One cuckoo was detected in Bunkerville during 2018 surveys (SWCA 2018).

Warm Springs Natural Area

The survey site known as Muddy Stringer 01 is approximately 100 m north of the main stem of the Muddy River and contains two distinct portions: a narrow, linear northern arm and a bulbous southern end. A narrow stringer of 10- to 15-m-tall palm trees runs the entire length of the site along an irrigation canal. The northern arm of the site is dominated by the palm tree stringer, which consists of widely spaced single trees. The understory of the northern arm contains scattered clumps less than 5 by 5 m in size of tamarisk or velvet ash no more than 2 m tall and several stands of arrowweed. Areas in the northern arm lacking woody vegetation are covered by dense yerba mansa. Canopy closure in the northern stringer reaches 25%. Near the very northern end of the site is a small patch of coyote willows approximately 5 by 20 m in size, reaching 5 m in height and 60 to 80% canopy closure. The southern end of the site is vegetated with two distinct vegetation types. The western half of the southern end is vegetated with 4- to 6-m-tall coyote willows with 80 to 95% canopy closure, a dense groundcover of yerba mansa, and a relatively open midstory. The eastern half of the southern end is vegetated in a more heterogeneous mix of 5- to 8-m-tall velvet ash and 5-m-tall tamarisk on either side of the palm tree stringer. Approximately 5% of the tamarisk within the site was yellow in July, although all the tamarisk in the surrounding area were yellow or defoliated. Some honey mesquite and cattails are also scattered throughout the eastern half. Canopy closure in the eastern half of the southern end ranges from 40 to 95%.

There was one individual cuckoo detected during 2017 surveys (SWCA 2017b) and one cuckoo detected during 2018 surveys (Van Dooremolen 2018 pers. comm.).

Las Vegas Wash

The potential suitable habitat in the Las Vegas Wash consists of stringers of native riparian habitat that run along either side of the channel with cottonwood, Goodding's and sandbar willows, and some seep willow and willow baccharis. Cattails, common reed, and to a lesser extent, bulrush occur in the wetter portions of the understory, and patches of mesquite, both screwbean and honey (often with quailbush or baccharis in the understory) connect the riparian habitat. Virtually no tamarisk remains.

In 2018, the Wetlands Park Nature Preserve (Preserve) was surveyed. Native-dominated riparian habitat rings constructed wetland ponds, which include the upper pond, three middle ponds, and Vern's Pond. It also lines the channels that run between them. Emergent vegetation – cattails, common reed, and bulrush – occurs in the wetter portions of the understory. The densest and widest riparian patches occur along the channels; the density and width of the habitat ringing the ponds themselves is generally thinner. A grove of cottonwoods just south of the middle ponds transitions to an overstory of Goodding willows with a few cottonwoods interspersed and a dense understory of sandbar willow and willow baccharis. The patches of riparian habitat are connected by patches of honey and screwbean mesquite. Both species of mesquite occur with either quailbush or willow baccharis in the understory or in thickets. Mesquite trees of various maturity with a saltgrass understory cover the site west of the main survey area to the West 80. In the West 80, which was constructed several years after the area to the east, the riparian zone along the feeder channels and ponds is generally much thinner than in the older portions of the Nature Preserve, limiting its potential suitability to southwestern willow flycatcher. A portion of Monson Channel bordering the preserve is also included in this site, as are small patches upstream and downstream of Upper Diversion Weir. Vegetation on Monson Channel is dominated by tamarisk, and there is one small patch of tamarisk adjacent to Vern's Pond. The route covers 40 acres.

Additional survey sites are located along the Las Vegas Wash. Potentially suitable habitat along the Wash begins just upstream of Pabco Road Weir and continues downstream to Calico Ridge Weir. Several weirs have been constructed along the Wash and significant revegetation has occurred and matured. Stringers of native riparian habitat run along either side of the channel, consisting of cottonwood, Goodding and sandbar willows, and some seep willow and willow baccharis. Cattails, common reed, and to a lesser extent bulrush occur in the wetter portions of the understory, and patches of mesquite, both screwbean and honey (often with quailbush or baccharis in the understory) connect the riparian habitat. Little tamarisk remains. The majority of the habitat is concentrated from just upstream of Pabco Road Weir to upstream of Calico Ridge Weir. Habitat further downstream is limited to a few small patches above Rainbow Gardens Weir that only have potential for flycatcher. The route covers 47 acres.

There were five cuckoo detections during 2017 surveys, but it could not be confirmed to be more than one cuckoo (SNWA 2017b). There were no detections during 2018 surveys (Van Dooremolen 2018 pers. comm.)

Ash Meadows

Dominant tree and shrub species in habitat patches include coyote willow, leather-leaf ash, honey mesquite, screw bean mesquite, and Emory's baccharis.

No cuckoo surveys were completed in 2017 following survey protocol, and no surveys were completed in 2018. There were no incidental detections made during other surveys. Cuckoos have not been detected at Ash Meadows since 2008.

Factors Affecting the Yellow-Billed Cuckoo in the Action Area

Invasive Species Management and Fire Management

BLM will continue fuel treatments along the Virgin River started in 1998 to reduce threats to the communities of Mesquite, Bunkerville, and Riverside (previously described in informal consultations 1-5-98-I-316, 1-5-03-I-438, 1-5-03-I-510, and 1-5-03-I-535). The Virgin River riparian corridor has converted to a dense tamarisk stand that contains a large fuel load that, if it ignites, would create a hot fast fire that would threaten adjacent communities. BLM has rehabilitated parcels burned in 1998 and 2003 and treated additional stretches of BLM lands on the river to reduce tamarisk.

BLM has also removed and treated tamarisk along the Muddy River under informal consultation 84320-2014-I-0111.

Recreation

Currently, the SNDO planning area is open to OHV cross-country travel. While noise and vibration may affect cuckoos, it is not known to what extent.

7.5 Yuma Clapper Rail

Status of the Yuma Clapper Rail in the Action Area

Historical distribution and status of the Yuma clapper rail in Nevada is not well known. Alcorn (1988) reported visual detections of up to 8 clapper rails at the Las Vegas Wash on in 1959. Suitable breeding habitat for clapper rails of the Virgin River, Muddy River, and Las Vegas Wash in Clark County were surveyed starting in 2000, and clapper rails were detected at sites along the Virgin River and along the Muddy River in Overton (McKernan and Braden 2001). Additional surveys in subsequent years have confirmed Yuma clapper rails at

Ash Meadows NWR in Nye County and along the Muddy River at Overton Wildlife Management Unit in Clark County. Annual total number of birds detected in 2018 throughout the action area was low (Las Vegas Wash: 0 (SNWA 2018); Ash Meadows: 15 [Service 2018b]; Overton WMA: 13 [Klinger 2018b pers. comm.]).

Factors Affecting the Yuma Clapper Rail in the Action Area

Recreation

Currently, the SNDO planning area is open to OHV cross-country travel. While noise and vibration may affect Yuma clapper rails, it is not known to what extent.

7.6 Virgin River Chub and Critical Habitat

Status of the Virgin River Chub in the Action Area

BLM-administered land adjacent to critical habitat for Virgin River chub and woundfin is within the Virgin River ACEC. The major limiting factors for the Virgin River chub and other native fish species both rangewide and within the action area are modification and loss of habitat and the introduction and establishment of non-native fish, particularly red shiner. The building of dams and associated reservoirs, water diversion structures, canals, laterals, aqueducts, and dewatering of streams causes loss and degradation of available habitat. The decline in both the species' range and population numbers is due to the physical reduction in available habitats within the various river systems caused by these water projects. This loss of habitat has been exacerbated due to the introduction and establishment of exotic species, further reducing the suitability of remaining habitats for woundfin and Virgin River chub.

Potential threats to the species' survival include further water removal, desalinization, urban growth, sedimentations, pollution, channel alteration, and competition and predation by introduced fishes, especially the red shiner. The threats are magnified by the naturally limited range of this fish and its consequent vulnerability to extensive losses from a single threat.

Surveys between 2015 and 2017 within the reaches of the Virgin River in Nevada (action area) observed 65 Virgin River chub (Kegerries et al. 2018).

Factors Affecting the Virgin River Chub in the Action Area

Invasive Species and Predators

Predators on Virgin River chub include piscivorous birds such as kingfishers and herons, soft-shelled turtles, and other vertebrate species. This is especially true during periods of low flow and clear water. Fish that feed on all life-stages of Virgin River chub include the introduced channel catfish, tilapia, and black bullhead (*Ameiurus melas*). Largemouth bass and green sunfish (*Lepomis cyanellus*), in addition to native Virgin spinedace, probably prey on larvae. The introduced mosquitofish (*Gambusia affinis*) may prey on larval life stages.

Competition with and predation by exotic fishes, specifically the red shiner and blue tilapia, also have negative effects to Virgin River chub.

Altered Flow Regimes

Designated critical habitat has been significantly altered due to dam construction and irrigation diversions which have resulted in decreased flows and thus available physical habitat throughout the Virgin River. Altered flow regimes both above and below major irrigation diversions at Washington Fields, Mesquite, and Riverside have resulted in loss of habitat due to complete dewatering of the river during low flow periods.

Other Threats

Additional threats to the Virgin River chub include diseases (such as Asian fish tapeworm); floods; and toxic spills. The limited distribution of the Virgin River chub within Nevada make it particularly vulnerable to these threats (Service 1995).

Status and Factors Affecting the Virgin River Chub Critical Habitat in the Action Area

Status of Virgin River chub critical habitat is the same as in the rangewide status section. Factors affecting critical habitat are the same as listed above for the species.

7.7 Woundfin and Critical Habitat

Status of the Woundfin in the Action Area

Woundfin abundance has declined significantly due to the introduction of red shiner. Woundfin has virtually been eliminated wherever red shiner became established which includes the action area, Arizona, and Utah. Very few woundfin are found in the reach of the Virgin River in the action area.

The woundfin population numbers that have existed in the action area (Nevada) are largely a result of stocking efforts in Arizona and Nevada since the late 1990s. About 11,200 woundfin were stocked in the Nevada portion of the Virgin River in 1999; 4,500 woundfin stocked in the Nevada portion of the Virgin River in 2000 (Holden and Golden 2000); and approximately 5,000 stocked in 2003 in the Beaver Dam reach of the Virgin River. Golden and Holden (2004) sampled these areas from 1996 to 2002 and reported dramatic declines of woundfin and other native species during the drought years of 1999 through 2002. In Nevada, no woundfin were collected by the fall of 2001 and none were collected in 2002, the lowest flow year on record. Albrecht et al. (2007) report that woundfin have remained absent in this lowest portion of the Virgin River since that time.

In 2012, BioWest observed an increase in native fish throughout the lower Virgin River system, including Nevada. A total of 5 woundfin were observed in the Virgin River within Nevada and immediately upstream in Arizona. Using the same conversion assumptions for the reach only partially within Nevada, approximately 3 woundfin were observed within Nevada in early 2012. There are too few woundfin to estimate statistically, but BioWest (Kegerries et al. 2015) counted 93 wild, unmarked woundfin from the Lower Gorge Reach downstream to below the Bunkerville Diversion in 2012 and 2013. Surveys between 2015 and 2017 within the reaches of the Virgin River in Nevada (action area) observed only 7 woundfin.

Factors Affecting the Woundfin in the Action Area

Invasive Species and Predators

Woundfin do not persist in the presence of red shiner, which are dense in both the Nevada and Arizona sections of the Virgin River, and subsequent surveys in August and September 2012 revealed a single woundfin and no woundfin, respectively, within these states. Chub persisted at a very low level and are probably largely ephemeral non-reproducing members of the local Virgin River fish community in Nevada. The general situation of few or no listed fish within the Nevada portion of the Virgin River will almost certainly persist until red shiner can be eradicated from these reaches.

Predation from birds and other fishes and competition from exotic species such as channel catfish, black bullhead, and largemouth bass all play a part in impacting woundfin populations within the Virgin River. Changes to flow patterns also facilitated movement of red shiners upstream in the Virgin River. This non-native fish has largely replaced the woundfin and has introduced the Asian tapeworm, a parasite on many of the remaining woundfin (Heckmann et al. 1986).

Altered Flow Regimes

Designated critical habitat has been significantly altered due to dam construction and irrigation diversions which have resulted in decreased flows and thus available physical habitat throughout the Virgin River. Altered flow regimes both above and below major irrigation diversions at Washington Fields, Mesquite, and Riverside have resulted in loss of habitat due to complete dewatering of the river during low flow periods.

Status and Factors Affecting the Woundfin Critical Habitat in the Action Area

Status of woundfin critical habitat is the same as in the rangewide status section. Factors affecting critical habitat are the same as listed above for the species.

7.8 Moapa Dace

Status of the Moapa Dace in the Action Area

The action area is the entire range of the Moapa dace, therefore the environmental baseline for these species in the action area is the same as the rangewide description above.

Factors Affecting the Moapa Dace in the Action Area

Groundwater Use Memorandum of Agreement

In the January 30, 2006, programmatic biological opinion for the proposed Muddy River MOA, the Service estimated that the cumulative actions of parties to the MOA could result in 31 percent reduction in the flows at the Warm Springs West in the Pedersen Unit of the NWR, reducing the flows to 2.7 cfs. This translates roughly into a 22 percent loss in riffle habitat and 16 percent loss in pool habitat in that area for the Moapa dace. Should flows at the Warm Springs West gage decline to a flow below 2.7 cfs, water use from those anticipated in the intra-Service PBO would be reduced.

On July 14, 2005, a MOA was signed by SNWA, Meadow Valley Water District (MVWD), CSI, Tribe, and the Service, regarding groundwater withdrawal of 16,100 afy from the regional carbonate aquifer in Coyote Spring Valley and California Wash Basins that included conservation measures for the Moapa dace. The MOA outlined specific conservation actions that each party would complete in order to minimize potential impacts to the Moapa dace should water levels decline in the Muddy River system as a result of the cumulative withdrawal of 16,100 afy of groundwater from two basins within the regional carbonate aquifer system. The MOA and PBO include the following conservation measures:

1. Provide funding toward restoration of Moapa dace habitat on the Apcar Unit of the Moapa Valley NWR;
2. Develop a Recovery Implementation Program which will be used to effectuate the goals of the MOA by implementing measures necessary to accomplish the protection and promote the recovery of the Moapa dace, as well as, outline the development of regional water facilities and include additional parties as appropriate. The Recovery Program will be developed for the purposes of continuing to identify the key conservation actions that, when implemented, would continue to contribute to off-set any pumping impacts that may result from groundwater pumping;
3. Assist in developing an ecological model to investigate the effects of habitat change on the ecology of the Moapa dace;
4. Construct fish barriers in order to prevent additional non-native fishes from migrating into Moapa dace habitat;
5. Eradicate non-native fish, such as tilapia from the historic range of Moapa dace;
6. Restore habitat necessary for the Moapa dace, and take other steps to protect and recover the dace;
7. Provide the use of the Tribal greenhouse to cultivate native plants for restoration actions in the Muddy River area;
8. Provide access to Tribal lands for the construction and maintenance of at least one fish barrier;

9. Dedicate the existing Jones Spring water right (MVWD) with a flow rate of 1.0 cubic feet per second (cfs) towards establishing and maintaining in-stream flows in the Apcar tributary system that empties into the Muddy River; and
10. Dedicate 460 afy of CSI appropriated water rights to the survival and recovery of the Moapa dace, in perpetuity through a conservation easement to the Nevada State Engineer.
11. Establish a Hydrologic Review Team to develop and coordinate regional monitoring efforts of the groundwater pumping proposed under the MOA. Team members discuss and perform analyses of groundwater pumping effects and natural climatic variation on the Muddy River and Muddy Springs.
12. Develop the Muddy River Recovery Implementation Program to provide a comprehensive program for water resource management in the Coyote Spring Valley, Warm Springs, and Muddy River areas, while working toward recovery of the Moapa dace.

In the January 30, 2006, programmatic biological opinion for the proposed Muddy River MOA, the Service estimated that the cumulative actions of parties to the MOA could result in 31 percent reduction in the flows at the Warm Springs West in the Pedersen Unit of the NWR, reducing the flows to 2.7 cfs. This translates roughly into a 22 percent loss in riffle habitat and 16 percent loss in pool habitat in that area for the Moapa dace. Should flows at the Warm Springs West gage decline to a flow below 2.7 cfs, the amount of incidental take for any project-specific action under the MOA would be exceeded for the Moapa dace and water use from those anticipated in the intra-Service PBO would be reduced.

Kane Springs Valley Groundwater Development Project

On October 29, 2008, the Service issued a non-jeopardy biological opinion (File No. 84320-2008-F-0007) to the Ely District Office of the Bureau of Land Management for the purpose of permitting the construction of groundwater production and monitoring wells, water pipelines, storage, tanks, power transmission lines and substations, access roads, and fiber optic lines by the Lincoln County Water District (LCWD), Lincoln County Power District Number 1, and the Lincoln County Telephone Company. The proposed action also included the pumping of 1,000 afy of water from the Kane Springs Valley aquifer, which is within the low-gradient, high-transmissivity zone that connects Kane Springs Valley, Coyote Springs Valley, and the Warm Springs Area Basins. The analysis stated it would be difficult to determine effects resulting specifically from this project from those resulting from the 2006 PBO (described above). However, concurrent monitoring of the Kane Springs well was required in addition to the monitoring required in the 2006 PBO. The project proponents also agreed (1) to reduce groundwater pumping by half in the Kane Springs Valley should stream flows reach 3.15 cfs or less but greater than 3.0 cfs at the Warm Springs West gage and (2) to stop pumping in Kane Springs Valley should stream flows reach 3.0 cfs or less at the Warm Springs West gage. Results from the 2-year pumping test described above includes impacts from groundwater pumping from this project.

Habitat Acquisition

In February 2006, the Secretary of the Interior approved funding through the Southern Nevada Public Lands Management Act for SNWA to purchase 1,218 acres of land historically known as the Warm Springs Ranch, located in the Moapa Valley. In 2007, the SNWA completed the purchase and committed to protect and preserve the property as a natural area. By purchasing the property, the SNWA was able to protect the majority of the Moapa dace population and its habitat, and prevent the property from being developed for residential purposes.

Habitat Improvement Projects

On July 17, 2008, the Service issued a biological opinion (84320-2008-F-0417) to the U.S. Army Corps of Engineers for their proposed issuance of a permit to SNWA for habitat restoration, establishment, and enhancement activities in the Lower Pederson Stream of the Warm Springs Natural Area. The permit would allow SNWA to restore part of the lower Pederson channel to a pre-modified alignment and construct an artificial channel connecting the stream to the channel. Incidental take of all Moapa dace occurring in the project area may be harassed during the course of activities, which is estimated to be approximately 100 fish. An additional 20 Moapa dace may be harmed (wounded or killed) during the course of salvage activities. An unknown number of Moapa dace eggs and/or larvae may be harmed during the course of activities due to desiccation of approximately 3,229 square feet of sheet flow.

Invasive Species and Predator Control

The introduction and establishment of non-native fish, particularly tilapia and mollies, continue to be a predation threat to Moapa dace. Efforts to control and monitor tilapia are currently underway.

Altered Flow Regimes

Habitat loss has occurred from water diversions and impoundments. Reductions to surface spring-flows resulting from groundwater development reduces spawning, nursery habitats, and the food base for the species.

Wildfires

A major wildfire occurred on July 1, 2010, affecting the Moapa dace. According to population survey data, up to 60 percent of the existing Moapa dace occurred within the action area at the time the fire started. Post-fire survey data indicate that most dace within the affected area quickly moved to safer areas in response to the fire. Although the number of dace that were lost during the fire is unknown, the Service estimates that less than 50 individuals were lost during the event and in the immediate aftermath.

There is an increased threat of fire due to encroachment of non-native plant species such as palm trees. The Moapa dace is more vulnerable to catastrophic events due to its limited distribution in conjunction with these threats.

Reproductive Ecology Study

On December 28, 2012, the Service issued a biological opinion (84320-2013-F-0029) for issuance of a recovery permit to the University of Arizona for the capture of up to 40 adult Moapa dace in order to study their reproductive ecology to determine whether and how the species can be bred successfully in captivity. The consultation was reinitiated, and the Service issued a second biological opinion (84320-2013-F-0029-R001) on December 3, 2013, to include the capture and study of an additional 30 dace. The Service determined that neither action were likely to jeopardize the continued existence of the Moapa dace because enough dace would remain in the wild population to compensate for the loss.

7.9 Ash Meadows Species and Critical Habitat

The action area is the entire range of the Ash Meadows species and critical habitat, therefore the environmental baseline for these species in the action area is the same as the rangewide descriptions above. There are populations of Ash Meadows gumplant and Amargosa niterwort and all of the Amargosa designated critical habitat that is in California outside of the action area.

Section 8: Effects of the Proposed Action

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

The updated Endangered Species Act regulations (84 FR 44976) combine effects into “all effects.” Even though we discuss direct and indirect effects, this biological opinion complies with the new regulations.

8.1 Desert Tortoise General Effects

The proposed action may affect desert tortoises in different ways. Tortoises may be captured, handled, and moved out of harm’s way or killed by construction equipment or vehicles. Disturbance of desert tortoise habitat will result in lost, degraded, and fragmented habitat; increased non-native species; increased edge effects; increased effects to genetics and connectivity; and increased pressure from human-subsidized predators.

To analyze how the various activities of the proposed action may affect desert tortoises, we will qualitatively describe effects and then consider the best available information with regard to the effects to the reproduction, numbers, and distribution of desert tortoises in the action area and recovery units to determine whether the proposed action is likely to jeopardize the continued existence of the species.

We acknowledge that with every proposed activity, desert tortoises are at risk of being killed or injured when workers (including authorized biologists and biological monitors) drive outside of areas that have been fenced or cleared of tortoises. Juvenile desert tortoises are at greater risk than larger animals because they are more difficult to see. This will generally be the case for every proposed activity, regardless of whether tortoises have previously been captured, handled, and moved out of harm's way.

Because hatchlings can take shelter in burrows of all sizes and are difficult to see due to their cryptic nature and their small size, surveyors are less likely to detect them than the larger desert tortoises. Consequently, we expect that most of the hatchlings and eggs are likely to remain in the work areas during construction, and construction is likely to kill these desert tortoises. Because construction activities are likely to occur year round, activities are likely to affect both hatchlings and eggs. Eggs and small desert tortoises, even those that are larger than hatchlings (juveniles), are always more difficult to detect than larger animals and therefore more likely to be killed during every type of activity; this applies for all proposed actions.

All minimization measures proposed by BLM to minimize the effects to the desert tortoise are within *Reasonable and Prudent Measures with terms and conditions*. Effects minimized by the measures are also identified in Appendix D. Specific measures designed to minimize effects will be detailed in the following appropriate effects section(s).

Effects of Capturing, Handling, and Moving Desert Tortoises

For projects that have desert tortoises in harm's way, the desert tortoises will be captured and moved to safe areas prior to any ground disturbance through (1) moving tortoises just outside the perimeter of a project (less than 300 meters) or (2) moving tortoises more than 300 meters away from the project through translocation. Capturing, handling, and moving tortoises may result in accidental death or injury if performed improperly, such as during extreme temperatures or if individuals void their bladders and are not rehydrated. Averill-Murray (2001) determined desert tortoises that voided their bladders during handling had lower overall survival rates (0.81 to 0.88) than those that did not void (0.96). If multiple desert tortoises are handled by biologists without the use of appropriate protective measures and procedures, such as latex gloves, pathogens may be spread among individuals.

Clearance survey guidelines call for the excavation of all desert tortoise burrows within construction footprints prior to the onset of ground disturbance. The biologists may detect some of the nests and eggs, but overall, we anticipate that detection of eggs is unlikely because the buried nests are difficult to find.

Translocation is the human movement of living organisms from one area and releasing them into another. The adverse effects of translocation include increased risk of mortality, spread of disease, and reduced reproductive success (Boarman 2002a). Tortoises moved short distances (up to 300 meters) may return to the point of capture and be in harm's way. Tortoises translocated beyond their home ranges are more active and may be injured or killed by other human actions (e.g., struck by vehicle) or stress. Stress associated with artificially increasing the density of tortoises in an area, and thereby increasing competition for resources, and disease transmission between and among translocated and resident desert tortoises may occur. Physiological stresses associated with handling and movement or from density-dependent effects could exacerbate this risk if translocated individuals with subclinical upper respiratory tract disease or other diseases present symptoms subsequent to translocation. This potential conversion of translocated desert tortoises from a non-contagious to contagious state may increase the potential for infection in the resident population above pre-translocation levels. To minimize this risk, an appended consultation with an approved translocation plan will include health assessments that are required on all desert tortoises to be moved beyond their home range prior to being released in accordance with the most recent Service guidance.

Because we cannot reasonably predict if an increase in disease prevalence within a resident desert tortoise population may occur due to translocation, BLM and the project proponent will be required to implement the most recent Service translocation guidance, which includes, but is not limited to, the following measures:

- Use experienced biologists and approved handling techniques;
- do not move or translocate any animal that has clinical signs of disease; and
- monitor translocated, resident, and control individuals to help determine the effects of moving tortoises.

Apart from disease, translocation also affects resident desert tortoises within the area due to local increases in population densities. Desert tortoises from project sites will likely be moved to areas now supporting a resident population. This may result in increased inter-specific encounters and, thereby, an increased potential for spread of disease, potentially reducing the health of the overall population; increased competition for shelter sites and other limited resources; increased competition for forage, especially during drought years; and increased incidence of aggressive interactions between individuals (Saethre et al. 2003). To minimize potential density-dependent effects, recipient areas must be sufficiently large to accommodate and maintain the resident and translocated desert tortoises.

Translocated animals spend more time moving, at least during the first year, which means they are more vulnerable to predators, adverse interactions with other desert tortoises, and weather conditions than resident animals. In spring 2013, biologists translocated and transmittered 69 desert tortoises from approximately 2,000 acres of the KRoad Moapa Solar Project on the Moapa River Indian Reservation northeast of Las Vegas; they also monitored large desert tortoises as controls (12) or residents (21). Extremely high temperatures during the summer, predation, and unknown causes have killed 28 translocated desert tortoises (Cardno Inc. 2018). No resident or control desert tortoises have died during monitoring.

A study found that almost half of desert tortoises translocated 1.2 miles (2 km) returned to their capture site; only one desert tortoise moved 3.1 miles (5 km) returned to the capture site and no desert tortoises returned home from 5 miles (8 km) away (Hinderle et al. 2015). When fencing is installed, tortoises that are released back into the area can find their access to previously used burrows cut off. This can lead to exposure to high temperatures that can raise carapace temperature to lethal limits (Peaden et al. 2017). The same study documented increasing carapace temperatures due to pacing along the fence. There is no published literature on how long a tortoise can withstand prolonged extreme temperatures before succumbing to death.

The reduction in reproductive success due to translocation has also been studied. Nussear et al. (2012) investigated the effects of translocation on reproduction in 120 desert tortoises. They found that, in the first year since translocation, the mean reproductive effort for translocated desert tortoises was slightly less than that of residents. Nussear et al. (2012) noted that the translocated animals may have benefited from being fed while in the pre-translocation holding facility; the food provided in the facility may have increased their production of eggs in the first year after translocation. In the second and third years after translocation, the mean number of eggs was not different between resident and translocated desert tortoises (That is, absent the food the desert tortoises received in the holding facility, the first year's reproduction may have been lower; the lack of difference in egg production between resident and translocated animals in subsequent years indicates that translocation did not have a long-term effect on reproductive output).

Minimization measures proposed for all programs include proper tortoise handling in order to reduce tortoise injury, voiding of bladder, and stress and requiring authorized desert tortoise biologists or monitors. The authorized biologist(s) will follow the most current version of the Desert Tortoise Field Manual (Service 2009a) when capturing, handling, and moving tortoises. These personnel will also use appropriate protective measures and procedures to reduce the spread of pathogens among individuals by using new latex gloves for each tortoises handled.

Capturing, handling, and moving tortoises is an effective means of minimizing adverse effects on desert tortoises during project implementation when occupied habitat cannot be avoided. We do not anticipate that survival rates of tortoises moved will significantly differ from that of resident tortoises. We cannot precisely predict the level of mortality after capture and moving because regional factors that we cannot control or predict (e.g., drought, predation related to a decreased prey base during drought, etc.) will likely affect the rate of mortality similarly for moved and resident desert tortoises.

Effects of Roads, Vehicles, and Project Access on the Desert Tortoise

The presence of a road poses a substantial risk to tortoises and their habitat; and the more roads there are, the greater the proportion of the tortoise population that is under the threat of illegal off-road activity (Boarman 2002a). The effects of roads and highways on animals are not limited to the immediate vicinity of a roadway because road mortality affects dispersing individuals as well as those whose home range includes the road. In addition, introduced predators and invasive plants can migrate outward from roads, affecting native animals in adjacent areas. The total area affected, or the "road-effect zone," can be substantial for species that either travel long distance or are vulnerable to predation by species introduced along road corridors (Boarman and Sazaki 1996). The combined environmental effects generated by roads (e.g., thermal, hydrological, pollutants, noise, light, invasive species, human access) within the road-effect zone extend outward from approximately 300 to 2,600 ft beyond the road edge. Continued use of existing roads may result in habitat fragmentation, increased opportunities for collection or vandalism, introduction of non-native plants and animals, injury or mortality as a result of encounters with pets, and illegal release of pet tortoises including exotic species.

Access to project sites will be identified by BLM and included in the project-level consultation. Access to project work areas outside of the fenced facilities may kill or injure desert tortoises due to construction of new routes or increased use and improvement of existing routes. The primary effect of project access on desert tortoises is the risk of injury or mortality from vehicle strikes. The risk to desert tortoises on access roads is influenced by variables such as speed limits, weather conditions, the nature and condition of the roads, and activity patterns of desert tortoises at the time the roads are in use.

Project access roads may be used solely by project vehicles or by both project and public vehicles. While measures imposed on project activities minimize the risk and take of desert tortoises that may occur on roads, such measures do not typically apply to public users. Effects to desert tortoises on new project access roads or substantial improvements to existing roads that provide public access to previously inaccessible areas are project-related effects. Effects to desert tortoises that result from public activities on existing access roads used by both public and project vehicles are not typically considered project-related effects.

Vehicles on well-maintained and paved roads may travel at excessive speeds, preventing the operator from seeing desert tortoises in time to avoid them. Roads enhance connectivity between rural and heavily populated areas and may facilitate urbanization. Roads may facilitate future development of an area, increasing use of surrounding habitats by humans for hunting, collection, and other recreational activities (Andrews et al. 2008).

Census data indicate that desert tortoise numbers decline as vehicle use increases (Bury et al. 1977) and that tortoise sign increases with increased distance from roads (Nicholson 1978). Tortoises often use roads which have depressions as drinking sites. Tortoises that move or occur in the paths of vehicles may be killed or injured (Bury and Luckenbach 1986, Nicholson 1978) or collected as pets or food (Berry et al. 1996). General road use and road construction and maintenance activities (grading, paving, and graveling) may cause physiological stress and disruption of movement, feeding, breeding, and sheltering behavior in desert tortoises.

Road kills and litter from vehicles may attract subsidized tortoise predators. Roads are major attractants for common ravens, which are predators on juvenile tortoises (Knight and Kawashima 1993, Boarman 1993). Ravens, being partly scavengers, are known for cruising road edges in search of road kills (Kristan et al. 2004). Desert tortoises using road depressions as drinking sites may be at increased risk or mortality from predation.

Habitat recovery is slow in the desert. As a result, proliferation of roads and unauthorized off-road vehicle use has left persistent scars in the desert. OHVs remain a major source of desert tortoise habitat degradation that disrupts water balance, thermoregulation, and energy requirements of desert tortoises (Service 1994); reduces availability of food for tortoises (Service 1994); and increases erosion and changes drainage patterns. (Brooks and Lair 2005).

BLM proposed minimization measures expected to minimize these effects include (1) provide desert tortoise awareness education, (2) establish vehicular traffic controls (speed limits, signs, and travel restrictions), (3) check for tortoises under vehicles prior to driving to reduce potential injury and mortality, and (4) establish signs to identify where vehicles may drive and to increase awareness of vehicle operators. We cannot estimate or quantify the level of non-compliance to these measures.

Effects to desert tortoises will increase from baseline conditions on existing roads, new project access roads, or those that are substantially improved. The majority of the desert tortoises impacted are likely those whose home ranges are intersected by or adjacent to these roads and trails. Tortoises could be affected by rights-or-way, mining, or recreation activities (permitted and casual), although any injury or mortality from casual use would likely not be detected or reported. Overall, we expect that the use of roads and vehicles is likely to injure or kill relatively few desert tortoises. We cannot quantify the number of desert tortoises that these activities may affect because we do not know how many animals will enter these linear areas. Also, we expect that authorized biologists and monitors will be able to detect and protect most desert tortoises during project activities.

Effects of Non-native Plant Species on the Desert Tortoise

BLM actions that result in surface disturbance such as OHV activity, roads, livestock grazing, agricultural uses, and other activities contribute to the spread of non-native species (or the displacement of native species) and the direct loss and degradation of habitats (Avery 1998). Project vehicles and equipment may transport non-native propagules into the project area where they may become established and proliferate. In addition, the introduction of non-native plant species may lead to increased wildfire risk, which ultimately may result in future habitat losses (Service 2011a, Brooks 2003) and changes in forage opportunities for desert tortoises.

Roadsides are widely considered to be one of the primary pathways for non-native plant invasions into desert regions (Amor and Stevens 1976 and Brooks and Pyke 2001, cited in Brooks and Berry 2006). Roads facilitate dispersal of plant seeds (Trombulak and Frissell 2000, cited in Brooks and Berry 2006). Four-wheel drive vehicles carry significantly more seeds than two-wheel drive vehicles (Lonsdale and Lane 1994, cited in Brooks and Berry 2006). OHV use tends to be concentrated around dirt roads and other pathways of travel away from roadsides, such as washes and utility ROWs (Matchett et al. 2004, cited in Brooks and Berry 2006) which may explain why there are more non-native plant species near dirt roads. In addition, dirt roads are often associated with elevated levels of livestock grazing and other human-related activities (Service 1994). Roadsides not only experience high levels of disturbance, but they also have high levels of productivity from rainfall flow off of road surfaces and onto adjacent roadside vegetation (Johnson et al. 1975 and Starr 2002, cited in Brooks and Berry 2006). Where road densities are high, non-native plant richness and biomass may increase from the combined effects of high non-native plant biomass near roads, increased dispersal of seeds along and away from roads by vehicles, decreased distances from roads to other areas of the landscape, and locally high productivity levels along roadsides.

The potential proliferation of nonnative plant species could also contribute to an increase in fire frequency within the action area. Fires in desert tortoise habitat result in loss of habitat by altering plant composition and structure.

Invasion of non-native plants can affect the quality and quantity of plant foods available to desert tortoises. Nonnative species generally do not provide adequate nutrition to desert tortoises (Abella and Berry 2016); when they out-compete native forage plants, they reduce the amount of food available to desert tortoises. Drake et al. (2016) studied captive Mojave desert tortoises and their response to a variety of diets ranging from all native grass to all invasive grass (red brome). They found that 37 percent of the tortoises given only an invasive grass diet were found dead or were removed from the experiment due to poor body condition. The all-invasive grass group fared the worst of all diet groups, including those that mixed native and invasive grasses.

Diets that include invasive species in the Mojave Desert may decrease desert tortoise health and therefore, survivorship and reproduction potential. Females may lay fewer eggs, although we are unaware of any research that demonstrates this effect; many other factors influence egg production in desert tortoises. We expect no injury or mortality to desert tortoises from the presence of non-native species, but there could be a decrease in reproduction and an effect on how tortoises are distributed across the range.

BLM proposed minimization measures to address the potential effects from non-native plant species, which include those described previously for habitat effects: (1) require a weed management plan with monitoring and control components; (2) implement actions to avoid introduction of weed by vehicles and equipment; (3) use low-toxicity herbicides applied in accordance with the plan; (4) use certified weed-free seed mixes of native shrubs, grasses, and forbs of local origin; (5) provide worker awareness training; (6) limit ground disturbance; (7) expedite reestablishment of native vegetation in disturbed areas to prevent weeds from colonizing newly disturbed areas; (8) require certified weed-free hay in corrals or similar enclosures; and (9) restore habitat disturbance and collect remuneration fees to reduce the threat of non-native plants and facilitate habitat recovery.

Effects on Desert Tortoise Genetics and Population Connectivity

Disturbance from proposed actions in desert tortoise habitat may affect connectivity between local desert tortoise populations occurring in the action area. Genetic variability of the species and sufficient ecological heterogeneity within and among populations must be maintained to ensure desert tortoise recovery (Murphy et al. 2007, Hagerty and Tracy 2010). This variation is necessary to allow tortoises to adapt to changes in the environment over time (Service 1994, 2011a). Because desert tortoises occupy large home ranges, the long-term persistence of extensive unfragmented habitats is essential for the survival of the species (Service 1994, 2011a). The loss or degradation of these habitats to urbanization, habitat conversion from frequent wildfire, or other landscape-modifying activities place the desert tortoise at increased risk of extirpation because the tortoise depends on the cover of shrubs and annuals for forage provided by contiguous native vegetation communities.

Landscape genetic analysis performed by Latch et al. (2011) identified both natural (slope) and anthropogenic (roads) landscape variables that significantly influenced desert tortoise gene flow of a local population. Although they found a higher correlation of genetic distance with slope compared to roads, desert tortoise pairs from the same side of a road exhibited significantly less genetic differentiation than tortoise pairs from opposite sides of a road. Some project access roads may decrease population connectivity substantially beyond the existing conditions.

As discussed in the revised recovery plan (Service 2011a) and elsewhere, habitat linkages are essential to maintaining rangewide genetic variation (Edwards et al. 2004a; Segelbacher et al. 2010) and the ability to shift distribution in response to environmental stochasticity, such as climate change (Ricketts 2001, Fischer and Lindenmayer 2007). Natural and anthropomorphic constrictions (e.g., I-15 at the Nevada-California border) can limit gene flow and the ability of desert tortoises to move between larger blocks of suitable habitat and populations. In the action area, existing anthropomorphic constrictions compound effects of natural barriers on desert tortoise population connectivity.

Linkages in the action area are already influenced by existing anthropomorphic constrictions that compound effects of natural barriers on desert tortoise population connectivity. These barriers include: I-15; US Highways 93 and 95; SR 160, 161, 163, 164, 165, and 168; the large-scale desert tortoise translocation site south of SR 161; the development at Primm, Nevada; the Union-Pacific railroad; numerous utility corridors and transmission lines with associated access roads; and a proposed high-speed train along the I-15 corridor. Some of these facilities function as sources of mortality with combined impacts from edge effects (e.g., impacts from construction-related noise, light, dust, increased vehicular traffic, and ground vibration). Existing obstacles to occupancy and movement, and possible increases in mortality have the potential to exert a significant adverse effect on the connectivity function of this and other areas where occupied and suitable habitats occur in narrow bands surrounded by lower quality habitats. Conserving the smaller-scale, internal redundancy within remaining portions of the habitat linkage is essential. Since redundancy in the linkage network between core populations in this portion of the species' range is extremely limited, maintenance of connectivity along the I-15 corridor at the Nevada-California state line is imperative.

Because little research exists relative to effects of habitat disturbance on desert tortoise genetics and population connectivity, we cannot at this time articulate the magnitude and extent of these potential effects on tortoises from BLM-proposed activities. It is conceivable that connectivity between local desert tortoise populations and linkages within and to the action area may be impacted by proposed actions.

While some level of impact to population connectivity and habitat linkages may occur from the proposed action, the loss and disturbance of 9,090 ac of desert tortoise habitat represents a small percentage (0.14 percent) of the desert tortoise habitat in the Eastern and Northeastern Mojave recovery units (6,563,960 ac) where the majority of the action area occurs. Furthermore, this loss and disturbance represents an even smaller percent of the estimated desert tortoise habitat (0.05 percent) within 16,745,848 ac rangewide. Based on this, we do not anticipate the loss of habitat will result in significant fragmentation or loss of connectivity over the entirety of the action area.

Effects of Subsidized Desert Tortoise Predators

The common raven is a known predator of the desert tortoise. Human activities in desert tortoise habitat potentially subsidize limited resources available for ravens and other desert tortoise predators. Habitat disturbance may remove shrubs and cover for desert tortoises exposing them to avian and other predators. Animals killed by vehicles on roads provide food for desert tortoise predators. Other human sources of desert tortoise predator subsidies include trash and discarded food, ponded water, and raven roosting and nesting sites.

Most raven predation on tortoises appears to occur during the raven breeding season (Boarman 2002b). By one estimate, ravens probably do most of their foraging (75 percent) within 0.25 mi of their nest (Sherman 1993), and raven predation pressure is notably intense near their nests (Kristan 2001). Therefore, ravens nesting on transmission towers where no other nesting substrate exists within 0.5 mi may significantly reduce juvenile tortoise populations within 0.25 mi of the corridor, but this effect is quite localized.

There has also been confirmed predation on desert tortoise by red-tailed hawks (*Buteo jamaicensis*). In spring 2015, a study in the Chemehuevi critical habitat unit in California, found juvenile tortoise scutes within red-tailed hawk pellets under transmission line structures (Anderson and Berry 2019). Of the pellets collected, 4.4 percent contained one to several juvenile tortoise scutes. This was the first report of predation by red-tailed hawks.

Natural predation rates may be altered or increased when natural habitats are disturbed or modified and human presence in otherwise remote desert areas increases. During the past few decades, the population of the common raven has increased substantially in the desert southwest, primarily in response to human-provided subsidies of food, water, and nest sites. There is documentation of numerous carcasses of hatchling and juvenile desert tortoises under the nests of common ravens and a reduction in the proportion of hatchling and juvenile desert tortoise at several locations in the Mojave Desert. Human activities that attract common ravens, desert kit foxes, feral dogs, and coyotes by providing resources in the form of food or water that would otherwise be unavailable may substantially increase predation of tortoises in the area (Berry 1986, BLM 1990). Roadkill of wildlife provides additional attractants and subsidies for opportunistic predators and scavengers. The use of water to control dust on construction sites and access roads result in ponding of water would provide a subsidized resource for ravens and other desert tortoise predators.

To avoid and minimize the availability of predator subsidies for all programs, proposed measures to control trash and other subsidized resources include (1) requiring transmission line support structures and other facility structures be designed to discourage their use by raptors for perching or nesting (e.g., by use of anti-perching devices) in accordance with the most current Avian Power Line Interaction Committee guidelines, (2) develop and implement a litter control program for each project to contain trash and food in closed and secured containers and remove them periodically, and (3) implement the Raven Management Plan and monitor raven use of tall structures and other species that are attracted to developed areas.

We cannot reasonably predict the amount of predation on desert tortoises that program activities are likely to add to baseline levels within the action area. Generally, minimization measures are effective in eliminating some, but not all, use of the project sites by predators.

Effects of Loss of Habitat

Projects undertaken or constructed within programs may include removing vegetation, which may coincide with the loss of desert tortoise habitat. A total of 10,595 acres of non-critical tortoise habitat and 2,570 acres of designated desert tortoise critical habitat may be lost due to program activities. These acres include both permanent and temporary disturbance.

Because recovery of vegetation in the desert can take decades or longer, ground-disturbing impacts associated with the Project may be long-term. Vasek et al. (1975) found that the Mojave Desert transmission line construction and O&M activities resulted in an unvegetated maintenance road, enhanced vegetation along the road edge and between tower sites (often dominated by nonnative species), and reduced vegetation cover under the towers, which recovered significantly but not completely in about 33 years. Webb (2002) determined that absent active restoration following extensive disturbance and compaction in the Mojave Desert, soils in this environment could take between 92 and 124 years to recover. Other studies have shown that recovery of plant cover and biomass in the Mojave Desert could require 50 to 300 years in the absence of restoration efforts (Lovich and Bainbridge 1999). Based on a quantitative review of studies evaluating post-disturbance plant recovery and success in the Mojave and Sonoran deserts, Abella (2010) found that reestablishment of perennial shrub cover (to amounts found on undisturbed areas) generally occurs within 100 years but no fewer than 40 years in some situations. He also found that a number of variables likely affect vegetation recovery times, including but not limited to climate (e.g., precipitation and temperatures), invasion by nonnative plant species, and the magnitude and extent of ongoing disturbance.

Project activities may permanently and temporarily impact 13,165 acres of desert tortoise designated critical and non-critical habitat. This loss of habitat will directly impact approximately 0.2 percent of the total 6,563,960 million acres available within the Northeastern and Eastern Mojave Recovery Units (Darst 2014) and only 0.08 percent loss of habitat rangewide (13,165 acres of 16,745,848 total acres). While the model does not take into account anthropomorphic disturbances that have historically or are currently affecting the species, it is unlikely that consideration of these would result in a substantial change in this estimate.

While this percentage (0.2) does not constitute a numerically significant portion of the Northeastern and Eastern Mojave Recovery Units, the low percentage of habitat within the recovery units that would be lost underestimates impact of the project activities on the desert tortoise, especially in light of existing land uses, changes in species composition and fire regimes due to establishment of nonnative plant species, existing and increasing disease and predation rates, and the expansion of human occupancy in what were once remote desert landscapes. The revised recovery plan (Service 2011a) and 5-year review (Service 2010a) provide detailed discussions of these and other past, present, and future threats facing the desert tortoise.

The loss of habitat would not only be a decrease in food availability but would also increase fragmentation and decrease connectivity, which could reduce the gene flow between tortoise populations.

To offset the loss and modification of tortoise habitat, BLM and their applicants will pay remuneration fees as outlined in the terms and conditions. Although the remuneration fees will not create new habitat within the recovery units, they will provide funding for mitigation on BLM lands.

Edge Effects on the Desert Tortoise

Disturbance from proposed actions will likely result in edge effects that will impact desert tortoises within habitat adjacent to the disturbance area. Desert tortoises may be adversely affected by construction noise, ground vibrations, and artificial lighting. Increased noise levels and the presence of facility lighting may affect desert tortoise behavior. While limited data exists on the effects of noise on desert tortoises, Bowles et al. (1999) demonstrated that the species has relatively sensitive hearing, but few physiological effects were observed with short-term exposures to jet air craft noise and sonic booms. These results cannot be extrapolated to chronic exposures over the lifetime of an individual or a population. Based on the ability of other species to adapt to noise disturbance, noise attenuation as distance from the project increases, and the fact that desert tortoises do not rely on auditory cues for their survival, we do not expect any desert tortoises to be injured or killed as a result of most project-related noise.

Heavy equipment and other vehicles and equipment used during construction or other activities produce ground vibrations. Vibration from construction equipment or high-speed vehicles is typically barely perceptible farther than 40 to 50 feet beyond the source, so only burrows within 50 feet of the activity should be impacted by vibration. Blasting during construction would also produce vibration. Ground vibrations could cause stress to tortoises, which may result in avoidance of the area, thereby increasing the risk of mortality from increased temperatures or predators. The number of tortoises that could be impacted by vibration is expected to be minimal, if any. Adverse effects from blasting would be avoided through implementation and compliance of the blasting minimization measure.

Construction activities and recreational vehicle traffic on roads and trails within the action area could generate dust that could affect vegetation adjacent to and within the action area during construction. Long-term adverse effects from dust on vegetation are not expected to occur. The buildup of dust on plant leaves could affect photosynthetic productivity and nutrient and water uptake, resulting in loss of potential foraging plants for desert tortoise. It is assumed that this low-level dusting effect during construction would be minimal and most likely washed away during rainstorms. Dust levels are expected to be reduced in areas slated for mowing as compared to areas developed using traditional methods, due to retention of plants and less disturbance to soil crusts and desert pavement.

Because few data exist relative to edge effects from noise, light, vibration, and increased dust from project activities, it is difficult to determine how these potential impacts may affect desert tortoise populations within and adjacent to project areas. Thus, the magnitude and extent of these edge effects cannot be articulated at this time, but conceivably could disturb individual desert tortoises to the extent that they abandon all or a portion of their established home ranges and move elsewhere. Proposed minimization measures that reduce dust and noise address some of the potential edge effects. We expect no injury or mortality to desert tortoises from edge effects, but there could be effects to distribution to avoid such impacts.

8.2 Desert Tortoise Effects by Program

Effects of Land, Realty, and Rights-of-way Actions on Desert Tortoise

Actions under this program result in a wide range and extent of effects to the desert tortoise. Most actions involve vehicles and equipment which are important threats to the desert tortoise. Tortoises may take shelter under parked vehicles and be killed, injured, or taken by other means when the vehicle is moved. Most project effects resulting in injury or mortality of desert tortoise on previous projects have been associated with vehicle or equipment use and activity.

BLM may authorize actions that result in desert tortoise habitat, and tortoises that occur on these lands, being isolated from adjacent habitat and populations. BLM will coordinate with the Service at the project-level consultation to determine the appropriate measures to minimize effects to the tortoise which may include capturing and relocating the tortoises to secure habitat.

Land Disposal

BLM may dispose of up to 4,500 ac of non-critical desert tortoise habitat during the term of this consultation. Although this PBO evaluates only the effects that may result from the transfer of BLM-administered land out of Federal ownership, we anticipate that the direct and indirect effects to listed species that may occur after transfer will be evaluated under section 10 of the Act. The survey for and removal of desert tortoises under the MSHCP is not a mandatory condition of the associated permit. In some cases, BLM may retain management discretion on the land following disposal to the extent that measures in this consultation may be enforced by BLM and incidental take may be exempted on the land under this PBO. Once BLM relinquishes discretion on the land, incidental take would no longer be exempted under section 7 unless another Federal nexus is established and section 7 consultation is completed. Lands transferred out of Federal administration would likely no longer benefit from conservation mandates of Federal agencies under section 7 of the Act.

The transfer of BLM land out of Federal administration may result in development for commercial purposes, residential housing, local government projects, or other actions. Once lands are transferred out of BLM administration, impacts that result from future non-Federal actions on these lands may be considered as cumulative effects, which are identified in Section 9 of this PBO.

To calculate the estimated number of tortoises within an area, we used an average of the most recent density estimates from 2016 (Service 2016) and 2017 (Service 2018a) for the five stratum within the action area (8 tortoises per square mile). The numbers used can be found in Table 19.

Based on desert tortoise abundance estimates of 8 adult tortoises per mi^2, we anticipate that approximately 56 adult and subadult desert tortoises (≥ 180 mm) may occur on the 4,500 ac of disposal lands. In addition to adult and subadult desert tortoises, the disposal lands likely support juvenile desert tortoises. Estimating densities of juvenile desert tortoises is difficult because of low detection probabilities due to their small size and cryptic nature. However, based on a 4-year study of their population ecology, Turner et al. (1987) determined that juveniles less than 180 mm accounted for 86.8 percent of the overall population. Using this range, we estimate that the disposal lands footprint may support 368 juveniles.

Desert tortoises from adjacent parcels may move onto areas to be developed if no barrier exists to exclude them from project areas. As development proceeds, public use and impacts in adjacent areas are anticipated to increase. These uses include increases in recreation, vandalism, ravens and dogs, illegal trash dumping, habitat degradation, and illegal collection of desert tortoise.

Leases

BLM may issue leases for R&PP actions that may disturb up to 1,000 ac of non-critical desert tortoise habitat and 650 ac of non-critical desert tortoise habitat for airport development. The effects of leases on the desert tortoise are expected to be similar to ROW actions described below. Based on the analysis, we anticipate that approximately 21 adult and subadult desert tortoises and 138 juveniles may occur on lands proposed for leases.

Designated Leasing Area (DLA)

The planning-level amendment to change 1,800 acres of non-critical desert tortoise habitat from multiple-use land into a DLA would disturb all 1,800 acres for the installation of a future solar facility. Solar development may affect the desert tortoise through the loss and degradation of habitat. Individuals may also be killed by project vehicles and equipment during all phases of a solar project. Mortality may also occur through increased abundance of predators (e.g., ravens). In addition to these direct impacts, facilities on the DLA could indirectly affect desert tortoises through habitat degradation and fragmentation, dust, noise, and lighting. Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the DLA. Effects of handling, translocation, roads, non-native plants, edge effects, genetics and connectivity, and predators are described in the previous sections.

The Service's Desert Tortoise Recovery Office used multi-year trends through 2014 from the best-fitting model to estimate the abundance of the Northeastern Mojave Recovery Unit at 4.4 adult desert tortoises per square kilometer. Based on this average, it is estimated that up to 31 adult tortoises could be affected by the designation and future construction of a solar project. The 1,800 acres of non-critical desert tortoise habitat and translocation of 31 adult tortoises are not part of this PBO. A desert tortoise translocation plan and separate section 7 consultation will be required for any project within the DLA.

Pre-project geotechnical ROWs

Pre-project ROWs may disturb up to 100 ac of non-critical desert tortoise habitat and five ac of designated critical habitat during the term of this PBO. In addition to habitat disturbance, desert tortoises may be killed or injured by vehicles and equipment traveling to and from work areas on access roads or by off-road travel. Small tortoises are cryptic and difficult to see and more likely to be killed by project vehicles and equipment. We determined that one adult or subadult tortoise and seven juveniles may occur on the 105 ac that may be disturbed.

Linear ROWs

Linear ROWs may disturb up to 2,000 ac of non-critical desert tortoise habitat and 1,500 ac of designated critical habitat during the term of this PBO. Infrastructure projects such as power transmission towers and poles, fences, buildings, and other structures may provide perching, roosting, and nesting opportunities for ravens and other avian tortoise predators. The presence of transmission towers in areas otherwise devoid of other raven nesting substrates (e.g., Joshua trees, palo verde trees, cliffs), may introduce heavy predation to an area previously immune to such predation (Boarman 1993). Project activities may provide food in the form of trash and litter which attracts tortoise predators such as the common raven, kit fox, and coyote (BLM 1990, Boarman and Berry 1995). The majority of raven predation occurs during the spring and is most likely accomplished by breeding ravens (Boarman 2002b). Ravens use transmission towers as well as other anthropogenic structures as nest sites which threaten small tortoises in the area surrounding the nest site (Boarman 2002b). During the raven breeding season, most foraging is probably done near the nest (Sherman 1993) and most food is likely brought back to or near the nest. The effects of subsidized predators on the desert tortoise were described earlier.

Tortoises may fall into trenches or other excavations that remain open. The risk to tortoises from open trenches and excavations is proportionate to the level of tortoise activity, length of the trench or excavation, and how long the trench is open and available to tortoises. During continuous or frequent monitoring of trenches and excavations by project biologists and monitors, tortoises may fall into the open areas. Fencing, covering, or providing escape ramps in the open areas is the most effective measure to prevent mortalities.

The greatest potential threat to desert tortoises resulting from linear ROWs and similar actions is from vehicle and heavy equipment activity on new and existing access roads. Project access roads are often required for activities authorized by BLM on ROWs that may use or require upgrades to existing roads or routes, may be temporary or long-term, and may provide public access to areas not previously accessible. ROW roads may provide new access into tortoise habitat for the public, resulting in all the effects associated with increased human presence. Any tortoise on an access road during project hours would be highly vulnerable. If vehicles travel at excessive speeds on access roads, they may inadvertently run over desert tortoises. Vehicles and equipment may stray from existing roads or designated areas and kill or injure tortoises or crush their burrows. Roads provide direct invasion routes and habitat generation for invasive weedy plants. Tortoises could also be killed or injured as a result of being crushed by worker vehicles commuting to and from the project area. Tortoises in harm’s way and not relocated before project activities commence, or not avoided by vehicles, could also be killed or injured. The effects of roads on the desert tortoise were described earlier.

Linear ROW project impacts to tortoise populations may affect tortoises at levels well beyond those of many point sources of impacts (Boarman 2002a). In a retrospective evaluation of results of 234 biological opinions in California and Nevada (LaRue and Dougherty 1999), 80 percent (47 of 59) of the tortoises reported killed in California and Nevada were killed along utility corridors. Most of those were along the Kern-Mojave Pipeline (Olson et al. 1993, Olson 1996). Considerable habitat destruction or alteration occurs when pipelines and transmission lines are constructed and the impacts are repeated as maintenance operations or new pipelines or power lines are placed along existing corridors. Open pipes on the ground available to tortoises may serve as traps for tortoises and other animals (Olson et al. 1993).

If not located and removed, tortoises could be killed by development or surface-disturbing activities. Tortoises may be taken by capture and relocated from harm’s way. Construction projects could likely kill and injure desert tortoises during activities such as clearing and grubbing of vegetation; trenching activities and entrapment in open trenches and pipes; and collisions with or crushing by vehicles or heavy equipment, including individuals that take shelter under parked vehicles and are killed or injured when vehicles are moved.

Overall, we expect death and injury of most adult tortoises to be avoided during construction, operation, and maintenance activities through implementation and compliance of minimization measures in this PBO. Measures intended to minimize injury and mortality of desert tortoises include, but are not limited to (1) use of fencing to exclude desert tortoises from project areas, (2) assignment of an authorized desert tortoise biologist to monitor and oversee project activities and compliance with protective measures, (3) timing of activities to minimize effects to desert tortoises (e.g., conduct activities during the less-active season and when temperatures are below desert tortoise activity thresholds), (4) move or translocate tortoises from harm’s way in coordination with BLM and the Service when avoidance is not feasible, (5) worker awareness training, (6) conduct pre-activity surveys to locate desert tortoises on-site, (7) restrict vehicles to access roads with enforceable speed limits, and (8) minimize the risk of entrapment by capping pipes and constructing escape ramps in open excavations.

Failure to report tortoise injuries and mortalities may result in additional take of tortoises if measures are insufficient to address the cause of such take. If BLM is not notified in advance of the project, proper oversight may not occur. If tortoise-proof fencing is installed, breaches may occur over time and allow tortoises to pass through the barrier and be in harm’s way. Temporary fencing left in place following the action may contribute towards habitat fragmentation. Materials and trash left behind following a project or action may be ingested by tortoises, entrap or entangle tortoises, attract desert tortoise predators such as common ravens and coyotes, or provide shelter for tortoises that when removed, may result in displacement or injury of the tortoise.

Activities in the action area that occur during and immediately after rainfall may result in adverse effects to desert tortoises. Tortoises may be attracted to roads or project areas to drink or may be disturbed to the extent that they fail to drink, thus affecting their survival. During previous projects in the action area, desert tortoises were known to become highly active during spring, summer, and fall precipitation events resulting in tortoise mortalities and many tortoises captured and moved from harm’s way. The risk to tortoises in association with precipitation rises substantially during this time.

Linear construction projects can negatively affect desert tortoise populations. Studies suggest that differences in the extent of the threat are related to the scale of the project, the ability of crews to avoid disturbing burrows, and the timing of construction to avoid peak activity periods of tortoises (Boarman 2002a). In addition to the discrete disturbance points formed by towers and lines, maintenance roads and repeated operations can introduce continuous sources of disturbance and provide potential sites for invasion of non-native species. ROWs can cause habitat destruction and alteration where vegetation is minimal, possibly increasing mortality, directly or indirectly (Boarman 2002a).

Following construction, the public may use project access roads that may result in adverse effects to tortoise populations. Humans use the desert for off-road exploring, casual shooting and target practice, personal or commercial collecting of animals and plants, searching and digging for minerals and gems, geocaching (GPS-guided stash hunts), and even producing illegal drugs. Desert tortoise shells found in the Mojave Desert with bullet holes were examined forensically and it was determined that these tortoises were alive when they were shot (Berry 1986). Project personnel could illegally collect tortoises for pets or bring dogs to the project area.

Based on the analysis above for linear ROW actions, we anticipate that approximately 44 adult and subadult desert tortoises and 289 juveniles may occur on 3,500 acres of lands proposed for linear ROWs.

Site-type ROWs

BLM may issue site-type ROWs for communication sites or towers, flood-control structures, wells, and other activities with similar effects to the desert tortoise and its habitat within the planning area. Communication sites typically affect a 100-ft by 100-ft area and require an access road. Following construction, personnel periodically visit the sites for maintenance at which time tortoises that occur on the access road are at greatest risk of take due to vehicle activity on the access roads. Most flood-control projects are located in or near urbanized areas such as Las Vegas and Pahrump where tortoise habitat may be degraded to some degree. Tortoises may be affected by well projects or activities by a minor level of disturbance (about 0.5 ac per year based on 2002-2010 data). If cross-country travel is required, tortoises may be crushed aboveground or in their burrows.

BLM estimates that 750 ac of desert tortoise non-critical habitat and 25 ac of designated critical habitat may be affected by all site-type ROWs under this PBO. Based on the analysis above for site-type ROW actions, we anticipate that approximately 10 adult and subadult desert tortoises and 66 juveniles may occur on lands proposed for site-type ROWs.

Effects of Mining on the Desert Tortoise

The direct effects, and many of the indirect effects, of mining are similar to those described above for ROW activities. Future oil and gas activity will be managed with no surface occupancy. The current mineral withdrawal for all ACECs within the SNDO jurisdiction went into effect November 2009 for a period of 20 years. The withdrawal will not affect valid existing claims.

During the term of this PBO, BLM estimates that 500 ac of non-critical habitat and 100 ac of designated critical habitat may be disturbed for locatable minerals and the same amount of disturbance for saleable mineral. BLM estimates that leasable minerals may disturb 200 ac of non-critical desert tortoise habitat and 25 ac of designated critical habitat.

Based on the analysis above for 1425 ac, we anticipate that approximately 18 adult and subadult desert tortoises and 118 juveniles may occur on lands proposed for mining actions.

Effects of Recreation on the Desert Tortoise

Speed Events

Studies show that vehicles that stray off existing roads and trails may cause habitat disturbance and collapse occupied burrows, thereby crushing nests and burying the occupants (Burge 1983; Bury 1978). Historically, event spectators have been difficult to control at many OHV events which has resulted in substantial environmental and habitat damage (Burge 1983). Vehicles operated by spectators of an organized event may enter unauthorized areas or travel cross-country to observe a race, causing adverse effects on individual desert tortoises or their habitat (Burge 1983, Woodman 1983). Unauthorized route proliferation, crushing of shrubs, and wind erosion resulting from vehicle disturbance contribute to habitat degradation and loss.

Studies have also shown that in areas of moderate to intensive OHV use, the number of perennial shrubs, as well as desert tortoise reproduction and body mass, are reduced (Bury 1987, Bury and Luckenbach 2002. Luke et al. 1991). In addition, OHV activities reduce floral diversity and forage species availability for desert tortoises (Medica et al. 1976, Webb et al. 1978). Bury (1987) demonstrated that desert tortoise densities and health deteriorated as a result of off-road vehicle activities when contrasted to populations from appropriately controlled areas. Impacts from OHVs to the soils and vegetation of desert ecosystems that support the desert tortoise are well documented and may affect desert tortoise populations and habitat quality over a long period of time. Many of these effects are similar to habitat disturbance associated with activities involving construction (e.g., projects within ROWs).

Census data indicate that desert tortoise numbers decline as OHV use increases (Bury et al. 1977) and that desert tortoise sign increases with increased distance from roads (Nicholson 1978). Desert tortoises that move or occur in the paths of recreational vehicles may be killed or injured (Bury 1978, Bury and Luckenbach 1986, Nicholson 1978) or collected as pets.

Noise levels produced by OHVs may alter tortoise behavior (potentially affecting foraging and other activities) or cause hearing loss, but these effects are difficult to assess and are not well documented. Noise from OHVs has the potential to disrupt communication and mask the sounds of approaching predators (Service 1994). Brattstrom and Bondello (1983) stated that the best available scientific data indicate that acoustical impacts of recreational vehicles pose a threat to the well-being of desert vertebrates, and the problem is not just the abilities of specific sounds to carry into desert regions but the abilities of specific sound sources to penetrate deep into these regions. Bondello (1976) reported that reptile hearing can be damaged by exposure at close range by impulsive noise from recreation vehicles. More recently, Bowles et al. (1997) found that no significant temporary threshold shift, or temporary change in auditory sensitivity, was detected even in the most acoustically sensitive tortoises after a worst case scenario exposure to subsonic aircraft noise. Bowles et al. (1999) demonstrated that the species has relatively sensitive hearing (i.e., mean = 34 decibels Sound Pressure Level), but few physiological effects were observed with short-term exposures to jet aircraft noise and sonic booms. These results cannot be extrapolated to chronic exposures over the lifetime of an individual or a population. Based on the ability of other species to adapt to noise disturbance, noise attenuation as distance from the project increases, and the fact that desert tortoises do not rely on auditory cues for their survival, we do not expect any desert tortoises to be injured or killed as a result of project-related noise impacts.

The effects of OHV activity on arid lands continue long after the event if some physical property of the soil is altered. Loosened soils blown off the surface can collect at the bases of shrubs or accumulate in nearby foothills, resulting in small dunes. Finer pulverized soils require lower threshold wind velocities for transportation than coarser pulverized soils with higher fine-clay content. Continued use of existing event courses may preclude natural revegetation of these disturbed areas. Course widening and rut formation are effects documented to occur as a result of previous BLM-permitted OHV events.

Jennings (1997) found that three of the ten most preferred desert tortoise forage plants, Rattlesnake weed (*Euphorbia albomarginata*), widow's milkvetch (*Astragalus layneae*), and Booth's evening primrose (*Camissonia boothii*), were largely confined to washes. The desert tortoises in this study spent significantly more time traveling and foraging in hills, washes, and washlets than on the flats, the same areas preferred by recreational vehicle users and typically used for OHV events. In the southern, eastern, and northeastern Mojave and the Sonoran deserts, washes are also important in the ecology and behavior of desert tortoises (Woodbury and Hardy 1948, Burge 1977, Baxter 1988). Desert tortoises use the washes for travel, excavation of burrows or dens, and for feeding. Because desert tortoises spend so much more time in washes and hills, they are also more likely to suffer direct mortality from vehicles than if they used the habitat randomly.

While the footprint of race courses are within existing disturbed areas (typically 15-ft wide or 30-ft wide), direct effects to the desert tortoise may still occur as a result of the proposed action. New habitat disturbance beyond existing baseline conditions may occur as a result from uncontrolled actions of race participants that cause their race vehicles to stray off the existing race course, particularly given the high rates of speed in some portions of the course. Desert tortoises and vegetation within their habitat could be crushed, injured, or damaged from these actions, and they are most likely to occur on a more frequent basis in portions of the course nearest the center line on either sides of the race course. In addition, desert tortoises and vegetation may also be crushed, injured, or damaged when race vehicles stray off the existing race course as a result of maneuvering turns at high rates of speed, losing control of their vehicles, and crashing their vehicles. These actions will occur less frequently and would likely result in effects beyond 200 ft from the center line on either side of the race course. Medical response activities and retrieval of out-of-commission vehicles could have similar effects in these areas. It is unknown where along the race course, how frequent, or the level of effect these incursions into open desert tortoise habitat may occur or have, but it is anticipated that they will be a relatively small portion of the undisturbed action area.

Locations of the check points, spectator areas, pit and parking areas, and pre- and post-race activities to prepare and clean up the race course are designated within existing disturbed locations. However, race activities, associated equipment, vehicles and support crews, or spectators and their vehicles may move beyond the boundaries of the designated areas and cause new disturbance by crushing, damaging, or trampling vegetation and compacting soil within desert tortoise habitat. Following the race event, spectators and other members of the public may use the race course, designated spectator or pit areas, and access roads which may result in adverse effects to desert tortoise populations and their habitats.

Minimization measures proposed by BLM that should minimize or greatly reduce these potential effects include (1) provide and volunteer environmental awareness program; (2) designate spectator and pit areas with boundary markers; (3) utilize directional signs and volunteers to direct spectators; (4) implement preventative measures along race course; (5) use authorized biologist and other personnel monitoring pre-race, race day, and post-race activities (including pre-event and post-event sweeps); (6) use race courses and designated race areas in previously disturbed locations; (7) inform participants of stipulations before event and disqualify those that fail to comply; and (8) limit the number, location, and timing of OHV events and number of participants.

Desert tortoises that are active during the speed event and enter the race course are at high risk for death or injury. Due to the high-speed nature of the event, there are few if any measures that could be implemented to locate and move tortoises from harm's way during the event. The most effective measure is to time the events to occur when tortoises are least active as proposed by BLM.

Desert tortoises physically moved out of harm's way prior to or during the race to prevent mortality or injury could be inadvertently harmed if not handled properly. Urine and large amounts of urates are frequently voided during handling and may represent a severe water loss, particularly to juveniles (Luckenbach 1982). Overheating can occur if tortoises are not placed in the shade when ambient temperatures equal or exceed temperature maximums for the species. The following minimization measures proposed by BLM should reduce these potential effects to desert tortoises: (1) provide worker and volunteer environmental awareness program, (2) utilize Service-approved protocols for handling desert tortoises and excavating burrows, and (3) utilize authorized biologists or other trained personnel to handle desert tortoises.

The resulting indirect impacts to the desert tortoise may include the risk of death, injury, or lower reproductive potential through increased predation and degradation and fragmentation of the habitat surrounding the project area. There is potential for an increase in the number of predatory and scavenger species due to the presence of humans and improper disposal of trash. Participants, spectators, and volunteers associated with the proposed race may provide food in the form of trash, litter, or water that attracts desert tortoise predators such as the common raven, kit fox, and coyote (BLM 1990, Boarman and Berry 1995). Natural predation in undisturbed healthy ecosystems is generally not of concern; however, predation rates may be altered when natural habitats are disturbed or modified (BLM 1990). Ravens are likely to be attracted to human activities and power lines for perch sites and food sources, increasing the potential for predation on juvenile desert tortoise in adjacent habitats. BLM proposes to minimize these impacts by implementing a litter-control program during and after events and providing a worker and volunteer environmental awareness program.

OHV activity may degrade desert tortoise habitat in the surrounding landscape by introducing non-native weeds or plants into the action area which later spread into the surrounding desert, increasing fuel loads for wildfires and competing with native forbs, shrubs, and other food sources for the desert tortoise. The following measures proposed by BLM should help reduce these potential effects to desert tortoise habitat: (1) minimize disturbance, (2) wash or steam-clean all equipment and vehicles associated with the event, and (3) restore or remediate new disturbance.

Hazardous materials associated with OHV activities such as diesel fuel, gasoline, oils, and solvents or chemicals will be used during the proposed race event. There may be incidents of small spills of these materials during the event, leading to isolated areas of contaminated soil and vegetation in desert tortoise habitat. The following measures proposed by BLM should minimize these potential effects to desert tortoise habitat: (1) perform pre-race inspection of all vehicles, (2) designate pit areas for refueling or repairs, and (3) contain spills and use proper disposal.

Humans use the desert for other recreational purposes including off-road exploring, casual shooting and target practice, searching and digging for minerals and gems, and geocaching (GPS-guided stash hunts). Personal or commercial collection of animals and plants may occur in association with recreational uses. Spectators or race participants and support crews could illegally collect desert tortoises or utilize the open desert for various uses after the race event.

During the term of this PBO, BLM estimates that 130 ac of non-critical habitat may be disturbed by speed events: 50 ac of disturbance along existing or realigned courses, 40 ac of course realignment, 20 ac of new pits, and 20 ac of new spectator areas.

Non-speed Events

Most effects from non-speed events to the desert tortoise will result from vehicular travel to the event or activity sites. The road effects to desert tortoise were described earlier. During the term of this PBO, BLM estimates that 5 ac of non-critical habitat may be disturbed by non-speed events.

Trails

The activities associated with the construction, use, and maintenance of non-motorized trails could result in mortality or injury from collision with vehicles; disruption of behavior during construction or use; loss of forage or other habitat characteristics; compaction of soils; habitat fragmentation; increased opportunities for collection or vandalism; introduction of exotic species by users and pack stock; disturbance, injury, or mortality from visitors or pets; potential for collection of wild tortoises; or disposition of pets. Indirect effects may include increased noise and human presence, dispersal of non-native plants, and dust effects. Up to 15 ac of desert tortoise non-critical habitat may be disturbed by proposed trails.

Overall, we expect that non-speed events are likely to injure or kill relatively few desert tortoises, since lower speeds allow recreationists to better see tortoises within their path. We cannot quantify the number of desert tortoises that these activities may affect, though, because we do not know how many animals will enter these linear areas.

Based on the analysis above for 150 ac of disturbance from speed and non-speed events and trails, we anticipate that approximately 2 adult and subadult desert tortoises and 13 juveniles may occur on lands proposed for recreation events.

Casual Recreation

Casual recreation is a broad category that contains hiking, biking, equestrian use, OHV and other vehicle use, and many other activities that are undertaken by the public without needing a permit. The effects of these activities are the same as those within the speed and non-speed event sections earlier. There is no data on the intensity or distribution of these activities throughout the SNDO, since they occur district-wide. Injury or mortality to desert tortoise is most likely to occur through the use of casual use vehicles that do not see a tortoise crossing their route. While many recreators are able to see tortoises and avoid them, those activities that occur at higher speeds are more likely not to see tortoises in their paths.

We are not able to accurately calculate the number of tortoises that are within all lands available to the casual user and that may be encountered by the public. BLM minimizes the effects of casual recreation by restricting vehicles to existing or designated roads and trails; providing law enforcement, public information, and education through personal contacts in the field; and distributing informative maps and pamphlets.

It is estimated that the BLM SNDO contains approximately 812 miles of designated roads and trails in ACECs, 5,000 miles of designated roads and trails within the district outside of ACECs, and 4,000 miles of motorcycle trails. Since the breakdown of roads and trails is unknown, we estimated an average width for all roads and trails of 10 feet. We also estimated that motorcycle trails could be up to two feet wide. Calculating the approximate acreage for all roads and trails comes to 8,015 acres.

Tortoises may be taken through capture (being picked up) or injured or killed by casual recreation activities, and we expect that most of these will go undetected. While it is not possible to know how many tortoises will be encountered on these linear features at any given time, using the acres of roads and trails gives us an estimate for tortoise numbers. Based on the total 8,015 acres of designated roads and trails within the SNDO, we estimate that 100 adult and subadult tortoises and 658 juveniles may occur within these lands.

Effects of Livestock Grazing on the Desert Tortoise

The full range of grazing effects may never be thoroughly understood, as it is much more diverse and complex than a simple enumeration of individual impacts (Donahue 1999) or lack thereof. Livestock may trample tortoises; crush their burrows; and reduce the vegetation on which tortoises depend for food, protection from predators, thermoregulation, and intraspecific behavioral interactions. Avery and Neibergs (1997) have observed tortoise burrows that were partially or completely destroyed by cattle trampling. They saw tortoises trying unsuccessfully to enter completely destroyed burrows. Grazing can alter the environment by compacting soils, depositing urine and feces, and trampling vegetation. Once altered, upland vegetation communities appear to change or improve only gradually. When management is directed at improving upland vegetation associations, improvements have occurred in as little as 20 years, but areas not receiving much precipitation (i.e., less than 12 inches of annual precipitation) generally have not improved (Service 1994).

Ecological processes may take a long time to express themselves, and many depend on rare or unpredictable events on a particular site which may occur once every 20 years or so. Climate must be recognized as a confounding factor in research on the effects of grazing. Because long-term ecological changes caused by climate may mask or confound impacts due to grazing, research based on short-term studies may not effectively detect such changes or determine their causes (Donahue 1999).

Tracy et al. (no date) found that in years of very low annual productivity, tortoises lay fewer eggs. They also found that cattle foraging reduced tortoise forage abundance enough to cause tortoises to lay fewer eggs than normal. The conclusion is that in years of low precipitation, cattle may remove enough forage to reduce tortoise reproductive output, thereby creating competition.

Little is known about the long-term effects of livestock on animals other than ungulates. The desert tortoise is of particular concern. Livestock eat or trample the same plants upon which tortoises feed. One tortoise eats far less plant forage in a year than a cow eats in a single day (Donahue 1999). In general, vegetation diversity decreases with grazing intensity, especially under continuous grazing pressure.

Cattle introduce propagules of non-native plants by bringing seed into an area either on their coats or in feces. Many non-native plant species have established themselves in part due to environmental modifications by livestock and ranching practices. Although these plants take hold and spread simply because they out-compete native species, more often it is because livestock grazing has changed the environment in ways conducive to non-native establishment and proliferation (Donahue 1999). Non-native plants such as red brome are usually well-adapted to grazing and invade overgrazed sites. Most range managers agree that moderate to heavy grazing over several years will usually change plant composition.

In a study of exotic plant invasions, Gelbard and Belnap (2003) found that cheatgrass cover was greater on sites without biological soil-crust cover (disturbed by either cattle or motorized use) than on sites with undisturbed crusts. Cheatgrass and other non-native annual grasses provide the fine fuels that facilitate wildfires. Non-native plants such as cheatgrass are usually well-adapted to grazing and invade overgrazed sites.

Signs of increased soil compaction occur in grazed areas compared to ungrazed areas. Avery (1998) measured soil type, bulk density, and infiltration in an exclosure that cattle were excluded from for approximately 12 years and compared them to grazed areas outside the exclosure. Avery demonstrated that soil in heavily trampled areas near water tanks was coarser, had higher bulk density, greater penetration resistance, and lower infiltration rates (all are measures of soil compaction) than in the protected area.

Environmental impact statements prepared by BLM between 1978 and 1989 indicate that removal of livestock from hot deserts would result in less soil erosion, increased water infiltration rates, and generally improved soils; vegetation would gain health and vigor, and cover would increase (U.S. General Accounting Office 1991).

Studies have documented significantly greater native plant species richness in ungrazed areas compared to those that are grazed (Brady et al. 1989, Floyd-Hanna et al. 2000). Sixteen years following removal of livestock grazing from the Appleton-Whittell Research Ranch Sanctuary in New Mexico resulted in an increase in plant and animal diversity (Brady et al. 1989).

Numerous studies document the adverse effects on the cryptobiotic crusts of arid soils as a result of disturbance (Jones 2001). Removal or damage of the cryptobiotic crusts may have adverse impacts on desert soils and nutrient cycling. Soil and plant characteristics of low- and mid-elevation arid and semi-arid ecosystems in North America west of the Rocky Mountains indicate that these ecosystems evolved with low levels of soil surface disturbance. Neff et al. (2005) found that many soils in southeastern Utah are protected from surface disturbance by biological soil crusts that stabilize soils and reduce erosion by wind and water. These cryptobiotic crusts are only prominent components of ecosystems where large-bodied herbivores have been absent from recent evolutionary history such as in the arid west. If grazing leads to disturbance of these soil crusts, regeneration typically requires decades for the recolonization of microbes and hundreds of years for a crust lichen community to form. Neff et al. compared never-grazed grassland in Canyonlands National Park with two historically-grazed sites with similar geologic, geomorphic, and geochemical characteristics that were grazed from the late 1800s until 1974. Despite almost 30 years without livestock grazing, surface soils in the historically grazed sites have 38 to 43 percent less silt, as well as 14 to 51 percent less total elemental soil magnesium, sodium, potassium, and manganese content relative to soils never exposed to livestock disturbances.

Neff et al. (2005) also found that grazing may lead to changes in soil organic matter content, including declines of 60 to 70 percent in surface soil carbon and nitrogen relative to the never-grazed sites. This study further suggests that nutrient loss due to wind erosion of soils should be a consideration for management decisions related to the long-term sustainability of grazing operations in arid environments.

Livestock turned out onto the range during the period of peak growth and nutritional value of forage can have an opportunity to graze the most nutritious forage first, forcing wildlife to forage and survive in a habitat that has been nutritionally degraded. The total biomass present in tortoise habitat may have little relation to the amount of suitable desert tortoise forage available to the tortoise which has an extremely narrow and highly selective diet requirement. Generally, a reduced level of nutritional intake has been shown to affect growth rates in juvenile desert tortoises (Medica et al. 1976) and female reproductive output (Turner et al. 1986, 1987; Henen 1992). Fencing can prevent livestock from moving to better forage areas, resulting in higher frequencies and intensities of defoliation than would occur otherwise (Donahue 1999). In Ivanpah Valley, California, livestock outside exclosures removed plants high in protein leaving lower quality forage for tortoises (Avery 1998).

Hobbs and Huenneke (1992) report that increases in baseline nutrient status such as those resulting from input from livestock feces can exacerbate the likelihood of invasive weedy plants. Deposition of feces and urine by livestock can alter the baseline nutrient status of ecosystems causing nutrient enrichment. For most arid western rangelands that have a naturally low nutrient status, this gradual enrichment is an important problem with important implications for the entire ecosystem.

Jones (2000) conducted a quantitative review of the effects of cattle grazing in arid systems on 16 response variables. Eleven of 16 analyses (69 percent) revealed significant detrimental effects of cattle grazing, suggesting that cattle can have a negative impact on arid ecosystems. Soil-related variables were most negatively impacted by grazing (3 of 4 categories tested were significantly impacted).

Winter grazing effects: There is considerable evidence that winter grazing can impact xeric communities. In Utah, a study by Rasmussen and Brotherson (1986) compared a winter-grazed site to an ungrazed site between the Paria River and the Arizona state line in southern Utah. The ungrazed site had higher species diversity, significantly greater litter cover, significantly greater shrub cover, significantly greater winterfat (*Krascheninnikovia lanata*) cover, greater coverage of Indian ricegrass (*Achnatherum hymenoides*), and 10 times less Russian thistle (*Salsola* sp.) cover than the winter-grazed site. They attributed the lower coverage of Indian ricegrass in the winter-grazed site to the fact that Indian ricegrass actively grows during the late winter months. In addition to impacts to the vegetal communities, Avery and Neibergs (1997) found that cattle grazing during winter may result in destruction of a large percentage of active tortoise burrows.

While considerable literature exists that enumerate the negative effects of grazing on the tortoise, particularly focused on habitat effects, there are no studies to date that quantify effects of grazing on entire populations of tortoises or that demonstrate the absence or insignificance of such effects. Although this knowledge is critically needed in order to inform management of the desert tortoise and its habitat, collecting such data may take decades.

Minimization measures proposed to reduce the effects of livestock grazing include (1) monitoring livestock use and (2) removing them if necessary to maintain management objectives and removing trespass livestock.

Other effects to tortoise from grazing include installing and maintaining range improvements, which could result in mortality or injury from collision with vehicles or falling into open trenches, disruption of behavior during construction or use, compaction of soils, and habitat fragmentation. Mortality and injury may also occur from livestock trampling. Indirect effects may include increased noise and human presence, dispersal of non-native plants, and dust effects. Up to five ac of desert tortoise non-critical habitat may be disturbed through range improvements.

Within the action area (Table 20), there are three allotments that actively graze 108,062 acres and five acres that may be disturbed through range improvements. Based on these total acres, we estimate that approximately 1,351 adult and subadult desert tortoises and 8,884 juveniles may occur on lands that are actively grazed or disturbed through range improvements.

It is difficult to determine the number of tortoises that could be taken by livestock grazing. There is a lack of documentation of tortoises being crushed by cattle, but there is an account of a tortoise found crushed inside a burrow collapsed by a cow in Utah (Esque pers. comm in Boarman 2002a). Cattle are cautious of stepping on uneven ground and may not step on tortoises (Boarman 2002a). The amount of trampling that may occur is related to the number of tortoises and livestock on the allotments, and these numbers can change over time. The numbers in Table 20 show low densities of cattle per active allotment. Though we estimate that there may be 1,351 adult and subadult tortoises and 8,884 juvenile tortoises within the active allotments, we believe that individuals are not likely to be killed or injured as a result of livestock grazing or range improvements. For this reason, we anticipate that no more than 2 adults and subadults and 13 juveniles are likely to be killed or injured as a result of livestock grazing or rangeland improvements over the life of this PBO. These individuals are not likely to be detected.

Effects of Fire Management on the Desert Tortoise

If a wildfire occurs in desert tortoise habitat and requires BLM suppression activities, desert tortoises and their habitat may be affected, but if suppression does not occur, the effects of the wildfire may be widespread resulting in devastating effects to localized tortoise populations. Wildfire suppression activities are typically short in duration (less than a week) and effects are localized. Desert tortoises, their nests, and habitat may be crushed by fire suppression vehicles and equipment traveling off-road. Creating fuel breaks may result in a swath of disturbance and create conditions for non-native plants to establish. If suppression activities are not undertaken by BLM or hindered, the amount of habitat burned and number of tortoises affected by the fire may be greater. BLM estimates that a maximum of 200 ac of non-critical habitat and 800 ac of designated critical habitat may be affected by creating fuel breaks. BLM minimizes effects from wildfire management through assigning a resource advisor to the fire and providing all firefighters and support personnel with a briefing on desert tortoise and their habitat to minimize tortoise injured and destruction, particularly those associated with vehicle use.

Based on the analysis, we anticipate that approximately 13 adult and subadult desert tortoises and 86 juveniles may occur on lands proposed for fuel breaks.

Effects of Vegetation Management and Resource Management on the Desert Tortoise

BLM estimates that a maximum of 20 ac of non-critical habitat and 5 ac of designated critical habitat may be affected by each of these two programs. Overall, the desert tortoise is likely to benefit from activities implemented under this program by restoring the native plant communities, thus improving habitat conditions. Acres of disturbance that may result from implementation of vegetation management activities is based on BLM's assessment of potential actions during the term of this consultation and effects of previous similar activities.

Actions may involve use of heavy equipment, ATVs, or hand-tools and include recontouring, ripping of soil, ground watering, broadcast seeding, using water trucks for dust abatement, and planting vegetation. The behavior of individual tortoises including foraging, breeding, and sheltering may be temporarily disrupted as a result of project activities. Weeds and invasive non-native plants may become established as a result of transport into project areas by vehicles and equipment. Animals used by permittees or contractors may also facilitate establishment of weeds and non-native plants.

Use of vehicles and heavy equipment may increase the risk of injury or mortality of individuals, short-term displacement from noise during the project, short-term loss of vegetation (though unlikely), and temporary ground disturbance. Many potential effects of habitat restoration are the same as, or similar to, other surface-disturbing activities. Activities associated with weed treatments that may affect the desert tortoise include applying herbicides, clearing or cutting vegetation by hand or with machinery, and using ATVs on disturbed areas for site access. Effects to the desert tortoise also include unintentional removal or destruction of plants used by tortoises for forage or shelter, soil compaction, and alteration of local microclimate through vegetation removal.

The desert tortoise may be affected by weed management activities that are approximately the same as those identified for vegetation management. In addition, desert tortoises could be negatively affected by dermal contact with vegetation or ingestion of vegetation that has been treated with herbicides. Some direct spray contact could occur to tortoises during aerial and ground application, but BLM will mostly be applying herbicides using backpack sprayers or other handheld devices during ground application, and this will minimize the potential for direct contact. Tortoise surveys will be conducted prior to aerial application, thereby minimizing the potential for direct contact during aerial application. Since noxious weeds are generally not considered primary foraging species for the desert tortoise and application will be completed with handheld devices, the potential for ingestion by tortoises of target species is minimized as long as the herbicide is applied as directed by the label and EISs (BLM 2007, 2016). Since tortoise-foraging plant species occur among target weed species, following labels and policies will ensure that herbicides will not drift to non-target plant species that could be considered foraging species for tortoise. In accordance with the Vegetation PEISs, herbicides that are believed to have deleterious effects on reptiles, such as 2,4-D, are not proposed for use in the SNDO planning area where there is any potential for contact with desert tortoise.

Further minimizing potential spray contact and the potential to cause behavioral changes during spring and fall breeding and hatchling dispersal, treatments will be scheduled to start and end during the least active season. If a treatment must be scheduled during the more active season, BLM will coordinate with the Service prior to treatment to ensure no further consultation is required.

Analysis of the effects of the use of herbicides has been completed as part of the EISs (BLM 2007, 2016), biological assessments for those EISs, and risk assessments for each herbicide approved for use on BLM managed land. These documents established standards, guidelines, and design criteria to which future noxious weed treatments must adhere. In addition, BLM will not exceed the label or the EIS application rates and will apply the minimum amount of herbicide, not the maximum amount, to treat the weed infestation in tortoise habitat, thus further reducing any potential effects from contact with any herbicide used. BLM found no information to indicate desert tortoise exposure to the seven proposed herbicides will result in injury or death of desert tortoises if the label and EIS restriction are followed.

Beneficial effects from weed treatment activities include erosion control, habitat quality improvement by revegetation of native plant species, and reduction or elimination of exotic species invasions. Also, weed management includes long term improvement of plant species diversity, which will increase habitat quality and quantity of nutritious foraging species, tortoise distribution, and acres of suitable habitat.

Based on the analysis, we anticipate that approximately 1 adult or subadult desert tortoise and 7 juveniles may occur on lands proposed for vegetation and resource management.

8.3 Desert Tortoise Designated Critical Habitat

Our analysis of effects to desert tortoise critical habitat follows Service-issued guidance: *Application of the "Destruction or Adverse Modification (DAM)" Standard under section 7(a)(2) of the Endangered Species Act* issued on February 11, 2016; and *Guidance on Conducting Endangered Species Act section 7 Consultations on the Desert Tortoise and Other Species* issued on February 15, 2005. These guidance documents indicate that critical habitat analyses should focus on the entire critical habitat area designated *unless* the final rule for the designation identifies another basis for the analysis, such as discrete units or groups of units that are necessary for different life cycle phases, units representing distinctive habitat characteristics or gene pools, or units fulfilling essential geographic distribution requirements, and the analysis should focus on the function and conservation role of affected CHU for the species.

The evaluation of actions that may affect critical habitat for desert tortoise should consider the effects of the action on its physical and biological features, or PBFs. The five PBFs of desert tortoise critical habitat include (1) sufficient space to support viable populations within each recovery unit and to provide for movement, dispersal, and gene flow; (2) sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species; (3) suitable substrates for burrowing, nesting, and over-wintering; burrows, caliche caves, and other shelter sites; (4) sufficient vegetation for shelter from temperature extremes and predators; and (5) habitat protected from disturbance and human-caused mortality.

Direct impacts to desert tortoise critical habitat from implementation of all actions under all programs in this PBO will be no more than 1,570 ac in the Mormon Mesa, Beaver Dam Slope, Gold Butte-Pakoon, and Piute-Eldorado CHUs. Most of this anticipated disturbance will result from ROW grants and fuel breaks. The number of acres that may be disturbed for each CHU is unknown and will be analyzed when projects are proposed.

Habitat disturbance caused by project vehicles and equipment often result in damage to desert soils which are protected by fragile organic or inorganic crusts. The organic crust can be the result of various microflora such as algae, lichen, and fungi, which form cryptobiotic crusts or macroflora consisting of the remnants of fibrous root material from dead annual plants (Went and Stark 1968). The inorganic crust can be comprised of desert pavement, silt or clay, or chemicals.

Mechanical disturbance of desert soils may cause (1) changes in annual and perennial plant production and species composition including introduction of non-native plants, introduction of noxious weeds, or increases in the distribution of weeds; (2) outright soil loss due to increased rates of water and wind erosion; (3) reduced soil moisture; (4) reduced infiltration rates; (5) changes in soil thermal regime; and (6) compaction or an increase in surface strength (Adams et al. 1982, Burge 1983, Bury 1978, Bury and Luckenbach 1983 and 1986, Davidson and Fox 1974, Luke et al. 1991, Nakata 1983, Wilshire 1979, Woodman 1983). When the soil surface is exposed by vehicular activity (e.g., OHVs), the thermal insulation provided by the vegetative cover is decreased which results in increased daytime temperatures. Higher temperatures decrease the soil moisture which causes soil temperature to increase further because less heat is required to vaporize the water present. Revegetation is inhibited as a result of these processes (Webb et al. 1978).

The potential proliferation of non-native plant species could also contribute to an increase in fire frequency within the action area by providing sufficient fuel to carry fires. Fires in desert tortoise habitat result in loss of habitat by altering plant composition and structure and could impact all the PBFs. The numerous fires of 2005 burned approximately 15,559 ac, or 4 percent of the Mormon Mesa CHU. In total, the 2005 fires burned approximately 10 percent of the Northeastern Mojave Recovery Unit. These numbers represent a worst-case scenario: burned acreages are the total area inside fire perimeters and are not broken out by unburned areas and burn severity class, as this information is currently not available. Although efforts are underway to rehabilitate these burned areas, it is unlikely that areas that were severely burned will return to fully functional desert tortoise habitat for decades. Unburned areas or areas that were not severely burned within and adjacent to fire perimeters may contribute seed and promote recovery of burned areas.

Effects of Loss of Desert Tortoise Designated Critical Habitat

BLM determined that all programs may include projects or activities that may result in disturbance of, or other impacts to, desert tortoise critical habitat as identified in Table 3. The effects of losing acres of designated critical habitat are similar to those summarized in the *Effects of Loss of Habitat* section.

Projects that have the ability to retain the native root structure and seeds within the project area will help retain soil stability, minimize soil erosion, and minimize fugitive dust pollution. Retention of native seed and roots within the project site will also facilitate recovery of vegetative cover. Use of native plant species will minimize the need to water the vegetation, because native species are already adapted to the local climate and moisture regime of the area.

Although we do not know precisely where the critical habitat disturbance will occur or within which of the three recovery units the disturbance will occur, the disturbance does not constitute a numerically significant portion of the designated critical habitat within the SNDO planning area (0.2%) or within all recovery units (0.01%); however, we do not have the ability to place a numerical value on edge effects, habitat degradation, impacts to habitat connectivity, and overall fragmentation that the proposed action may cause or that occurs in the CHUs as a whole. Overall, the increased level of activity that may result from the proposed action within critical habitat would not have a measurable effect on the ability of the critical habitat units to provide the desert tortoise with habitat that is protected from disturbance and human-caused mortality.

To offset the loss and modification of designated critical tortoise habitat, BLM and their applicants will pay remuneration fees as outlined in the terms and conditions. Although the remuneration fees will not create new habitat within the recovery units, they will provide funding for mitigation on BLM lands.

Effects of Land, Realty, and Rights-of-way Actions on Desert Tortoise Designated Critical Habitat

Pre-project geotechnical ROWs

Pre-project ROWs may disturb up to 5 ac of desert tortoise critical habitat during the term of this PBO by vehicles and equipment traveling to and from work areas on access roads or by off-road travel.

Linear ROWs

Linear ROWs may disturb up to 1,500 ac of desert tortoise designated critical habitat during the term of this PBO. The greatest impact to designated critical habitat from linear ROW and similar actions is from vehicles and heavy equipment activity on new and existing access roads. Project access roads are often required for activities authorized by BLM on ROWs which may use or require upgrades to existing roads or routes; will be temporary or long-term; and may provide public access to areas not previously accessible. ROW roads may provide new access into tortoise habitat for the public resulting in all the effects associated with increased human presence. Vehicles and equipment may stray from existing roads or designated areas and crush vegetation or burrows. Roads provide direct invasion routes and habitat generation for invasive weedy plants.

Considerable habitat destruction or alteration occurs when pipelines and transmission lines are constructed and the impacts are repeated as maintenance operations or new pipelines or power lines are placed along existing corridors.

Site-type ROWs

BLM may issue site-type ROWs for communication sites or towers, flood-control structures, wells, and other activities with effects to tortoise designated critical habitat within the planning area. Communication sites typically affect a 100 ft by 100 ft area and require an access road. Most flood-control projects are located in or near urbanized areas such as Las Vegas and Pahrump where tortoise habitat may be degraded to some degree. If cross-country travel is required, vegetation may be crushed.

BLM estimates that 25 ac of desert tortoise designated critical habitat may be affected by all site-type ROWs under this PBO.

Effects of Mining on the Desert Tortoise Designated Critical Habitat

The direct effects and many of the indirect effects of mining are similar to those described for ROW activities. Future oil and gas activity will be managed with no surface occupancy. The current mineral withdrawal for all ACECs within the SNDO jurisdiction went into effect November 2009 for a period of 20 years. The withdrawal will not affect valid, existing claims.

During the term of this PBO, BLM estimates that 100 ac of desert tortoise designated critical habitat and may be disturbed for locatable minerals and the same amount of disturbance for saleable mineral. BLM estimates that leasable minerals may disturb 25 ac of critical desert tortoise habitat.

Effects of Recreation on the Desert Tortoise Designated Critical Habitat

Trails

The activities associated with the construction, use, and maintenance of non-motorized trails could result in reduction in forage or other habitat characteristics, compaction of soils, habitat fragmentation, and disturbance. Indirect effect may include dispersal of non-native plants and dust effects. Up to 5 ac of desert tortoise designated critical habitat may be disturbed by proposed trails.

Effects of Fire Management on the Desert Tortoise Designated Critical Habitat

If a wildfire occurs in desert tortoise habitat and requires BLM suppression activities, desert tortoise designated critical habitat may be affected, but if suppression does not occur, the effects of the wildfire may be widespread resulting in devastating effects to localized tortoise habitat. Wildfire suppression activities are typically short in duration (less than a week) and effects are localized. Desert tortoise nests and habitat may be crushed by fire suppression vehicles and equipment traveling off-road. Creating fuel breaks may result in a swath of disturbance and create conditions for non-native plants to establish. If suppression activities are not undertaken by BLM or hindered, the amount of habitat burned and affected by the fire may be greater. BLM estimates that a maximum of 800 ac of critical habitat may be affected by creating fuel breaks.

Effects of Vegetation Management and Resource Management on the Desert Tortoise Designated Critical Habitat

BLM estimates that a maximum of 5 ac of designated critical habitat may be affected by each of these two programs (10 acres combined). Overall, the desert tortoise is likely to benefit from activities implemented under these program by restoring the native plant communities, thus improving habitat conditions. Acreage of disturbance that may result from implementation of vegetation management activities is based on BLM's assessment of potential actions during the term of this consultation and effects of previous similar activities.

8.4 Desert Tortoise Conclusions

Reproduction

The proposed action may introduce invasive, non-native species into tortoise habitat or increase the presence of those plants already present. If non-native species replace the native forage for tortoises, females may lay fewer eggs. Weed management, restoration, and weed prevention will help counteract these effects.

Translocating tortoises may also reduce reproductive success in the first year but only slightly less than resident tortoises. In the second and third years after translocation, the mean number of eggs was not different between resident and translocated desert tortoises. The majority of tortoises that will need to be captured and moved will be moved less than 300 meters due to the size of the projects. Therefore, translocation of desert tortoises is likely to result in the short-term reduction of the reproductive success of relatively few desert tortoises.

Because the desert tortoises will be captured and moved from the site prior to construction and all the adult individuals should be found, we expect that few, if any, adult animals will die as a result of construction. Juvenile desert tortoises may be killed because they are more difficult to find; however, the reproductive ecology of the desert tortoise is such that reproductive individuals (i.e., adult animals) play a more important role in maintaining populations than those that are not able to reproduce (i.e., juvenile animals), in large part because of the higher mortality rates of eggs and juvenile desert tortoises. Consequently, the loss of juvenile animals and eggs will not have a measurable effect on the reproductive capacity of desert tortoises in the area.

We cannot provide an estimate to the number of eggs that will be lost as a result of surface disturbance. In areas where eggs will be lost, we anticipate that the loss of eggs will not be significant at a population level because areas where eggs will be lost comprises a small proportion of the reproductive capacity of the action area. In addition, most of the eggs that may be lost are unlikely to produce individuals that would reach reproductive age due to high rates of natural mortality.

For these reasons, we expect that the proposed action is likely to have a minimal negative effect on the reproductive capacity of desert tortoises in the action area.

Numbers

We expect that project development and program activities within the action area are likely to kill or injure few large desert tortoises. Many more tortoises are likely to be captured and moved prior to project activities. Because we do not know exactly where development may be sited, we estimated the number of adults (≥180 mm) and juveniles (< 180 mm) using the total number of acres proposed to be disturbed, the density estimate of 8 tortoises per square mile, and the Turner et al. (1987) estimate that juveniles less than 180 mm account for 86.8 percent of the overall population. Within the 13,165 acres of potential disturbance in desert tortoise habitat and designated critical habitat, we estimate 166 adult tortoises and 1,092 juvenile tortoises may experience some type of take. Although we expect most to be captured and moved, some may be injured or killed.

There are other program activities that should not disturb desert tortoise habitat but may capture and move, injure, or kill tortoises. Such activities include livestock grazing, casual recreation, and casual locatable mining. An estimated 112 adult tortoises and 681 juvenile tortoises may be captured and moved, injured, or killed due to these activities.

The 2014 abundance estimate for the Northeastern and Eastern Mojave Recovery Units is 71,365 adult tortoises (Allison and McLuckie 2018). The overall number of desert tortoises would increase if we included individuals smaller than 180 mm. If all 278 (166 + 112) adult tortoises were lost due to program activities, which will not occur due to most being captured and moved, the loss would account for 0.39 percent of all adult tortoises within the 2 recovery units and an even lower percent (0.13) of all 212,343 adult tortoises rangewide. Biologists find most adult desert tortoises during clearance surveys, so killing every adult tortoise is not likely to occur.

Juvenile desert tortoises (< 180 mm) are smaller than adults and more likely to be missed during surveys. We've estimated that 1,092 juvenile tortoises may occur within the 13,165 acres of proposed project disturbance and if not detected, they will likely be killed. We've estimated another 681 juveniles may be taken during grazing, casual recreation, and casual locatable mining and not detected. Although we are not comparing the overall estimate of the numbers of juvenile desert tortoises likely to be killed or injured to the overall numbers within the recovery unit, we can reasonably conclude that the number of juvenile desert tortoises affected by the proposed projects is a small percentage of the population in the Northeastern Mojave Recovery Unit. Since juvenile tortoises have naturally higher mortality rates than adult tortoises, the loss of these juveniles is not likely to appreciable diminish the overall tortoise population. The key to recovery is to ensure that reproducing adult tortoises have high survival rates and are reproducing.

For these reasons, we expect that the proposed action is likely to have a minimal negative effect on the numbers of desert tortoises in the action area.

Distribution

Direct impacts to desert tortoise habitat from implementation of all programs in this PBO will be no more than 10,595 acres of non-critical desert tortoise habitat and 2,570 acres of designated critical habitat. This loss would not appreciably reduce the distribution of the desert tortoise. Based on the information in Table 11. Acres of desert tortoise habitat within recovery units of the PBO, the Northeastern and Eastern Mojave Recovery Units (where most to the action area encompasses) contain approximately 6,563,960 acres of modeled tortoise habitat. The proposed action will result in a loss of approximately 0.2 percent of the habitat in those two recovery units, and only 0.08 percent loss of habitat rangewide (13,165 acres of 16,745,848 total acres).

The placement of program projects will fragment habitat, but we expect any fragmentation effects on tortoises to be limited as projects are spaced throughout the action area. Project or activity noise could also result in tortoises moving away from specific areas, but these effects should be minimal.

For these reasons, we expect that the proposed action is likely to have a minimal negative effect on the distribution of desert tortoises in the action area.

Effects on Recovery

To achieve recovery, each recovery unit must contain well distributed, self-sustaining populations across a sufficient amount of protected habitat to maintain long-term population viability and persistence (Service 2011a).

We do not have the ability to place a numerical value on edge effects, habitat degradation, impacts to habitat connectivity, and overall fragmentation that the proposed action may cause. As a result, the percentage of habitat within the recovery units that will be affected may be greater than the area physically disturbed; however, we still expect the direct and indirect disturbance will not constitute a numerically significant portion of the three affected recovery units. Therefore, we anticipate adequate intact habitat will remain in which desert tortoises will be able to forage, breed, and shelter.

Based on these considerations, the proposed action may have an overall slight negative effect on the reproduction, numbers, and distribution of desert tortoises in the action area; however, it is unlikely to appreciably diminish the ability of the desert tortoise to reach stable or increasing population trends in the future.

Critical Habitat

The action area lies mostly within the Northeastern and Eastern Mojave Recovery Units, with a small portion within the Colorado Desert Recovery Unit. Direct impacts to habitat from implementation of all programs in this PBO will be no more than 2,570 acres within designated critical habitat (800 acres will be fuel breaks to protect habitat).

The revised recovery plan for the desert tortoise (Service 2011a) lists three objectives and associated criteria to achieve delisting: (1) to maintain self-sustaining populations of desert tortoises within each recovery unit into the future, (2) to maintain well-distributed populations of desert tortoises throughout each recovery unit, and (3) to ensure that habitat within each recovery unit is protected and managed to support long-term viability of desert tortoise populations.

The acres of habitat disturbance, degradation, and fragmentation in the CHUs would affect all five PBFs to some extent; however, all PBFs would continue to function in the CHUs and provide for recovery of the species.

There are approximately 750,000 ac of designated critical habitat in the action area on BLM lands (Service 2011a). All program actions will only affect 0.34 percent of critical habitat within the action area, 0.04 percent of all critical habitat rangewide (using total modeled habitat from Table 12), and would not prevent achieving the three objectives of delisting and recovery. We expect impacts to be localized and thus not affect the conservation value and function over large areas. We anticipate effects on recovery of the desert tortoise to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the Mojave desert tortoise.

8.5 Southwestern Willow Flycatcher

Adverse effects to the flycatcher could result from ROWs, recreation, and fire management in the action area. We anticipate that the BLM strategies for riparian habitat conservation will maintain the conditions that support flycatcher habitat; however, habitat improvement projects may result in short-term adverse effects to the southwestern willow flycatcher.

ROWs may affect riparian habitat through invasive species encroachment and habitat fragmentation. Construction of water diversion structures may cause decreases in the water table that could adversely affect flycatcher habitat. Construction of other structures near riparian habitats may produce noise that could affect breeding and nesting behavior.

Southwestern willow flycatchers may be disturbed by recreation activities depending on seasonal timing of the action. If within or adjacent to riparian habitats, trails could result in increases in human disturbance of birds. Indirect impacts from increased noise and human presence, dispersal of noxious weeds, and dust effects associated with unpaved roads and trails could further reduce habitat quality.

Direct impacts to the southwestern willow flycatcher from fire suppression could result in the incremental long-term disturbance of breeding and foraging habitat and contribute to habitat fragmentation. Direct short-term impacts could include the loss of flycatcher eggs or young if fire suppression activities were to occur during the breeding season. However, potential long-term impacts will be minimized through emergency stabilization and rehabilitation actions following any necessary fire suppression activities.

Prescribed burning may enhance flycatcher habitat over time, particularly if tamarisk is burned and native vegetation is replanted. Prescribed fire may decrease bank stability and lead to increased runoff until native vegetation can become established. Fuels reduction may include the removal of invasive plant species by hand pulling, cutting, or herbicide treatments if approved by BLM and the Service. Long-term beneficial effects will include improved ecological health and vegetation resiliency, and a reduction of potential fire events that could affect riparian habitat.

8.6 Southwestern Willow Flycatcher Critical Habitat

Adverse effects to flycatcher designated critical habitat could result from recreation, fire management, and vegetation management actions in the action area, including the loss of 300 acres of designated critical habitat. We anticipate that the BLM strategies for riparian habitat conservation will maintain the conditions that support flycatcher habitat; however, habitat improvement projects may result in short-term adverse effects to the southwestern willow flycatcher critical habitat. Designated critical habitat for the southwestern willow flycatcher occurs within the Virgin River ACEC and is, therefore, protected from most potential adverse effects that may result from the proposed action.

Speed-based OHV activities are not allowed in the Virgin River ACEC. Organized and non-speed activities, mountain bike rides, and casual recreation may occur in the Virgin River ACEC but are limited to existing roads, trails, and dry washes. If within or adjacent to riparian habitats, trails could result in damage to riparian habitat. Indirect impacts from dispersal of noxious weeds and dust effects associated with unpaved roads and trails could further reduce habitat quality. Direct impacts to the flycatcher designated critical habitat from fire suppression could result in the incremental long-term disturbance of breeding and foraging habitat and contribute to habitat fragmentation. However, potential long-term impacts will be minimized through emergency stabilization and rehabilitation actions following any necessary fire suppression activities.

Vegetation management or fuels reduction may include the removal of invasive plant species by hand pulling, cutting, or herbicide treatments if approved by BLM and the Service. Removal of invasive plants such as tamarisk may decrease bank stability and lead to increased runoff until native vegetation can become established. Vegetation management activities may result in short-term adverse effects to flycatcher designated critical habitat. Long-term beneficial effects will include improved ecological health and vegetation resiliency, and a reduction of potential fire events that could affect riparian habitats.

8.7 Southwestern Willow Flycatcher Conclusions

Reproduction

Any restoration activities occurring within SWFL habitat will occur outside of the active breeding season. We also have no information to indicate that ROWs, recreation, and fire management activities will affect the reproductive capacity of southwestern willow flycatchers in any manner.

Numbers

Since 2012, the most current estimated number of rangewide territories is 1,629 (Durst 2017), and only 40 territories are in the action area along the Virgin River. This estimate does not include non-breeding southwestern willow flycatchers, and we do not know the size of the population of southwestern willow flycatchers that may occur in the action area.

Since the proposed actions will not injure or kill southwestern willow flycatcher, there will be no effect on the numbers of southwestern willow flycatchers in the action area.

Distribution

The proposed action will not result in a loss of non-critical habitat. During migration, southwestern willow flycatchers may stop to rest and forage in the desert scrub habitat where restoration activities may be occurring; the minor loss of this stop-over habitat will not have a measurable effect on the species. Consequently, the proposed action will not alter the distribution of the southwestern willow flycatcher.

Effects on Recovery

The BLM will require anyone implementing projects in SWFL habitat to follow the proposed minimization measures. The BLM also plans to continue the restoration of SWFL habitat to remove non-native species and plant native riparian species. As we stated previously, habitat loss and degradation are contributing factors to the decline of the southwestern willow flycatcher; consequently, the BLM's proposal to create or restore additional breeding habitat may benefit the recovery of the southwestern willow flycatcher. There are no acres of disturbance allowed for non-critical habitat under this PBO.

Within the action area, the main conservation needs for the flycatcher are to maintain, improve, and increase the quantity of nesting habitat. In addition, monitoring of breeding flycatchers will continue in breeding sites along the Virgin and Muddy Rivers (Mesquite, Overton Wildlife Management Area, and Warm Springs Natural Area) to estimate abundance and determine nest success and location of territories.

Recovery objectives for critical habitat include but are not limited to (1) increasing and improving occupied, suitable, and potential breeding habitat; (2) minimizing threats to wintering and migration habitat; (3) conducting research; and (4) providing public education and outreach (Service 2002).

We anticipate effects on recovery of the southwestern willow flycatcher to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the southwestern willow flycatcher.

Critical Habitat

Adverse effects to the flycatcher designated critical habitat could result from the loss of 300 acres of designated critical habitat from recreation, fire management, and vegetation management actions in the action area under this PBO. Recovery of the southwestern willow flycatcher, as identified in the Service's 2002 recovery plan, will entail maintaining a total known population of 1,950 territories (approximately 3,900 individuals) that are geographically distributed to allow proper function of a metapopulation and creating and securing sufficient habitat to ensure maintenance of these populations and habitats over time (Service 2002).

The PBFs of SWFL designated critical habitat are those habitat elements that provide sufficient riparian habitat for breeding, non-breeding, territorial, dispersing, and migrating SWFLs and to SWFLs throughout their range and provide those habitat components essential for conservation of the subspecies. Short-term effects on PBFs may occur during the habitat vegetation management process between the time of removal of tamarisk and the growth of sufficient structure of native vegetation. Overall, however, the project is expected to improve SWFL habitat. The project is expected to have short-term adverse effects on the PBFs of designated critical habitat, but in the longer term is expected to improve these PBFs and the overall quality of SWFL habitat.

Only 300 acres of southwestern willow flycatcher designated critical habitat may be lost due to the proposed action. This is only 3.5 percent of the critical habitat in Nevada (8,603 acre) and only 0.14 percent of all critical habitat rangewide (208,973 acres). These acres will not be lost but restored to native habitat.

We anticipate effects on southwestern willow flycatcher designated critical habitat to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the southwestern willow flycatcher.

8.8 Yellow-billed Cuckoo

Migrant yellow-billed cuckoo occurrence in the action area is irregular, unpredictable, and of short-duration. Adverse effects to the cuckoo could result from ROWs, recreation, and fire management actions in the action area. We anticipate that the BLM strategies for riparian habitat conservation will maintain the conditions that support cuckoo habitat; however, habitat improvement projects may result in short-term adverse effects to the cuckoo.

ROWs may affect riparian habitat through invasive species encroachment and habitat fragmentation. Construction of water diversion structures may cause decreases in the water table that could adversely affect cuckoo habitat. Construction of other structures near riparian habitats may produce noise that could affect breeding and nesting behavior.

Speed-based OHV activities are not allowed in the Virgin River ACEC. Organized and non-speed activities, mountain bike rides, and casual recreation may occur in the Virgin River ACEC but are limited to existing roads, trails, and dry washes. Yellow-billed cuckoos may be disturbed by recreation activities depending on seasonal timing of the action. If within or adjacent to riparian habitats, trails could result in increases in human disturbance of birds. Indirect impacts from increased noise and human presence, dispersal of noxious weeds, and dust effects associated with unpaved roads and trails could further reduce habitat quality.

Direct impacts to the yellow-billed cuckoo from fire suppression could result in the incremental long-term disturbance of breeding and foraging habitat and contribute to habitat fragmentation. Direct short-term impacts could include the loss of cuckoo eggs or young if fire suppression activities were to occur during the breeding season. However, potential long-term impacts will be minimized through emergency stabilization and rehabilitation actions following any necessary fire suppression activities.

Prescribed burning may enhance cuckoo habitat over time, particularly if tamarisk is burned and native vegetation is replanted. Prescribed fire may decrease bank stability and lead to increased runoff until native vegetation can become established. Vegetation management or fuels reduction may include the removal of invasive plant species by hand pulling, cutting, or herbicide treatments if approved by BLM and the Service. BLM proposes to conduct vegetation management activities when cuckoos are not present; therefore, no adverse effects to cuckoos are anticipated. Long-term beneficial effects will include improved ecological health and vegetation resiliency, and a reduction of potential fire events that could affect riparian habitats.

8.9 Yellow-billed Cuckoo Conclusions

Reproduction

There are very few records of breeding cuckoos in the action area, with the most recent record from 2001 (not on BLM land). Restoration activities will also take place outside of the active breeding season. We also have no information to indicate that ROWs, recreation, and fire management activities will affect the reproductive capacity of western yellow-billed cuckoos in any manner.

Numbers

In 2012, 49 sites were surveyed from Pahranagat NWR in Nevada south along the Lower Colorado River to Yuma, Arizona, and a total of 279 cuckoos were detected over 5 survey periods (McNeil et al. 2013). Suitable habitat in the action for foraging and migrating yellow-billed cuckoos exists in small patches of riparian habitat along the Muddy and Virgin Rivers. Only four yellow-billed cuckoos were detected during 2018 surveys in the action area. We do not know the size of the population of yellow-billed cuckoos that may occur in the action area.

Since the proposed actions will not injure or kill yellow-billed cuckoos, there will be no effect on the numbers of yellow-billed cuckoos in the action area.

Distribution

The proposed action will not result in a loss of habitat. During migration, yellow-billed cuckoos may stop to rest and forage in the desert scrub habitat where restoration activities may be occurring; the minor loss of this stop-over habitat will not have a measurable effect on the species. Consequently, the proposed action will not alter the distribution of the yellow-billed cuckoo.

Effects on Recovery

The BLM will require anyone implementing projects in cuckoo habitat to follow the proposed minimization measures. The BLM also plans to continue the restoration of SWFL habitat to remove non-native species and plant native riparian species, which should also benefit cuckoos. As we stated previously, habitat loss and degradation are contributing factors to the decline of the yellow-billed cuckoo; consequently, the BLM's proposal to create or restore additional breeding habitat may benefit the recovery of the yellow-billed cuckoo.

There are no acres of disturbance allowed for cuckoo habitat under this PBO. While a recovery plan has not yet been completed, general recovery actions include habitat preservation, habitat restoration, and a reduction in the threats to riparian habitat. In the absence of a recovery plan, we default to standard conservation practices for this species. For a species like the yellow-billed cuckoo with limited riparian habitat of adequate size, recovery focuses on the preservation of much of the remaining habitat that supports the cuckoo. In general terms, where suitable habitat exists, it should be conserved and where possible, additional habitat should be created or restored.

We anticipate effects on recovery of the yellow-billed cuckoo to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the yellow-billed cuckoo.

8.10 Yuma Clapper Rail

Yuma clapper rails occur in marsh habitats in the action area. Marsh habitat may be affected by BLM actions including issuance of linear ROWs, fire management, and vegetation management. Actions (or failure to take action) that maintain or increase overgrowth of cattails or other emergent vegetation with increasing accumulation of dead plant material may alter habitat to the extent that rail access through vegetation becomes restricted or eliminated. The interior of cattail patches is usually where nests are built, and if adult birds cannot adequately access the interior of the patch, nests may be built in more exposed and unsafe areas, resulting in nest predation or nest failure. Similarly, foraging is impeded since the invertebrate prey of the Yuma clapper rail can remain hidden and less available in the overgrown dead vegetation mats.

Prescribed burns are intended to improve marsh habitat by removing decadent vegetation but may result in short-term adverse effects to the rail. Individual birds may be disturbed and leave the treatment area. The prescribed burns will not take place during the breeding period of the Yuma clapper rail, therefore nests, eggs, and chicks are not at risk. Adult Yuma clapper rails are flightless during the late summer, and burns will not be planned for that period. Yuma clapper rail adults and juveniles should be able to escape once fire is ignited by flying away or moving through the vegetation.

The ROW effects described above for the southwestern willow flycatcher and yellow-billed cuckoo also apply to the Yuma clapper rail. Adverse effects to the rails will also occur if groundwater is withdrawn or local hydrology affected to the extent that marsh habitat is reduced or degraded. Actions that will disrupt natural processes that establish and maintain marsh habitat may adversely affect Yuma clapper rails.

8.11 Yuma Clapper Rail Conclusions

Reproduction

All program activities will occur outside of the active breeding season. Because of this, we have no information to indicate that any program activities will affect the reproductive capacity of Yuma Clapper rails in any manner.

Numbers

In 2018, surveyors detected 757 Yuma clapper rails in surveyed marshes in the United States. This number is not a population estimate because we do not know the response rate to vocal surveys. We expect that additional individuals reside in the surveyed marshes and in locations that were not surveyed. Surveys in 2018 throughout the action area detected low numbers of Yuma clapper rails (Las Vegas Wash: 0; Ash Meadows: 15; Overton WMA: 13).

Since the proposed actions will not injure or kill Yuma clapper rails, there will be no effect on the numbers of Yuma clapper rails in the action area.

Distribution

The proposed actions within the action area will not result in the loss of habitat or long-term displacement of rails. Proposed actions near habitat may cause Yuma Clapper rails to disperse but likely within the same marsh. Consequently, the proposed action will not alter the distribution of the Yuma Clapper rail.

Effects on Recovery

There are no acres of disturbance allowed for Yuma clapper rail habitat under this PBO for any program. The draft revised recovery plan (Service 2010b) addressed the need to maintain rail habitat in current core population areas and also allow for dispersal among populations in the U.S. and Mexico. The general criteria proposed for reclassifying the rail from endangered to threatened includes (1) a stable or increasing population based on a minimum of 824 rails in the U.S., (2) management plans for all Federal and State-owned areas with rail habitat, and (3) securing an adequate long-term water supply for conserved rail habitats at the Salton Sea. The criteria proposed for delisting the species includes (1) a stable or increasing population for a minimum of ≥10 years based on a desired population of 824 rails, (2) securing the amount of habitat needed to maintain a minimum population size (see previous criterion), (3) an assessment of threat from contaminants, (4) an evaluation of dispersal pathways to provide for connectivity between core habitat areas, and (5) securing an adequate long-term water supply to maintain habitat at the Cienega de Santa Clara.

Habitat loss and degradation are contributing factors to the decline of Yuma Clapper rail, but there will be no habitat loss under the proposed action.

The action area lies outside of currently and historically occupied sites for which recovery targets were established in the recovery plan. We anticipate effects on recovery of the Yuma clapper rail to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the Yuma clapper rail.

8.12 Virgin River Chub and Woundfin

BLM may issue ROWs or conduct fire management actions that could result in adverse effects to the Virgin River chub and woundfin. Construction and maintenance of ROW projects are unlikely to impact populations of Virgin River chub or woundfin as alignments are generally sited on stable areas outside the active floodplain or along roads and not within the Virgin River floodplain. Where the alignments cross the river, it is unlikely that adverse effects will occur to individual chub or woundfin. Powerline ROWs will likely span the Virgin River and floodplain and will not require access roads through the riparian area.

Flood-control projects (site-type ROWs) that are proposed within the Virgin River riparian area may alter the stream habitats. Altered stream habitats have the tendency to favor populations of non-native fishes which further threaten native fish populations.

Prescribed fire, fuels reduction, and fire suppression activities may adversely affect chub or woundfin habitat by increasing runoff and sediment loads that may enter aquatic systems or decrease bank stability. Direct take of fish could occur during water extraction, by uptake through hoses into storage tanks in the fire suppression aircraft. Water extraction and transport equipment used to suppress wildfire could introduce non-native fish or invertebrate species; however, BLM’s best management practices will be used to decrease or eliminate this risk.

8.13 Virgin River Chub and Woundfin Critical Habitat

BLM may issue ROWs or conduct fire management actions that could result in adverse effects to the Virgin River chub and woundfin designated critical habitat. Flood-control projects (site-type ROWs) that are proposed within the Virgin River riparian area may alter the stream flow range and regime, change instream habitat, cause a reduction in stream heterogeneity, lead to a change in water temperatures, or lead to an increase in sediment load with a reduction in natural organic input. Water quality may be reduced by the introduction of pollutants and run-off associated with construction and operation of flood-control projects.

8.14 Virgin River Chub and Woundfin Conclusions

Reproduction

We have no information to indicate that any program activities will affect the reproductive capacity of Virgin River chub or woundfin in any manner.

Numbers

Surveys between 2015 and 2017 within the reaches of the Virgin River in Nevada (action area) observed only 65 Virgin River chub and 7 woundfin.

Direct take of chub and woundfin could occur during water extraction for wildlife suppression. It is not possible to predict if this will occur and, if so, how many fish could be adversely affected. Consequently, there are likely to be minimal effects to Virgin River chub and woundfin numbers in the action area from the proposed action.

Distribution

The proposed actions within the action area will not result in the loss of habitat or long-term displacement of Virgin River chub or woundfin. Proposed actions near habitat may cause individual fish to disperse but they will still remain within the Virgin River. Consequently, the proposed action will not alter the distribution of Virgin River chub or woundfin.

Effects on Recovery

There are no acres of disturbance allowed for Virgin River chub or woundfin habitat under this PBO for any program.

The Service completed a recovery plan for the Virgin River fishes in 1979, a revised plan approved in 1985, and the most recent recovery plan completed in 1995. As of 1995, delisting criteria for the Virgin River chub had not yet been determined.

Recovery actions addressing threats include (1) maintain and enhance native fish communities of the Virgin River chub, (2) protect and enhance habitat for the native Virgin River fish communities, (3) establish additional populations of Virgin River chub within their historic range, (4) determine ecological requirements of native Virgin River fishes with emphasis on Virgin River chub, and (5) develop and implement educational and informational programs highlighting recovery needs and ongoing efforts for Virgin River fishes.

Habitat loss and non-native species are contributing factors to the decline of Virgin River chub and woundfin, but there will be no habitat loss or introduction of non-native species under the proposed action. We anticipate effects on recovery of the Virgin River chub and woundfin to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the Virgin River chub and woundfin.

Critical Habitat

There are no acres of disturbance allowed for Virgin River chub or woundfin designated critical habitat under this PBO for any program.

Recovery actions addressing threats include (1) maintain and enhance native fish communities of the Virgin River chub and woundfin, (2) protect and enhance habitat for the native Virgin River fish communities, (3) establish additional populations of Virgin River chub within their historic range, (4) determine ecological requirements of native Virgin River fishes with emphasis on Virgin River chub, and (5) develop and implement educational and informational programs highlighting needs and ongoing efforts for Virgin River fishes.

The Recovery Team recognizes the primary threats to the Virgin River include degraded habitat conditions (reduced flow and high temperatures). We anticipate effects to designated critical habitat to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the Virgin River chub or woundfin.

8.15 Moapa Dace

The Moapa dace may be adversely affected by ROWs or fire management actions if groundwater is withdrawn from the California Wash or Coyote Spring Valley hydrographic basins as a direct or indirect result of these actions. The effects of the proposed groundwater pumping on the Moapa dace were previously analyzed in a 2006 Intra-Service PBO. Because the interconnections among adjacent hydrographic basins are not fully understood in combination with uncertainty regarding future water use, adverse effects may occur to the Moapa dace as a result of BLM actions. The Service anticipates future BLM actions involving groundwater use from either of these basins will be evaluated and appended to this PBO and tiered to the 2006 PBO for the Memorandum of Agreement, as appropriate. The use of water for future BLM actions will become part of the environmental baseline for the Moapa dace.

8.16 Moapa Dace Conclusions

Reproduction

We have no information to indicate that any program activities will affect the reproductive capacity of Moapa dace in any manner.

Numbers

Direct take of Moapa dace could occur during water extraction for wildlife suppression. It is not possible to predict if this will occur and, if so, how many fish could be adversely affected. Consequently, there are likely to be minimal effects to Moapa dace numbers in the action area from the proposed action.

Distribution

The proposed actions within the action area will not result in the loss of habitat or long-term displacement of Moapa dace. Proposed actions near habitat may cause individual fish to disperse but they will still remain within the Virgin River. Consequently, the proposed action will not alter the distribution of Moapa dace.

Effects on Recovery

There are no acres of disturbance allowed for Moapa dace habitat under this PBO for any program. In 1983, the Service prepared a recovery plan for Moapa dace which was updated in 1996, and identified various tasks to guide recovery (Service 1996). The Service assigned the Moapa dace the highest recovery priority because (1) it is the only species within the genus *Moapa*, (2) the high degree of threat to its continued existence, and (3) the high potential for its recovery (Service 1996). A final recovery plan was approved by the Service in 1996 (Service 1996).

The actions needed for recovery include (1) protect instream flows and historical habitat within the upper Muddy River and tributary spring systems, (2) conduct restoration/management activities, (3) monitor Moapa dace population, (4) research population health, and (5) provide public information and education.

Habitat loss and non-native species are contributing factors to the decline of Moapa dace, but there will be no habitat loss or introduction of non-native species under the proposed action. We anticipate effects on recovery of the Moapa dace to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the Moapa dace.

8.17 Ash Meadows Species

BLM may issue ROWs that may impact individual plants of spring-loving centaury, Ash Meadows gumplant, Amargosa niterwort, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, and Warm Springs pupfish and individuals of Ash Meadows naucorid. BLM proposes to issue no more than one ROW during the term of this PBO that may impact any population of listed plant or aquatic species. Listed plant habitat on BLM land is managed as avoidance areas not exclusion areas. If impacts cannot be avoided, effects to the species may occur including disturbance, loss, and mortality.

All Ash Meadows species may be impacted by wildfire, though knowing if this will occur and where is not possible. Wildfire would cause the death or loss of species due to plants being consumed by the fire and aquatic species being exposed to extreme increases in temperatures.

The listed aquatic species are dependent on surface water provided by the Amargosa Desert groundwater basin, and the listed plants need water within 20 inches of their root system (BIO-WEST 2011). Therefore, the groundwater declines that have occurred due to groundwater pumping in the past have adversely affected these species and are likely to continue to affect them. Small declines in spring discharge, changes in water temperature, and adjustments in soil or water chemistry resulting from groundwater withdrawals in the basin may affect species inhabiting waters in spring pools and wetland systems in the Ash Meadows area. Withdrawals from groundwater or surface water sources may alter hydrological regimes and reduce the amount of surface water available to the species, resulting in adverse effects on Ash Meadows species and their critical habitat. Hydrological dynamics within wetland and riparian areas may also be affected, thereby potentially affecting the aquatic and terrestrial plant and animal species that utilize these resources. Individual organisms may die and local populations may become extirpated if water resources are reduced.

The Amargosa Desert Hydrographic Basin is currently over-appropriated. The hydrologic impacts to Ash Meadows aquatic resources from future actions that require groundwater are uncertain, but fluctuations in water levels in the Amargosa Desert Hydrographic Basin have been tied directly to groundwater pumping (Bedinger and Harrill 2006). Groundwater pumping associated with future actions is indirect and interrelated. Withdrawals from groundwater or surface water sources may alter hydrological regimes and reduce the amount of water available to the species, resulting in adverse effects on Ash Meadows species identified in this PBO. Hydrological dynamics within wetland and riparian areas may also be affected, thereby potentially affecting the aquatic and terrestrial plant and animal species that utilize these resources. Individual organisms may die and local populations may become extirpated if water resources are dramatically reduced.

8.18 Ash Meadows Species Critical Habitat

BLM may issue ROWs that may disturb critical habitat for the spring-loving centaury, Ash Meadows gumplant, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, or Ash Meadows speckled dace. BLM proposes to issue no more than one ROW during the term of this PBO that will impact any Ash Meadows species critical habitat. Designated critical habitat for Ash Meadows plant species on BLM land is managed as avoidance areas not exclusion areas. If impacts cannot be avoided, effects to the species may occur including disturbance, loss, mortality, and effects to the species physical and biological features.

All Ash Meadows species critical habitat may be impacted by wildfire, though knowing if this will occur and where is not possible. Wildfire would cause the death or loss of species due to plants being consumed by the fire and aquatic species being exposed to extreme increases in temperatures.

Critical habitat may be lost or degraded, potentially resulting in loss of PBFs of critical habitat. The PBFs potentially affected include saltgrass meadows alongside streams and pools, saline seeps, moist to wet clay soils along streams or in seeps, spring outflows, and flowing warm water over rock and gravel substrate. The primary threat to the critical habitat PBFs is lowered groundwater elevation due to groundwater pumping in support of ROWs or mining projects.

Small declines in spring discharge, changes in water temperature, drying of soils, and adjustments in soil or water chemistry resulting from groundwater withdrawals in the basin may affect all critical habitat. A thorough project-level analysis will be required to provide more information on the effects of changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry to Ash Meadows listed species.

8.19 Ash Meadows Species Conclusions

Reproduction

We have no information to indicate that any program activities will affect the reproductive capacity of any Ash Meadows plant or aquatic species in any manner.

Numbers

Small declines in spring discharge, changes in water temperature, and adjustments in soil or water chemistry resulting from groundwater withdrawals in the basin may affect species inhabiting waters in spring pools and wetland systems in the Ash Meadows area. Withdrawals from groundwater or surface water sources may alter hydrological regimes and reduce the amount of surface water available to the species, resulting in adverse effects on Ash Meadows species. Hydrological dynamics within wetland and riparian areas may also be affected, thereby potentially affecting the aquatic and terrestrial plant and animal species that utilize these resources. Individual organisms may die and local populations may become extirpated if water resources are reduced. Such withdrawals from groundwater and surface water are not part of the proposed action.

BLM may issue ROWs that may impact individual plants of the spring-loving centaury, Ash Meadows gumplant, Amargosa niterwort, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, and Warm Springs pupfish. BLM proposes to issue no more than one ROW during the term of this PBO that will impact any population of listed plant or aquatic species. Listed plant habitat on BLM land is managed as avoidance areas not exclusion areas. If the loss of some plants does occur, it will only be a very small percentage of the overall population; therefore, there are likely to be minimal effects to Ash Meadows species numbers in the action area from the proposed action.

Distribution

The proposed actions within the action area could result in some loss of individual plants or short-term displacement of aquatic species. Proposed actions near habitat may cause some aquatic species to disperse but they will still remain within their habitat. Consequently, the proposed action will not alter the distribution of Ash Meadows species.

Effects on Recovery

A recovery plan was completed in 1990 for the endangered and threatened species of Ash Meadows, Nevada. Although many recovery objectives described in the recovery plan have largely been achieved or are no longer relevant, uncertainties remain regarding the potential significance of groundwater pumping and surface mining.

Due to very few proposed program activities within Ash Meadows species habitat, we anticipate effects on recovery of the Ash Meadows species to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery of the Ash Meadows species.

Critical Habitat

There are no acres of disturbance allowed for any Ash Meadows species critical habitat under this PBO for any program. The groundwater declines that have occurred due to groundwater pumping in the past have adversely affected these species and may continue to affect these species. Small declines in spring discharge, changes in water temperature, drying of soils, and adjustments in soil or water chemistry resulting from a project's groundwater withdrawals in the basin may affect all designated critical habitat. A thorough project-level analysis will be required to provide more information on the effects of changes in spring discharge, groundwater levels, water temperature, and water and soil chemistry to Ash Meadows listed species.

We anticipate effects on recovery of all Ash Meadows species to be minimal. Therefore, we conclude that the proposed actions will not appreciably reduce the likelihood of recovery Ash Meadows species critical habitat.

Section 9: Cumulative Effects

Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the particular Federal action subject to consultation pursuant to section 7 of the Act. Cumulative effects do not include future Federal activities that are physically located within the action area of the particular Federal action under consultation. Past and present impacts of non-federal actions are considered part of environmental baseline conditions. Most of the action area is federally owned, and any future projects on these lands will be subject to separate section 7 consultation. Projects that may result in adverse effects to the desert tortoise on private (non-Federal) land are anticipated to fall under purview of existing HCPs and associated incidental take permits.

There is currently a HCP being developed for an expansion to the Spring Mountain Raceway in Pahrump, Nevada in Nye County. The proposed project is to expand the existing facility another 620 acres that were recently purchased from BLM.

Increased development would cause continued habitat loss, degradation, and fragmentation for the local desert tortoise population; as well as increased harm of individual desert tortoises, contributing to the cumulative degradation of the area. Planned future actions such as future transmission line and road corridors, electrical power substations, and industrial solar power plants would likely continue this trend. However, we know of other specific proposals by any non-Federal entity in the action area. The Service determined that most other future actions in the action area would likely require section 7 consultation since the action area is managed by BLM.

Section 10: Conclusion

10.1 Jeopardy Conclusion

When determining whether a proposed action is likely to jeopardize the continued existence of a species, we are required to consider whether the action would "reasonably be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

After reviewing the current status of the species, the environmental baseline for the project area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of programmatic activities as proposed in the PBA is not likely to jeopardize the continued existence of the desert tortoise, southwestern willow flycatcher, western yellow-billed cuckoo, Yuma clapper rail, Virgin River chub, woundfin, Moapa dace, spring-loving centaury, Ash Meadows sunray, Ash Meadows milkvetch, Ash Meadows ivesia, Ash Meadows gumplant, Amargosa niterwort, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, or Warm Springs pupfish.

The Service has reached this conclusion based on the following:

1. The number of desert tortoises anticipated to be killed or injured is low relative to the estimated number of tortoises occurring within the action area and impacted recovery units. Even if all 278 estimated adult tortoises were lost due to program activities, the loss would account for 0.39 percent of all adult tortoises within the 2 recovery units and an even lower percent (0.13) of all adult tortoises rangewide. Biologists will find most adult desert tortoises during clearance surveys, and the public is likely to capture and move numerous tortoises that will not be detected, so killing all 278 adult tortoises is not likely to occur.
2. BLM will implement numerous actions identified in this document and appendices to minimize or avoid adverse effects to listed species and their habitats.
3. The amount of desert tortoise non-critical habitat proposed to be disturbed is small relative to the amount available in the action area and within the Eastern Mojave and Northeastern Mojave Recovery Units. The proposed action would result in a loss of approximately 0.2 percent of the habitat in those two recovery units, and only 0.08 percent loss of habitat rangewide (13,165 acres of 16,745,848 total acres). This would not affect distribution of tortoises.
4. New actions greater than 20 acres of non-critical tortoise habitat and 5 acres of designated tortoise habitat that may adversely affect the desert tortoise will require additional project-specific consultation between the BLM and the Service and will subsequently be appended to this PBO.
5. The proposed action will not appreciably affect the reproduction or recovery of the desert tortoise.

6. BLM will avoid working in breeding areas and during breeding seasons for the southwestern willow flycatcher, yellow-billed cuckoo, and Yuma clapper rails for all proposed actions (except wildfire suppression activities).
7. To minimize impacts to groundwater dependent species, BLM will require applicants to implement conservation measures, including purchase and relinquishment of groundwater rights to offset the effects of groundwater withdrawal and avoidance of siting points of groundwater withdrawal closer to species' occurrences and (or) increased pumping in areas with a significant potential to affect habitat for those species.
8. To minimize impacts to groundwater dependent species, BLM will append land disposals in the Amargosa and Pahrump basins.
9. The magnitude of the effects to all species is not capable of delaying or precluding recovery in these species.

10.2 Adverse Modification Conclusion

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of programmatic activities as proposed in the PBA is not likely to adversely modify any designated critical habitat for the desert tortoise, southwestern willow flycatcher, Virgin River chub, woundfin, spring-loving centaury, Ash Meadows sunray, Ash Meadows milkvetch, Ash Meadows ivesia, Ash Meadows gumplant, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, or Ash Meadows speckled dace.

The Service has reached this conclusion based on the following:

1. BLM will implement actions identified in this document and appendices to minimize or avoid adverse effects to designated critical habitat.
2. The amount of desert tortoise designated critical habitat proposed to be disturbed is small relative to the amount available in the action area and within the Eastern Mojave, Northeastern Mojave, and Colorado Desert recovery units. All program actions would only affect 0.34 percent of critical habitat within the action area, 0.04 percent of all critical habitat rangewide, and would not prevent achieving the three objectives of delisting.
3. New actions greater than 5 acres of designated tortoise habitat that may adversely affect the desert tortoise will require additional project-specific consultation between the BLM and the Service and will subsequently be appended to this PBO.
4. Only 300 acres of southwestern willow flycatcher designated critical habitat may be lost due to the proposed action. This is only 3.5 percent of the critical habitat in Nevada (8,603 acres) and only 0.14 percent of all critical habitat rangewide (208,973 acres). These acres will not be completely lost or permanently disturbed but restored to native habitat.
5. Other than actions disturbing less than the 5-acre threshold for desert tortoise designated critical habitat, no actions will proceed under this biological opinion until: (1) BLM submits required action-specific information on each project that *may adversely affect* designated critical habitat for the desert tortoise, southwestern willow flycatcher, Yuma clapper rail, Virgin River chub, woundfin, spring-loving centaury, Ash Meadows sunray,

Ash Meadows milkvetch, Ash Meadows ivesia, Ash Meadows gumplant, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, or Ash Meadows speckled dace and (2) BLM receives a response from the Service to append this programmatic biological opinion in accordance with the Service's guidance.

Section 11: Incidental Take Statement

11.1 Incidental Take for Programmatic Consultations

Each BLM action that may result in incidental take must have an incidental take statement, whether the action is preparing planning documents for future projects or the implementation of specific activities. The regulations that implement section 7(a)(2) of the Act allow the Service to refrain from issuing an incidental take statement when it issues biological opinions on program-level consultations (see "framework programmatic action" at 50 CFR402.02). In many cases, anticipating the amount or extent of incidental take when evaluating a program-level action is not possible because we do not know the locations or nature of future actions.

For the proposed action, the Service knows, within reasonable bounds, the nature of the activities that are likely to be proposed are within defined BLM lands. We have projected, in the *Effects of the Proposed Action* section of this PBO, an estimate of the anticipated amount of take as a result of acres of disturbance for actions under each program proposed by BLM. Therefore, we have determined that it is appropriate to include an incidental take statement in this PBO. In accordance with 50 CFR 402.14(i)(6), the Service is not required to include an incidental take statement at the programmatic level but will be doing so in this PBO to address incidental take of desert tortoise resulting from all program- and project-level actions.

Though the intent in the appended programmatic approach is for the programmatic incidental take statement to contain all necessary reasonable and prudent measures and associated terms and conditions, due to the lack of available information regarding the specifics of individual projects, it may be necessary to develop project-specific reasonable and prudent measures and terms and conditions to ensure the minimization of the impacts of the incidental take associated with the specifics of each individual project. However, if this is the case, the Service would carefully consider whether the individual proposed project is beyond the scope of the programmatic consultation.

Section 9 of the Act and Federal regulation pursuant to section 4(d} of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(0)(2}, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the

Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

In June 2015, the Service finalized new regulations implementing the incidental take provisions of section 7(a)(2) of the Act. The new regulations also clarify the standard regarding when the Service formulates an incidental take statement [50 CFR 402.14(g)(7)], from "…if such take may occur" to "…if such take is reasonably certain to occur." This is not a new standard, but merely a clarification and codification of the applicable standard that the Service has been using and is consistent with case law. The standard does not require a guarantee that take will result; only that the Service establishes a rational basis for a finding of take. The Service continues to rely on the best available scientific and commercial data, as well as professional judgment, in reaching these determinations and resolving uncertainties or information gaps.

The Service hereby incorporates by reference the conservation measures proposed by BLM from the Description of the Proposed Action into this incidental take statement as part of these terms and conditions to be applied to future appended actions, as appropriate. Terms and conditions for actions covered under, or appended to, this opinion (1) modify the measures proposed by BLM or (2) specify additional measures considered necessary by the Service. Where action-specific terms and conditions (i.e., terms and conditions developed for each action to be appended and covered under this programmatic opinion in the future) vary from or contradict the minimization measures proposed under the Description of the Proposed Action or general terms and conditions below, the action-specific terms and conditions would apply. The measures described are general in nature and may or may not apply to future actions proposed for appendage to this programmatic biological opinion. Terms and conditions are nondiscretionary and must be implemented by BLM, or other jurisdictional Federal agency, so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply.

The BLM, or other jurisdictional Federal agency, has a continuing duty to regulate the activity that is covered by this incidental take statement as long as the affected area is retained in Federal ownership or control. If BLM, or other jurisdictional Federal agency, (1) fails to require the project proponent to adhere to the action-specific terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document or (2) fails to retain oversight to ensure compliance with action-specific terms and conditions, the protective coverage of section 7(o)(2) may lapse.

11.2 Amount or Extent of Take Anticipated - Desert Tortoise

Based on the analysis of the proposed action and the effects, and the measures proposed by BLM, the Service anticipates that the level of take of desert tortoise identified in Table 21 below is likely to occur as a result of all program-level and project-level actions that may be authorized, carried out, or funded by the BLM, including the requirement to append actions to this PBO (i.e., actions that result in total disturbance of more than 20 ac desert tortoise habitat or more than 5 ac desert tortoise critical habitat or more).

We acknowledge that not all individuals killed or injured during project activities will be detected. The inability to detect all tortoises is largely due to the cryptic nature of desert tortoises (i.e., individuals spend much of their lives underground or concealed under shrubs), their fossorial habits, their inactivity in years of low rainfall, and their limited abundance; and in the case of juveniles and eggs, their small size and location underground that reduce detection probabilities of these life stages during surveys. Another confounding factor is that scavengers may locate, consume, or remove carcasses before biologists or monitors can locate them.

In the absence of site-specific surveys, our estimate of the anticipated level of incidental take was primarily based on the 2016 and 2018 population density estimates for the Northeastern Mojave Recovery Unit (Beaver Dam Slope, Coyote Springs Valley, Gold Butte-Pakoon, and Mormon Mesa strata) and the Eastern Mojave Recovery Unit (Piute-Eldorado stratum). The 2016 and 2018 data estimate eight adult desert tortoises occur per mi^2 in the action area. We used Turner et al. (1987) to determine the number of juveniles in the action area (86.8 percent of the overall population is less than 180 mm). Since we used the number of acres of habitat disturbance as a surrogate for tortoises, if the extent of habitat disturbance exceeds the level identified in our effects analysis or if the number of desert tortoises taken as stated below is exceeded, reinitiation of consultation would be required (see Reinitiation Notice).

It is difficult to determine the number of tortoises that could be taken as a result of livestock grazing. There is a lack of documentation of tortoises being crushed by cattle, but there is an account of a tortoise found crushed inside a burrow collapsed by a cow in Utah (Esque pers. comm in Boarman 2002a). Cattle are cautious of stepping on uneven ground and may not step on tortoises (Boarman 2002a). The amount of trampling that may occur is related to the number of tortoises and livestock on the allotments, and these numbers can change over time. The numbers in Table 20 show low densities of cattle per active allotment. Though we estimate that there may be 1,351 adult and subadult tortoises and 8,884 juvenile tortoises within the active allotments, we believe that very few individuals may be killed or injured as a result of livestock grazing or range improvements. For this reason, we anticipate that no more than 2 adults or subadults and 13 juveniles are likely to be killed or injured as a result of livestock grazing or rangeland improvements over the life of this PBO. These individuals are not likely to be detected.

It is even more difficult to determine the number of tortoises that could be taken as a result of casual locatable mining. Since notices to BLM are not required, we do not know how many individuals from the public will engage in casual mining or where. Since these casual miners would use the same designated roads and trails as the casual recreation user, we assume that the take for roads and trails has been adequately addressed through recreational take. Because casual miners may be within desert tortoise habitat while undertaking such activities, it is likely that some tortoises may be taken through capture. We estimate that approximately 10 adult and 10 juvenile tortoises may be taken by capture, but not detected, during casual mining activities.

In addition, we expect the project areas to support desert tortoise eggs if undertaken during the desert tortoise nesting period, approximately May and June (Turner et al. 1984; Wallis et al. 1999). Estimating the number of tortoise eggs is extremely difficult given that the eggs are buried beneath the soil surface. Applying any assumptions has an unknown and high level of uncertainty. Therefore, we cannot calculate a precise estimate for the number of eggs that may be impacted by the proposed project. An unknown number of tortoise eggs will be destroyed as a result of the proposed action. So while we cannot estimate the number of eggs, should more than the number of adult tortoises be moved as referenced in the Incidental Take Statement, reinitiation would occur. Reinitiation could indicate that more eggs may be destroyed during construction due to higher numbers of tortoises in the action area.

11.3 **Effect of Take**

In the accompanying PBO, the Service determined that the level of anticipated take is not likely to result in jeopardy to the Mojave desert tortoise. This determination is based in part on the implementation of minimization measures detailed in this PBO and PBA provided by BLM with their request for consultation and subsequent discussions during the consultation period. Table 21 shows the incidental take exemption for desert tortoise for program-level actions and project-level actions.

Table 21. Incidental take exemption for desert tortoise.

Program and activity	**Non-injury or non-mortality take limits (capture)[1,2]**		**Number injured or killed (detected)[2]**	**Estimated number injured or killed (not detected)**		**Total Take**
	Adults and Subadults[3]	Juveniles[4]	All size classes unless specified	Adults and Subadults[3]	Juveniles[4]	All size classes
1. Lands and Realty						
• Land disposal (with BLM discretion)	50	18	N/A[5]	6	350	424
• R&PP leases	11	6	3	2	80	102
• Airport leases	7	3	2	1	49	62
• Other FLPMA (non-ROW) actions	2	1	0	0	6	9
2. Rights-of-way						
• Pre-project geotechnical	2	1	1(<180 mm)	0	6	10
• Linear ROWs	40	19	8	2	270	339
• Site-type ROWs	9	5	2	1	61	78
3. Mining						
• Locatable	18[6]	30[6]	2	1	30	81
• Leasable	1	5	1	0	13	20
• Saleable	8	20	2	1	30	61
4. Recreation Management						
• Speed events (pit, spectator areas, and new courses)	5 per event; 10 per MINT 400 event; 150 total during term of PBO (any size class)		1 per event; 5 total during term of PBO (any size class)	2	13	120
• Non-speed events and trails	2	7	2 (<180 mm)	0	4	15
• Casual, non-permitted	90[7]	648[8]	20	90[7]	648[8]	748
5. Livestock Grazing	0	0	0	2	13	15
6. Fire Management[9]						
• Fuel Breaks	12	5	1	1	80	99
7. Vegetation Management	1	1	1 (<180 mm)	0	0	3

Program and activity	Non-injury or non-mortality take limits (capture)[1,2]		Number injured or killed (detected)[2]	Estimated number injured or killed (not detected)		Total Take
	Adults and Subadults[3]	Juveniles[4]	All size classes unless specified	Adults and Subadults[3]	Juveniles[4]	All size classes
8. Resource Management	1	1	1 (<180 mm)	0	0	3

[1] Desert tortoises observed in harm's way may be moved to a safe location as outlined in this PBO. These are estimates of the number we expect will need to be moved. Unless otherwise specified, the number is the total for duration of the proposed action.
[2] If the incidental take for capture or injury/mortality detected is exceeded, reinitiation will be required.
[3] Adults and subadults are ≥180 mm
[4] Juveniles are <180 mm
[5] Development anticipated to occur following transfer of ownership; take exempted under Section 10 of Act.
[6] This includes 10 tortoises (any age class) that may be taken by capture during casual locatable mining.
[7] The total number of adult tortoises estimated to be taken by capture or be injured or killed (not detected).
[8] The total number of juvenile tortoises estimated to be taken by capture or be injured or killed (not detected).
[9] Fire suppression and emergency stabilization and rehabilitation (ESR) activities will be consulted on through separate emergency consultation after the fire effects and acres of disturbance are known.

Reinitiation would be required if (1) the threshold for habitat disturbance (surrogate) or take identified in Table 21 is exceeded; (2) a proposed action would result in effects beyond those identified in the *Effects of the Proposed Action*; or (3) an action is proposed in an area that will result in a level of effect to important habitat for the desert tortoise which may affect our ability to recover the species as determined by the Service. Reinitiation for each program would be required for desert tortoise based on the following.

1. **Lands and Realty**:

    a. Any adverse effects to desert tortoise critical habitat are proposed or occur as a result of a BLM lands and realty action.

    b. More than 4,500 ac of desert tortoise habitat is proposed for disposal.

    c. More than 1,000 ac of desert tortoise habitat is proposed for R&PP leases; more than 650 ac are proposed for airport leases; or more than 1 acre is proposed for Section 302 FLPMA actions.

    d. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

2. **Rights-of-way**:

    a. More than 5 ac of desert tortoise critical habitat or 100 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of pre-project geotechnical activities.

b. More than 1,500 ac of desert tortoise critical habitat or 2,000 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of linear ROW activities.

b. More than 25 ac of desert tortoise critical habitat or 750 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of site-type ROW activities.

c. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

3. **Mining:**

a. More than 100 ac of desert tortoise critical habitat or 500 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of locatable mineral activities.

b. More than 25 ac of desert tortoise critical habitat or 200 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of leasable mineral activities.

c. More than 100 ac of desert tortoise critical habitat or 500 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of saleable mineral activities.

d. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

4. **Recreation Management**:

a. Any adverse effects to critical habitat for any listed species are proposed or occur as a result of a speed or non-speed recreation event.

b. More than 130 ac of desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of speed event-related activities or 5 ac due to non-speed-related events.

c. More than 5 ac of desert tortoise critical habitat or 15 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of recreational trail actions.

d. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

5. **Grazing**:

   a. Any adverse effects to critical habitat for any listed species are proposed or occur as a result of livestock grazing.

   b. More than 5 ac of desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of rangeland improvements.

   c. Utilization levels identified in the terms and conditions are exceeded.

   d. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

6. **Fire Management**:

   a. More than 800 ac of desert tortoise critical habitat or 200 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of fuel break activities.

   b. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

7. **Vegetation Management**:

   a. More than 5 ac of desert tortoise critical habitat or 20 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of vegetation management activities.

   b. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

8. **Resource Management**:

   a. More than 5 ac of desert tortoise critical habitat or 20 ac of non-critical desert tortoise habitat is adversely affected or proposed to be adversely affected as a result of resource management activities.

   b. More desert tortoises are taken than identified in Table 21 as numbers captured or detected.

Reinitiation requirements for actions that adversely affect the southwestern willow flycatcher, yellow-billed cuckoo, Yuma clapper rail, Ash Meadows fishes, and Moapa dace are described below.

11.4 Southwestern Willow Flycatcher and Yellow-Billed Cuckoo

Reinitiation of consultation would be required if actions result in the disturbance of more than 300 acres of designated southwestern willow flycatcher critical habitat or the loss of any individual flycatchers or cuckoos or their nests; actions are proposed to occur during the breeding season or within potential breeding areas for the flycatcher or cuckoo; long-term adverse effects to flycatcher or cuckoo habitat occurs or is proposed; or proposed actions exceed the scope identified in this PBO.

11.5 Yuma Clapper Rail

Reinitiation of consultation would be required if appended actions result in the loss of any individual birds or nests; actions are proposed to occur during the breeding season or within potential breeding areas for the Yuma clapper rails; or long-term effects to rail habitat occurs or is proposed.

11.6 Virgin River Chub and Woundfin

Reinitiation of consultation would be required if proposed or appended actions result, or are anticipated to result, in long-term effects to the Virgin River that would further diminish the ability of either species to persist in the action area.

11.7 Moapa Dace

The most concerning impact to the Moapa dace that could result from BLM actions is the reduction of overall volume or quality of water that would be available to the species, thereby limiting the chance for long-term survival of Moapa dace. Larger water volumes provide the habitat necessary for increased food production and subsequently larger fish, thus greater fecundity. Hence, more numerous, larger eggs provide a better opportunity for species long-term survival.

Habitat loss and associated incidental take of Moapa dace specific to a given project is difficult to separate from the other parties simultaneously withdrawing groundwater from different locations within the same carbonate aquifer. Given this, the most accurate way to establish habitat loss and associated incidental take of Moapa dace is by evaluating the impacts to Moapa dace habitat on a landscape level, as was done in the 2006 PBO. In that parent document, the cumulative withdrawal of 16,100 afy by the parties associated with the MOA predicted a loss of approximately 22 percent riffle and 16 percent pool habitat as measured at the Warm Springs West gage downstream from the Pedersen Unit, when the flows reach 2.78 cfs. Therefore, while incidental take is not exempted under the PBO but deferred to project-level action-specific biological opinions, the total amount of incidental take of Moapa dace anticipated for the cumulative actions of parties to the MOA is that which is associated with 22 percent loss in riffle habitat and 16 percent loss in pool habitat. Should flows at the Warm Springs West gage decline to a flow below 2.78 cfs, the amount of incidental take for any action under the MOA would be exceeded for the Moapa dace and reinitiation of consultation for the Moapa dace would be required.

11.8 Ash Meadows Species

The most concerning impact to the Ash Meadows species that could result from the indirect effect of BLM actions is the potential reduction in the overall volume of water that would be available to the species, thereby limiting their chances for long-term survival. Reinitiation of consultation would be required if proposed or appended actions result, or are anticipated to result, in any net increase in groundwater use in the Amargosa Desert hydrographic basin.

11.9 Reasonable and Prudent Measures with Terms and Conditions

The BLM will implement proposed minimization measures, incorporated by reference into the Terms and Conditions, to minimize the incidental take of Mojave desert tortoise. All Terms and Conditions are measures proposed by BLM that are included as part of the proposed action to minimize take. The Service believes these measures are adequate and appropriate to minimize the incidental take of desert tortoise. Therefore, we are not including any additional reasonable and prudent measures with terms and conditions in this incidental take statement that have not already been part of the proposed action and the effects analyses. Additionally, BLM has proposed to coordinate with the Service when proponents propose specific actions to adapt the appropriate minimization measures for that activity.

The Service believes that the following Reasonable and Prudent Measures (RPMs) with Terms and Conditions stated below are necessary and appropriate to minimize the incidental take for program-level actions and may be relevant for future project-level actions appended to this biological opinion. In order to be exempt from the prohibitions of section 9 of the Act, BLM, or other jurisdictional Federal agency, must comply with RPMs as implemented by Terms and Conditions. For future project-level actions to be appended to this programmatic biological opinion, Terms and Conditions will be provided at the project-level consultation and are non-discretionary. Terms and Conditions will be based on measures proposed by BLM in the proposed action. Where proposed measures or decisions vary from the proposed action as described in this biological opinion, Terms and Conditions in this incidental take statement will take precedence.

Reasonable and Prudent Measures with Terms and Conditions will apply towards all future program-level and below-threshold project-level BLM actions that may result in adverse effects to the desert tortoise. The measures below may not apply to all future appended actions, and additional measures may be required when specific actions are proposed to be appended to this PBO. The Service considers desert tortoise sign in a project action area as an indicator that desert tortoises potentially or likely occur there.

RPM 1: Applies towards lands and realty, ROWs, and mining actions and other activities that involve vehicle and equipment use, excavation, or blasting. ***BLM, and other jurisdictional Federal agencies as appropriate, will implement or ensure implementation of measures to minimize injury or mortality of desert tortoises***

due to project construction, operation and maintenance; and most actions involving habitat disturbance.

Terms and Conditions:

1.a. *Field Contact Representative*—BLM will ensure a Field Contact Representative (FCR) or Compliance Inspection Contractor (CIC) is designated for large projects including each contiguous stretch of construction activity for linear projects or isolated work areas for non-linear projects. The FCR or CIC will serve as a representative of BLM and the Service to ensure that all instances of non-compliance or incidental take are reported. BLM has discretion over approval of potential FCRs and CIC's; however, those who also may be acting as authorized desert tortoise biologists, must be approved by the Service (see Term and Condition 1.b). All FCRs and CIC's will report directly to BLM and the Service.

The FCR or CIC, authorized desert tortoise biologist, and monitors (see Term and Condition 1.c.) will have a copy of all stipulations when work is being conducted on the site and will be responsible for overseeing compliance with terms and conditions of the ROW grant. BLM will ensure the FCR or CIC and authorized desert tortoise biologists have authority to halt any activity that is in violation of the stipulations. The FCR or CIC will be on site year-round during all project activities.

1.b. *Authorized desert tortoise biologist*—All authorized desert tortoise biologists (and monitors) are representatives of BLM and the Service and will report directly to BLM and the proponent concurrently regarding all compliance issues and take of desert tortoises; this includes all draft and final reports of non-compliance or take. The initial draft report will be provided to BLM and Service within 24 hours of the observation of take or non-compliance.

Authorized desert tortoise biologists, monitors, and the FCR (see Term and Condition 1.a.) will be responsible for ensuring compliance with all conservation measures for the project. This responsibility includes: (1) enforcing the litter-control program; (2) ensuring that desert tortoise habitat disturbance is restricted to authorized areas; (3) ensuring that all equipment and materials are stored within the boundaries of the construction zone or within the boundaries of previously-disturbed areas or designated areas; (4) ensuring that all vehicles associated with construction activities remain within the proposed construction zones; (5) ensuring that no tortoises are underneath project vehicles and equipment prior to use or movement; (6) ensuring that all monitors (including the authorized desert tortoise biologist) have a copy of the required measures in their possession, have read them, and they are readily available to the monitor when on the project site.

An authorized desert tortoise biologist will serve as a mentor to train desert tortoise monitors and will approve monitors if required. An authorized desert tortoise biologist is responsible for errors committed by desert tortoise monitors.

An authorized desert tortoise biologist will record each observation of desert tortoise handled on the Desert Tortoise Handling and Take Report (Appendix E). This information will be provided directly to BLM and the Service.

Potential authorized desert tortoise biologists must submit their statement of qualifications to the Service's Southern Nevada Fish and Wildlife Office in Las Vegas for approval, allowing a minimum of 30 days for Service response. The statement form is available in Chapter 3 of the Desert Tortoise Field Manual on the internet at:
https://www.fws.gov/nevada/desert_tortoise/dt/dt_manuals_forms.html

Authorized desert tortoise biologist requests in southern Nevada should be e-mailed to: ADTB_request@fws.gov

1.c. *Desert tortoise monitor*—Desert tortoise monitors assist an authorized desert tortoise biologist during surveys and serve as apprentices to acquire experience. Desert tortoise monitors ensure proper implementation of protective measures, and record and report desert tortoises and sign observations in accordance with Term and Condition 1.b. They will report incidents of noncompliance to the authorized desert tortoise biologist or FCR or CIC. No monitors will be on the project site unless supervised by an authorized desert tortoise biologist or approved by the BLM.

If a desert tortoise is immediately in harm's way (e.g., certain to immediately be crushed by equipment), desert tortoise monitors may move the desert tortoise then place it in a designated safe area until an authorized desert tortoise biologist assumes care of the animal.

Desert tortoise monitors may not conduct field or clearance surveys or other specialized duties of an authorized desert tortoise biologist unless directly supervised by an authorized desert tortoise biologist or approved to do so by the Service; "directly supervised" means an authorized desert tortoise biologist has direct sight and voice contact with the desert tortoise monitor.

1.d. *Desert tortoise education program*—A desert tortoise education program will be presented to all personnel on site during construction activities by an agency or authorized desert tortoise biologist. The BLM will approve the program. At a minimum, the program will cover desert-specific Leave-No-Trace guidelines, the distribution of desert tortoises, general behavior and ecology of this species, sensitivity to human activities, threats including introduction of exotic plants and animals, legal protection, penalties for violation of State and Federal laws, reporting requirements, and project measures in this biological opinion. All field workers will be instructed that activities must be confined to locations within the approved areas and their obligation to walk around and check underneath and vehicles and equipment before moving them (or be cleared by an authorized desert tortoise biologist). In addition, the program will include fire prevention measures to be implemented by employees during project activities. The program will instruct participants to report all observations of desert tortoise and their sign during construction activities to the FCR or CIC and authorized desert tortoise biologist.

1.e. *Vehicle travel*—Project personnel will exercise vigilance when commuting to the project area to minimize risk for inadvertent injury or mortality of all wildlife species encountered on paved and unpaved roads leading to and from the project site. Speed limits will be clearly marked, and all workers will be made aware of these limits. On-site, personnel will carpool to the greatest extent possible.

During the desert tortoise least-active season (generally November through February), vehicle speed on project-related access roads and in the work area will not exceed 25 mph.

During the most and less active seasons (generally March16 through October 31), and if temperatures are above 60 but below 95 °F for more than 7 consecutive days, vehicle speed on project-related access roads and in the work area will not exceed 15 mph. For large linear projects, and at the discretion of the BLM, all vehicles and construction equipment will operate in groups with size determined by the BLM in coordination with the applicant. A desert tortoise monitor will escort or clear ahead of vehicles and equipment for ROW travel. The escort will be on foot or ATV or UTV and clear the area of tortoises in front of each traveling construction equipment group (see Term and Condition 1.g.). The speed or pace will be determined by an authorized desert tortoise biologist and will be slow enough to ensure adequate inspection.

1.f. *Unauthorized access*—To the extent possible, BLM will ensure that unauthorized personnel, including the public and off-duty project personnel, do not travel on project-related temporary access roads. Signs will be used and say that access on the ROW is strictly prohibited except by authorized personnel. Any use of the access roads by the public will be recorded.

1.g. *Desert tortoise clearance*—Prior to surface-disturbing activities, authorized desert tortoise biologists potentially assisted by desert tortoise monitors, will conduct a clearance survey to locate and remove all desert tortoises from harm's way including areas to be disturbed using techniques that provide full coverage of all areas (Service 2009a). During the more-active season, clearance surveys will be conducted either the day prior to, or the day of, any surface-disturbing activity. During the less-active season, clearance surveys will be conducted within 7 days prior to any surface-disturbing activity. No surface-disturbing activities will begin until two consecutive surveys yield no individuals.

An authorized biologist will excavate all burrows that have characteristics of potentially containing desert tortoises in the area to be disturbed with the goal of locating and removing all desert tortoises and desert tortoise eggs. During clearance surveys, all handling of desert tortoises and their eggs and excavation of burrows will be conducted solely by an authorized desert tortoise biologist in accordance with the most current Service-approved guidance (currently Service 2009a). If any tortoise active nests are encountered, the Service must be contacted immediately, prior to removal of any tortoises or eggs from those burrows, to determine the most appropriate course of action. Unoccupied burrows will be collapsed or blocked to prevent desert tortoise entry. Outside construction work areas, all potential desert tortoise burrows and pallets within 50 ft of the edge of the construction work area will be flagged. If the burrow is occupied by a desert tortoise during the less-active season, the tortoise will be temporarily penned (see Term and Condition 1.j.). No stakes or flagging will be placed on the berm or in the opening of a desert tortoise burrow. Desert tortoise burrows will not be marked in a manner that facilitates poaching. Avoidance flagging will be designed to be easily distinguished from access route or other flagging, and will be designed in consultation with experienced construction personnel and authorized biologists. All flagging will be removed following construction activities.

An authorized desert tortoise biologist will inspect areas to be backfilled and areas where excavation spoil piles will be created immediately prior for tortoise activity.

1.h. *Desert tortoise in harm's way*—Any project-related activity that may endanger a desert tortoise will cease if a desert tortoise is found on the project site. Project activities may resume after an authorized desert tortoise biologist or desert tortoise monitor (see restrictions in Term and Condition 1.c.) removes the desert tortoise from danger or after the desert tortoise has moved to a safe area on its own.

1.i. *Handling of desert tortoises*—Desert tortoises will only be moved by an authorized desert tortoise biologist or desert tortoise monitor (see restrictions in Term and Condition 1.b.) solely for the purpose of moving the tortoises out of harm's way. During construction, operation, and maintenance, an authorized desert tortoise biologist will pen, capture, handle, and relocate desert tortoises from harm's way as appropriate and in accordance with the most current Service-approved guidance. No tortoise will be handled by more than one person. Each tortoise handled will be given a unique number, photographed, and the biologist will record all relevant data on the Desert Tortoise Handling and Take Report (Appendix E) to be provided to BLM in accordance with the project reporting requirements.

Desert tortoises that occur aboveground and need to be moved from harm's way will be placed in the shade of a shrub, 150 to 984 ft from the point of encounter. In situations where desert tortoises must be moved more than 984 ft (300 m), translocation procedures may be required. Translocation would likely result in a level of effect to the desert tortoise that would require the appended procedures.

If desert tortoises need to be moved at a time of day when ambient temperatures could harm them (less than 40 °F or greater than 95 °F), they will be held overnight in a clean cardboard box. These desert tortoises will be kept in the care of an authorized biologist under appropriate controlled temperatures and released the following day when temperatures are favorable. All cardboard boxes will be discarded after one use and never hold more than one tortoise. If any tortoise active nests are encountered, the Service must be contacted immediately, prior to removal of any tortoises or eggs from those burrows, to determine the most appropriate course of action.

Desert tortoises located in the project area sheltering in a burrow during the less-active season may be temporarily penned in accordance with Term and Condition 1.j. at the discretion of an authorized desert tortoise biologist. Desert tortoises should not be penned in areas of moderate to heavy public use, rather they should be moved from harm's way in accordance with the most current Service-approved guidance (currently Service 2009a).

Desert tortoises will be handled in accordance with the Desert Tortoise Field Manual (Service 2009a). Equipment or materials that contact desert tortoises (including shirts and pants) will be sterilized, disposed of, or changed before contacting another tortoise to prevent the spread of disease. All tortoises will be handled using disposable surgical gloves and the gloves will be disposed of after handling each tortoise. An authorized desert tortoise biologist will document each tortoise handling by completing the Desert Tortoise Handling and Take Report (Appendix E).

1.j. *Penning*—Penning will be accomplished by installing a circular fence, approximately 20 ft in diameter to enclose and surround the tortoise burrow. The pen should be constructed with 1-inch horizontal by 2-inch vertical, galvanized welded wire. Steel T-posts or rebar should be placed every 5 to 6 ft to support the pen material. Pen material will extend 18 to 24 inches aboveground. The bottom of the enclosure will be buried 6 to 12 inches or bent towards the burrow, have soil or rocks mounded along the base, and other measures implemented to ensure zero ground clearance. Care will be taken to minimize visibility of the pen by the public. An authorized desert tortoise biologist or desert tortoise monitor will check the pen at a frequency to ensure that the desert tortoise is secure and not stressed. No desert tortoise will be penned for more than 48 hours without written approval by the Service. Because this is a new technique, all instances of penning or issues associated with penning will be reported to the Service within 3 days (see Appendix E).

1.k. *Temporary tortoise-proof fencing*—At BLMs discretion, all construction areas, including open pipeline trenches, hydrostatic testing locations, and tie-in work will be fenced with temporary tortoise-proof fencing or inspected by an authorized desert tortoise biologist periodically throughout and at the end of the day and immediately the next morning. BLM and the Service will determine the appropriate length of open trench that will be allowed on the project.

Fencing will be designed in a manner that reduces the potential for desert tortoises and hatchlings to access the construction areas. Thus, the lower 6 to 12 inches of fencing will be folded outward (i.e., away from the construction area and towards the direction a tortoise would approach the work area), and covered with sufficient amount of soil, rocks, and staking to maintain zero ground clearance and secure the bottom section of material. An authorized desert tortoise biologist or monitor will check the integrity of the fencing daily and ensure that there are no breaches in the fencing and no desert tortoises are pacing the fence. After the fencing is erected and secure, the inside will be cleared by an authorized desert tortoise biologist. The fencing must remain closed during any construction activities.

1.l. *Permanent tortoise-proof fencing*—Tortoise-proof fencing will be installed around the boundary of permanent aboveground facilities that require regular monitoring and maintenance and other areas as directed by the BLM or Service. Fence specifications will be consistent with those approved by the Service (Service 2009a). Tortoise guards will be placed at all road access points where desert tortoise-proof fencing is interrupted, to exclude desert tortoises from the facility. Gates will provide minimal ground clearance and deter ingress by desert tortoises. Permanent tortoise-proof fencing along the project area will be appropriately constructed, monitored, and maintained. Fencing will be inspected in accordance with Table 22 and reports prepared in accordance with Term and Condition 7.c. unless modified by the Service. Monitoring and maintenance will include regular removal of trash and sediment accumulation and restoration of zero ground clearance between the ground and the bottom of the fence, including re-covering the bent portion of the fence if not buried. Tortoise shade structures will be installed along the fence line, at a distance determined by the BLM and FWS, to provide cover for tortoises pacing the new fence in their home range.

Table 22. Desert tortoise fence inspection requirements

Condition	Minimum Requirements
Quarterly	Inspect fence perimeter, tortoise guards, and gates once per quarter.
Following major storm event, tortoises active	Inspect fence perimeter, tortoise guards, and gates within 48 hours.
Following major storm event, tortoises inactive	Inspect fence perimeter, tortoise guards, and gates within 72 hours.
Breach in fence observed, tortoise guard or gate requires maintenance, tortoises active	Repair within 48 hours of breach occurrence.
Breach in fence observed, tortoise guard or gate requires maintenance, tortoises inactive	Repair within 1 week of breach occurrence.

1.m. *Wildlife escape ramps*—Escape ramps will be placed on either side of open trench segments at a distance no greater than every 0.25 mi. These distances will be reduced if the FCR and authorized desert tortoise biologist determine that the escape ramp spacing is insufficient to facilitate animal escape from the trench. Any tortoise that is found in a trench or excavation will be promptly removed by an authorized desert tortoise biologist in accordance with the most current Service-approved guidance. If the authorized desert tortoise biologist is not allowed to enter the trench for safety reasons, the alternative method of removal must have prior approval by the Service.

1.n. *Dust control*—Water applied for dust control will not be allowed to pool outside desert-tortoise fenced areas, as this can attract desert tortoises. Similarly, leaks on water trucks and water tanks will be repaired to prevent pooling water. An authorized desert tortoise biologist or monitor will be assigned to patrol each area being watered immediately after the water is applied and at approximate 60-minute intervals until the ground is no longer wet enough to attract tortoises if conditions favor tortoise activity.

1.o. *Blasting*—If blasting is required in desert tortoise habitat, detonation will only occur after the area has been surveyed and cleared by an authorized desert tortoise biologist no more than 24 hours prior. A minimum 200-foot buffered area around the blasting site will be surveyed. A larger area will be surveyed depending on the anticipated size of the explosion as determined by the authorized desert tortoise biologist. All desert tortoises above ground within the surveyed area will be moved 500 feet from the blasting site to a shaded location or placed in an unoccupied burrow. Desert tortoises that are moved will be monitored or penned (see Term and Condition 1.j.) to prevent returning to the buffered survey area. Tortoises located outside of the immediate blast zone and that are within burrows will be left in their burrows. All potential desert tortoise burrows, regardless of occupied status, will be stuffed with newspapers, flagged, and location recorded using a global positioning system (GPS) unit. Immediately after blasting, newspaper and flagging will be removed. If a burrow or cover site has collapsed that could be occupied, it will be excavated to ensure that no tortoises have been buried and are in danger of suffocation. Tortoises removed from the blast zone will be returned to their burrow if it is intact or placed in a similar unoccupied or constructed burrow.

1.p. *Power transmission projects*—Transmission line support structures and other facility structures will be designed to discourage their use by raptors for perching or nesting (e.g., by use of anti-perching devices) in accordance with the most current Avian Power Line Interaction Committee guidelines (see Terms and Conditions 2.b and 2.c.).

1.q. *Timing of construction*—The BLM will ensure that when possible, the project proponent schedules and conducts construction, operation, and maintenance activities within desert tortoise habitat during the least active season (generally November 1 to March 15) and during periods of reduced desert tortoise activity (typically when ambient temperatures are less than 60 or greater than 95 °F).

All vehicles and equipment that are not in areas enclosed by desert tortoise exclusion fencing will stop activities in desert tortoise habitat during rainfall events in the most and less active seasons (generally March 16 to October 31), until the FCR or CIC can determine, in coordination with the BLM and Service, when it is appropriate for project activities to continue based on tortoise activity.

1.r. For large linear projects, an authorized desert tortoise biologist will be assigned to each piece or group of large equipment engaged in activities that may result in take of desert tortoise (e.g., clearing, blasting, grading, lowering in pipe, hydrostatic testing, backfilling, recontouring, and reclamation activities) and other work areas that pose a risk to tortoises. BLM may use their discretion to require a monitor instead of an authorized desert tortoise biologist to monitor equipment that is low risk to tortoises.

RPM 2: Predator Control—Applies to all actions. BLM, and other jurisdictional Federal agencies as appropriate, will ensure their agency personnel, the project proponent, and their contractors implement the following measures to minimize injury to desert tortoises as a result of predators drawn to the project area from construction, operation, and minor maintenance activities:

<u>Terms and Conditions</u>:

2.a. *Litter control, applies to all projects*—A litter control program will be implemented to reduce the attractiveness of the area to opportunistic predators such as desert kit foxes, coyotes, and common ravens. Trash and food items will be disposed of properly in predator-proof containers with predator-proof lids and emptied daily.

2.b. *Deterrence*—The project proponent will implement measures to discourage the presence of predators on site (coyotes, ravens, etc.), including elimination of available water sources, designing structures to discourage potential nest sites, and use of hazing to discourage raven presence.

2.c. *Monitoring and predator control*—The project proponent will implement BLM's Raven Management Plan to monitor for the increased presence of ravens and other potential human-subsidized predators.

2.d. *Evaporation ponds and open water sources*—Tortoise-proof fencing should be installed to prevent tortoises from entering the ponds.

RPM 3: Impacts to Desert Tortoise Habitat—Applies towards all actions that involve habitat impacts. BLM, and other jurisdictional Federal agencies as appropriate, will ensure their agency personnel, the project proponent, and their contractors implement the following measures to minimize loss and long-term degradation and fragmentation of desert tortoise habitat, such as soil compaction, erosion, crushed vegetation, and introduction of weeds or contaminants from construction, operation, and minor maintenance activities:

Terms and Conditions:

3.a. *Restoration plan*—BLM will ensure that the applicant develops and implements a restoration or reclamation plan approved by the BLM prior to surface disturbance.

3.b. *Minimizing new disturbance*—Cross-country travel outside designated areas will be prohibited. All equipment, vehicles, and construction materials will be restricted to the designated areas and new disturbance will be restricted to the minimum necessary to complete the task.

3.c. *Chemical spills*—Hazardous and toxic materials such as fuels, solvents, lubricants, and acids used during construction will be controlled to prevent accidental spills. Any leak or accidental release of hazardous and toxic materials will be stopped immediately and cleaned up at the time of occurrence.

3.d. *Residual impacts from disturbance*—BLM will collect remuneration fees to offset residual impacts to desert tortoises from project-related disturbance to desert tortoise habitat.

Remuneration fees will be used for management actions expected to promote recovery of the desert tortoise over time, including management and recovery of desert tortoise in Nevada in accordance with Hastey et al. 1991. Actions may involve habitat acquisition, population or habitat enhancement, increasing knowledge of the species' biological requirements, reducing loss of individual animals, documenting the species status and trend, and preserving distinct population attributes. Fees will be used to fund the highest priority recovery actions for desert tortoises in Nevada

The current rate is $902 per ac of disturbance, as indexed for inflation, effective March 1, 2018. The next adjustment will become effective March 1, 2019. The fee rate will be indexed for inflation based on the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (CPI-U) on January 31st of each year, becoming effective March 1st. Fees assessed or collected for projects covered under this biological opinion will be adjusted based on the current CPI-U for the year they are collected. Information on the CPI-U can be found on the internet at: *http://stats.bls.gov/news.release/cpi.nr0.htm*

RPM 4: Recreation: Speed events—BLM, and other jurisdictional Federal agencies as appropriate, will ensure their agency personnel, the project proponent, and their contractors implement the following measures to minimize effects to the desert tortoise as a result of speed OHV events.

Terms and Conditions:

4.a. An Environmental Awareness Program consisting of a tortoise fact sheet will be provided to registered drivers and support personnel prior to race activities. The fact sheet will include discussion of the Act, and consequences of noncompliance with it. Additionally, it will include a tortoise education program with information on the legal protection for desert tortoises, penalties for violations of Federal and State laws, general tortoise activity patterns, reporting requirements, measures to protect tortoises, and terms and conditions of the biological opinion.

4.b. An appropriate number of monitors, as determined by BLM, will be present to control spectators and enforce compliance with stipulations of the event permit.

4.c. All non-race vehicles will not exceed the legal speed limit (posted or unposted) on the roads used during events.

4.d. In sections of the racecourse that allow for passing, passing may occur only in those areas that have a clear and defined second lane.

4.e. Temporary or permanent fences or boundary markers will be installed around pit and spectator areas to clearly delineate the boundaries of these areas from adjacent desert habitat, using sturdy materials such as ropes and T-posts.

4.f. All event-related activities will be confined to authorized vehicle routes, pit areas, spectator areas, and the course itself, and will not stray into vegetated areas Personnel will be stationed at these areas, as appropriate, to enforce access restrictions.

4.g. During pre-race maintenance activities involving the use of heavy equipment to grade new course, if required, a tortoise monitor will be present to check for tortoises.

4.h. Any desert tortoises located on, immediately adjacent to, or moving directly toward the racecourse will be captured and temporarily held. All handling and temporary holding of desert tortoise will be performed by BLM personnel or BLM contractors experienced or trained in the handling of desert tortoises according to current Service-approved protocol (Service 2009a). Tortoises will be held to the end of the event or to the following morning and released at the point of capture. All instances of handling tortoises will be reported to the Service with the Desert Tortoise Handling and Take Report (Appendix E).

4.i. All occupied desert tortoise burrows that are in close proximity to the race course, but are not at immediate risk of damage from race activities will be temporarily penned by the authorized biologist(s) or monitor(s) overseen by the biologist to ensure the desert tortoise is confined to the burrow and will not wander onto the course during each race event. Identified burrows will have the entrance blocked 1-2 days before each race event prior to 7:00 a.m. to ensure that desert tortoises are not trapped outside of resident burrows. Removal of the temporary pens will occur by no later than 12:00 p.m. the day after each race event. Penning will be constructed as directed in Term and Condition 1.j.

4.j. If any participant, event volunteer, spectator or BLM personnel locates an injured desert tortoise, BLM personnel or contractor experienced or trained in handling tortoises, or BLM designated FCR will be notified immediately (Appendix E). Any desert tortoise injured as a result of race activities will immediately be transported to a qualified veterinarian. As soon as possible or within 12 hours of the injured tortoise being found, the Service's Southern Nevada Fish and Wildlife Office in Las Vegas will be notified at (702) 515-5230.

4.k. Any fuel or hazardous waste leaks or spills will be contained immediately and cleaned up at the time of occurrence. Contaminated soil will be removed and disposed of at an appropriate facility.

4.l. The race promoters will ensure that all measures are deployed to prevent racers from straying into vegetated areas identified as potential problems (e.g., sharp turns and sandy soils) during pre-race meetings with BLM. Potential measures include flagging, signing and reduced speed requirements.

4.m. If a vehicle breaks down, it will be moved to the side of the racecourse, avoiding damage to vegetation to the extent possible. Teams will not be allowed to retrieve vehicles without an official escort to the retrieval site to ensure that no additional habitat disturbance takes place during this process. Any retrieval must be done on the racecourse, or approved routes, not the adjacent vegetated areas.

4.n. If desert tortoise habitat is disturbed as a result of an OHV event or activity, BLM will collect an additional per-acre fee based on the quality of habitat disturbed. This fee will be used by BLM to restore desert tortoise habitat in accordance with BLM restoration methods. The fee rate will be indexed for inflation based on the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (CPI-U) on January 31st of each year. Fees assessed or collected for projects covered under this biological opinion after March 1st of each year will be adjusted based on the CPI-U. Information on the CPI-U can be found on the Internet at: http://stats.bls.gov/news.release/cpi.nr0.htm

This fee will be paid directly to BLM's State Office in Reno, Nevada. These funds are independent of any other fees collected by BLM for desert tortoise conservation planning. The payment will be accompanied by the attached Section 7 Fee Payment Form, and completed by the payee (Appendix F).

4.o. Race promotor and BLM will ensure that race vehicles are free of dried mud and vegetation debris prior to technical inspection. If race vehicle is documented to have either mud or debris, vehicle must be cleaned prior to entering the race area to prevent the spread of noxious weeds. Any vehicle that leaves the race area will be cleaned prior to re-entering the race area.

4.p. The racecourse will be inspected by monitor(s) or trained BLM personnel as soon as possible after the race to document any observable instances of "take" (mortality or injury) to desert tortoises from race activities. This information will be reported in accordance with Term and Condition 7.d.

4.q. A brief report will be written by BLM documenting the results of implementation of the terms and conditions and submitted to the Service's Southern Nevada Fish and Wildlife Office in Las Vegas within 30 days.

Information for the report includes amount of new disturbance, amount of take exempted and take reported (Appendix E), effectiveness or ineffectiveness of the Terms and Conditions of this incidental take statement (measured by quantitative data or qualitative observations), fees assessed, and restoration or remediation actions taken to address habitat disturbance including amount of habitat restored. Information relevant to each race event also will be included such as the number of vehicles that participated and approximate number of spectators and support staff.

RPM 5: Livestock Grazing—BLM, and other jurisdictional Federal agencies as appropriate, will ensure their agency personnel, the project proponent, and their contractors implement the following measures to minimize effects to the desert tortoise as a result of permitting livestock grazing.

Terms and Conditions:

5.a. A litter-control program will be implemented to minimize predation on tortoises by ravens drawn to project sites (e.g., range improvements, water hauls, etc). This program will include the use of covered, raven-proof trash receptacles, removal of trash from project areas to the trash receptacles following the close of each work day, and the proper disposal of trash in a designated solid waste disposal facility. Appropriate precautions must be taken to prevent litter from blowing out along the road when trash is removed from the site. The litter-control program will apply to all actions. A litter-control program will be implemented by the responsible Federal agency or their contractor, to minimize predation on tortoises by ravens and other predators drawn to the project site.

5.b. Livestock grazing in desert tortoise habitat will be managed consistent with the most current version of the Desert Tortoise Recovery Plan, including allotments or portions of allotments that become vacant and occur within desert tortoise critical habitat outside of ACECs. Grazing may continue in currently active allotments until such time they become vacant. BLM will work with the permittees of active allotments to implement changes in grazing management to improve desert tortoise habitat which may include use of water, salt or mineral licks, or herding to move livestock; changes in season of use or stocking rates; installation of exclusionary fences; reconfiguring pasture or allotment boundaries; and retiring pastures or allotments. Renewal of term grazing permits will be appended to this PBO.

5.c. Livestock grazing utilization levels or other thresholds will be incorporated into the allotment term permits.

5.d. The permittee will be required to take immediate action to remove any livestock that moves into areas unavailable for grazing. If straying of livestock becomes problematic, BLM, in consultation with the Service, will take measures to ensure straying is prevented.

5.e. All vehicle use in listed species habitat associated with livestock grazing, with the exception of range improvements, will be restricted to existing roads and trails. Permittees and associated workers will comply with posted speed limits on access roads. No new access roads will be created.

5.f. Use of hay or grains as a feeding supplement will be prohibited outside designated areas (e.g., in and near corrals and watering areas). Where mineral and salt blocks are deemed necessary for livestock grazing management, they will be placed in previously-disturbed areas at least 0.5 mi from riparian areas. In some cases, blocks may be placed in areas that have a net benefit to tortoise by distributing livestock more evenly throughout the allotment, and minimizing concentrations of livestock that result in habitat damage.

5.g. Site visits will be made to active allotments by BLM rangeland specialists and other qualified personnel, including Service biologists, at a frequency sufficient to ensure compliance with the terms and conditions of the grazing permit. Any instance of non-compliance will be rectified by BLM and permittee, and reported to the Service.

5.h. Livestock levels will be adjusted to reflect significant, unusual conditions that result in a dramatic change in range conditions (e.g., drought and fire) and negatively impact the ability of the allotment to support both listed species and cattle.

5.i. Livestock grazing may continue in desert tortoise habitat under current conditions established in the 1998 PBO (1-5-98-F-053) until such time the term permits come up for renewal based on the existing permit expiration dates. During this interim period for grazing within desert tortoise habitat, livestock use may occur from March 1 to October 31, as long as forage utilization management levels are monitored and do not exceed 40 percent on key perennial grasses, shrubs and perennial forbs; and between November 1 and February 28/29, provided forage utilization management levels are monitored and do not exceed 50 percent on key perennial grasses and 45 percent on key shrubs and perennial forbs. If the utilization management levels are reached, livestock will be moved to another location within the allotment or taken entirely off the allotment. BLM will ensure that no livestock grazing (including trespass) will occur in desert tortoise critical habitat or ACECs.

RPM 6: Vegetation and Resource Management—Applies towards restoration, weed treatments, fish and wildlife projects, desert clean-ups, hazardous material management, mine closures, public information and education, cultural and paleontological activities, and wild horse and burro management. ***BLM, and other jurisdictional Federal agencies as appropriate, will implement or ensure implementation of measures to minimize injury or mortality of desert tortoises and habitat impacts due to resource and vegetation activities.***

Terms and Conditions:

6.a. In addition to RPMs and terms and conditions required for all actions, BLM will implement RPM 3 and associated terms and conditions (desert tortoise habitat effects) as part of the Vegetation and Resource Management Program, as appropriate.

6.b. Wild horse and burro trap sites will be located in previously disturbed areas where possible. Any significant surface disturbance resulting from herd gathers will be restored to prevent continued public use.

6.c. Only weed-free hay will be used if available and supplemental feeding is required

6.d. Herbicides will be used in accordance with all product label requirements and restrictions as well as any additional restrictions in the Vegetation PEISs.

6.e. Vegetation treatments in undisturbed habitat will be conducted during the tortoise least active season. Those treatments that have to be conducted during the most active or less active season due to the weed species will be coordinated with the Service to ensure no further consultation is required.

6.f. If conducting manual spot applications of herbicides to vegetation in upland habitats occupied by Mojave desert tortoises, BLM will utilize the typical, rather than the maximum, application rate.

6.g. All individuals applying herbicides will be given education and instruction on what to do if a tortoise is located in treatment area.

6.h. If a tortoise is found in a proposed treatment area, the area will be avoided and treatment will move 500 feet ahead. Treatment can be completed the following day as long as the tortoise is no longer in the immediate area.

6.i. If a tortoise is found to have been sprayed with herbicide, the tortoise will be immediately rinsed with fresh water while still on the ground. If the tortoise voids its bladder, BLM will immediately be contacted for further guidance.

6.j. At least one person applying herbicides will be given education on how to handle a tortoise if the plastron of the tortoise needs to be rinsed.

6.k. No ATV or UTV cross country travel will be used while applying herbicides unless the treatment area is too large. If required, a monitor will walk in front of vehicle ensuring no tortoise or tortoise burrows are impacted.

6.l. If conducting aerial application of herbicides for fuel breaks during the more active season, tortoise surveys will be conducted the day prior to application.

6.m. Non-native weeds that were common in the project area prior to disturbance must be maintained at levels (cover and density) less than or equal to pre-disturbance conditions. Non-native weeds that were not found in the project area prior to disturbance will all be treated.

6.n. Survey for, and apply treatment (herbicide) in newly disturbed ROW during biologically appropriate times and before noxious weeds and non-native weeds have gone to seed.

6.o. Monitor and submit annual reports to BLM on non-native and noxious weeds occurrence, spread, and treatment for the lifetime of the ROW.

RMP 7: Compliance and Reporting—Applies towards all actions. BLM, and other jurisdictional Federal agencies as appropriate, will ensure their agency personnel, the project proponent, and their contractors implement the following measures to comply with the reasonable and prudent measures, terms and conditions, reporting requirements, and reinitiation requirements contained in this biological opinion:

Terms and Conditions:

7.a. *Desert tortoise deaths*—The deaths and injuries of desert tortoises will be investigated as thoroughly as possible to determine the cause. The Service and appropriate state wildlife agency must be verbally informed immediately and within 5 business days in writing (electronic mail is sufficient). The Authorized

Desert Tortoise Biologist will complete the Desert Tortoise Handling and Take Report (Appendix E).

7.b. *Non-compliance*—Any incident occurring during project activities that was considered by the FCR, authorized desert tortoise biologist, or biological monitor to be in non-compliance with this biological opinion will be immediately documented by an authorized desert tortoise biologist. Documentation will include photos, GPS coordinates, and details on the circumstances of the event. The incident will be included in the annual report and post-project report.

7.c. *Fence inspection*—Quarterly reports (January-March, April-June, July-September, and October-December) for monitoring and repair of tortoise-proof fencing as specified in Table 22, will be submitted to the BLM and Service's Southern Nevada Fish and Wildlife Office in Las Vegas. Quarterly reports will be compiled into an annual report due January 31 the following calendar year.

7.d. *Project reporting requirements*—BLM will submit information on below-acreage threshold projects and all appended actions and their effects to desert tortoise in an annual report. BLM will submit the annual reports that will cover the calendar year and are due January 31st following each calendar year. An Excel spreadsheet form has been made available for annual reporting. The reports will not only be for one calendar year, but they will be a running list of all projects and all take since the starting date of the PBO.

The annual reports will include Appendix Gs (annual and final project reports) and Appendix Es (Desert Tortoise Handling and Take Reports). If available, GIS shape files will be included.

7.e. *Operation and maintenance*—If a tortoise is observed or if take occurs during any maintenance and repair activities (within any of the five general categories), a report will be submitted to the BLM and the Service. The report will include all deaths, injuries, illnesses, moving, or observation of desert tortoises within the operation and maintenance area, whether associated with project activities or not.

11.10 Reporting Requirements

Pursuant to 50 CFR 402.14(i)(3), the BLM must report the progress of the action and its impact on the species to the Service as specified in this incidental take statement. The BLM will ensure that a report documenting desert tortoise encounters, incidental take (including capture and relocation), and effectiveness and compliance with the desert tortoise protection measures is prepared and submitted to the Service's Southern Nevada Fish and Wildlife Office in Las Vegas. Reporting requirements are found under Reasonable and Prudent Measure 7, Term and Condition 7.d.

11.11 Disposition or Care for Dead or Injured Species

To ensure that the protective measures are effective and are being properly implemented, BLM will contact the Service immediately if a desert tortoise, southwestern willow flycatcher, western yellow-billed cuckoo, Yuma clapper rail, Virgin River chub, woundfin, Moapa dace, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, or Warm Springs pupfish is killed or injured as a result of any activity covered under this PBO. Upon locating a dead or injured federally listed species within the action area, notification must be made by phone to the Southern Nevada Fish and Wildlife Office at (702) 515-5230 and by completing the Desert Tortoise Take Report (Appendix E). Appendix E may also be used for other species as needed. At that time, the Service and BLM will review the circumstances surrounding the incident to determine whether additional protective measures are required. Care should be taken in handling sick or injured animals to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death.

In conjunction with the care of sick or injured desert tortoises or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Service to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

If a desert tortoise, southwestern willow flycatcher, western yellow-billed cuckoo, Yuma clapper rail, Virgin River chub, woundfin, Moapa dace, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, or Warm Springs pupfish is injured or killed, it will be delivered to a qualified veterinarian for appropriate treatment or disposal. The applicant will bear the cost of any required treatment of listed species injured from the Project, euthanasia of sick animals, and cremation of animals that die during treatment. Dead listed species suitable for preparation as museum specimens shall be frozen immediately and provided to an institution holding appropriate Federal and State permits per their instructions. Should no institutions want the specimens, or if it is determined that they are too damaged (crushed, spoiled, etc.) for preparation as a museum specimen, then they may be buried away from the project area or cremated, upon authorization by the Service. Should sick or injured listed species be treated by a veterinarian and survive, they may be transferred as directed by the Service.

Section 12: Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In order for the Service to be kept informed of actions that either minimize or avoid adverse effects or that benefit listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations. The Service recommends the following conservation measures which should be considered for the revised RMP:

1. BLM should designate desert tortoise habitat and population linkages as ACECs in coordination with the Service and avoid locating projects in tortoise habitat with substantial impacts to the desert tortoise (e.g., projects that result in ≥20 ac disturbance).
2. We encourage BLM to establish contracts directly with environmental consulting firms to implement the measures for major appended actions in this biological opinion and oversee compliance. This would establish primary communication with biologists, improve reporting required in this biological opinion, reduce influences from the project proponents, and inform BLM and the Service of issues in a timely manner. At a minimum for projects with the potential to result in substantial effects to the desert tortoise and its habitat, BLM should approve the contract between the environmental consulting firm and the project proponent to ensure that biologists report directly to BLM and the Service as appropriate.
3. We suggest that BLM not consider disposal of land within the Amargosa Desert groundwater basin (Hydrographic Basin 230) or within the Pahrump Valley groundwater basin (Hydrographic Basin 162). All existing and future ACECs in the Ash Meadows area should be managed as exclusion areas.
4. We recommend that BLM continue to pursue funding to construct a fish barrier at Halfway Wash. The barrier would prevent red shiners and tilapia from entering habitat for the woundfin and Virgin River chub. We believe this action is necessary to achieve recovery of these fish species.
5. In the RMP revision, we recommend that BLM include desert tortoise-appropriate habitat monitoring as part of the livestock grazing program. We are concerned that the monitoring in place under the 1998 RMP does not accurately assess impacts to the desert tortoise particularly concerning forage availability. The land disposal boundaries in the revised RMP should not include or adversely affect desert tortoise linkage areas and high-value desert tortoise habitat.
6. BLM actions, particularly OHV activities, should avoid desert washes which are important habitat for the desert tortoise.

Section 13: Reinitiation Notice

This concludes formal consultation on the actions outlined in your request. As required by 50 CFR § 402.16, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

An agency shall not be required to reinitiate consultation after the approval of a land management plan prepared pursuant to 43 U.S.C. 1712 or 16 U.S.C. 1604 upon listing of a new species or designation of new critical habitat if the land management plan has been adopted by the agency as of the date of listing or designation, provided that any authorized actions that may affect the newly listed species or designated critical habitat will be addressed through a separate action-specific consultation. This exception to reinitiation of consultation shall not apply to those land management plans prepared pursuant to 16 U.S.C. 1604 if (1) fifteen years have passed since the date the agency adopted the land management plan prepared pursuant to 16 U.S.C. 1604 and (2) five years have passed since the enactment of Public Law No. 115-141 [March 23, 2018] or the date of the listing of a species or the designation of critical habitat, whichever is later.

If you have any questions about this programmatic biological opinion, please contact Carla Wise at 702-515-5102 or by e-mail at Carla_Wise@fws.gov. Please reference File No. 08ENVS00-2019-F-0153 in future correspondence concerning this consultation.

Appendices

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District Manager, Ely District Office, Bureau of Land Management, Ely, Nevada
Field Manager, Tonopah Field Office, Bureau of Land Management, Tonopah, Nevada
District Manager, Battle Mountain District Office, Bureau of Land Management, Battle Mountain, Nevada
State Director, Bureau of Land Management, Reno, Nevada

Section 14: Literature Cited

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Section 15: Appendices

Appendix A. Request to Append Action Form

ACTION APPENDED TO THE BLM's SOUTHERN NEVADA DISTRICT PROGRAMMATIC BIOLOGICAL OPINION (File No. 08ENVS00-2019-F-0153)

This consultation consists of the programmatic biological opinion (PBO), BLM's request to append the proposed action to the PBO with project-specific information (Part A, below), referenced sections of the biological assessment (BA) provided with the request, and the Fish and Wildlife Service's response (Part B, below).

Service Project File Append No.

Part A: **Information provided by the BLM**

Date of request:	Agency Contact:	
Project/action title:		
NEPA # and Case File # [1]		
Section 7 Log no.: [1]		
Proponent/applicant:		
Program:		
Species/critical habitat affected:	Mojave desert tortoise (*Gopherus agassizii*)	
No. of acres to be affected:	Non-critical:	Critical:

[1] If applicable

DESCRIPTION OF PROPOSED ACTION

- What is the Federal action (e.g., right-of-way, permit, lease, etc.)?
- When would the action begin/end?
- What are the specific activities that would be implemented?
- How will access to work areas be accomplished?

Habitat Description and Survey Summary and Results

- Describe in detail, the pre-project survey results including description or condition of the habitat, dominant vegetation, and existing disturbance.
- Attach survey data sheets and maps.

Description of existing factors affecting the species in the project (action) area not discussed in the PBO

- Describe current and prior human uses or activities in the action area. Include reference to previous consultations in the action area and reports of such actions submitted to the Service.

EFFECTS OF THE ACTION

- How will the proposed activities affect listed species and their critical habitat?

Proposed Minimization Measures and Remuneration Fees:

[Terms and conditions for desert tortoise in the PBO may be referenced by number with a brief summary (e.g., T&C 1.a. Designate and require a field contact representative); additional measures may be proposed by BLM beyond those in the PBO.]

Part B: Fish and Wildlife Service Response
Date received:
Service File No.
Date of response:

ENVIRONMENTAL BASELINE

PROJECT-SPECIFIC EFFECTS OF PROPOSED ACTION

CONCLUSION

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the Terms and Conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE EXEMPTED

REASONABLE AND PRUDENT MEASURES WITH TERMS AND CONDITIONS

REINITIATION REQUIREMENT

Appendix B. Figures

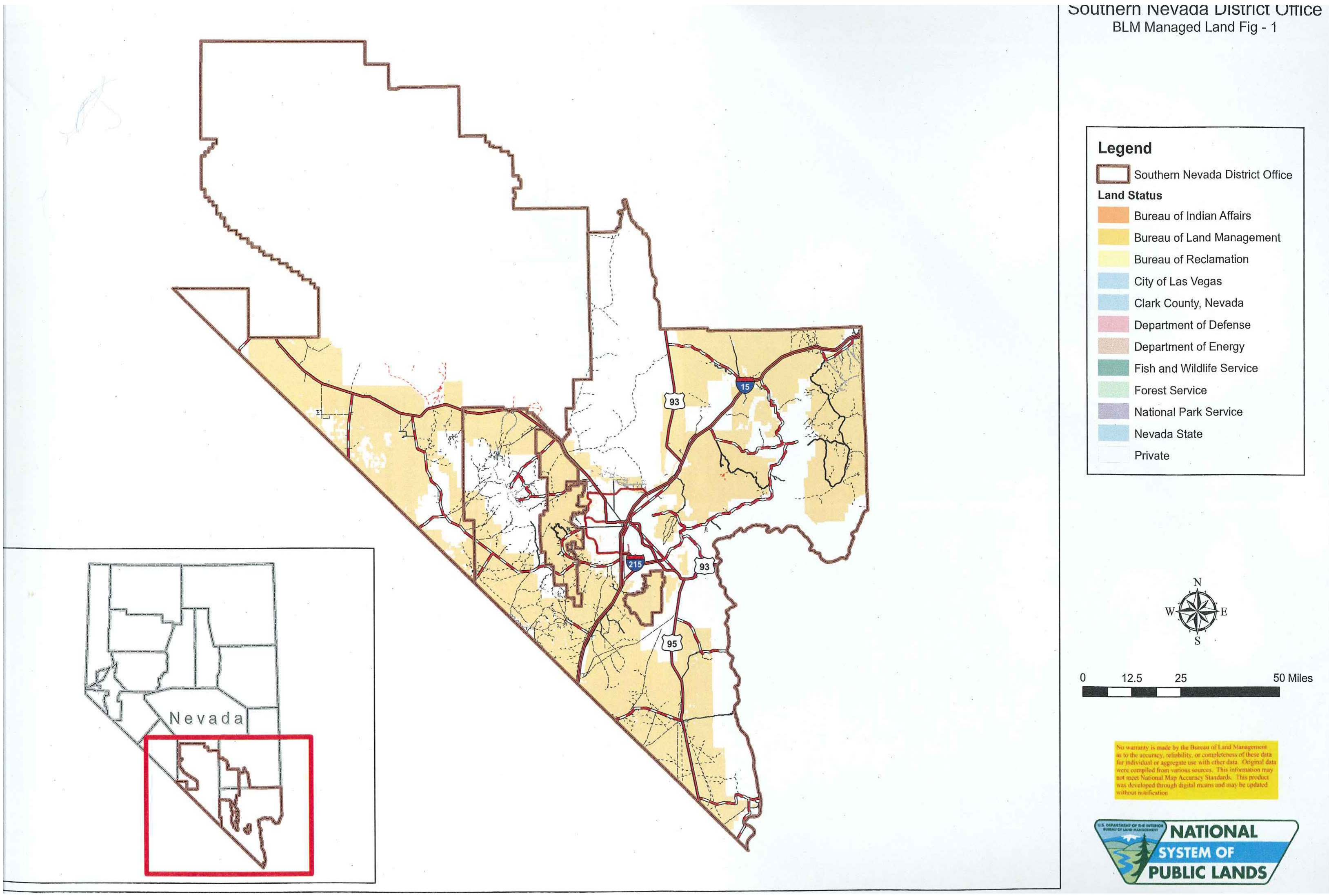

Figure 1. Action Area for this programmatic biological opinion.

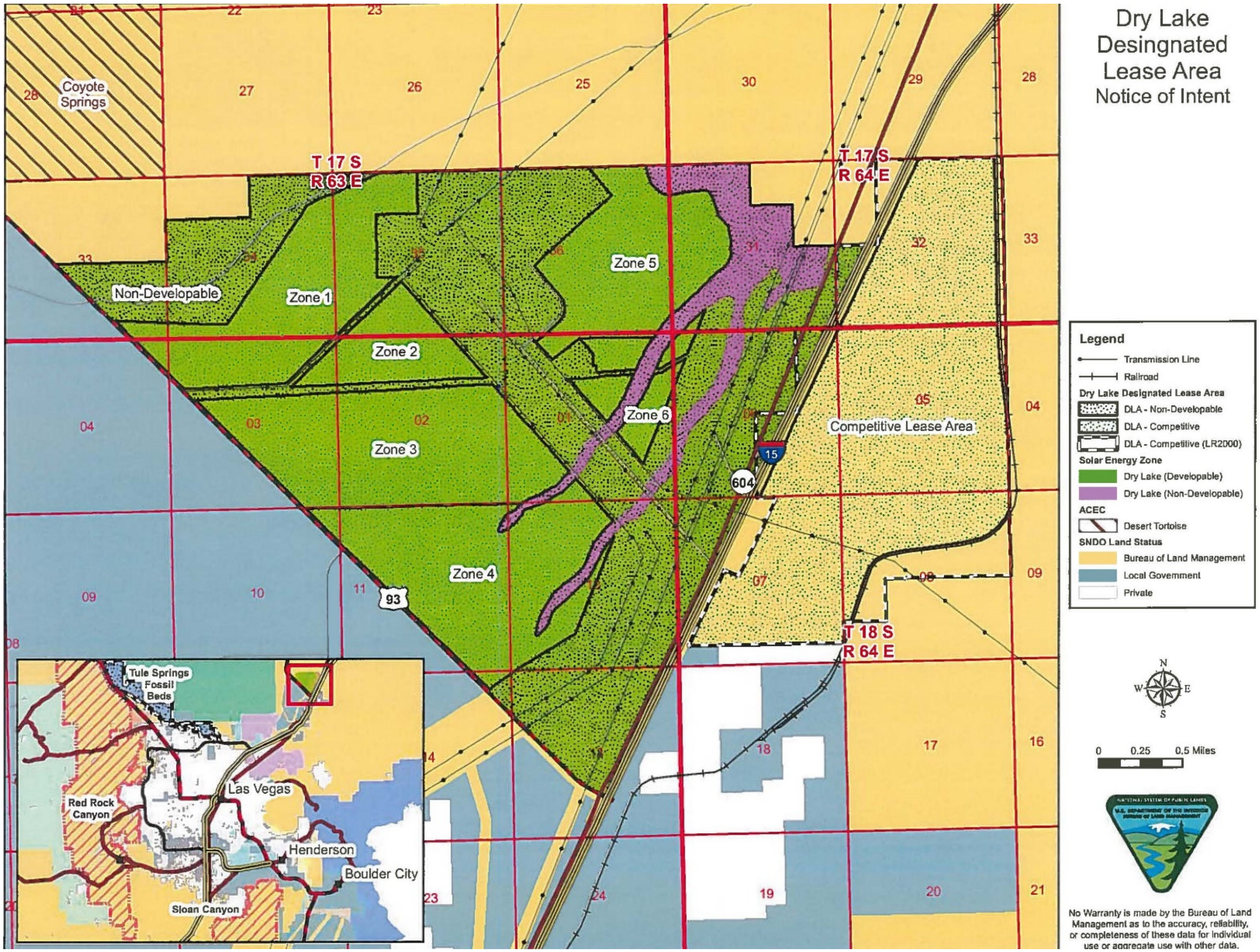

Figure 2. Designated Leasing Area.

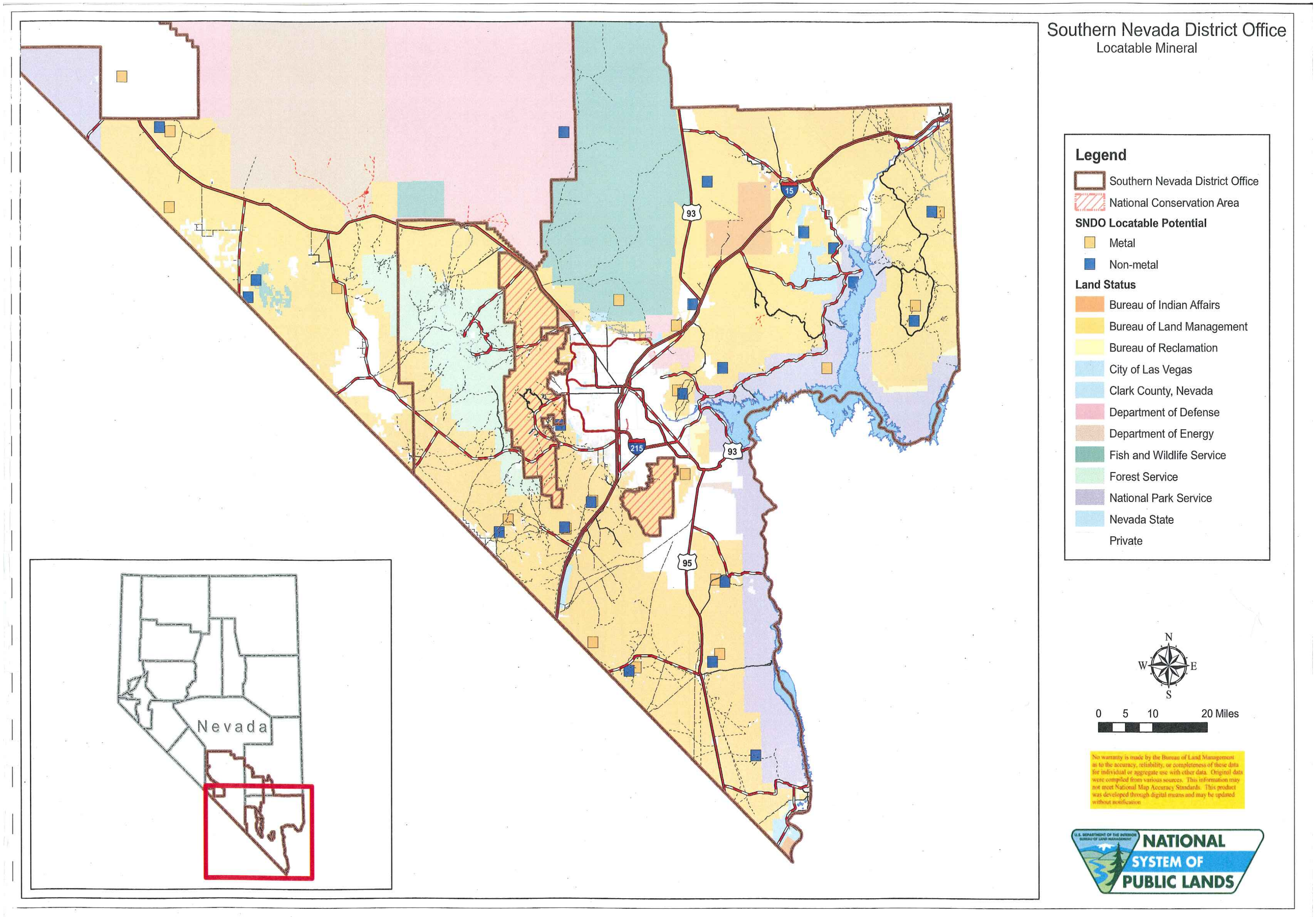

Figure 3. Locatable mineral potential.

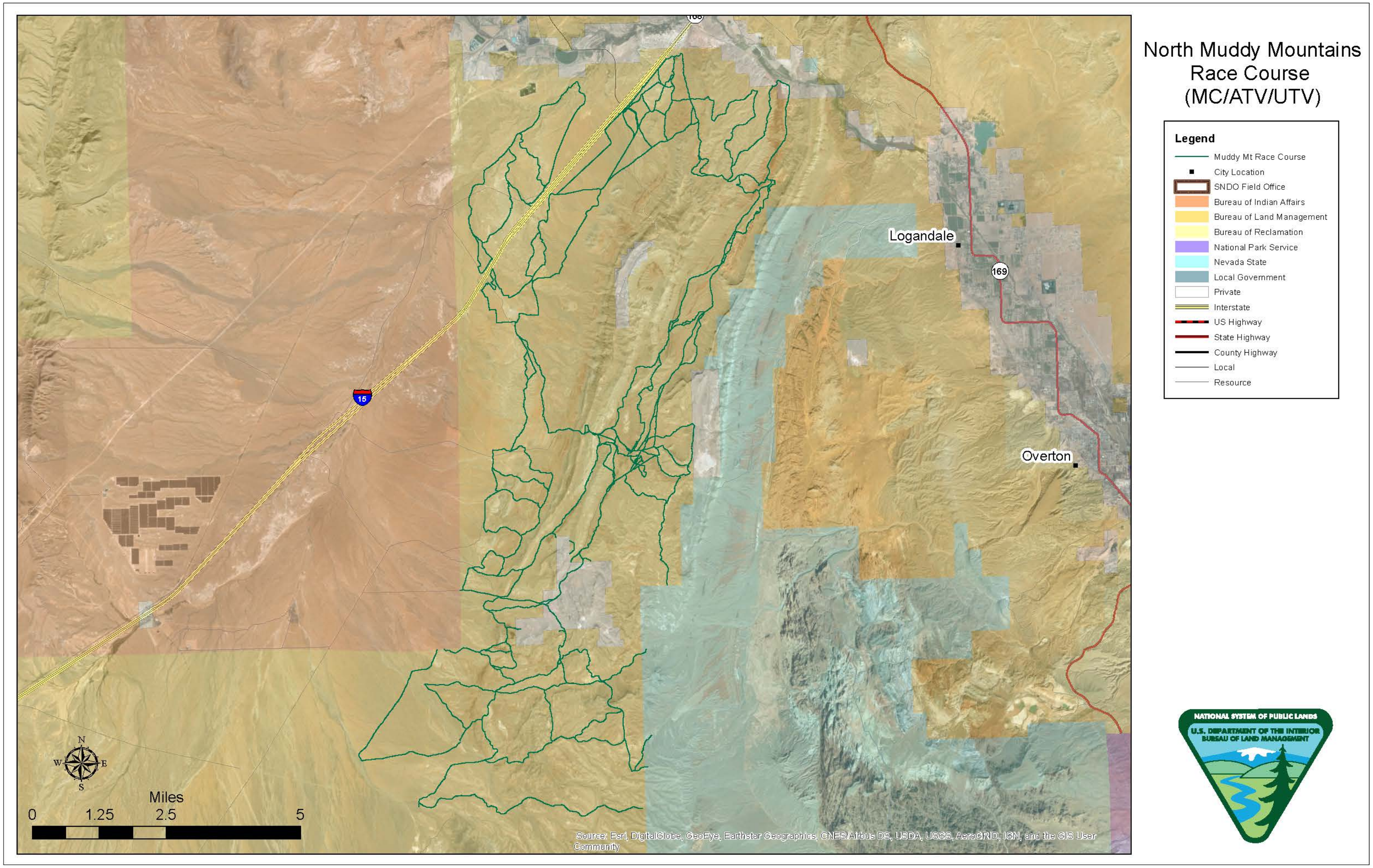

Figure 4. Muddy Mountains motorcycle and OHV .

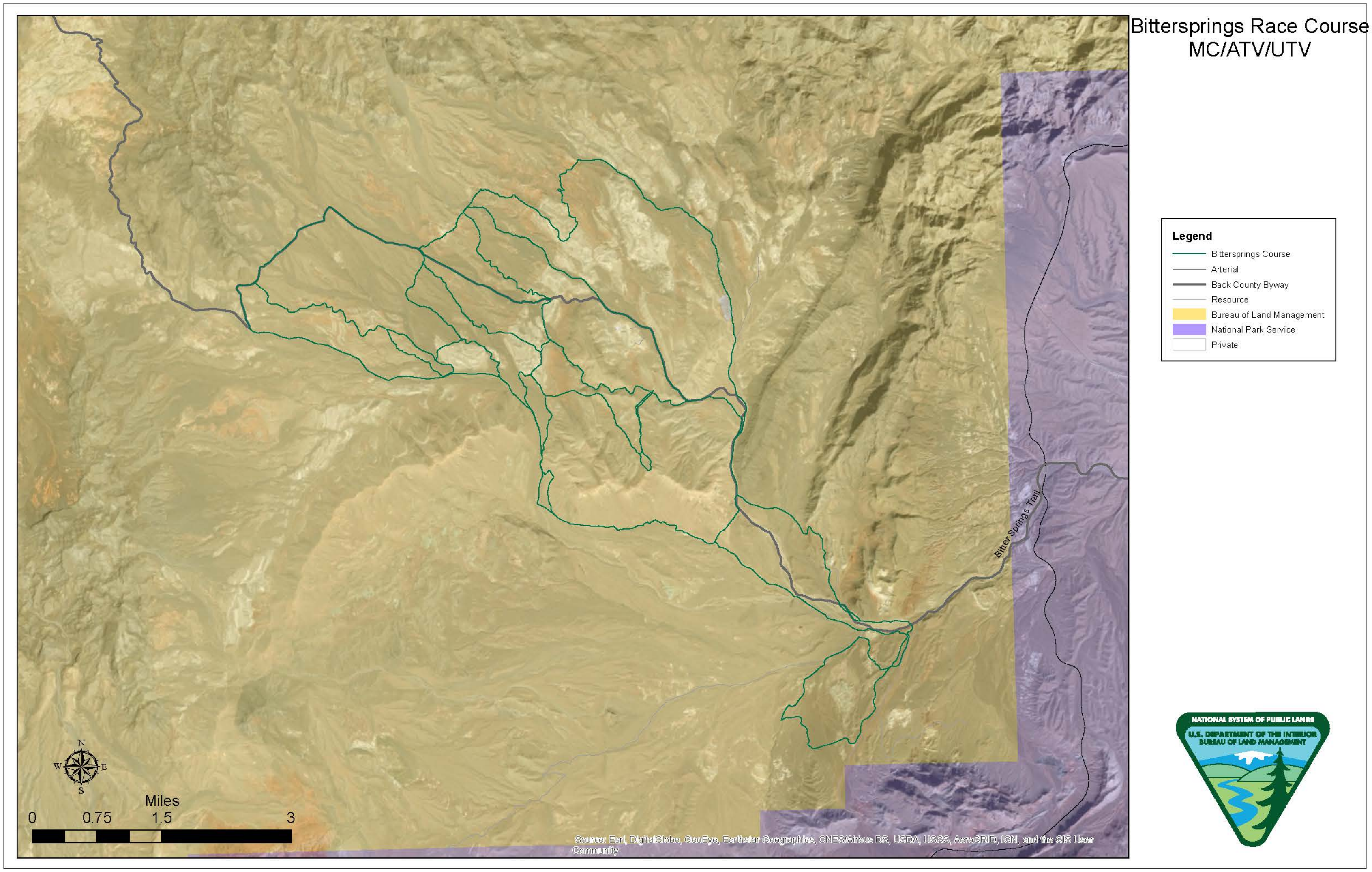

Figure 5. Bittersprings motorcycle and OHV race course.

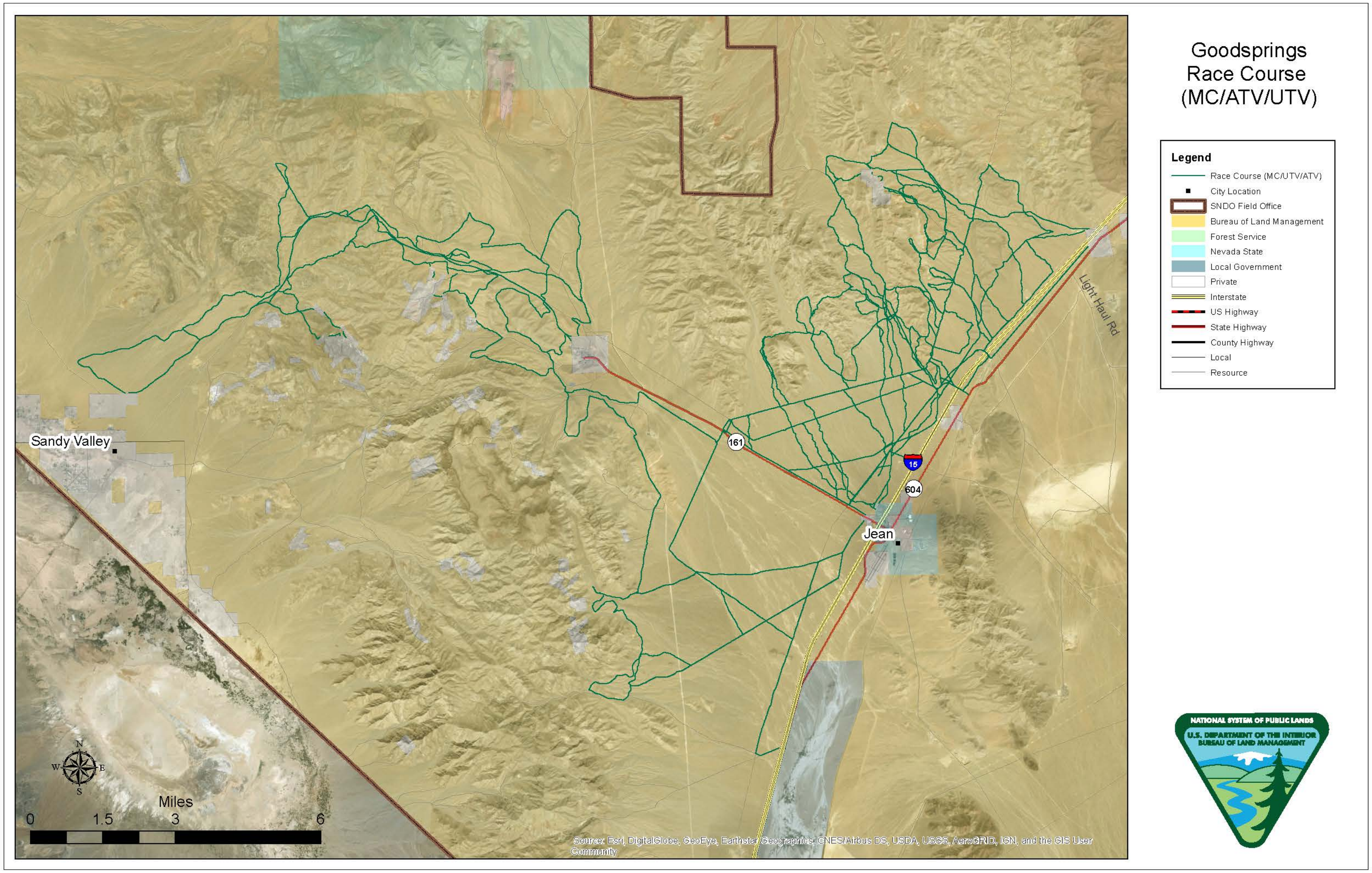

Figure 6. Goodsprings motorcycle and OHV race course.

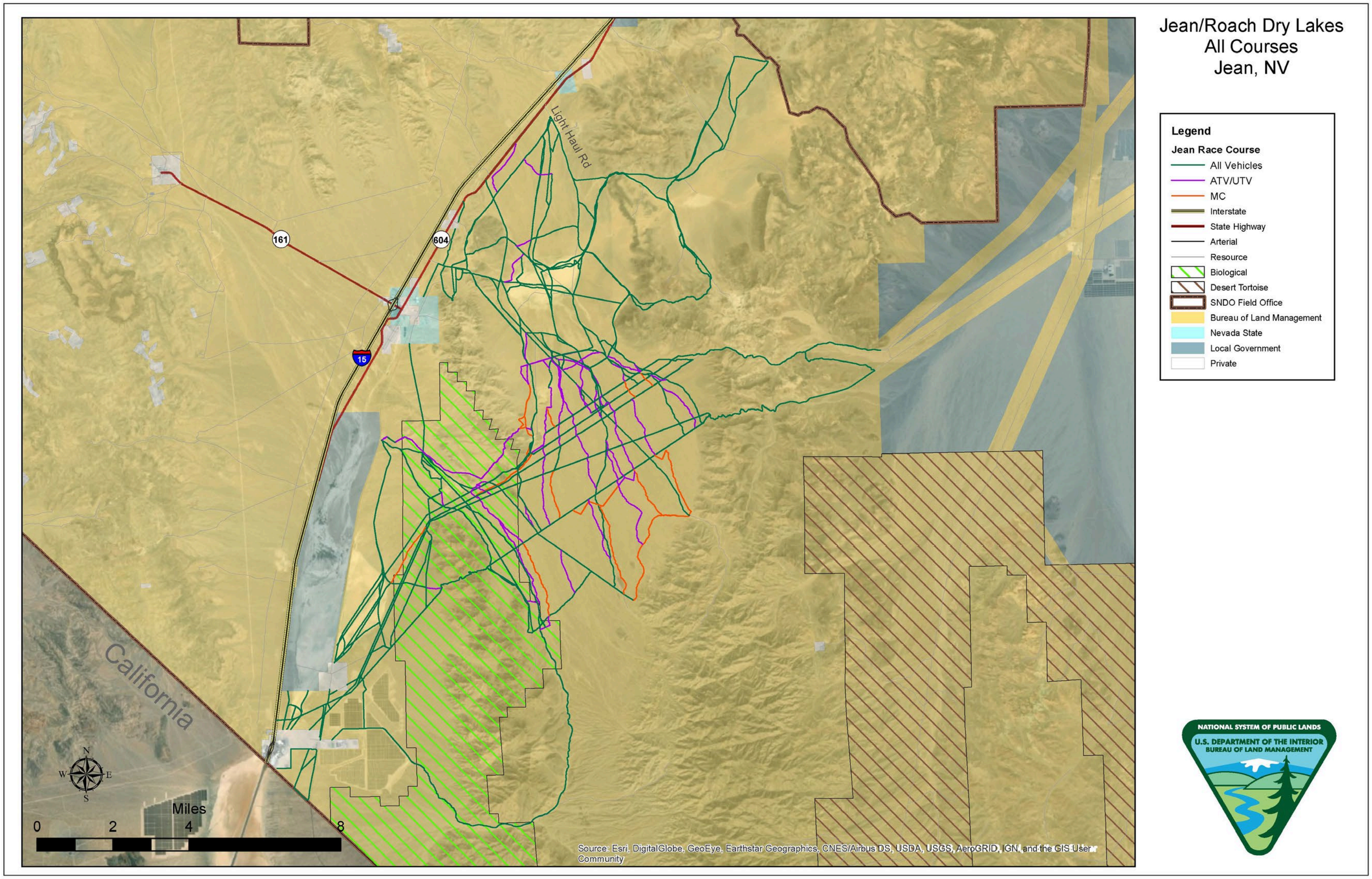

Figure 7. Jean motorcycle and truck and buggy race courses.

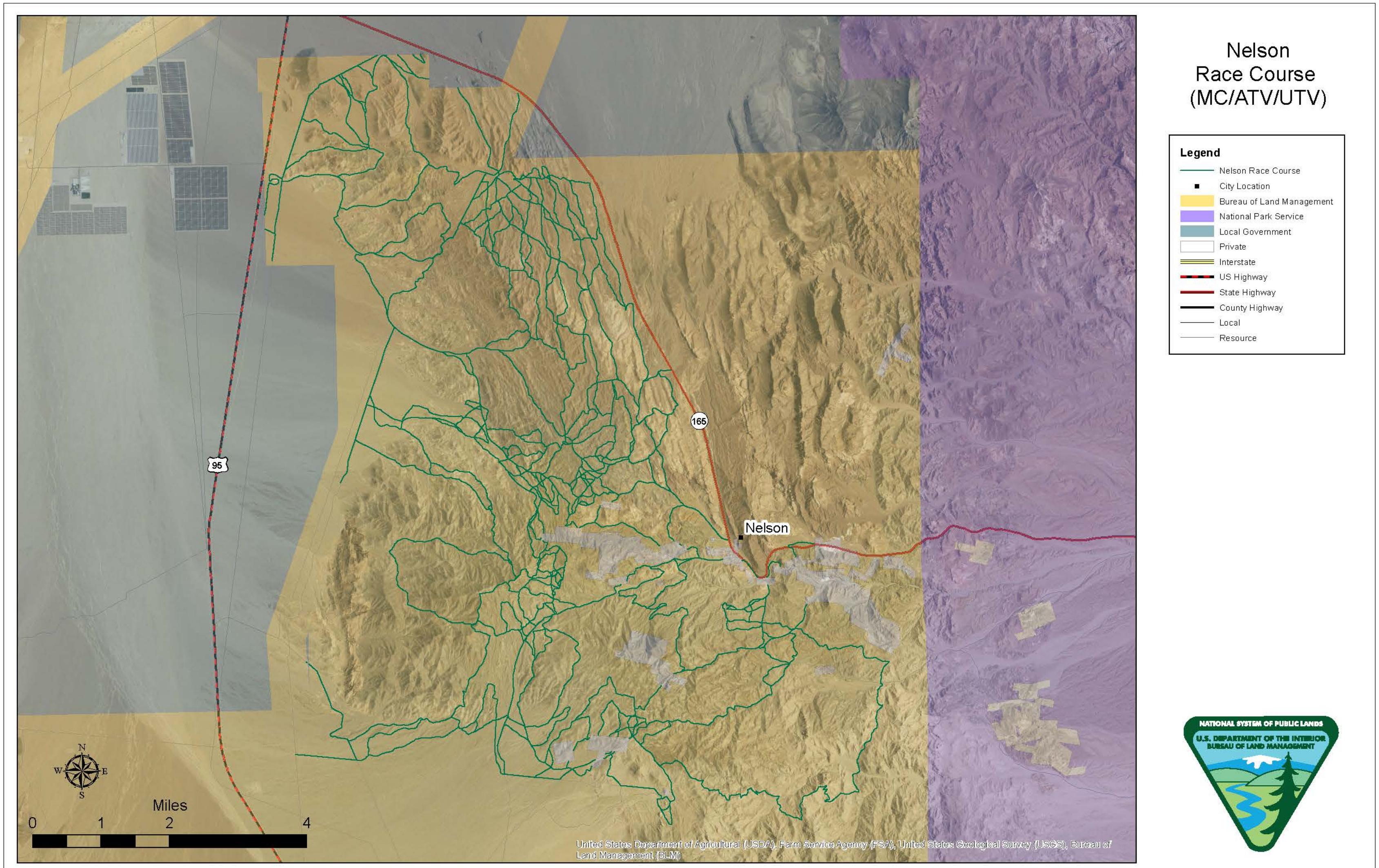

Figure 8. Nelson Hills motorcycle and OHV race course.

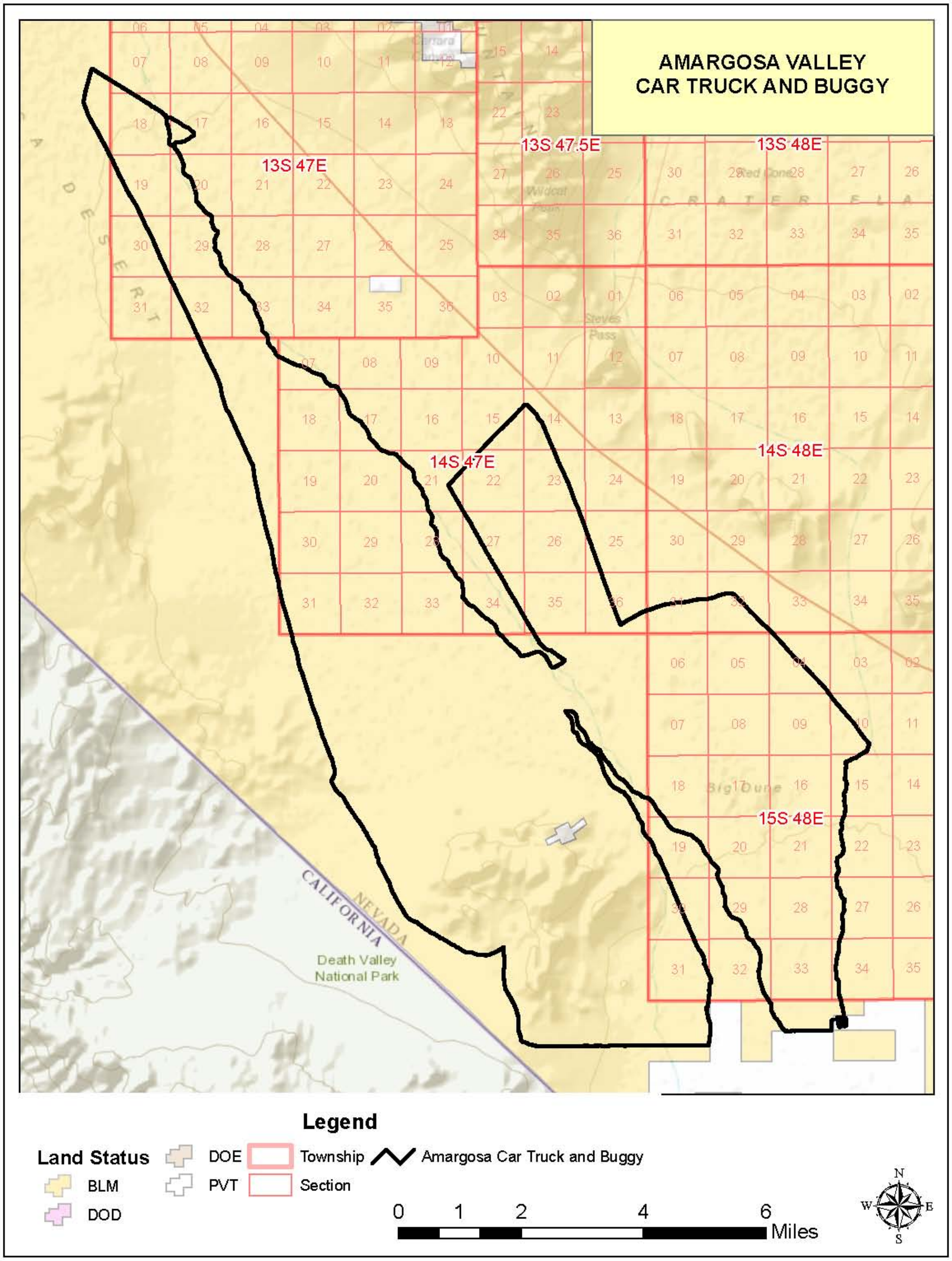

Figure 9. Amargosa Valley truck and buggy race course.

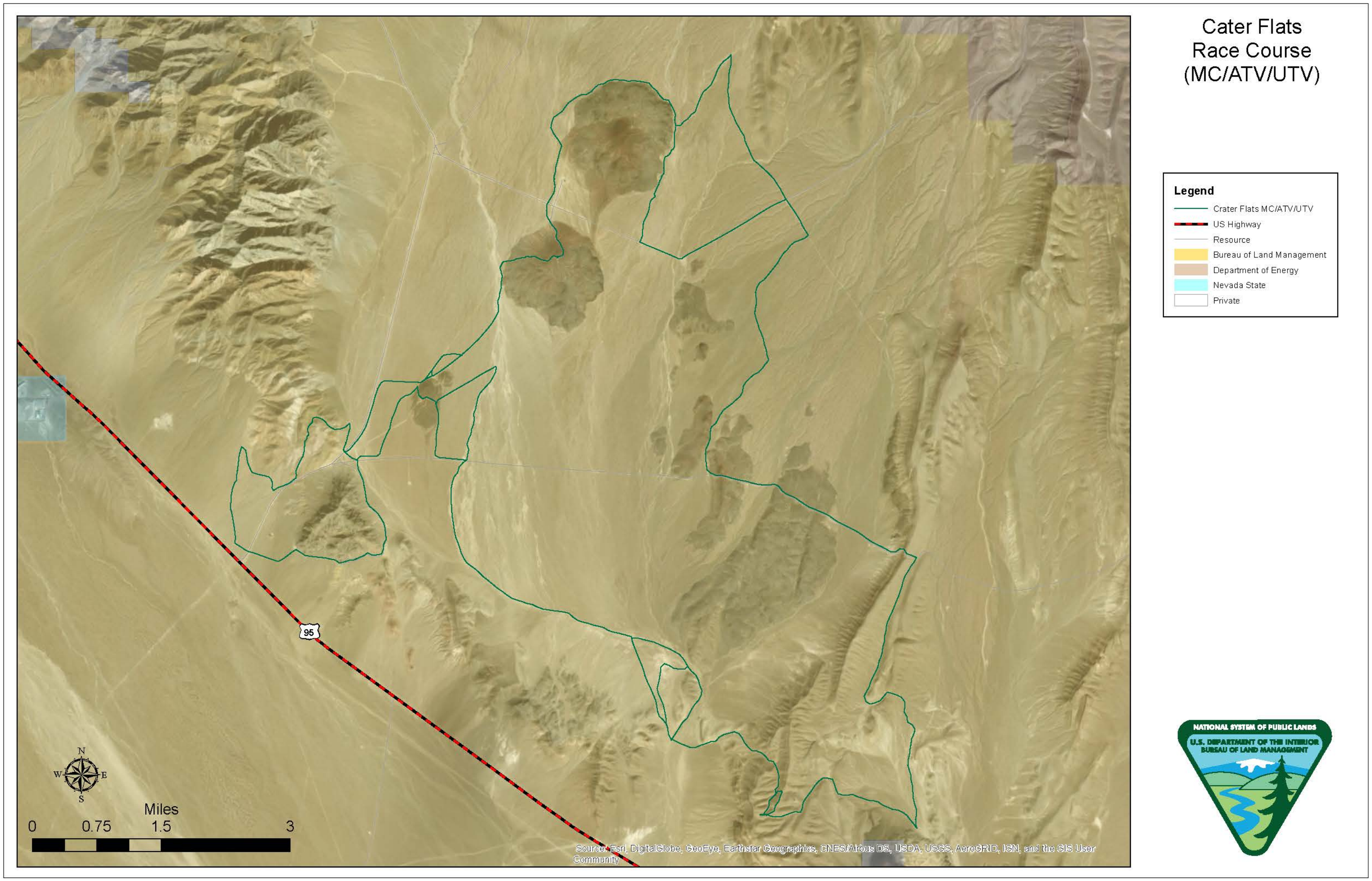

Figure 10. Crater Flat motorcycle and OHV race course.

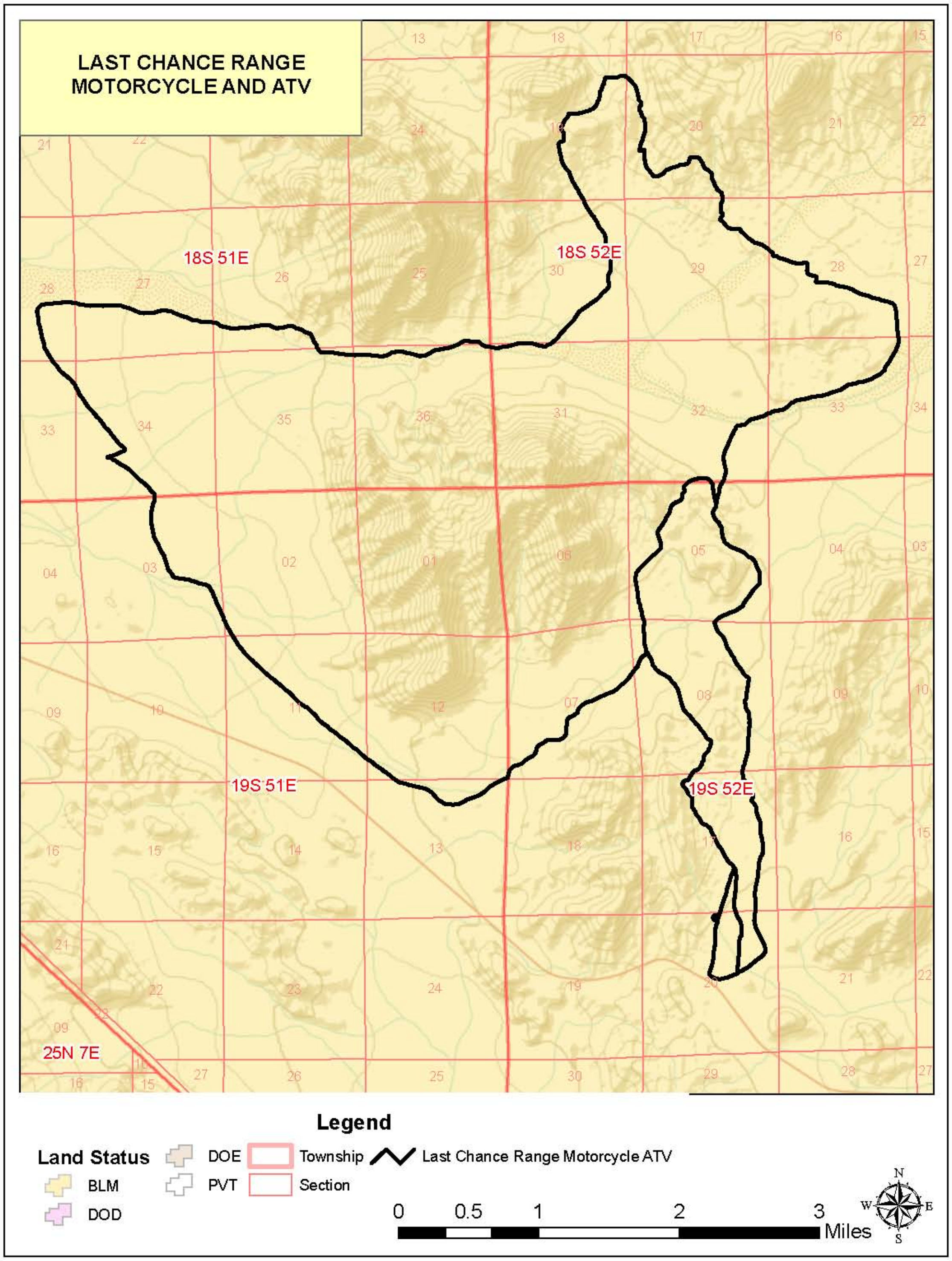

Figure 11. Last Chance Range motorcycle and OHV race course.

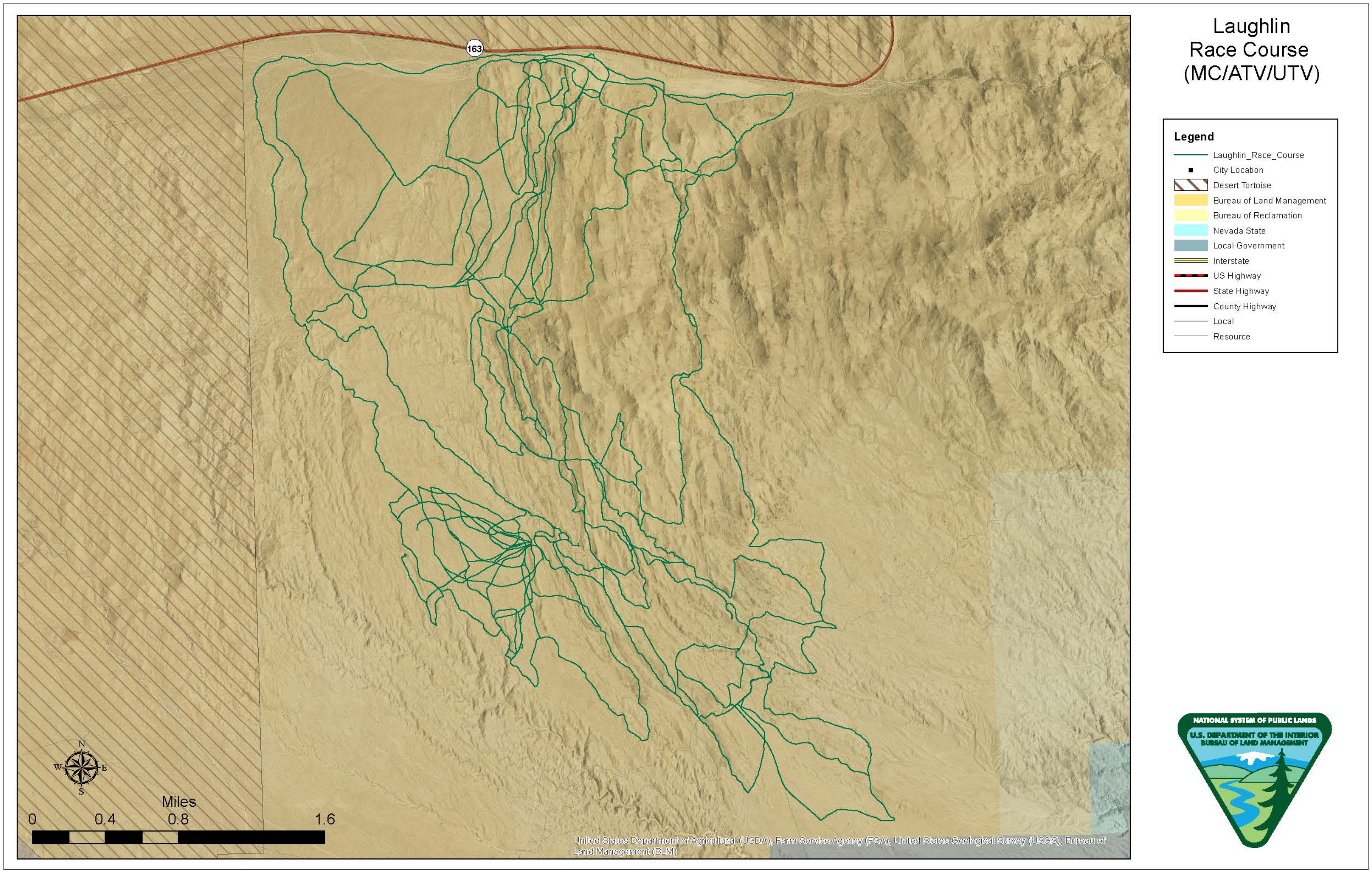

Figure 12. Laughlin motorcycle and OHV race course.

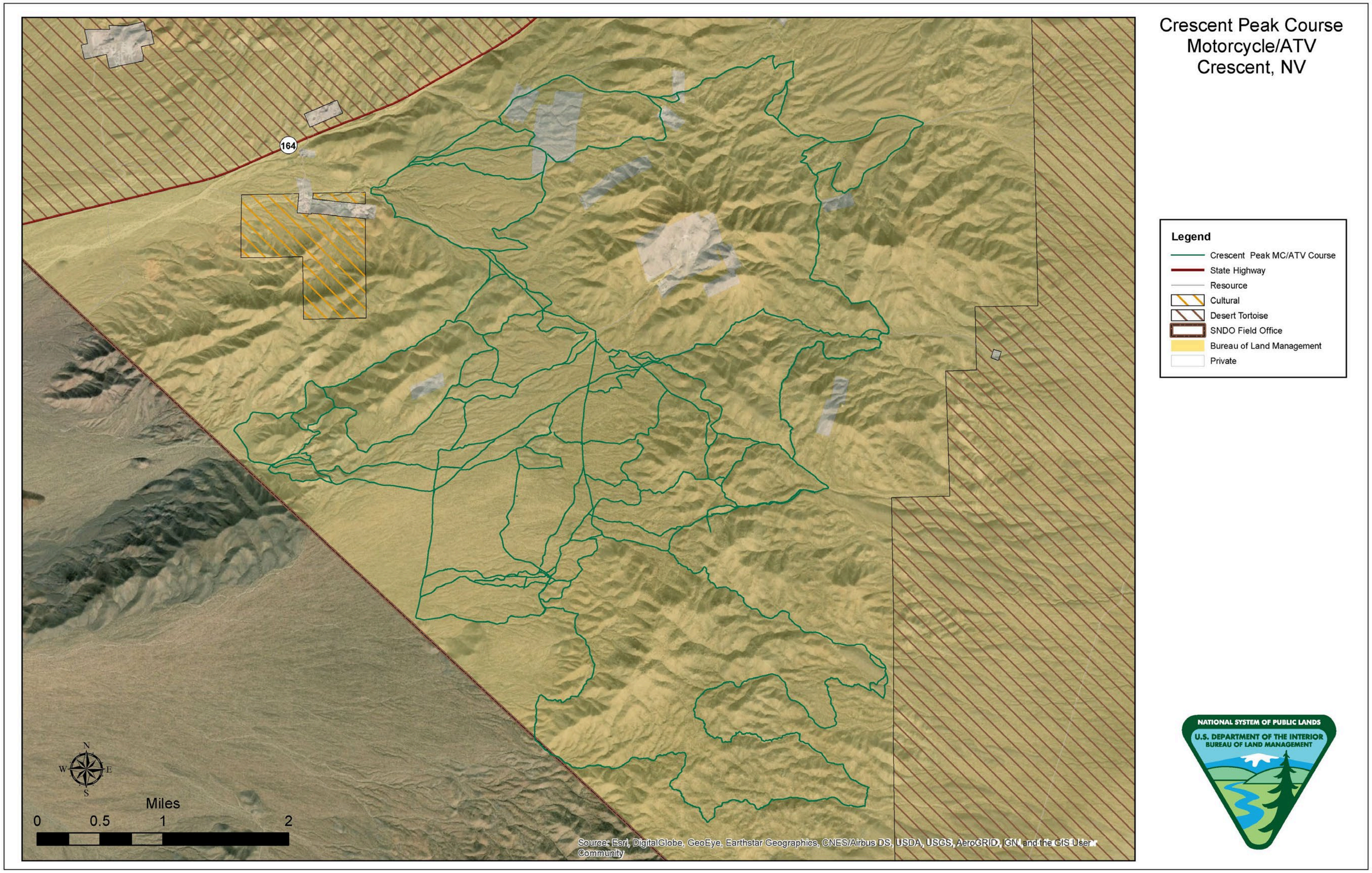

Figure 13. Crescent Peak motorcycle and OHV race course.

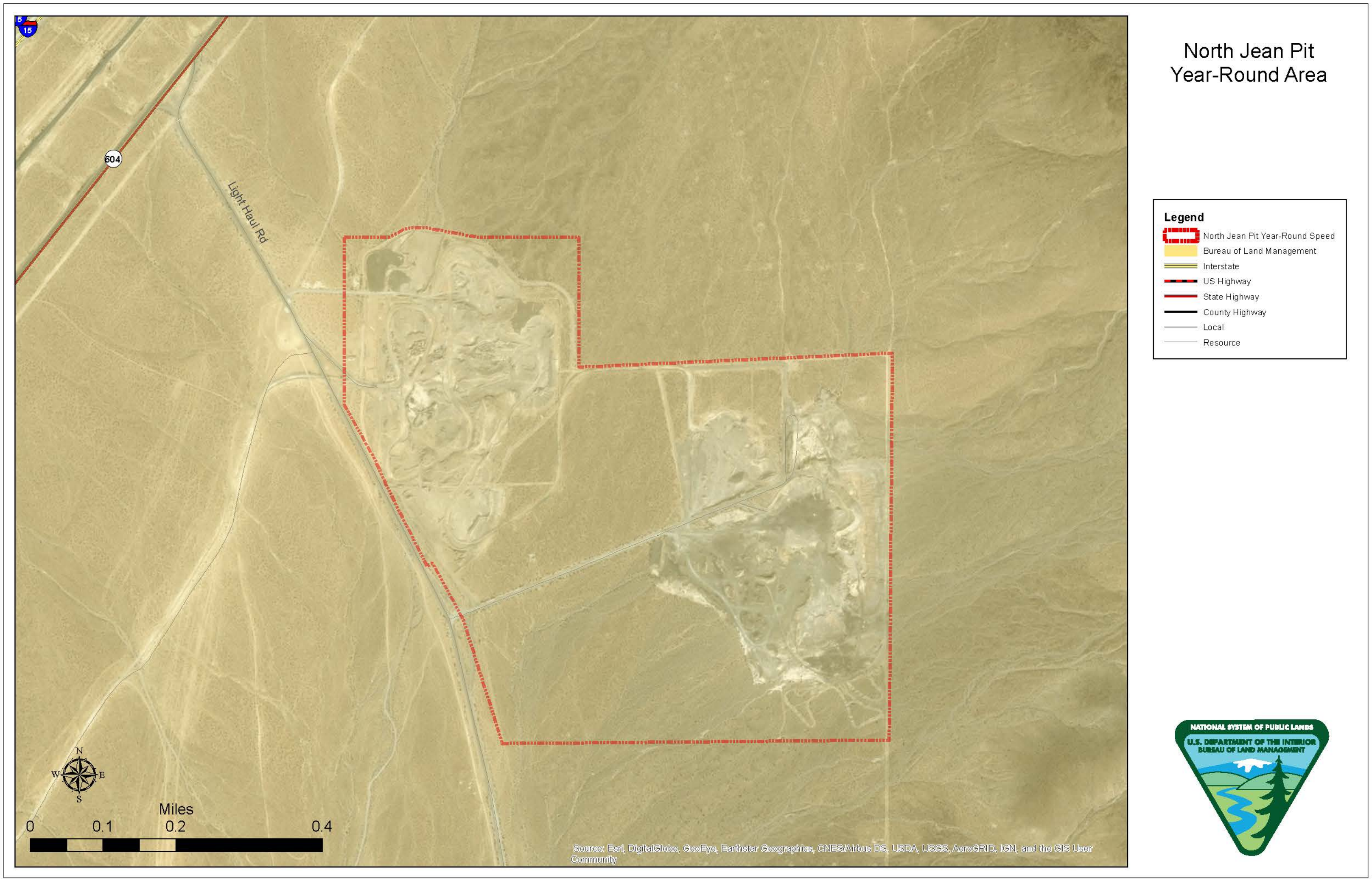

Figure 14. North Jean Pit OHV year-round racing area.

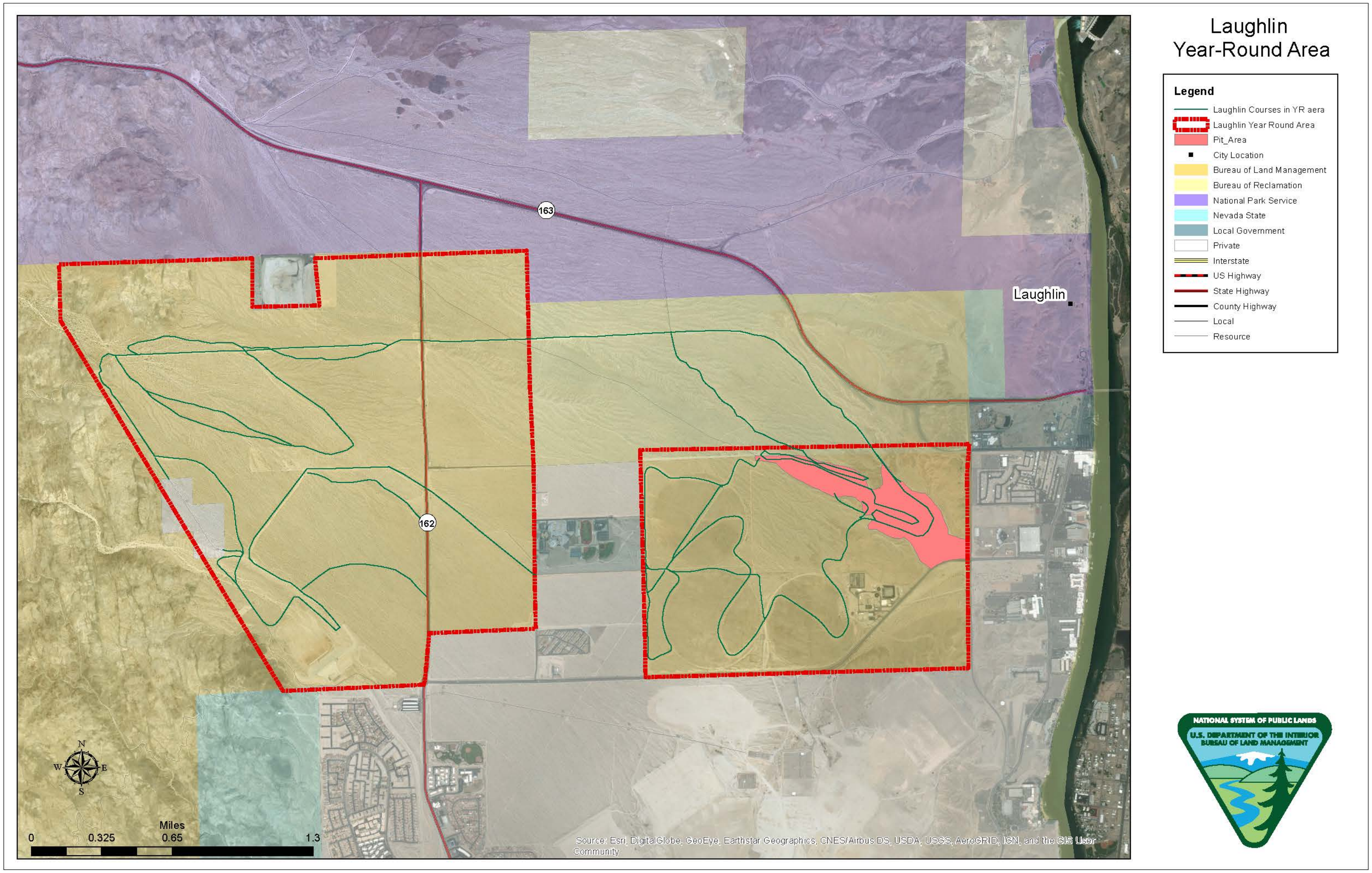

Figure 15. Laughlin OHV year-round racing area.

Figure 16. Primm OHV year-round racing area.

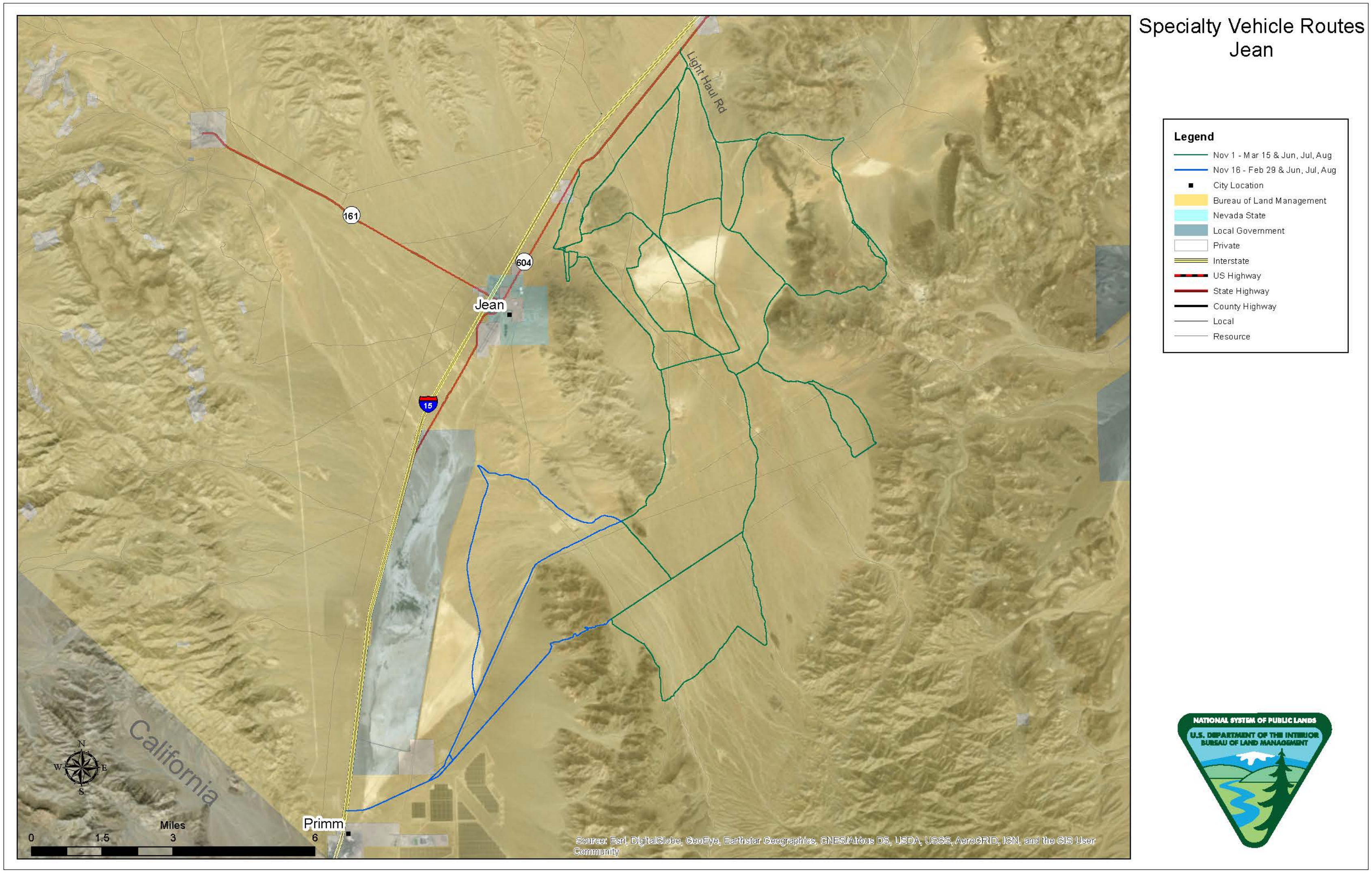

Figure 17. Jean area specialty vehicle routes.

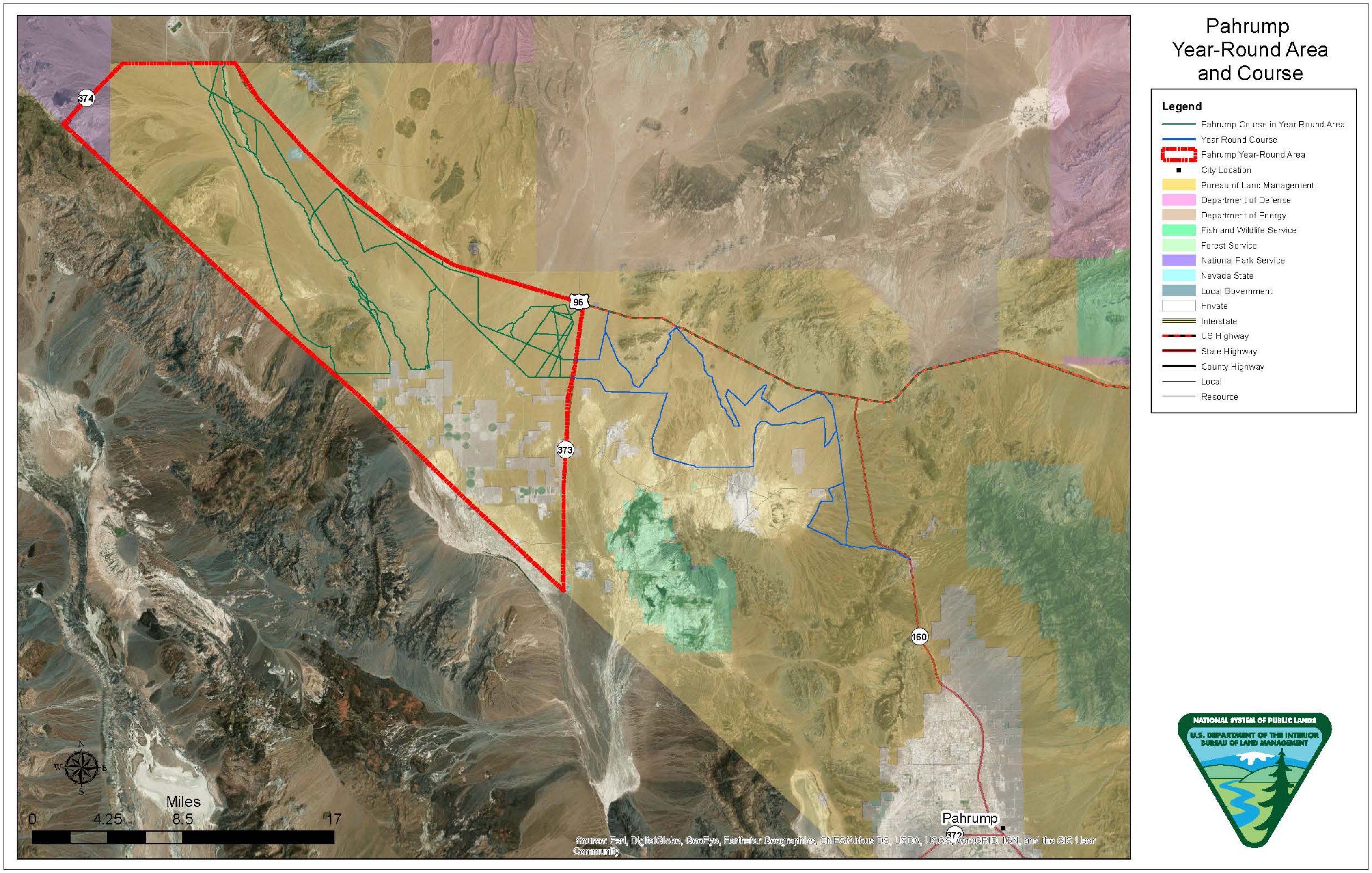

Figure 18. Pahrump OHV year-round racing area and specialty vehicle routes.

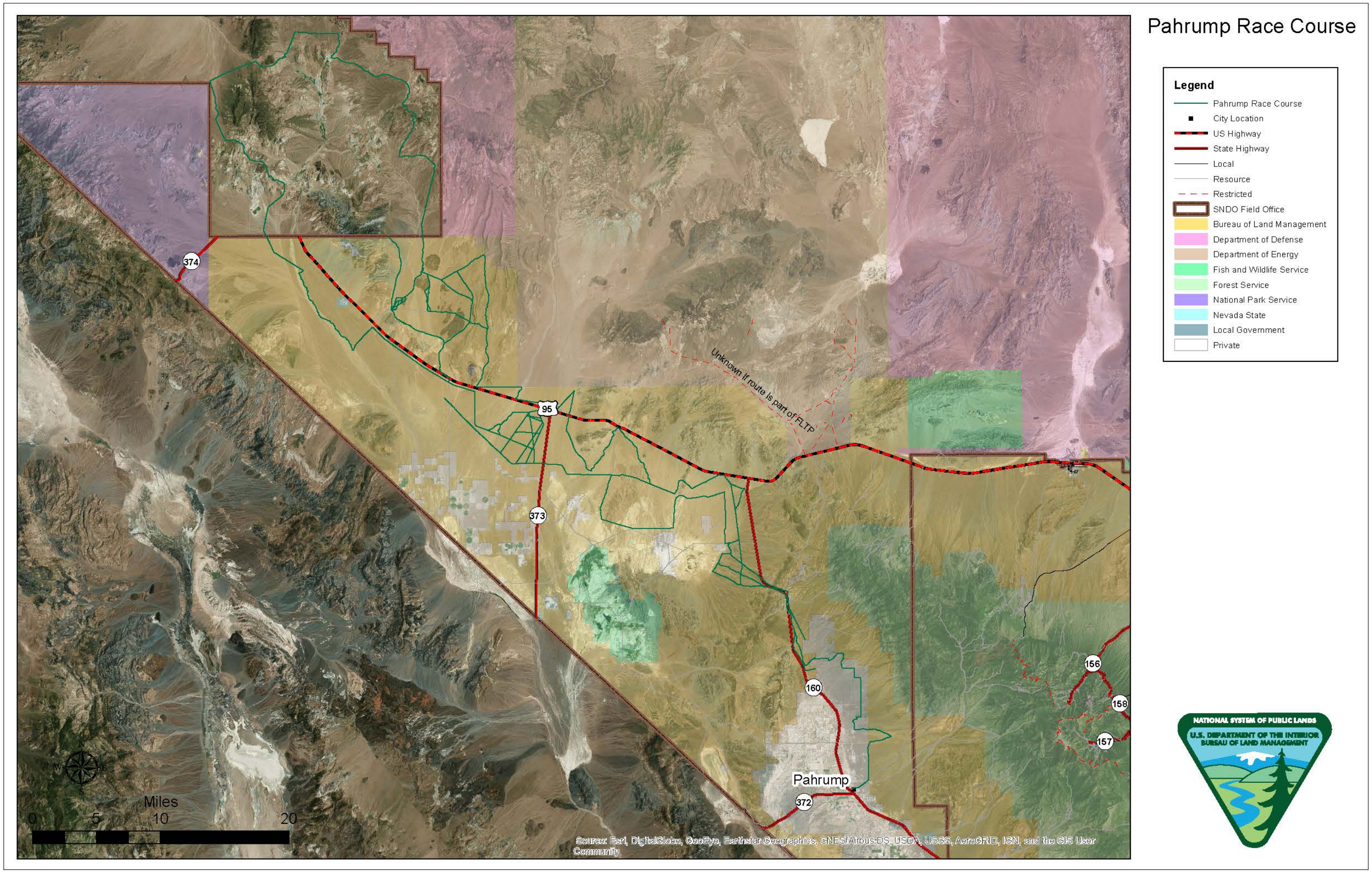

Figure 19. Pahrump race course – entire.

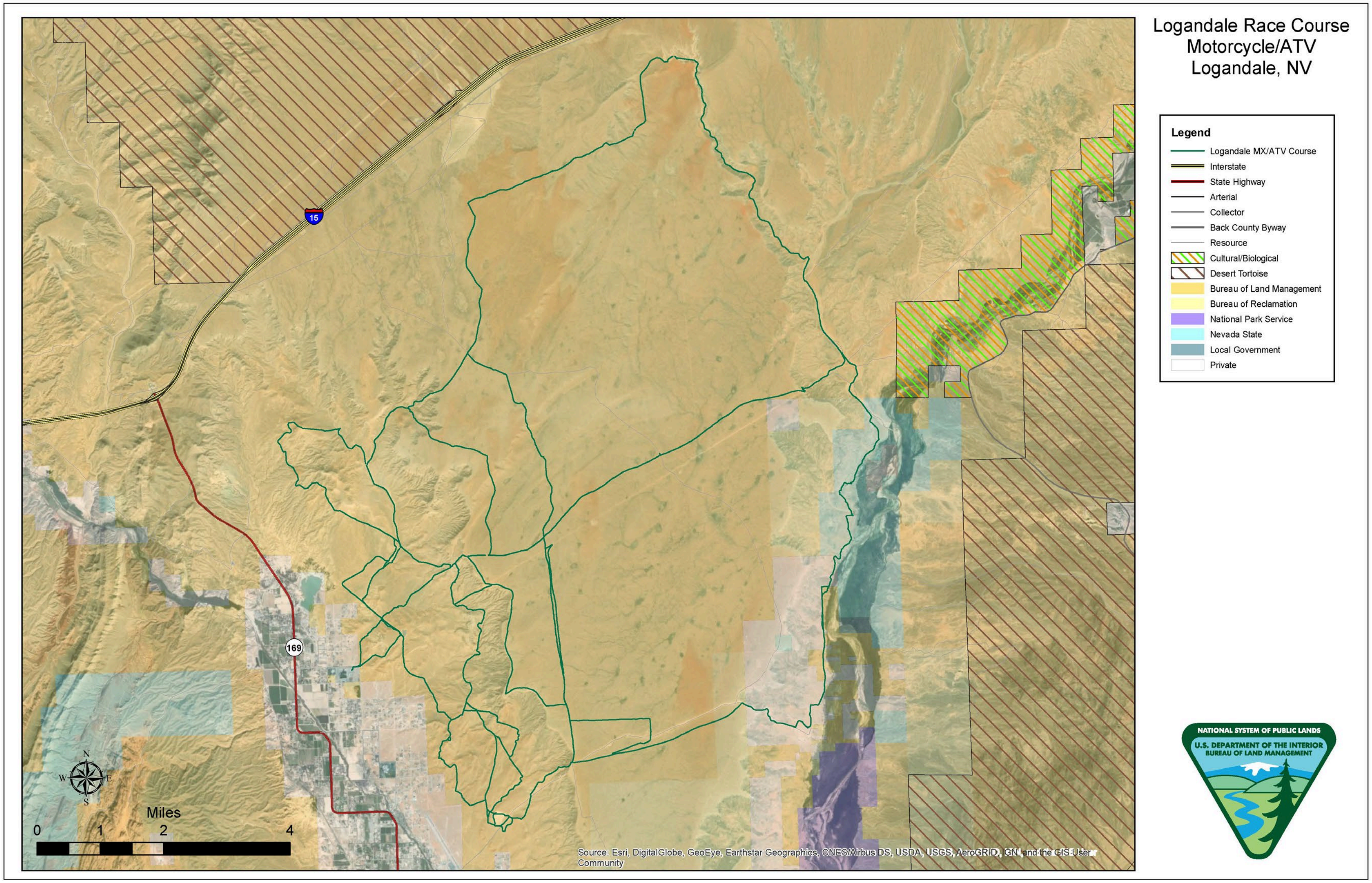

Figure 20. Logandale motorcycle and OHV race course.

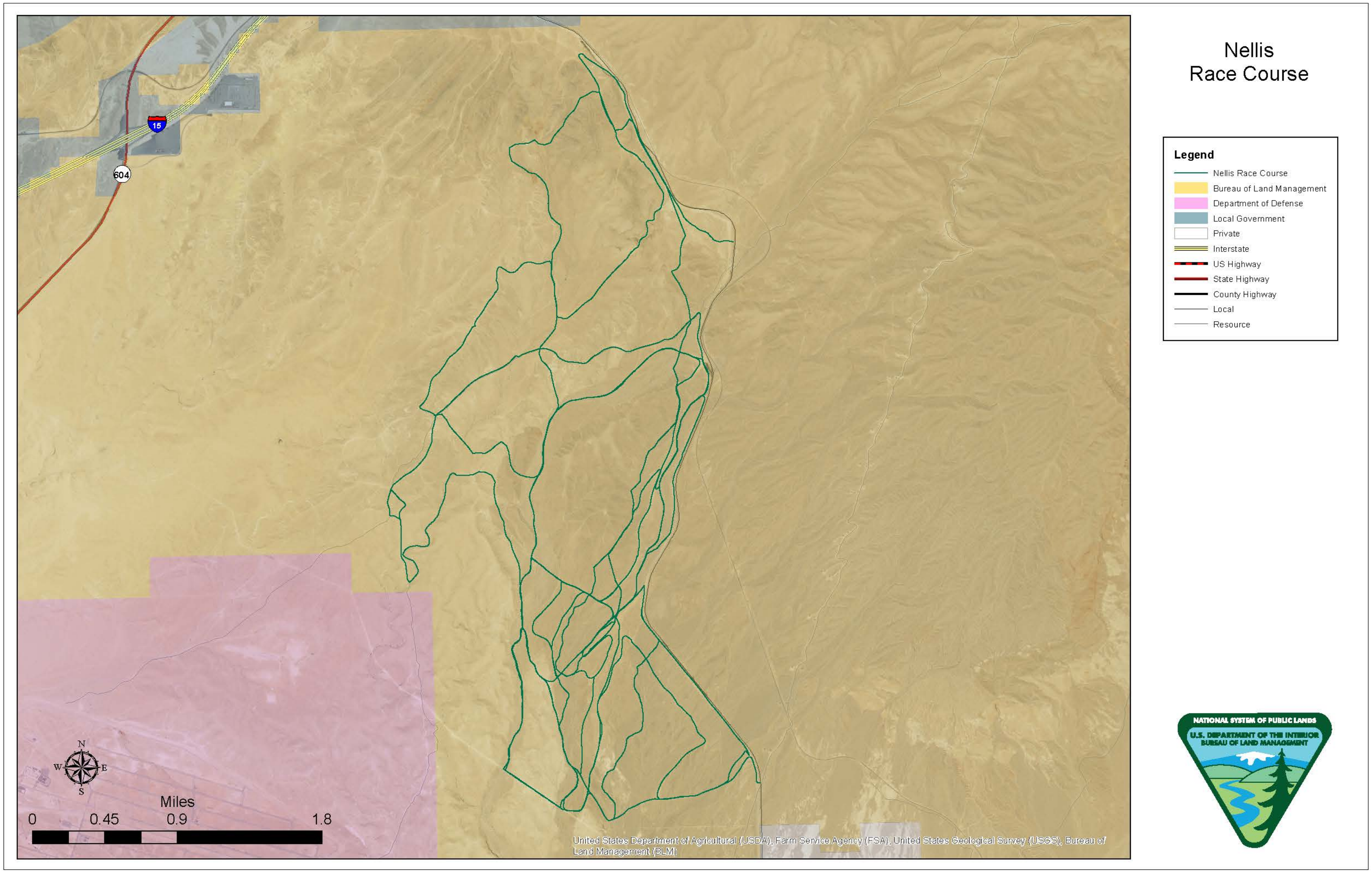

Figure 21. Nellis race course.

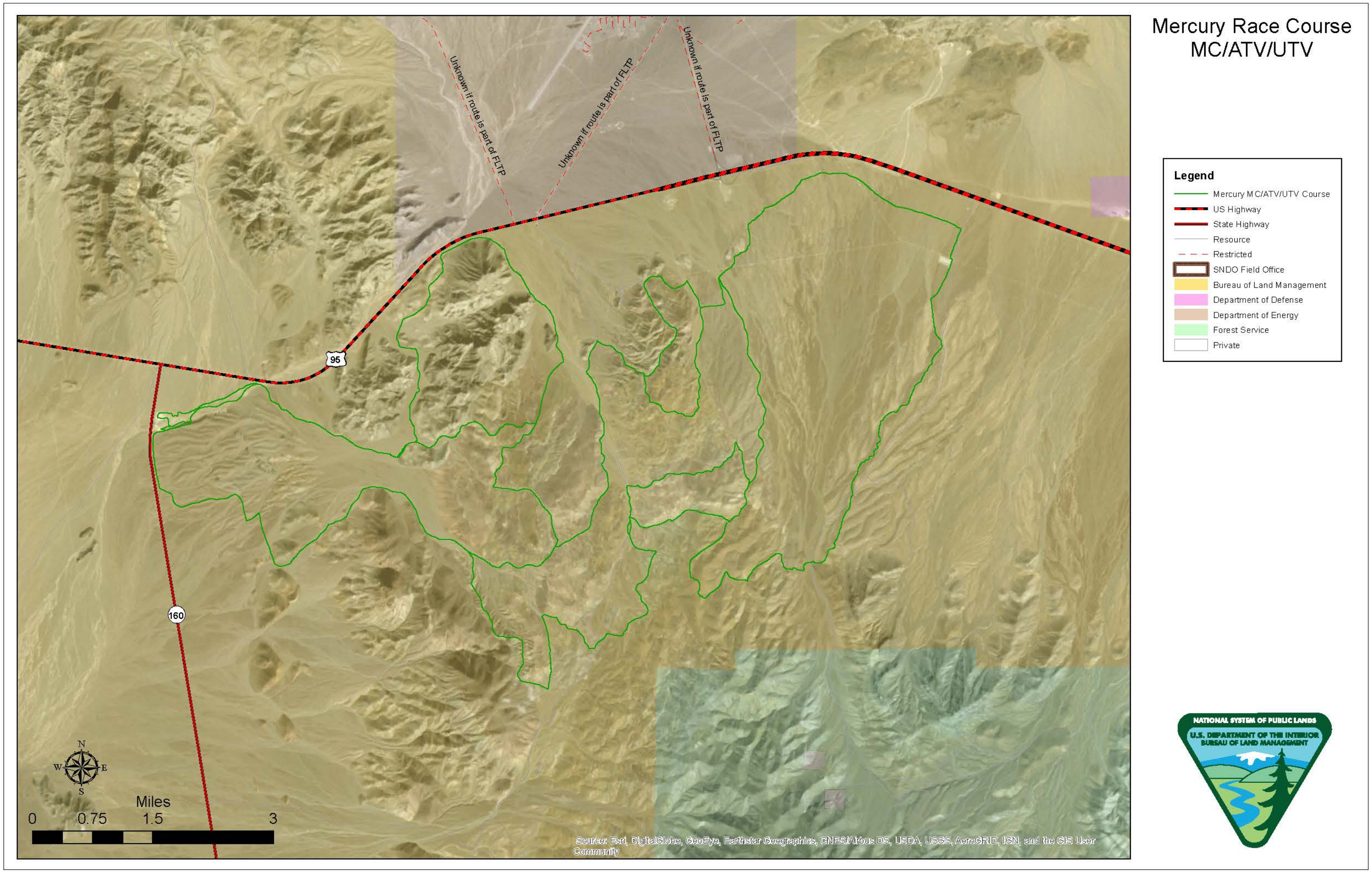

Figure 22. Mercury motorcycle and OHV race course.

Figure 23. Searchlight motorcycle and OHV race course.

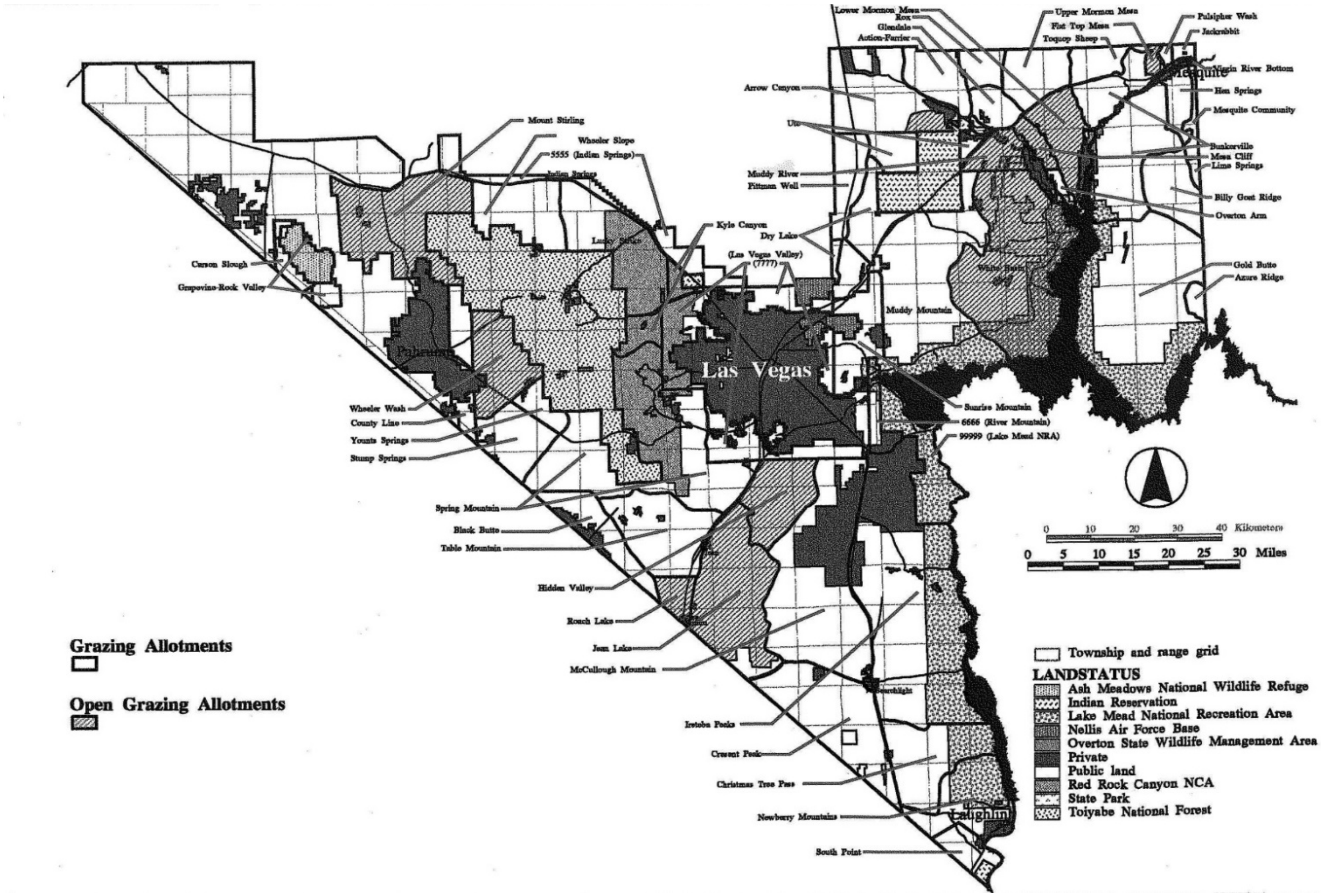

Figure 24. Active grazing allotments.

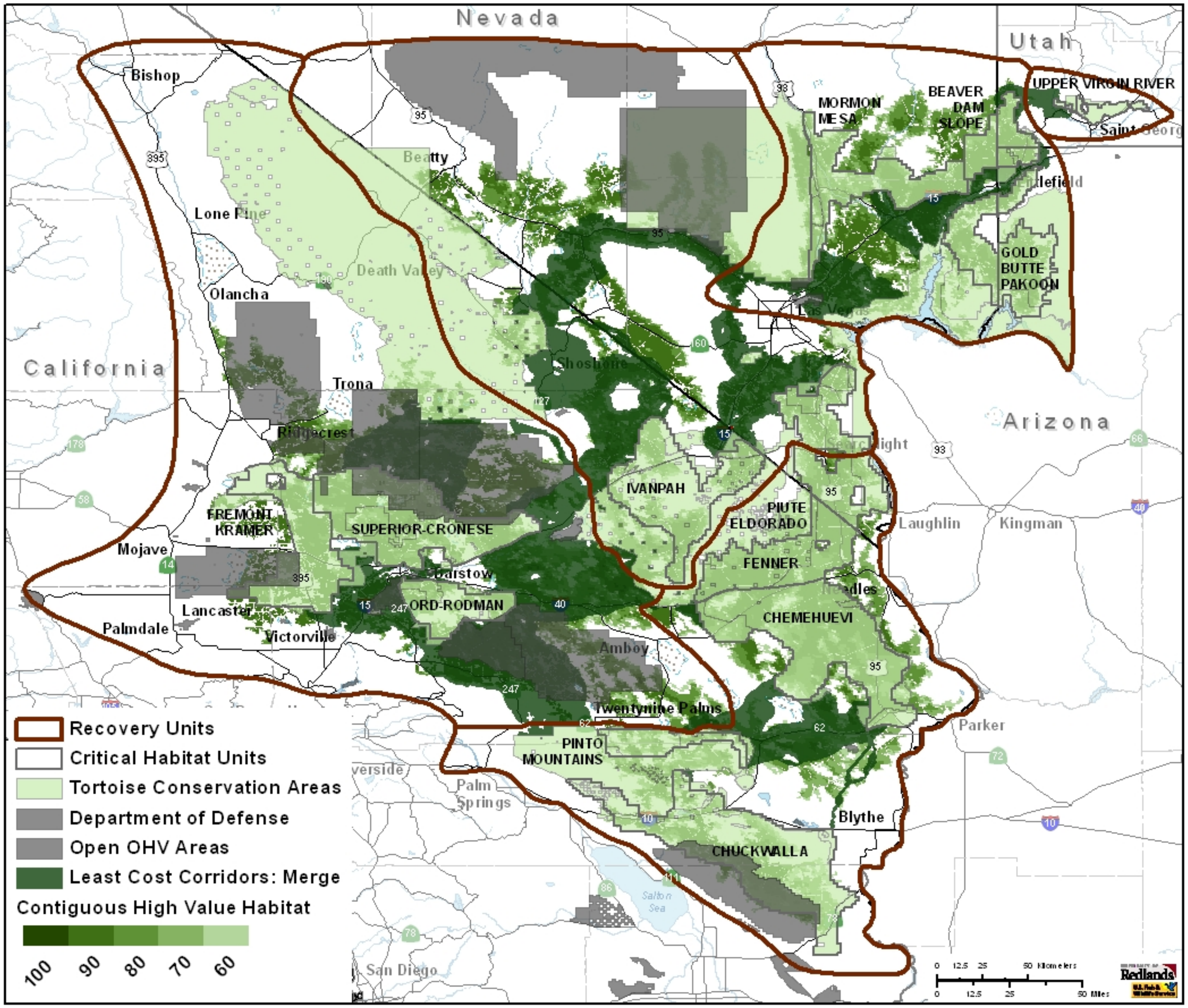

Figure 25. Recovery units, critical habitat units, conservation areas, and contiguous high value habitat.

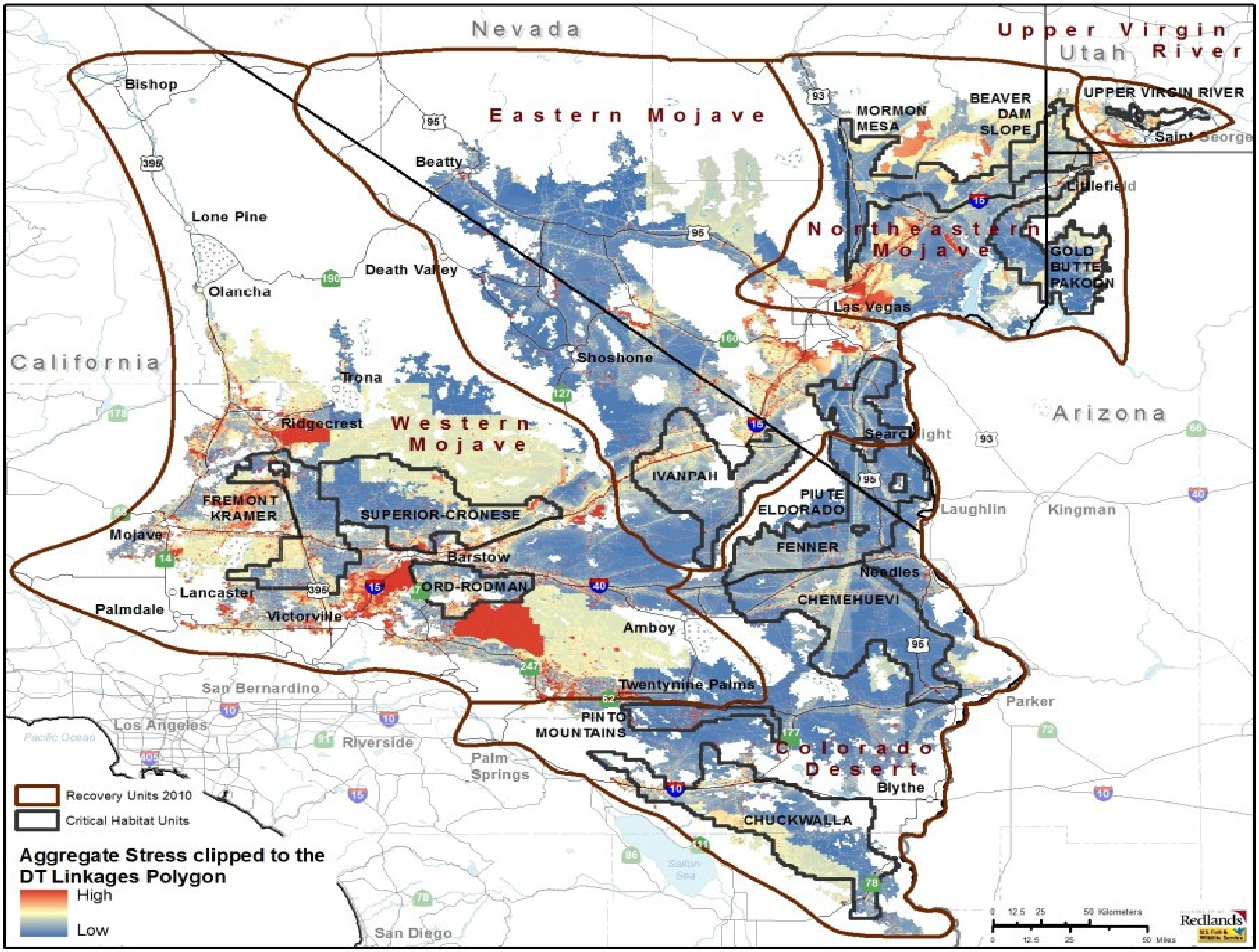

Figure 26. Critical habitat units, recovery units, and linkages.

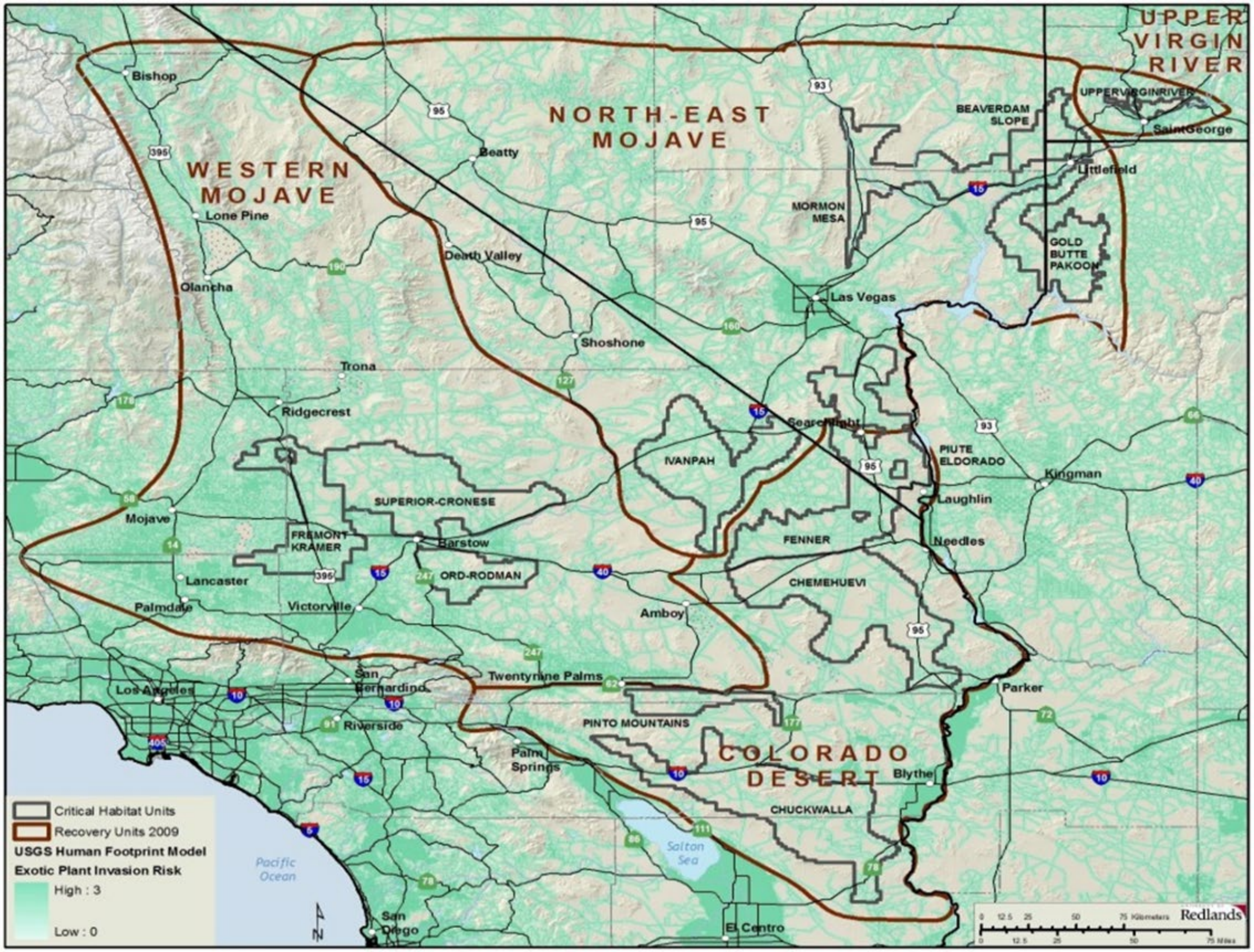

Figure 27. Potential for exotic invasion in desert tortoise habitat.

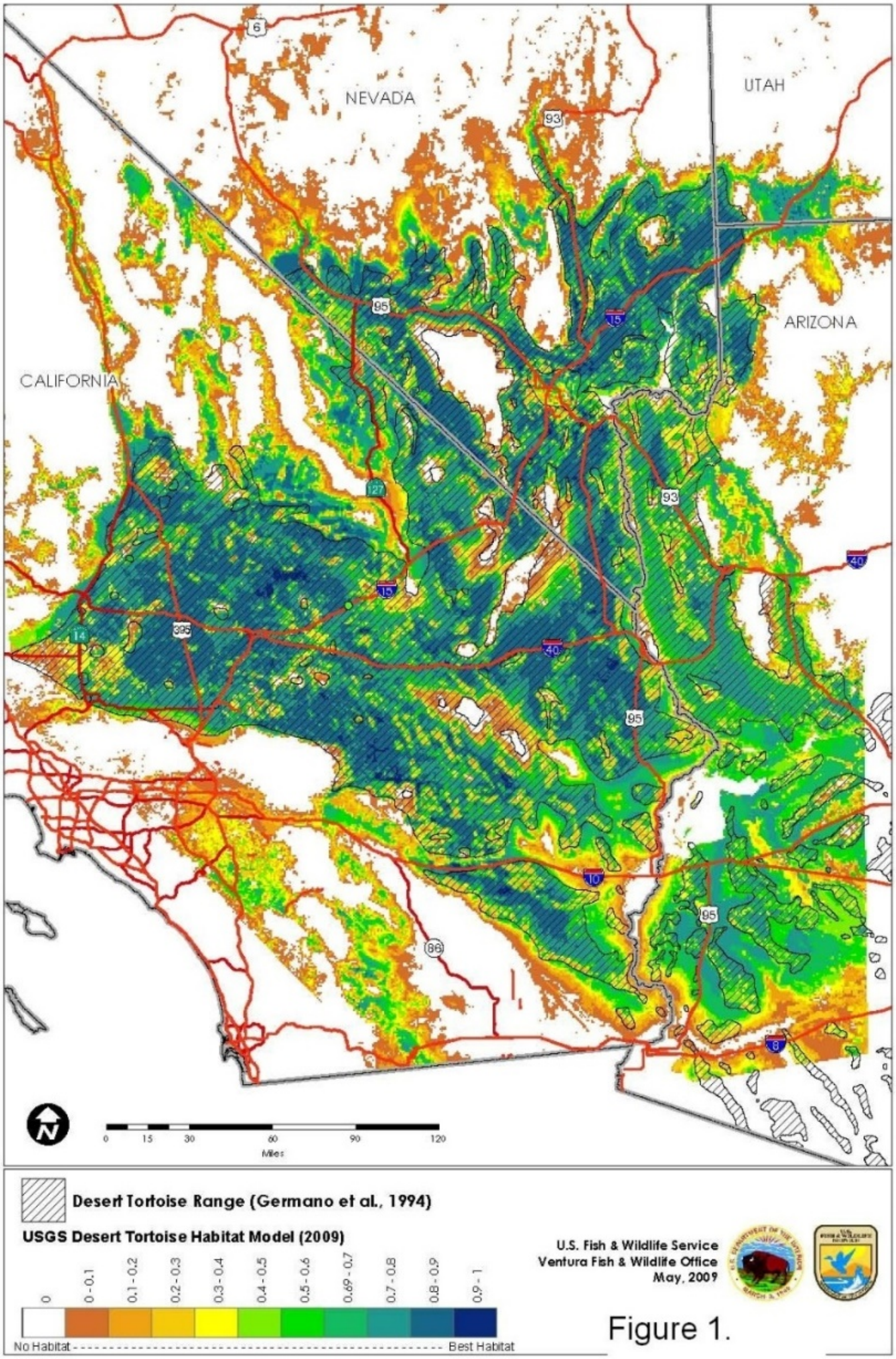

Figure 28. Modeled tortoise habitat within recovery units.

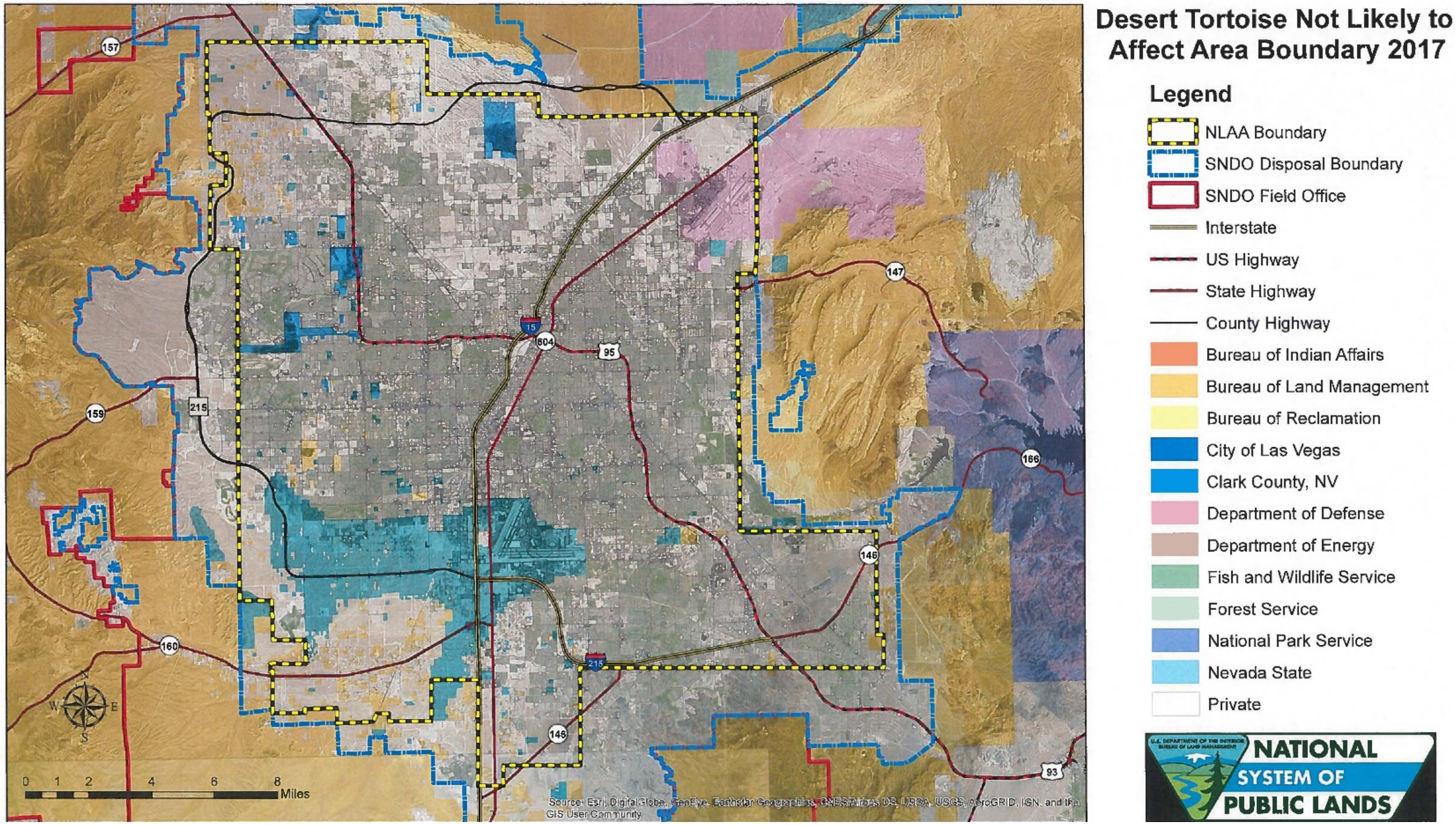

Figure 29. Not likely to adversely affect (NLAA) Boundary.

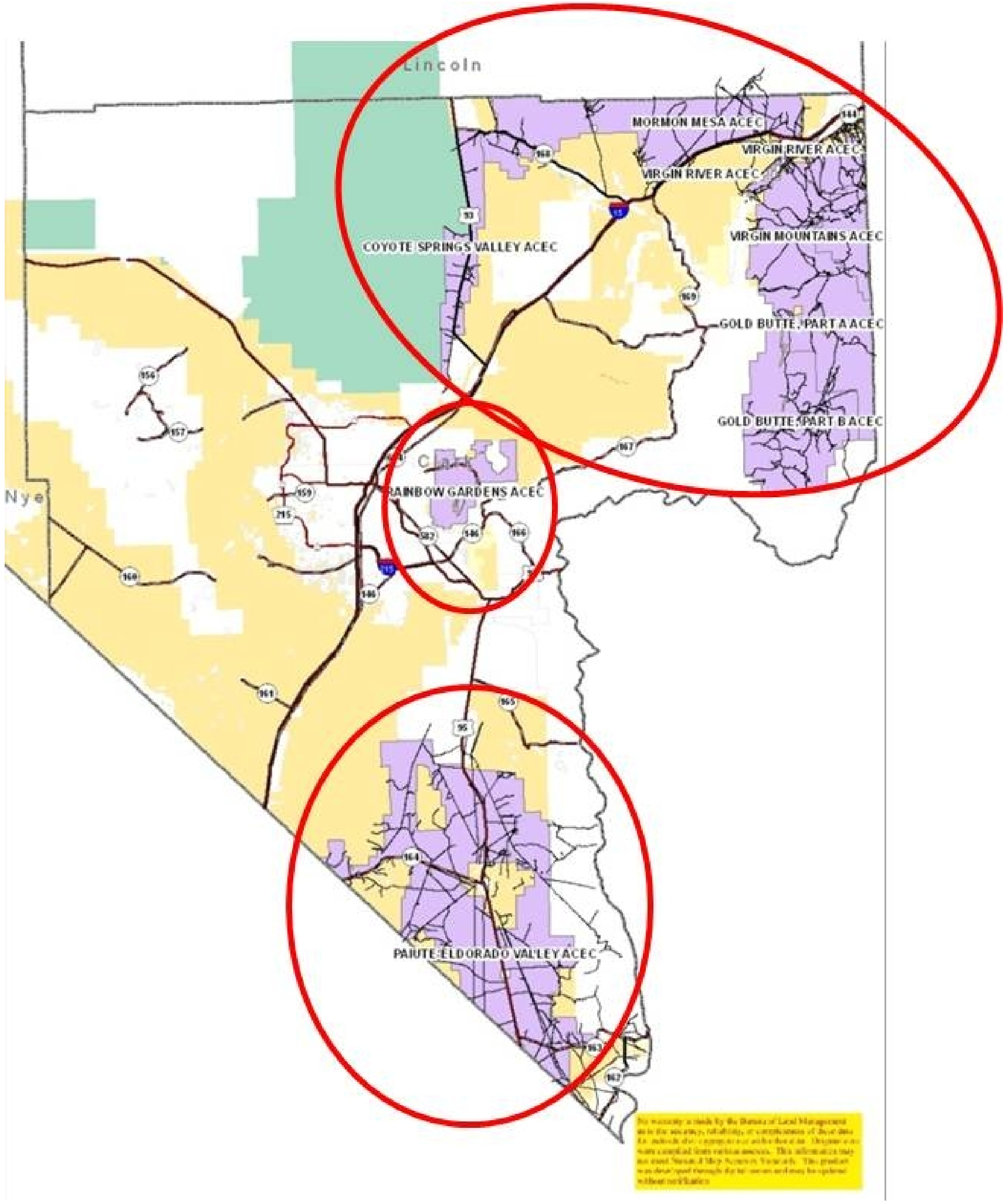

Figure 30. Areas with route designations.

Appendix C. Previous Consultations with Substantial Effects to the Desert Tortoise

File Number	Date	Action - Title	Anticipated Non-CH	Anticipated CH	Disturbance Non-CH	Disturbance (Acres) CH	Exempted Non-mortality-injury	Exempted Non-mortality-injury Year	Exempted- all forms of take	Exempted Mortality-injury	Exempted Mortality-injury /Year	Reported Non-mortality-injury	Reported Mortality-injury
98-F-032	13-May-98	Touch America, Inc's FTV Western Build Fiber Optic Cable Installation Project in Box, Elder, Weber, Davis, Salt Lake, Utah, Juab, Miller, Beaver, Iron, and Washington Counties, Utah, and in Lincoln and Clark Counties, Nevada	153	142	153	142	50	0	0	4	0	50	4
98-F-053	18-Jun-98	Implementation of Proposed Actions in the Las Vegas District's Resource Management Plan/Final EIS Statement	23,530	1,500	3,315	0	35	15	0	6	12	0	3
98-F-312	31-Dec-98	Multi-Use Recreation Facility in Pahrump, Nevada	390	0	w/d	w/d	17	0	0	2	0	w/d	w/d
99-F-411	8-Dec-99	Construction of Nevada Segment of the Level 3 Communications Multi-Conduit Fiber-Optic Line in Lincoln and Clark Counties, Nevada	260	0	260	0	20	0	0	4	0	5	1
02-F-475	23-Sep-02	Table Mountain Wind Generating Facility, Clark County, Nevada	270	0	0	0	12	0	0	2	0	0	0

02-F-528	4-Apr-03	Plan of Operations for the Mojave Mineral Project for Rinker Materials West LLC, Sloan, Clark County, Nevada	563	0	w/d	w/d	5	0	0	1	0	w/d	w/d
03-F-502	17-Oct-03	Development of the Ivanpah Energy Center near Jean and Goodsprings, Clark County, Nevada	300	20			100	0	0	2	0		
04-F-412	28-Apr-04	Construction of the Harry Allen to Mead 500 kV Transmission Line, Clark County, Nevada	290	0	290	0	45	0	0	1	0	13	1
96-F-023R.3	20-Dec-04	Reinitiation for the Las Vegas Valley Programmatic	41,484	0	40,621	0	0	0	1,723	0	0	69	1
05-F-414	14-Jul-05	Sempra Energy's Eldorado Valley Extension Project, Clark County, Nevada	212	51	212	51	100	0	0	2	0	100	0
06-F-498	6-Jul-06	Widening of 23 mi of SR 160 from Mountain Springs in Clark County into Nye County, Nevada	538	0	538	0	5	0	0	1	0	2	0
07-F-403	5-Mar-07	Material Site CL 82-03 to Provide Materials for Work on I-15, Clark County, Nevada	500	0			5	0	0	2	0		
07-F-458	7-May-07	Laughlin Regional Heritage Greenway Trail System in Clark County, Nevada	235	0	14	0	2	0	0	1	0	0	0

07-F-456	27-Jun-07	Stirling Mountain to Northwest Transmission Line Project, Clark and Nye Counties, Nevada	148	0	140	0	37	0	0	1	0	7	0
07-F-506	16-Aug-07	Expansion of Material Site CL 47-04 in Las Vegas, Clark County, Nevada (HENV-NV)	110	0			8	0	0	1	0		
08-F-050	21-Dec-07	Mesquite Regional Park, Clark County, Nevada	135	0	135	0	9	0	2	0	0	3	0
08-F-054	25-Feb-08	Reid Gardener Power Plant Expansion Project, Clark County, Nevada	444	0			25	0	0	4	0		
08-F-052	9-Apr-08	Reliant Energy Bighorn Plant to El Dorado Substation Transmission Interconnection Project, Clark County, Nevada	151	61			50	0	0	2	0		
08-F-053	19-Apr-08	Coyote Springs Transmission Line Project, Clark and Lincoln Counties, Nevada	4	169	0	18	25	0	0	2	0	0	0
08-F-469	5-Sep-08	Reinitiation for Water Conveyance System in Coyote Springs Valley, Clark County, Nevada	0	110	0	108	5	0	0	1	0	0	0
08-F-293	2-Oct-08	Reward Mine Plan of Operations, Nye County, Nevada	406	0			20	0	0	2	0		

08-F-429	30-Dec-08	Sunrise Tap Transmission Line Project, Clark County, Nevada	114	0			30	0	0	2	0		
02-F-447R	20-Nov-09	Reinitiation of widening of US Highway 95 from the US 93/95 Junction to the SR 163 Intersection, Clark County, Nevada	1,566	0	1,566	0	150	0	0	7	0	15	0
10-F-391	28-Jul-10	Reinitiation for Southwest Intertie Project (SWIP) to Include Additional Disturbance of Desert Tortoise Habitat	372	385			50	0	0	2	0	3	0
10-F-208	16-Sep-10	Silver State Solar Project (NextLight Renewable Power, LLC), Clark County, Nevada	2,966	0	427	0	123	0	0	8	1	7	1
10-F-285	27-Sep-10	Programmatic Activities Conducted by NDOT in Southern Nevada	4,468	1,170	103	0	80	0	0	6	0	0	0
10-F-476	15-Oct-10	Reinitiation for City of Mesquite's Replacement General Aviation Airport, Clark County, Nevada	792	0			10	0	0	1	0		
10-F-315	1-Nov-10	Amargosa Farm Road Solar Energy Project, Nye County, Nevada	6,320	0			4	0	0	1	0		
11-F-274	26-Apr-11	DesertXpress High-Speed Train Project, Victorville, California to Las Vegas, Nevada (8-8-11-F-10)	1,190	0			26	0	0	2	0		

10-F-448	29-Apr-11	Eldorado-Ivanpah Power Transmission Project, Clark County, Nevada and San Bernardino County, California	220	94			28	0	0	3	0		
11-F-337	28-Sep-11	Reinitiation for Operation and Maintenance of the Kern River and Mojave Gas Transmission Pipeline in Nevada, California, Utah, and Wyoming	1,204	557	1118	534	0	4	0	5	0	1	0
05-FW-536 Tier 5	7-Mar-12	K Road Moapa Solar Project, Moapa Indian Reservation, Clark County, Nevada	2,153	0			202	0	0	5	0		
12-F-023R	19-Apr-12	Reinitiation for Copper Mountain North Solar Project, Boulder City, Clark County, Nevada	1,459	0			5	0	0	0	0		
11-F-435	13-Nov-09, 1-Jul-11, 29-Sep-11	UNEV Pipeline Project (6-UT-09-F-023)	332	399			237	0	0	12	0	87	5
		TOTALS	93,279	4,658	48,892	853	1,520	19	1,725	95	13	362	16

Appendix D. Summary of Measures Proposed by BLM to Minimize Effects to the Desert Tortoise

Minimization Measures	Results of Implementation of Measures	Program/Activity
Report injuries/mortalities	Further take if injury/mortality source not evaluated	All
Designate FCR; notify BLM before commencement of activities	Provide oversight to ensure reporting and compliance; anticipated result; minimize all forms of take including habitat disturbance	Lands & Realty, ROW, Mining
Ensure proper tortoise handling	Injury; voiding bladder; stress	All
Provide authorized desert tortoise biologists and monitors	Implements or ensure all relevant measures are implemented including proper tortoise handling; tortoise in harm's way are located and moved; workers are informed of measures and the tortoise; information is collected and compiled the required reports;	All activities that anticipate encountering tortoises.
Tortoise awareness training	Inform workers of their responsibilities and consequences of non-compliance; ensure or maximize compliance with protective measures	All
Avoid tortoise burrows	Reduce risk of injury or mortality to tortoises that may occur in burrow; if burrows are damaged, tortoise sheltering habitat would be lost	All
Cease activities if a tortoise is in the area	Reduce risk of tortoises injury or mortality	All
Use previously disturbed areas or areas designated by an authorized biologist	Minimize habitat disturbance and chances of encountering desert tortoises	All
Mark or flag work areas	Minimize habitat disturbance and chances of encountering desert tortoises	All
Move tortoises from harm's way	Reduce risk of tortoises injury or mortality; move tortoises from isolated fragments	All
Install, inspect, and maintain tortoise exclusionary fencing	Exclude tortoises from harm's way	All at the discretion of the BLM and Service
Cover and inspect open trenches and excavations	Reduce risk to tortoises that may fall into trenches or excavations	Lands & Realty, ROW, Mining
Implement litter-control	Reduce resources for desert tortoise predators which may increase predator threat	All
Use raven deterrents	Reduce raven perching and nesting opportunities	Lands & Realty, ROW, Mining
Impose speed limits	Reduce injury and mortality of tortoise due to vehicle travel	All
Check underneath vehicles and equipment before moving them	Reduce injury and mortality of tortoises that shelter underneath vehicles and equipment	All
Limit the number, location, and timing of OHV events and number of participants	Reduce tortoise mortality; disruption of feeding, breeding, and sheltering behavior	Recreation

Minimization Measures	Results of Implementation of Measures	Program/Activity
During OHV events: Require disabled vehicles to be moved to areas along course to avoid habitat damage	Minimize or avoid habitat disturbance or crushing tortoises or their burrows	Recreation
Restrict OHV event spectators and pit crews to designated areas which have been marked or fenced	Minimize or avoid habitat disturbance or crushing tortoises or their burrows	Recreation
BLM will provide staff, including sufficient law enforcement, at OHV events; promoters will also provide event monitors	Ensure maximum compliance with protective measures; observe and report tortoise observations	Recreation
Disqualify OHV event participants if they fail to comply with required stipulations	Reduce habitat disturbance and risk to tortoises that may be encountered by event vehicles, participants, or spectators	Recreation
Restore habitat disturbance; collect fee	Reduce threat of non-native plants, facilitate habitat recovery	All that involve habitat disturbance
BLM will conduct pre-event and post-event sweeps of OHV courses	Locate and move tortoises in harm's way or killed or injured as a result of the action	Recreation
Control vehicle passing during OHV events	Minimize or avoid habitat disturbance or crushing tortoises or their burrows	Recreation
Inform OHV event participants of stipulations before event	Ensure or maximize compliance with protective measures	Recreation
Restrict horse endurance rides to existing roads and trails outside ACECs	Avoid habitat damage	Recreation
Require certified weed-free hay; use only in corrals or similar enclosures (livestock)	Reduce habitat degradation due to presence of non-native plants	Recreation (horse endurance rides), livestock grazing, and resource management (wild horse and burro management
Monitor livestock use and remove livestock if necessary to maintain management objectives	Avoid habitat damage and degradation	Livestock grazing
Manage for native species	Improve tortoise nutrition, reduce habitat degradation due to presence of non-native plants	Livestock grazing
Promptly remove trespass livestock	Reduce habitat damage; enforce compliance	Livestock grazing

Appendix E. Desert Tortoise Handling and Take Report

If a desert tortoise is killed or injured, immediately contact the U.S. Fish and Wildlife Service and BLM, by phone at the numbers below and complete Section 1 of the form.

Completed forms should be submitted to the BLM and Fish and Wildlife Service:

Bureau of Land Management 4701 North Torrey Pines Drive Las Vegas, Nevada 89130	U.S. Fish and Wildlife Service 4701 North Torrey Pines Drive Las Vegas, Nevada 89130

Project Name:	Report Date:
Fish and Wildlife Service PBO File No. 08ENVS00-2019-F-0153	
Fish and Wildlife Service Append File No. 08ENVS00-	
Authorized Desert Tortoise Biologist: ______________________________________ Employed by:	
Section 1: Complete all information below if a desert tortoise is injured or killed in addition to initial contact described above.	
If tortoise was injured ☐ or killed ☐ (check appropriate box):	
Date and time found: ______________________________ Found by: ____ GPS location (NAD 83): easting: ____________________ northing: ____________________ No. of photos taken: _______ Disposition: ____ ____ ____ ____ Attach report with photos that describe in detail, the circumstances and potential cause of injury or mortality. For injuries include name of veterinarian and detailed assessment of injuries.	

702-515-5000 702-515-5230

Section 2: Complete all information below for each desert tortoise handled.

All instances of desert tortoise handling must be reported in this section and be included in the quarterly, annual, and final project reports.

Desert tortoise number: __________________

Date and time found: ______________________________ Sex of tortoise: ________

Air temperature when found: __________ Air temperature when released: __________

Tortoise activity when found: ____

Handled by: _____________________________________ Approx. carapace length _________

GPS location (NAD 83) found: easting: _________________ northing: __________________

GPS location released: easting: _________________ northing: __________________

Approximate distance moved: __________________

Did tortoise void bladder; if so state approximate volume and actions taken:

____
____
____

Post handling or movement monitoring and observations:

____
____
____
______

Section 3: Complete for each tortoise burrow penned.

All instances of desert tortoise penning must be reported in this section and be included in the quarterly, annual, and final project reports.

Date and time of pen construction:

Began: ______________________________ Completed: _____________________________

Date and time pen removed: ____

Pen constructed by: ____

Why was tortoise penned? ____

How frequently was pen monitored? ____

Observations of desert tortoise behavior including time and date of observation:

____

____

____

____

____

Include photos of pen and burrow with report.

Appendix F. Desert Tortoise Remuneration Fee Form

Biological Opinion File Number: 08ENVS00-2019-F-0153
Biological Opinion Issued By: Southern Nevada Fish and Wildlilfe Office, Las Vegas, Nevada
Species: Mojave Desert Tortoise (*Gopherus agassizii*)
Project Name
NEPA No. DOI-BLM-NV-S0#0-201#-####-XX
Case File/Serial #:
BLM Sec 7 log: NV-052-1#-###
Project Proponent:
Phone Number:

Payment Calculations:	Clark County		______ County		______ County	
	Critical habitat	Non-critical habitat	Critical habitat	Non-critical habitat	Critical habitat	Non-critical habitat
# acres anticipated to be disturbed on federal land						
Fee rate (per acre)		$902.00				
Total cost/habitat type (per county)	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total cost per county	**$ -**		**$ -**		**$ -**	

Total payment required (all counties): **$**

Amount paid: ____________ **Date:** ____________ **Check/Money Order #:** ____________

Authorizing agencies: Bureau of Land Management, Las Vegas, Nevada

Make check payable to: Bureau of Land Management

Deliver check to: **Physical Address**
Bureau of Land Management
Las Vegas, Nevada 89130
702-515-5000

Credit Card Payments: Contact BLM Southern Nevada District Office at 702-515-5000

Process check to:
Contributed Funds-All Other
WBS: LVTFFX000800

Remarks: LLNV934000 L71220000.JP0000 LVTFFX000800
Desert Tortoise Conservation Program

***T&E Program Lead will provide a copy to the appropriate District Office(s)*

Appendix G. Programmatic Biological Opinion (File No. 08ENVS00-2019-F-0153) Report to the BLM for the Fish and Wildlife Service

The information below should be completed by the Authorized Desert Tortoise Biologist or the Applicant for the project/action. Reports for all appended actions are required to be submitted annually (due January 31 of each year for prior calendar year activities) and upon completion of the project/action.

Project Name:
NEPA No.: DOI-BLM-NV-S0
Case File No./SRP No.:
BLM Section 7 Log No.: NV-052

☐ Annual Report ☐ Project Completion Report

1. Date: ____________________

2. Fish and Wildlife Service File No (for appended actions): 08ENVS00-____________________

3. Species and critical habitat affected:

☐ Desert tortoise ☐ Desert tortoise critical habitat

Other (identify):

4. Project/action status:

☐ Not begun ☐ In progress* ☐ Ongoing SRP ☐ Completed date ____________________

If in progress, state approximate percent complete: ____________

5. Desert tortoise habitat disturbed:

Non-critical habitat		Critical habitat	
Proposed disturbance (ac)	Actual disturbance (ac)	Proposed disturbance (ac)	Actual disturbance (ac)

6. Habitat of other species disturbed (identify species, non-critical, and critical habitat affected below):

7. Summary of individual desert tortoises taken (appended action):

Incidental Take	Adults Captured	Adults Killed or Injured	Juveniles Captured	Juveniles Killed or Injured
Exempted				
Actual				

Describe other individuals taken:

8. Name of authorized desert tortoise biologists and monitors on the project and the dates they were on the project.

9. Describe all non-compliance issues and event

10. Desert tortoise/burrows observed during activity/event:

Total number desert tortoises observed: ________________

Total number desert tortoises burrows observed: ____

Attach a summary report detailing each desert tortoise and/or desert tortoise burrows observed during activity/event including tortoise activity when found, how the animal was avoided, what happened to the tortoise, the date and time encountered and GPS location (NAD 83 easting and northing)

11. Contact Information

Name______________________________ Company_____________________________

Address____

Phone_________________________

Signature________________________________ Date____________________________

Send completed form to:

Bureau of Land Management
Attn: Wildlife Staff
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130
702-515-5000