United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
81440 2011-F 0122

April 26, 2011

David Valenstein
Environment and Systems Planning Division
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Subject: Biological Opinion on DesertXpress High-Speed Train Project, Victorville, California to Las Vegas, Nevada (8-8-11-F-10)

Dear Mr. Valenstein:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion regarding the effects on the federally threatened desert tortoise (*Gopherus agassizii*) and it's designated critical habitat of the Federal Railroad Administration's (FRA) proposal to authorize and permit the DesertXpress high-speed passenger train project. This review is in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). DesertXpress Enterprises, LLC (DesertXpress) proposes to construct and operate a fully grade-separated, double-track passenger-only railroad along an approximately 200-mile corridor, from Victorville, California, to Las Vegas, Nevada. We received your December 14, 2010, request for formal consultation on December 16, 2010.

This biological opinion is based on information which accompanied your request for consultation, including the biological assessment (ICF International 2010), as well as further information or details we have received via electronic mail and conference calls. A complete record of this consultation can be made available at the Ventura Fish and Wildlife Office.

Consultation History

The biological assessment mentions that electrical lines associated with the proposed project would cross the Mojave River near Victorville and that the least Bell's vireo (*Vireo bellii pusillus*) and southwestern willow flycatcher (*Empidonax traillii extimus*), both federally endangered species, could potentially occur in riparian habitat associated with the river. This section of the Mojave River is also designated critical habitat for the southwestern willow flycatcher; however, the biological assessment does not mention avoidance measures to ensure these species will not be affected by the project.

Subsequently, on a conference call on February 24, 2011, the FRA, DesertXpress, and the Service determined this issue needed to be addressed and agreed on certain measures that would be implemented to avoid impacts. DesertXpress is proposing to design and construct the utility line in a manner that places the utility poles outside of riparian vegetation along the Mojave River. The conductors would be placed at a height over the riparian vegetation that avoids the need for vegetation management within the riparian habitat. Required construction and maintenance of the facilities will take place between September 16 and April 14 to avoid the nesting period of the least Bell's vireo. (The southwestern willow flycatcher begins nesting at a later date and concludes breeding at roughly the same time as the least Bell's vireo.) An acceptable alternative would be to conduct Service-defined protocol surveys to determine whether individuals of the species are present in the immediate project area. If the protocol surveys determine individuals of the species are not present, DesertXpress would be free to construct or maintain the utility line at any time during the year. If the surveys determine the species is present, the applicant would continue to abide by the construction and maintenance timeframes described above to avoid the nesting period. Because DesertXpress will implement these avoidance measures, the FRA has determined the project would result in no effect to these species or critical habitat of the southwestern willow flycatcher (Messenger 2011a). The Service acknowledges the FRA's determination; we will not discuss the least Bell's vireo or the southwestern willow flycatcher and its critical habitat further in this biological opinion.

The Service electronically mailed a draft biological opinion to FRA on April 5, 2011 and received comments on the draft, via electronic mail from FRA on April 19, 2011 (Messenger 2011b). The Service sent final responses to those comments back to FRA on April 21, 2011 (Service 2011), and a follow-up conference call was held on April 25, 2011 to verify all changes made within this final biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

We summarized the following description of the proposed action from the biological assessment (ICF International 2010), unless otherwise noted. The proposed action includes the construction, operation, and maintenance of approximately 200 miles of rail alignment, passenger stations, maintenance facilities, autotransformers and substations, electrical transmission lines, and temporary construction areas. DesertXpress is proposing to develop the detailed project plans through a design-build process. The design-build process involves developing detailed engineering designs after the record of decision has been signed; thus, the biological assessment lacks some detailed information that it might otherwise include. Once the design has been completed, the proposed project would be constructed within a period of approximately 48 months, including simultaneous construction on multiple segments.

The FRA is the lead Federal agency, intending to authorize and permit the proposed action under the Act. FRA is the National Environmental Policy Act lead, as well as providing clearance for

and ensuring safety of a train. The Bureau of Land Management (BLM) manages the use of public lands in the action area; the Surface Transportation Board has jurisdiction over the construction, acquisition, operation, and abandonment of rail lines, railroad rates and services, and rail carrier consolidations and mergers; and the Federal Highway Administration has jurisdiction over the use and modification of the Interstate highway right-of-way.

Rail Alignment Features

The components of the rail alignment would include a 75-foot-wide permanent right-of-way, including the rail bed with tracks spaced 15 feet apart, concrete barriers, overhead electrical distribution and transmission lines, fencing, and access and maintenance areas. The 75-foot right-of-way would also include culverts, bridges, and overcrossing structures at drainage crossings. A 162.5-foot temporary construction area would extend beyond the permanent corridor.

Physical Facilities

Victorville Passenger Station
The Victorville Passenger Station would be a permanent facility located at the southwestern portion of the interchange of Interstate 15 and Dale Evans Parkway (also known as Bell Mountain Road). The facility would be composed of station buildings, a parking lot and associated structures, and utilities within the proposed project footprint.

Victorville Operations, Maintenance, and Storage Facility
The Victorville Operations, Maintenance, and Storage Facility (OMSF) would be located immediately south of Victorville Passenger Station. The facility would include a train-washing facility, repair shop, parts storage, and operations control center.

Autotransformers and Substations
The passenger train would operate by electrical multiple unit technology propulsion power delivered along the project right-of-way by an overhead contact electrical distribution system with poles and conductors. Preliminary engineering identified the need for 17 autotransformers, spaced at 10- to 12-mile intervals along the alignment.

Maintenance-of-way Facility
The Maintenance-of-way Facility (MOW) facility would be contained in a 5,200-square-foot building, plus tail tracks, a radio signal tower, fuel storage, and other related facilities that would serve as a headquarters for DesertXpress employees charged with daily inspection of tracks and associated facilities to ensure ongoing safe operations.

Utility Corridors
The proposed action includes two utility corridors, including connections at the Victorville OMSF and Baker MOW to connect the project to electricity sources. The utility corridors

associated with the Victorville OMSF and the Baker MOW would be approximately 6 miles and 1.2 miles in length, respectively. Each utility corridor right-of-way would be 100 feet wide and a permanent access road, approximately 10 feet wide, would be within the right-of-way. The utility line towers would range in height from 95 feet to 135 feet, depending upon land mark clearance. Tower spacing would range from 440 feet to 940 feet depending on tower height and necessary clearance.

Temporary Construction Areas
Temporary construction areas (TCA) would be used during construction for project lay-down and temporary storage of construction materials. A total of 16 sites spread out along the rail alignment are identified for temporary construction use. Of these, 12 are for temporary use only; the remaining 4 are associated with permanent facilities. See Final EIS Table 2.4.3 for more detail (FRA 2011). The entire TCA would be bladed and graded with all vegetation removed. It would then be rehabilitated and restored once construction is completed. The TCAs are located both within and outside of the rail alignment right-of-way. The following discussion of the segment components describes the locations of the TCAs.

Segment Components

Segments 1, 2c, and 3b would lie entirely in California. Segment 4c would lie mostly in California, with a small portion in Nevada. Segments 5b and 6b would be built in Nevada. Each segment would be composed of the rail alignment and the additional facilities we described previously in this biological opinion.

Segment 1
Segment 1 of the rail alignment would begin at the proposed Victorville Passenger Station and utility corridor, run along the northwest side of Interstate 15, and connect with Segment 2c near Lenwood Road, approximately 7 miles southwest of the community of Lenwood. The segment would include the Victorville Passenger Station, the Victorville OMSF, autotransformers 2 and 3, and a 230-kV utility corridor.

Segment 2C
Segment 2C would run along the northwest side of Interstate 15 through Lenwood, central Barstow, and eastward to Yermo. It would then connect to Segment 3b just east of Yermo. In central Barstow, the rail alignment would cross the Mojave River on a new bridge immediately adjacent to the existing southbound Interstate 15 bridge. In the vicinity of the Interstate 15/Fort Irwin Road interchange just west of Yermo, the rail alignment would divert from the existing freeway corridor and would follow a northerly course around the community of Yermo for approximately 9 miles. It would reconnect with the freeway corridor approximately 1 mile east of the Interstate 15/Yermo Road interchange, where Segment 2C would connect with Segment 3b. This segment would also include TCAs 2C1 and 5, and autotransformer sites 4 and site 5a.

Segment 3B
Segment 3B would be located alongside Interstate 15, predominately along the north side, within the existing freeway right-of-way from Fort Irwin Road to Mountain Pass, a distance of approximately 85 miles. Grade-separated elevated structures would be incorporated for crossing roadways and at the interchanges, from the on-off ramps. This segment would also include TCAs 6, 7, 8, 9, and 10; autotransformer sites 6 through site 12; the Baker MOW facility; and the Baker utility corridor. Just west of Mountain Pass, Segment 3b would connect to Segment 4C.

Segment 4C
Segment 4C would leave the freeway right-of-way at Mountain Pass and extend north, passing through three new dual track tunnels through the Clark Mountains. It would travel northwardly from the Clark Mountains and turn east to cross the California-Nevada state line and connect back to the freeway corridor north of Primm. Here, the segment would connect with Segment 5B. This segment would also include TCAs 4C1 through 4C5 and autotransformer sites 13 and 14.

Segment 5B
Segment 5B would be located on the east side of Interstate 15 within the freeway right-of-way between Primm and Jean. It would cross back to the west side of the freeway at the existing Union Pacific Railroad tracks south of Sloan. Upon crossing over to the west side of the freeway, Segment 5b would connect with Segment 6B. This segment would also include TCA13 and autotransformer site 15.

Segment 6B
Segment 6B would be located along the west side of Interstate 15 primarily within the freeway right-of-way. It would be constructed at-grade until reaching the interchange of Interstate 15/Blue Diamond Road in the Las Vegas metropolitan area, where the rail alignment would transition to an elevated structure through Las Vegas. This segment would also include autotransformer site 16B.

Minimization Measures

General Protective Measures
To minimize adverse effects to the desert tortoise, DesertXpress will implement the following protective measures. We have summarized the measures from the biological assessment (ICF International 2010); we have slightly modified these measures in response to comments by the FRA and DesertXpress on the draft biological opinion (Messenger 2011b).

> All personnel working within the project area will attend an environmental awareness training program. The program will be presented by Service-authorized biologists (hereafter 'authorized biologists' and include information on the life history of the desert tortoise, the legal protection it is afforded by the Endangered Species Act, the definition of "take" for listed species, measures to protect the desert tortoise, reporting

requirements, specific measures that each worker will need to employ to avoid adverse impacts on desert tortoises, a detailed description of environmental project commitments as described in the decision records (i.e., record of decision), right-of-way grants, and biological opinion, and penalties for violation of Federal and state environmental laws.

The following measures will be implemented during project construction:

1. Authorized biologists will be on site during any construction activity within or near desert tortoise habitat to ensure the implementation and compliance of environmental commitments and avoidance measures.

2. Authorized biologists will have the authority to stop work if dangers to desert tortoises arise, and to allow work to proceed after the hazard has been removed. The Southern Nevada and Ventura Fish and Wildlife Offices, BLM Offices, and the California Department of Fish and Game must be notified of any desert tortoise injury or death resulting from project-related activities.

3. As part of the monitoring, the authorized biologists will check construction areas immediately before construction activities each day to ensure that no desert tortoise has moved into the construction area. If desert tortoises are discovered within the construction area, they will be relocated to adjacent habitat approximately 300 feet from the limit of disturbance (i.e., beyond the 162.5-foot temporary construction area).

4. The authorized biologists will ensure proper implementation of protective measures, record and report desert tortoise and sign observations in accordance with approved protocol, report incidents of noncompliance in accordance with the biological opinion and other relevant permits and authorizations, and move desert tortoises from harm's way and place these animals in adjacent habitat approximately 300 feet of the limit of disturbance.

5. All construction activities will be confined to the designated work areas. Grubbing of vegetation will only be done to the extent necessary for construction and will be limited to areas designated for that. Overnight parking and storage of equipment and materials will be limited to previously disturbed areas or areas identified in the BLM right-of-way grant.

6. All vehicle traffic will be restricted to existing paved roads and the project alignment within the permanent or temporary construction area. Disturbance beyond the construction area would be prohibited except in emergency situations.

7. Construction vehicles within sensitive species habitat will not exceed 15 miles per hour.

8. A litter-control program will be implemented during construction. The program will include the use of covered, common raven-proof trash receptacles, daily removal of trash from work areas to the trash receptacles, and proper disposal of trash in a designated solid waste disposal facility. Precautions will also be taken to prevent trash from blowing out of construction vehicles.

9. DesertXpress will promptly remove all road-killed animals with the project construction area and the permanent rail alignment to reduce the adverse effects associated with predation of desert tortoise by common ravens (*Corvus corax*).

10. No pets or firearms will be permitted in the work area.

11. Both pre- and post-construction photographs will be taken to document sensitive habitat conditions within the limits of project disturbance.

12. During construction, DesertXpress will perform weekly inspections and weed removal/control during the growing season of all construction areas, rail alignment, and facilities. Following the completion of construction activities, from March through August, DesertXpress will continue monitoring and removal monthly during the first 2 years of operation and quarterly for the life of the facility. Weed removal and control will consist of physical control methods (e.g., hand pulling, hoeing, etc.) or herbicide application. A provision of this measure requires preparation of an invasive weed monitoring and treatment plan that would be applicable to all lands affected by the proposed action. This weed control plan will be developed in cooperation with FRA and BLM to ensure that weed control and removal activities do not affect desert tortoises. The use of herbicides to control weeds within the DesertXpress construction and operation area will be coordinated with the BLM and California Fish and Game Department and Nevada Department of Wildlife biologists to ensure the application does not affect desert tortoises. In instances where desert tortoises may come into contact with herbicide, the plan will require manual removal of individual plants. The FRA will ensure the same methods and caution will occur on lands within the action area that are outside of those managed by BLM (Messenger 2011a).

Topsoil Removal and Stockpile

The construction area topsoil would be removed and stockpiled prior to initiating construction and replaced within areas of temporary disturbance once construction is complete. A vegetation and topsoil removal and restoration plan will be developed and implemented to reduce impacts on biological resources. Any permanent topsoil stabilization measures will be constructed and maintained within the permanent right-of-way. These measures may include, but are not limited to, the use of geo-textile mats or rip-rap to in areas of high erosion potential (Messenger 2011a).

Installation of Erosion Control Measures
The installation and maintenance of rice wattles, straw wattles, and silt fencing along the temporary construction area will be used to prevent the sediment from being transported off of the right-of-way during construction. Permanent stabilization measures will be deployed upon completion of construction along washes and in other areas of potential erosion.

Desert Tortoise Protective Measures
To minimize adverse effects to the desert tortoise, DesertXpress will fence the boundary of the Victorville Passenger Station and the Victorville OMSF with permanent desert tortoise exclusion fencing. DesertXpress will install desert tortoise guards at gated entries to prevent desert tortoises from gaining entry to the project sites. DesertXpress will also fence the TCAs, the Baker MOW, autotransformers sites and substations, the construction areas for the utility corridors, and the rail alignment's temporary construction area, with temporary desert tortoise fencing prior to clearance surveys and ground disturbance. Proposed construction sites along the alignment that are not located in desert tortoise habitat (i.e., within Barstow, Baker, and Las Vegas) will not be fenced.

To ensure the clearance of all desert tortoises from all potential habitat areas, Service-authorized desert tortoise biologists will conduct clearance surveys as required by the Service. Desert tortoise relocation from the project area will include:

1. The installation of temporary desert tortoise fencing around the perimeter prior to the commencement of on-site construction. Installation of the fencing will be monitored by a qualified biologist to ensure that desert tortoises are not killed or injured during this activity. Temporary desert tortoise fencing will be installed in areas of construction that are beyond the perimeter of the right-of-way or in areas where construction staging will occur. Desert tortoise guards will be installed at construction area entry points and permanent rail alignment maintenance access points. After installation, the fence will be regularly inspected to ensure its integrity. The project proponent will ensure that cross-country travel for construction purposes outside of the areas of desert tortoise fencing is prohibited.

2. The desert tortoise exclusionary fencing may require the use of a desert tortoise guard in areas of high vehicular construction traffic. This device resembles a cattle guard and is positioned at ground level and connected to the exclusionary fencing to prohibit desert tortoise from crossing into the construction area but allowing the passage of construction vehicles. The guard would be maintained throughout its use during the construction process by DesertXpress. Such maintenance would require the presence of an authorized desert tortoise biologist. The guard would have a clear escape route away from construction activity for any desert tortoise that should fall into the guard. The guard would be inspected daily for desert tortoise and to ensure the escape route is free of obstruction. The guard would also be cleared of debris that may allow desert tortoise passage across the guard and into a construction area (Messenger 2011a).

3. Only biologists authorized by the Service will handle desert tortoises and will follow the guidelines within the *Desert Tortoise Field Manual.* Desert tortoises found within the project area will be removed and relocated to undisturbed suitable habitat beyond the construction site and within their own territory, where they may be familiar with alternate burrows. If no burrows are available, artificial burrows will be created following the guidelines within the *Desert Tortoise Field Manual.*

4. After installation of the temporary fencing, the entire project will be surveyed for desert tortoises by a qualified biologist. Following the procedures and precautions outlined in the *Desert Tortoise Field Manual*, all desert tortoise pallets and burrows within the survey areas will be examined and excavated by hand, either by or under the direct supervision of an authorized biologist, and collapsed to prevent re-entry.

5. An authorized biologist will be present during all initial top soil removal, blading, or grading activities within the project area. During project implementation, all workers will inform the qualified biologist if a desert tortoise is found within or near project areas. All work in the vicinity of the desert tortoise, which could injure or kill the animal, will cease and it will be observed until it is moved from harm's way by the authorized biologist.

6. Workers will inspect for desert tortoises under vehicles and equipment before such equipment is moved. If a desert tortoise is present, the worker will wait for it to move out from underneath the vehicle or the authorized biologist will be contacted to remove it.

DesertXpress will replace any previously installed permanent desert tortoise exclusionary fencing along Interstate 15 that is removed during project construction.

Culverts
DesertXpress proposes to install culverts under the railroad line that match existing Interstate 15 or Union Pacific Railroad culverts. Where the project deviates from the existing transportation facilities, DesertXpress will install culverts at natural drainage features and at regular intervals to allow wildlife to pass under the proposed rail grade. Before construction begins, the culvert design will be approved by the Service, the BLM, California Department of Fish and Game, and Nevada Department of Transportation.

Minimization measures for potential impacts to downstream habitat from Segment 4c include the use of tunnels, aerial crossing structures, at-grade overcrossing structures, and culverts. At a minimum, all ephemeral drainages equal to or greater than 4 feet wide would be avoided by these types of structures. Where tunnels and aerial crossing structures would be used, drainages less than 4 feet in width would also be avoided. If support piles or piers are necessary to support over crossing structures these structures would be located outside of the drainage being over crossed. Authorized biologists would be present during construction to ensure impacts to drainages are avoided or, where an impact is unavoidable, ensure the impact is minimized and

the natural substrate of the drainage that has been disturbed is re-established to original grade and with natural substrate materials within the drainage channel. In addition to the ephemeral drainages over crossed, drainages established (created) or re-established as part of the project's compensatory mitigation for replacement of affected waters of the United States or State of California would be monitored by an agency-approved biologist for a minimum of 5 years to ensure that agency-approved performance standards are met.

Compensation
In addition to habitat restoration, DesertXpress will compensate for habitat disturbance through payment of a per-acre fee for disturbance of desert tortoise habitat in California and Nevada. These funds will be paid to the BLM and used for management actions expected to provide a benefit to the desert tortoise over time. Actions may involve habitat acquisition, population or habitat enhancement, increasing knowledge of the species' biological requirements, reducing loss of individual animals, documenting the species' current status and trends, and preserving distinct population attributes. Specific actions to be funded will be determined during annual meetings between the BLM and Service to identify and prioritize management actions, which may include implementation of range wide monitoring of desert tortoises.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

Section 7(a)(2) of the Endangered Species Act 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 Code of Federal Regulations 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the range-wide condition of the desert tortoise, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the desert tortoise in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the desert tortoise; (3) the Effects of the Action, which determine the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the desert tortoise; and (4) the Cumulative Effects, which evaluate the effects of future, non-Federal activities in the action area on the desert tortoise.

Adverse Modification Determination

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of the critical habitat of listed species. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied on the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this biological opinion relies on four components: (1) the *Status of Critical Habitat*, which describes the range-wide condition of designated critical habitat for the desert tortoise in terms of primary constituent elements, the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the *Environmental Baseline*, which analyzes the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (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 primary constituent elements and how that will influence the recovery role of the affected critical habitat units; and (4) *Cumulative Effects*, which evaluates the effects of future non-Federal activities in the action area on the primary constituent elements and how that will influence the recovery role of affected critical habitat units.

STATUS OF THE SPECIES AND CRITICAL HABITAT

The following summarizes the rangewide status of the desert tortoise and its designated critical habitat, which includes information on its listing history, recovery plan, recovery and critical habitat units (CHUs), species account, reproduction, population distribution and monitoring, and threats.

Listing History

On August 20, 1980, the Service published a final rule listing the Beaver Dam Slope population of the desert tortoise in Utah as threatened (45 FR 55654). In the 1980 listing of the Beaver Dam Slope population, the Service concurrently designated 26 square miles of the BLM -administered land in Utah as critical habitat. The reason for listing was population declines because of habitat deterioration and past over-collection. Major threats to the desert tortoise identified in the rule included habitat destruction through development, overgrazing, and geothermal development, collection for pets, malicious killing, road kills, and competition with grazing or feral animals.

On August 4, 1989, the Service published an emergency rule listing the Mojave population of the desert tortoise as endangered (54 FR 42270). On April 2, 1990, the Service determined the Mojave population of the desert tortoise to be threatened (55 FR 12178). Reasons for the determination included significant population declines, loss of habitat from construction projects

such as roads, housing and energy developments, and conversion of native habitat to agriculture. Livestock grazing and off-highway vehicle (OHV) activity have degraded additional habitat. Also cited as threatening the desert tortoise's continuing existence were: illegal collection by humans for pets or consumption; upper respiratory tract disease (URTD); predation on juvenile desert tortoises by common ravens, coyotes (*Canis latrans*), and kit foxes (*Vulpes macrotis*); fire; and collisions with vehicles on paved and unpaved roads.

On February 8, 1994, the Service designated approximately 6.45 million acres of critical habitat for the Mojave population of the desert tortoise in portions of California (4,750,000 acres), Nevada (1,220,000 acres), Arizona (339,000 acres), and Utah (129,000 acres) (59 FR 5820-5846, also see corrections in 59 FR 9032-9036), which became effective on March 10, 1994.

Recovery Plan

On June 28, 1994, the Service approved the final Desert Tortoise (Mojave Population) Recovery Plan (1994 Recovery Plan) (Service 1994). The 1994 Recovery Plan divided the range of the desert tortoise into 6 recovery units and recommended establishment of 14 desert wildlife management areas (DWMAs) throughout the recovery units. Within each DWMA, the 1994 Recovery Plan recommended implementation of reserve-level protection of desert tortoise populations and habitat, while maintaining and protecting other sensitive species and ecosystem functions. The design of DWMAs should follow accepted concepts of reserve design. As part of the actions needed to accomplish recovery, the 1994 Recovery Plan recommended that land management within all DWMAs should restrict human activities that negatively impact desert tortoises (Service 1994). The DWMAs/ACECs have been designated by the BLM through development or modification of their land-use plans in Arizona, Nevada, Utah, and parts of California.

The U.S. General Accounting Office (GAO) Report, *Endangered Species: Research Strategy and Long-Term Monitoring Needed for the Mojave Desert Tortoise Recovery Program* (GAO 2002), directed the Service to periodically reassess the 1994 Recovery Plan to determine whether scientific information developed since its publication could alter implementation actions or allay some of the uncertainties about its recommendations. In response to the GAO report, the Service initiated a review of the 1994 Recovery Plan in 2003. In March 2003, the Service impaneled the Desert Tortoise Recovery Plan Assessment Committee (Committee) to assess the 1994 Recovery Plan. The charge to the Committee was to review the entire 1994 Recovery Plan in relation to contemporary knowledge to determine which parts of the 1994 Recovery Plan needed updating. The recommendations of the Committee were presented to the Service and Desert Tortoise Management Oversight Group on March 24, 2004 (Tracy et al. 2004). The recommendations were used as a guide by a recovery team of scientists and stakeholders to modify the 1994 Recovery Plan.

On November 3, 2004, the Service announced the formation of the DTRO. The DTRO is revising the 1994 Recovery Plan and coordinating with regional recovery implementation work groups to develop 5-year recovery action plans under the umbrella plan. A draft revision of the recovery plan was released to the public on August 4, 2008 (Service 2008). The Service anticipates a final recovery plan in 2011.

The draft recovery plan identifies three recovery objectives:

1. Maintain self-sustaining populations of desert tortoises within each recovery unit into the future.

2. Maintain well-distributed populations of desert tortoises throughout each recovery unit.

3. Ensure that habitat within each recovery unit is protected and managed to support long-term viability of desert tortoise populations.

Recovery objectives and criteria generally will be measured within tortoise conservation areas or other areas identified by Recovery Implementation Teams, and they are not independent of each other but must be evaluated collectively. Recovery does not depend on absolute numbers of tortoises or comparisons to pre-listing estimates of tortoise populations, but rather the reversal of downward population trends and elimination or reduction of threats that initiated the listing.

Recovery Units

Northeastern Mojave Recovery Unit

The 1994 Recovery Plan delineates the Northeastern Mojave Recovery Unit to occur primarily in Nevada, but it also extends into California along the Ivanpah Valley and into extreme southwestern Utah and northwestern Arizona. Vegetation within this unit is characterized by creosote bush scrub, big galleta-scrub steppe, desert needlegrass scrub-steppe, and blackbrush scrub (in higher elevations). Topography is varied, with flats, valleys, alluvial fans, washes, and rocky slopes. Much of the northern portion of the Northeastern Mojave Recovery Unit is characterized as basin and range, with elevations from 2,500 to 12,000 feet. Desert tortoises typically eat summer and winter annuals, cacti, and perennial grasses. Since the northern portion of this recovery unit represents the northernmost distribution of the species, desert tortoises are typically found in low densities (about 10 to 20 adults per square mile). The proposed project would be located in the Northeastern Mojave Recovery Unit.

The Northeastern Mojave Recovery Unit includes the Mormon Mesa, Coyote Spring, Beaver Dam Slope and Gold Butte-Pakoon DWMAs; and a portion of the Piute-Eldorado DWMAs. These areas generally overlap the Mormon Mesa, Piute-Eldorado, Beaver Dam Slope, and Gold Butte-Pakoon CHUs.

Using the U.S. Geological Survey habitat model (Nussear et al. 2009) and a 0.5 probability threshold based on the prevalence approach, the Service estimates that about one half of the Northeastern Mojave Recovery Unit contains potential desert tortoise habitat (approximately 4,853,368 acres). Although this analysis likely omits some marginal desert tortoise habitat, it explains the occurrence of 95 percent of the 938 test points used in the model. This analysis does not consider habitat loss, fragmentation, or degradation associated with human-caused impacts.

Eastern Mojave Recovery Unit

The 1994 Recovery Plan delineates the Eastern Mojave Recovery Unit to occur primarily in California, but also extends into Nevada in the Amargosa, Pahrump, and Piute valleys. The Ivanpah, Piute-Eldorado, and Fenner DWMAs are included in the Eastern Mojave Recovery Unit which generally overlap the Ivanpah and Piute-Eldorado CHUs in California. In the Eastern Mojave Recovery Unit, desert tortoises are often active in late summer and early autumn in addition to spring because this region receives both winter and summer rains and supports two distinct annual floras on which they can feed. Desert tortoises in the Eastern Mojave Recovery Unit occupy a variety of vegetation types and feed on summer and winter annuals, cacti, perennial grasses, and herbaceous perennials. They den singly in caliche caves, bajadas, and washes. This recovery unit is isolated from the Western Mojave Recovery Unit by the Baker Sink, a low-elevation, extremely hot and arid strip that extends from Death Valley to Bristol Dry Lake. The Baker Sink area is generally not considered suitable for desert tortoises. Desert tortoise densities in the Eastern Mojave Recovery Unit can vary dramatically, ranging from 5 to as much as 350 adults per square mile (Service 1994).

Northern Colorado Recovery Unit

The 1994 Recovery Plan delineates the Northern Colorado Recovery Unit completely in California. The 874,843-acre Chemehuevi DWMA is the sole conservation area for the desert tortoise in this recovery unit. Desert tortoises in this recovery unit are found in the valleys, on bajadas and desert pavements, and to a lesser extent in the broad, well-developed washes. They feed on both summer and winter annuals and den singly in burrows under shrubs, in intershrub spaces, and rarely in washes. The climate is somewhat warmer than in other recovery units, with only 2 to 12 freezing days per year.

Eastern Colorado Recovery Unit

The 1994 Recovery Plan delineates the Eastern Colorado Recovery Unit completely in California. The Chuckwalla DWMA and CHU, and a portion of the Joshua Tree DWMA and Pinto Basin CHU, occur in this recovery unit. This recovery unit occupies well-developed washes, desert pavements, piedmonts, and rocky slopes characterized by relatively species-rich succulent scrub, creosote bush scrub, and Blue Palo Verde-Ironwood-Smoke Tree communities. Winter burrows are generally shorter in length, and activity periods are longer than elsewhere due to mild winters and substantial summer precipitation. The desert tortoises feed on summer and winter annuals and some cacti; they den singly.

Western Mojave Recovery Unit

The 1994 Recovery Plan delineates the Western Mojave Recovery Unit completely in California. It is composed of the Western Mojave, Southern Mojave, and Central Mojave regions which are exceptionally heterogeneous and have broad, indistinct boundaries due to gradational transitions among sub-regions and with surrounding areas. The central Mojave is topographically and climatically transitional between the southwestern and eastern Mojave Desert. The south-central Mojave is a transitional region to the Colorado/Sonoran Desert, and the southern half of this region is similar climatically and floristically to the eastern Mojave. Many of the differences in vegetation among these regions can be explained by differences in climate, which varies linearly across the range of the desert tortoise. The most pronounced difference between the Western Mojave and other recovery units is in timing of rainfall and the resulting vegetation. Most rainfall occurs in fall and winter and produces winter annuals, which are the primary food source of desert tortoises. Above ground activity occurs primarily in spring, associated with winter annual production. Thus, desert tortoises are adapted to a regime of winter rains and rare summer storms. Here, desert tortoises occur primarily in valleys, on alluvial fans, bajadas, and rolling hills in saltbush, creosote bush, and scrub steppe communities. Desert tortoises dig deep burrows (usually located under shrubs on bajadas) for winter hibernation and summer aestivation. These desert tortoises generally den singly.

Four DWMAs occur wholly or partially within the Western Mojave Recovery Unit: Fremont-Kramer, Ord-Rodman, Superior-Cronese, and Joshua Tree. These areas approximate the Fremont-Kramer, Ord-Rodman, Superior-Cronese, and Pinto Basin CHUs.

Upper Virgin River Recovery Unit

The 1994 Recovery Plan delineates the Upper Virgin River Recovery Unit to encompass all desert tortoise habitat in Washington County, Utah, except the Beaver Dam Slope, Utah population. Only the Upper Virgin River DWMA and CHU occur in this recovery unit. The desert tortoise population in the area of St. George, Utah is at the extreme northeastern edge of the species' range and experiences long, cold winters (about 100 freezing days) and mild summers, during which the desert tortoises are continually active. Here the desert tortoises live in a complex topography consisting of canyons, mesas, sand dunes, and sandstone outcrops where the vegetation is a transitional mixture of sagebrush scrub, creosote bush scrub, blackbush scrub, and a psammophytic community. Desert tortoises use sandstone and lava caves instead of burrows, travel to sand dunes for egg-laying, and use still other habitats for foraging. Two or more desert tortoises often use the same burrow.

Species Account

The desert tortoise is a large, herbivorous reptile that occurs in portions of California, Arizona, Nevada, and Utah. It also occurs in Sonora and Sinaloa, Mexico. The Mojave population of the desert tortoise includes those desert tortoises living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, southwestern Utah, and in the Sonoran Desert in California.

Desert tortoises reach 8 to 15 inches in carapace length and 4 to 6 inches in shell height. Hatchlings emerge from the eggs at about 2 inches in length. Adults have a domed carapace and relatively flat, unhinged plastron. Their shells are high-domed, and greenish-tan to dark brown in color with tan scute centers. Desert tortoises weigh 8 to 15 pounds when fully grown. The forelimbs have heavy, claw-like scales and are flattened for digging, while hind limbs are more stumpy and elephantine.

Optimal habitat for the desert tortoise has been characterized as creosote bush scrub in which precipitation ranges from 2 to 8 inches, where a diversity of perennial plants is relatively high, and production of ephemerals is high (Luckenbach 1982; Turner 1982; Turner and Brown 1982). Soils must be friable enough for digging burrows, but firm enough so that burrows do not collapse. Desert tortoises occur from below sea level to an elevation of 7,300 feet, but the most favorable habitat occurs at elevations of approximately 1,000 to 3,000 feet (Luckenbach 1982). Neonate desert tortoises use abandoned rodent burrows for daily and winter shelter; these burrows are often shallowly excavated and run parallel to the surface of the ground.

Desert tortoises are most commonly found within the desert scrub vegetation type, primarily in creosote bush scrub. In addition, they occur in succulent scrub, cheesebush scrub, blackbrush scrub, hopsage scrub, shadscale scrub, microphyll woodland, Mojave saltbush-allscale scrub and scrub-steppe vegetation types of the desert and semidesert grassland complex (Service 1994). Within these vegetation types, desert tortoises potentially can survive and reproduce where their basic habitat requirements are met. These requirements include a sufficient amount and quality of forage species; shelter sites for protection from predators and environmental extremes; suitable substrates for burrowing, nesting, and overwintering; various plants for shelter; and adequate area for movement, dispersal, and gene flow. Throughout most of the Mojave Desert region, desert tortoises occur most commonly on gently sloping terrain with soils ranging from sandy-gravel and with scattered shrubs, and where there is abundant inter-shrub space for growth of herbaceous plants. Throughout their range, however, desert tortoises can be found in steeper, rockier areas (Gardner and Brodie 2000).

The size of desert tortoise home ranges varies with respect to location and year. Desert tortoise activities are concentrated in overlapping core areas, known as home ranges. In the western Mojave Desert, Harless et al. (2007) estimated mean home ranges for desert tortoises to be 111 acres for males and 40 acres for females. Over its lifetime, each desert tortoise may require more than 1.5 square miles of habitat and make forays of more than 7 miles at a time (Berry 1986). In drought years, the ability of desert tortoises to drink while surface water is available following rains may be crucial for desert tortoise survival. During droughts, desert tortoises forage over larger areas, increasing the likelihood of encounters with sources of injury or mortality including humans and other predators.

Desert tortoises spend most of the year in subterranean burrows or caliche caves (Nagy and Medica 1986). Desert tortoises in the west Mojave are primarily active in May and June, with a secondary activity period from September through October. In Nevada and Arizona, desert

tortoises are considered to be most active from approximately March 1 through October 31. Their activity patterns are primarily controlled by ambient temperature and precipitation (Nagy and Medica 1986; Zimmerman *et al.* 1994). In the east Mojave and Colorado Deserts, annual precipitation occurs in both summer and winter, providing food and water to desert tortoises throughout much of the summer and fall. Most precipitation occurs in winter in the West Mojave Desert, resulting in an abundance of annual spring vegetation, which dries up by late May or June. Neonate desert tortoises emerge from their winter burrows as early as late January to take advantage of freshly germinating annual plants through the spring. Under certain conditions desert tortoises may be aboveground any month of the year, particularly during periods of mild or rainy weather in summer and winter.

During active periods, they usually spend nights and the hotter part of the day in their burrow; they may also rest under shrubs or in shallow burrows (pallets). Desert tortoises may use an average of 7 to 12 burrows at any given time (Bulova 1994; TRW Environmental Safety Systems Inc. 1997). Walde et al. (2003) observed that desert tortoises retreated into burrows when air temperature reached 91.0° Fahrenheit (F) ± 3.55° F and ground temperatures reached 94.6° F ± 6.05° F; 95 percent of observations of desert tortoises aboveground occurred at air temperatures less than 91° F. The body temperature at which desert tortoises become incapacitated ranges from 101.5° F to 113.2° F (Naegle 1976; Zimmerman et al. 1994).

Although desert tortoises eat nonnative plants, they generally prefer native forbs when available (Jennings 1993; Avery 1998). Consumption of nonnative plants may cause desert tortoises to have a nitrogen and water deficit (Henen 1997). Droughts frequently occur in the desert, resulting in extended periods of low water availability. Periods of extended drought place desert tortoises at even greater water and nitrogen deficit than during moderate or high rainfall years (Peterson 1996; Henen 1997). During a drought, more nitrogen than normal is required to excrete nitrogenous wastes, thus more rapidly depleting nitrogen stored in body tissues. Plants also play important roles in stabilizing soil and providing cover for protection of desert tortoises from predators and heat.

The U.S. Geological Survey modeled desert tortoise habitat across the range of the desert tortoise (Nussear et al. 2009). This model, which is based on 3,753 desert tortoise locations, uses 16 environmental variables, such as precipitation, geology, vegetation, and slope. In addition, Nussear et al. used 938 additional occurrence locations to test the model's accuracy. Using this model and a 0.5 probability threshold based on the prevalence approach, the Service estimates that there are approximately 20,542,646 acres of potential desert tortoise habitat rangewide. This analysis likely omits some marginal desert tortoise habitat, and it does not consider habitat loss, fragmentation, or degradation associated with human-caused impacts; however, it provides a reference point relative to the amount of desert tortoise habitat.

Further information on the range, biology, habitat, and ecology of the desert tortoise is available in: Bury (1982); Bury and Germano (1994); Ernst et al. (1994); Jennings (1997); Service (2008); Tracy et al. 2004; Van Devender (2002); and collected papers in Chelonian Conservation and

Biology (2002, Vol. 4, No. 2), Herpetological Monographs (1994, No. 8), and the Desert Tortoise Council Proceedings.

Reproduction

Desert tortoises possess a combination of life history and reproductive characteristics that affect the ability of populations to survive external threats. Desert tortoises grow slowly, require 15 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; Tracy et al. 2004).

Choice of mate is mediated by aggressive male-male interactions and possibly by female choice (Niblick et al. 1994). Desert tortoises in the West Mojave Desert may exhibit pre-breeding dispersal movements, typical of other vertebrates, ranging from 1 to 10 miles in a single season (Sazaki et al. 1995). The advantage of pre-breeding dispersal may be to find a more favorable environment in which to reproduce. However, risks include increased mortality from predation, exposure, starvation, or anthropogenic factors (e.g., motor vehicle mortality).

The average clutch size is 4.5 eggs (range 1 to 8; on rare occasions, clutches can contain up to 15 eggs), with 0-3 clutches deposited per year (Turner et al. 1986). Clutch size and number probably depend on female size, water, and annual productivity of forage plants in the current and previous year (Turner et al. 1984, 1986; Henen 1997). The eggs typically hatch from late August through early October. The ability to alter reproductive output in response to resource availability may allow individuals more options to ensure higher lifetime reproductive success. The interaction of longevity, late maturation, and relatively low annual reproductive output causes desert tortoise populations to recover slowly from natural or anthropogenic decreases in density. To ensure stability or increased populations, these factors also require relatively high juvenile survivorship (75 to 98 percent per year), particularly when adult mortality is elevated (Congdon et al. 1993). Bjurlin and Bissonette (2004) determined that 74 percent of desert tortoise nests survived and, over 2 years, 84 and 91 percent of the neonates survived the initial period of post-hatching dispersal. They predicted that 40 percent of eggs produce hatchlings that survive to hibernation at their study site. Desert tortoises generally lay eggs from mid-May to early July, but occasionally as late as October (Ernst et al. 1994). Eggs are laid in sandy or friable soil, often at the entrance to burrows. Hatching occurs 90 to 120 days later, mostly in late summer and fall (mid-August to October). Eggs and young are untended by the parents.

Desert tortoise sex determination is environmentally controlled during incubation (Spotila et al. 1994). Hatchlings develop into females when the incubation (i.e., soil) temperature is greater than 88.7° F and males when the temperature is below that (Spotila et al. 1994). Mortality is higher when incubation temperatures are greater than 95.5° F or less than 78.8° F. The sensitivity of embryonic desert tortoises to incubation temperature may make populations vulnerable to unusual changes in soil temperature (e.g., from changes in vegetation cover).

At Yucca Mountain in Nye County, Nevada (Northeastern Mojave Recovery Unit), Mueller et al. (1998) estimated that the mean age of first reproduction was 19 to 20 years; clutch size (1 to 10 eggs) and annual fecundity (0 to 16 eggs) were related to female size but annual clutch frequency (0 to 2) was not. Further, Mueller suggested that body condition during July to October may determine the number of eggs a desert tortoise can produce the following spring. McLuckie and Fridell (2002) determined that the Beaver Dam Slope desert tortoise population, within the Northeastern Mojave Recovery Unit, had a lower clutch frequency (1.33 ± 0.14) per reproductive female and fewer reproductive females (14 out of 21) when compared with other Mojave desert tortoise populations. In the 1990s, Beaver Dam Slope experienced dramatic population declines due primarily to disease, and habitat degradation and alteration (Service 1994). 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 (Henen 1997; McLuckie and Fridell 2002).

Population Distribution and Monitoring

Patterns of desert tortoise distribution are available from preliminary spatial analyses in Tracy et al. (2004). Their analyses revealed areas with higher probabilities of encountering both live and dead desert tortoises. In the western Mojave Desert, areas with concentrations of dead desert tortoises without corresponding concentrations of live desert tortoises were generally the same areas where declines have been observed in the past, namely the northern portion of the Fremont-Kramer CHU and the northwestern part of the Superior-Cronese CHU. Limited data revealed large areas where dead desert tortoises, but no live desert tortoises, were observed in the Piute-Eldorado Valley and northern Coyote Spring Valley, Nevada, and the western and southern portions of the Ivanpah Valley CHU in California. Most other recently sampled areas (mostly within critical habitat) reveal continued desert tortoise presence, although local population declines are known within some of these areas, such as the Beaver Dam Slope, Arizona.

Rangewide desert tortoise population monitoring began in 2001 and is conducted annually. The status and trends of desert tortoise populations are difficult to determine based only upon assessment of desert tortoise density due largely to their overall low abundance, subterranean sheltering behavior, and cryptic nature of the species. Thus, monitoring and recovery should include a comprehensive assessment of the status and trends of threats and habitats as well as population distribution and abundance. Studies during early research on desert tortoises focused on basic biology and demography and were largely centered in areas with high densities of desert tortoises. These high-density areas were used to establish permanent (long-term) study plots that have been studied at various intervals from 1979 through the present, while some low-density plots were discontinued (Berry and Burge 1984; K. Berry, U.S. Geological Survey, pers. comm. 2003, as reported in Tracy et al. 2004). However, historic estimates of desert tortoise density or abundance do not exist at the range-wide or regional level for use as a baseline. While a substantial body of data has been collected from long-term study plots and other survey efforts over the years, plot placement is generally regarded as a factor limiting demographic and trend conclusions only to those specific areas. Tracy et al. (2004) concluded that estimating accurate

long-term trends of desert tortoise populations, habitat, and/or threats across the range was not feasible based on the combined suite of existing data and analyses. Instead, these data provide general insight into the rangewide status of the species and show appreciable declines at the local level in many areas (Luke et al. 1991; Berry 2003; Tracy et al. 2004).

In an attempt to refine the long-term monitoring program for the desert tortoise, annual rangewide population monitoring using line distance transects began in 2001 (1999 in the Upper Virgin River Recovery Unit; McLuckie et al. 2006) and is the first comprehensive effort undertaken to date to estimate densities across the range of the species (Service 2006a). Rangewide sampling was initiated during a severe drought that intensified in 2002 and 2003, particularly in the western Mojave Desert in California. At the time the 1994 Recovery Plan was written, there was less consideration of the potentially important role of drought in the desert ecosystem, particularly regarding desert tortoises. In the meantime, studies have documented vulnerability of juvenile (Wilson et al. 2001) and adult desert tortoises (Peterson 1994, Peterson 1996, Henen 1997, Longshore et al. 2003) to drought.

The monitoring program is designed to detect long-term population trends, so density estimates from any brief time period (e.g., 2001 to 2005) would be expected to detect only catastrophic declines or remarkable population increases. Therefore, following the first 5 years of the long-term monitoring project, the goal was not to document trends within this time period, but to gather information on baseline densities and annual and regional (between recovery unit) variability (Service 2006a). Density estimates of adult desert tortoises varied among recovery units and years. Only if this variability is associated with consistent changes between years will monitoring less than 25 years describe important trends. For instance, considerable decreases in density were reported in 2003 in the Eastern Colorado and Western Mojave recovery units, with no correspondingly large rebound in subsequent estimates (Service 2006a). Until the underlying variability that may affect our interpretation of these first years of data can be identified, inferences as to the meaning of these data should not be made. Over the first 5 years of monitoring, desert tortoises were least abundant in the Northeast Mojave Recovery Unit (0.68 to 8.30 desert tortoises per kilometer^2 [0.26 to 3.20 desert tortoises per mile^2] (Service 2009).

There are many natural causes of mortality, but their extents are difficult to evaluate and vary from location to location. Native predators known to prey on desert tortoise eggs, hatchlings, juveniles, and adults include: coyote, kit fox, badger (*Taxidea taxus*), skunks (*Spilogale putorius*), common ravens, golden eagles (*Aquila chrysaetos*), and Gila monsters (*Heloderma suspectum*). Additional natural sources of mortality to eggs, juvenile, and adults may include desiccation, starvation, being crushed (including in burrows), internal parasites, disease, and being turned over onto their backs during fights or courtship (Luckenbach 1982, Turner et al. 1987). Free-roaming dogs cause mortality, injury, and harassment of desert tortoises (Evans 2001). Population models indicate that for a stable population to maintain its stability, on average, no more than 25 percent of the juveniles and 2 percent of the adults can die each year

(Congdon et al. 1993, Service 1994). However, adult mortality at one site in the western Mojave Desert was 90 percent over a 13-year period (Berry 1997). Morafka et al. (1997) reported 32 percent mortality over five years among free-ranging and semi-captive hatchling and juvenile desert tortoises (up to five years old) in the western Mojave Desert. When the 26 that were known to have been preyed on by ravens were removed from the analysis, mortality dropped to 24 percent. Turner et al. (1987) reported an average annual mortality rate of 19 to 22 percent among juveniles over a nine-year period in the eastern Mojave Desert.

Declines in desert tortoise abundance appear to correspond with increased incidence of disease in some desert tortoise populations. The Goffs permanent study plot in Ivanpah Valley, California, suffered 92 to 96 percent decreases in desert tortoise density between 1994 and 2000 (Berry 2003). The high prevalence of disease in Goffs desert tortoises likely contributed to this decline (Christopher et al. 2003). Upper respiratory tract disease has not yet been detected at permanent study plots in the Colorado Desert of California, but is prevalent at study plots across the rest of the species' range (Berry 2003) and has been shown to be a contributing factor in population declines in the western Mojave Desert (Brown et al. 2002; Christopher et al. 2003). High mortality rates at permanent study plots in the northeastern and eastern Mojave Desert appear to be associated with incidence of shell diseases in desert tortoises (Jacobson et al. 1994). Low levels of shell diseases were detected in many populations when the plots were first established, but were found to increase during the 1980s and 1990s (Jacobson et al. 1994; Christopher et al. 2003). A herpesvirus has recently been discovered in desert tortoises, but little is known about its effects on desert tortoise populations at this time (Berry et al. 2002; Origgi et al. 2002).

The general trend for desert tortoises within the California Desert is one of decline. Tracy et al. (2004) concluded that the apparent downward trend in desert tortoise populations in the western portion of the range that was identified at the time of listing is valid and ongoing. Results from other portions of the range were inconclusive, but recent surveys of some populations found too few desert tortoises to produce population estimates (e.g., 2000 survey of the Beaver Dam Slope, Arizona), suggesting that declines may have occurred more broadly. Transects surveyed in the Western Mojave Recovery Unit that did not detect any sign over large areas of previously-occupied habitat, and the numerous carcasses found on permanent study plots provide evidence of a decline. During line distance sampling conducted in 8 DWMAs in California in 2003, 930 carcasses and 438 live desert tortoises were detected; more carcasses than live desert tortoises were detected in every study area (Woodman 2004). In 2004, workers conducting line distance sampling in California detected 1,796 carcasses and 534 live desert tortoises; more carcasses were detected than live desert tortoises in every study area (Woodman 2005). Below, we elaborate on patterns within each recovery unit.

Northeastern Mojave Recovery Unit

A kernel analysis was conducted in 2003-2004 for the desert tortoise (Tracy et al. 2004) as part of the reassessment of the 1994 Recovery Plan. The kernel analyses revealed several areas in which the kernel estimations for live desert tortoises and carcasses did not overlap. The pattern of non-overlapping kernels that is of greatest concern is those in which there were large areas

where the kernels encompassed carcasses but not live animals. These regions represent areas within DWMAs where there were likely recent die-offs or declines in desert tortoise populations. The kernel analysis indicated large areas in the Piute-Eldorado Valley where there were carcasses but no live desert tortoises. For this entire area in 2001, there were 103 miles of transects walked, and a total of 6 live and 15 dead desert tortoises found, resulting in a live encounter rate of 0.06 desert tortoises per mile of transect for this area. This encounter rate was among the lowest that year for any of the areas sampled in the range of the Mojave desert tortoise (Tracy et al. 2004).

Results of desert tortoise surveys at three survey plots in Arizona indicate that all three sites have experienced significant die-offs. Six live desert tortoises were located in a 2001 survey of the Beaver Dam Slope Exclosure Plot (Walker and Woodman 2002). Three had definitive signs of URTD, and two of those also had lesions indicative of cutaneous dyskeratosis. Previous surveys of this plot detected 31 live desert tortoises in 1996, 20 live desert tortoises in 1989, and 19 live desert tortoises in 1980. The 2001 survey report indicated that it is likely that there is no longer a reproductively viable population of desert tortoises on this study plot. Thirty-seven live desert tortoises were located in a 2002 survey of the Littlefield Plot (Young et al. 2002). None had definitive signs of URTD. Twenty-three desert tortoises had lesions indicative of cutaneous dyskeratosis. Previous surveys of this plot detected 80 live desert tortoises in 1998 and 46 live desert tortoises in 1993. The survey report indicated that the site might be in the middle of a die-off due to the high number of carcasses found since the site was last surveyed in 1998. Nine live desert tortoises were located during the mark phase of a 2003 survey of the Virgin Slope Plot (Goodlett and Woodman 2003). The surveyors determined that the confidence intervals of the population estimate would be excessively wide and not lead to an accurate population estimate, so the recapture phase was not conducted. One desert tortoise had definitive signs of URTD. Seven desert tortoises had lesions indicative of cutaneous dyskeratosis. Previous surveys of this plot detected 41 live desert tortoises in 1997 and 15 live desert tortoises in 1992. The survey report indicated that the site may be at the end of a die-off that began around 1996-1997.

Eastern Mojave Recovery Unit

The permanent study plot in the Ivanpah Valley is the only such plot in this DWMA; consequently, we cite information from that plot herein, although it is located within the Mojave National Preserve. Data on desert tortoises on a permanent study plot in this area were collected in 1980, 1986, 1990, and 1994; the densities of desert tortoises of all sizes per square mile were 386, 393, 249, and 164, respectively (Berry 1996).

The Shadow Valley DWMA lies north of the Mojave National Preserve and west of the Clark Mountains. It occupies approximately 101,355 acres. Data on desert tortoises on a permanent study plot in this area were collected in 1988 and 1992; the densities of desert tortoises of all sizes per square mile were 50 and 58, respectively (Berry 1996).

The Piute-Fenner DWMA lies to the east of the southeast portion of the Mojave National Preserve. It occupies approximately 173,850 acres. The permanent study plot at Goffs is the

only such plot in this DWMA; consequently, we cite information from that plot herein, although it is located within the Mojave National Preserve. Data on desert tortoises on the permanent study plot were collected in 1980, 1990, and 1994; Berry (1996) estimated the densities of desert tortoises of all sizes at approximately 440, 362, and 447 individuals per square mile, respectively. As Berry (1996) noted, these data seem to indicate that this area supported "one of the more stable, high density populations" of desert tortoises within the United States. Berry (1996) also noted that "a high proportion of the desert tortoises (had) shell lesions." In 2000, only 30 live desert tortoises were found; Berry (2003) estimated the density of desert tortoises at approximately 88 desert tortoises per square mile. The shell and skeletal remains of approximately 393 desert tortoises were collected; most of these desert tortoises died between 1994 and 2000. Most of the desert tortoises exhibited signs of shell lesions; three salvaged desert tortoises showed abnormalities in the liver and other organs and signs of shell lesions. None of the three salvaged desert tortoises tested positive for upper respiratory tract disease.

Ivanpah and Piute-Eldorado valleys contained study plots that were analyzed in the Eastern Mojave Recovery Unit analysis. While there was no overall statistical trend in adult density over time, the 2000 survey at Goffs and the 2002 survey at Shadow Valley indicate low densities of adult desert tortoises relative to earlier years. Unfortunately, there are no data in the latter years for all five study plots within this recovery unit, and therefore, while there is no statistical trend in adult densities, we cannot conclude that desert tortoises have not experienced recent declines in this area. The probability of finding a carcass on a distance sampling transect was considerably higher for Ivanpah, Chemehuevi, Fenner, and Piute-Eldorado, which make up the Eastern Mojave Recovery Unit.

Northern Colorado Recovery Unit

Two permanent study plots are located within the Chemehuevi DWMA. At the Chemehuevi Valley and Wash plot, 257 and 235 desert tortoises were registered in 1988 and 1992, respectively (Berry 1999). During the 1999 spring survey, only 38 live desert tortoises were found. The shell and skeletal remains of at least 327 desert tortoises were collected; most, if not all, of these desert tortoises died between 1992 and 1999. The frequency of shell lesions and nutritional deficiencies appeared to be increasing and may be related to the mortalities.

The Upper Ward Valley permanent study plot was surveyed in 1980, 1987, 1991, and 1995; Berry (1996) estimated the densities of desert tortoises of all sizes at approximately 437, 199, 273, and 447 individuals per square mile, respectively.

Eastern Colorado Recovery Unit

Two permanent study plots are located within this DWMA. At the Chuckwalla Bench plot, Berry (1996) calculated approximate densities of 578, 396, 167, 160, and 182 desert tortoises per square mile in 1979, 1982, 1988, 1990, and 1992, respectively. At the Chuckwalla Valley plot, Berry (1996) calculated approximate densities of 163, 181, and 73 desert tortoises per square mile in 1980, 1987, and 1991, respectively. Tracy et al. (2004) concluded that these data show a statistically significant decline in the number of adult desert tortoises over time; they further

postulate that the decline on the Chuckwalla Bench plot seemed to be responsible for the overall significant decline within the recovery unit.

The kernel analysis of the Eastern Colorado Recovery Unit shows that the distributions of the living desert tortoises and carcasses overlap for most of the region. The Chuckwalla Bench study plot occurs outside the study area, which creates a problem in evaluating what may be occurring in that area of the recovery unit. However, the few transects walked in that portion of the DWMA yielded no observations of live or dead desert tortoises. This illustrates our concern for drawing conclusions from areas represented by too few study plots and leaves us with guarded concern for this region. The percentage of transects with live desert tortoises was relatively high for most DWMAs within the Eastern Colorado Recovery Unit. In addition, the ratio of carcasses to live desert tortoises was low within this recovery unit relative to others.

Western Mojave Recovery Unit

This recovery unit includes the Pinto Mountains, Ord-Rodman, Superior-Cronese, and Fremont-Kramer DWMAs. Based on areas sampled within the Western Mojave Recovery Unit (Service 2009), we estimate 43,701 desert tortoises (with a 95 percent confident interval of 24,361 to 79,126 tortoises) occur in this recovery unit.

The 117,016-acre Pinto Mountains DWMA is located in the southeastern portion of the Western Mojave Recovery Unit. No permanent study plots are located in this proposed DWMA. Little information exists on the densities of desert tortoises in this area. Tracy et al. (2004) noted that the distribution of carcasses and live desert tortoises appeared to be what one would expect in a "normal" population of desert tortoises; that is, carcasses occurred in the same areas as live desert tortoises and were not found in extensive areas in the absence of live desert tortoises.

The Ord-Rodman DWMA is located to the southeast of the city of Barstow and covers approximately 247,080 acres. The 1994 Recovery Plan notes that the estimated density of desert tortoises in this area is 5 to 150 desert tortoises per square mile (Service 1994). Three permanent study plots are located within and near this proposed DWMA.
The Superior-Cronese DWMA is located north of the Ord-Rodman DWMA; two interstate freeways and rural, urban, and agricultural development separate them. This DWMA covers 629,389 acres. No permanent study plots have been established in this area; the density of desert tortoises has been estimated through numerous triangular transects and line distance sampling efforts. This DWMA supports densities of approximately 20 to 250 desert tortoises per square mile (Service 1994).

The Fremont-Kramer DWMA is located west of the Superior-Cronese DWMA; the two DWMAs are contiguous and cover approximately 511,901 acres. The 1994 Recovery Plan notes that the estimated density of desert tortoises in this area was 5 to 100 desert tortoises per square mile (Service 1994). Berry (1996) notes that the overall trend in this proposed DWMA is "a steep, downward decline" and identifies predation by common ravens and domestic dogs, off-

road vehicle activity, illegal collecting, upper respiratory tract disease, and environmental contaminants as contributing factors.

During the summers of 1998 and 1999, the BLM funded surveys of over 1,200 transects over a large area of the western Mojave Desert. These transects failed to detect sign of desert tortoises in areas where they were previously considered to be common. Although these data have not been fully analyzed and compared with previously existing information, they strongly suggest that the number of desert tortoises has declined substantially over large areas of the western Mojave Desert. The Desert Tortoise Recovery Plan Assessment Committee also noted that the Western Mojave Recovery Unit has experienced declines in the number of desert tortoises (Tracy et al. 2004).

The Western Mojave Recovery Unit has experienced marked population declines as indicated in the 1994 Recovery Plan and continues today. Spatial analyses of this Recovery Unit show areas with increased probabilities of encountering dead rather than live animals, areas where kernel estimates for carcasses exist in the absence of live animals, and extensive regions where there are clusters of carcasses where there are no clusters of live animals. Collectively, these analyses point generally toward the same areas within the Western Mojave Recovery Unit, namely the northern portion of the Fremont-Kramer DWMA and the northwestern part of the Superior-Cronese DWMA. Together, these independent analyses, based on different combinations of data, all suggest the same conclusion for the Western Mojave. Data are not currently available with sufficient detail for most of the range of the desert tortoise with the exception of the Western Mojave Recovery Unit (Tracy et al. 2004).

Upper Virgin River Recovery Unit

The 1994 Recovery Plan states that desert tortoises occur in densities of up to 250 adult desert tortoises per square mile within small areas of this recovery unit; overall, the area supports a mosaic of areas supporting high and low densities of desert tortoises (Service 1994). The Utah Division of Wildlife Resources (UDWR) has intensively monitored desert tortoises, using a distance sampling technique, since 1998. Monitoring in 2003 indicated that the density of desert tortoises was approximately 44 per square mile throughout the reserve. This density represents a 41 percent decline since monitoring began in 1998 (McLuckie et al. 2006). The report notes that the majority of desert tortoises that died within one year (n=64) were found in areas with relatively high densities; the remains showed no evidence of predation.

In the summer of 2005, approximately 10,446 acres of desert tortoise habitat burned in the Red Cliffs Desert Reserve. The UDWR estimated that as many as 37.5 percent of adult desert tortoises may have died as a direct result of the fires (McLuckie et al. 2006).

Summary

Density estimates of adult tortoises varied among recovery units and years. Over the first six years of range-wide monitoring (2001-2005, 2007), tortoises were least abundant in the

Northeast Mojave Recovery Unit (1 to 3.7 tortoises per kilometer^2 [2 to 10 tortoises per mile^2]; Service 2009), and the highest reported densities occurred in the Upper Virgin River Recovery Unit (15 to 27 tortoises per kilometer^2 [38 to 69 tortoises per mile^2]; McLuckie et al. 2008). Considerable decreases in density were reported in 2003 in the Eastern Colorado and Western Mojave recovery units (Service 2006a). However, the variability between annual estimates among all years is consistent with variability due to sampling between years; only after several years of consistent patterns will the range-wide approach distinguish population trends from the variability due to sampling. Beyond noting that no range-wide population losses or gains were detected, inferences as to the meaning of these first years of data would be premature.

Please refer to *The Status of the Desert Tortoise (*Gopherus agassizii*) in the United States* (Berry 1984) and the *Desert Tortoise Recovery Plan Assessment* (Tracy et al. 2004) for a detailed description of the methods and population trend and distribution analyses described above. In addition, *Range-wide Monitoring of the Mojave Population of the Desert Tortoise: 2007 Annual Report* (Service 2009) provides information regarding the current monitoring effort.

Based on information in the draft recovery plan (Service 2008), desert tortoise (Mojave population) is classified as a) at a moderate degree of threat, which, although increased since 1994, does not place the species at imminent risk of extinction; b) has a low potential for recovery, adjusted based on current uncertainties about various threats and our ability to manage them; c) is a listed population below the species level; and d) is in potential conflict with development or other forms of economic activity. We anticipate that implementation of the revised recovery plan will resolve key uncertainties about threats and management, thereby improving recovery potential.

Threats

The Service identified key threats when the Mojave population of the desert tortoise was emergency listed as endangered and subsequently listed as a threatened species, which remains valid today. The 1994 Recovery Plan discusses threats and developed recovery objectives to minimize their effects on the desert tortoise and allow the desert tortoise to recover. Since becoming listed under the Act, more information is available on threats to the desert tortoise with some threats such as wildfires and nonnative plants affecting large areas occupied by desert tortoises.

Nonnative plants continue to contribute towards overall degradation or habitat quality for the desert tortoise. Land managers and field scientists identified 116 species of nonnative plants in the Mojave and Colorado deserts (Brooks and Esque 2002). The proliferation of nonnative plant species has also contributed to an increase in fire frequency in desert tortoise habitat by providing sufficient fuel to carry fires, especially in the intershrub spaces that are mostly devoid of native vegetation (Service 1994; Brooks 1998; Brown and Minnich 1986). Changes in plant communities caused by nonnative plants and recurrent fire may negatively affect the desert

tortoise by altering habitat structure and species composition of their food plants (Brooks and Esque 2002).

Changing ecological conditions as a result of natural events or human-caused activities may stress individual desert tortoises and result in a more severe clinical expression of URTD (Brown et al. 2002). For example, the proliferation of non-native plants within the range of the desert tortoise has had far-reaching impacts on desert tortoise populations. Desert tortoises have been documented to prefer native vegetation over non-natives (Tracy et al. 2004). Nonnative, annual plants in desert tortoise critical habitat in the western Mojave Desert were identified to compose over 60 percent of the annual biomass (Brooks 1998). The reduction in quantity and quality of forage may stress desert tortoises and make them more susceptible to drought- and disease-related mortality (Brown et al. 1994). Malnutrition has been associated with several disease outbreaks in other chelonians (Borysenko and Lewis 1979).

Numerous wildfires occurred in desert tortoise habitat across the range of the desert tortoise in 2005 due to abundant fuel from the proliferation of nonnative plant species after a very wet winter. These wildfires heavily impacted two of the six desert tortoise recovery units, burning almost 19 percent of desert tortoise habitat in the Upper Virgin River and 10 percent in the Northeastern Mojave (Table 1). There were no significant fires from 2007 to 2009 in this area. In the Upper Virgin River Recovery Unit, 19 percent of the Upper Virgin River CHU burned. In the Northeastern Mojave Recovery Unit, three CHUs were impacted: approximately 23 percent of the Beaver Dam Slope CHU burned, 13 percent of the Gold Butte-Pakoon CHU, and 4 percent of the Mormon Mesa CHU. 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 is likely to require decades.

Table 1. Area (hectares) of desert tortoise Critical Habitat burned in the Northeastern Mojave and Upper Virgin River recovery units unit during 2005*.

Recovery Unit	Critical Habitat Unit	Total Area Burned	Percent Burned
Northeastern Mojave			
	Beaver Dam Slope	53,528	26
	Gold-Butte Pakoon	65,339	13
	Mormon Mesa	12,952	3
	non-Critical Habitat	404,685	-
Upper Virgin River			
	Upper Virgin River	10,557	19

*Complete data sources: NV fire data from the BLM as a single 2005 file: *http://www.BLM.gov/nv/st/en/prog/more_programs/geographic_sciences/gis/geospatial_data.html*; AZ fire data from Forest Service, part of historic files [cross referenced against the BLM ADSO fire data]: *http://www.fs.fed.us/r3/gis/datasets.shtml*; UT fire data from the BLM, as part of historic fires file: *http://www.BLM.gov/ut/st/en/prog/more/geographic_information/gis_data_and_maps.print.html.*

Disease and raven predation have been considered important threats to the desert tortoise since its emergency listing in 1989. What is currently known with certainty about disease in the desert tortoise relates entirely to individual desert tortoises and not populations; virtually nothing is known about the demographic consequences of disease (Tracy et al. 2004). Disease was identified in the 1994 Recovery Plan as an important threat to the desert tortoise. Disease is a natural phenomenon in wild populations of desert tortoises and can contribute to population declines by increasing mortality and reducing reproduction. However, URTD appears to be a complex, multi-factorial disease interacting with other stressors to affect desert tortoises (Brown et al. 2002; Tracy et al. 2004). The disease probably occurs mostly in relatively dense desert tortoise populations, as mycoplasmal infections are dependent upon higher densities of the host (Tracy et al. 2004).

From 1969 to 2004 the numbers of common ravens in the West Mojave Desert increased approximately 700 percent (Boarman and Kristan 2006). Population increases have also been noted at other locations particularly in the California Desert. This many-fold increase above historic levels and a shift from a migratory species to a resident species is due in large part to recent human subsidies of food, water, and nest sites (Knight et al. 1993, Boarman 1993, Boarman and Berry 1995). While not all ravens may include desert tortoises as significant components of their diets, these birds are highly opportunistic in their feeding patterns and concentrate on easily available seasonal food sources, such as juvenile desert tortoises.

Boarman (2002) identified the following major categories of threats: Agriculture, collection by humans, construction activities, disease, drought, energy and mineral development, fire, garbage and litter, handling and deliberate manipulation of desert tortoises, invasive or nonnative plants, landfills, livestock grazing, military operations, noise and vibration, OHV activities, predation, non-off-road vehicle recreation, roads, highways and railroads, utility corridors, vandalism, and wild horses and burros. For additional information on threats to the desert tortoise refer to Boarman (2002), Tracy et al. (2004), and Service (2008).

Desert Tortoise Critical Habitat – Rangewide Status

Desert tortoise critical habitat was designated by the Service to identify the key biological and physical needs of the desert tortoise and key areas for recovery, and focuses conservation actions on those areas. Desert tortoise critical habitat is composed of specific geographic areas that contain the primary constituent elements of critical habitat, consisting of the biological and physical attributes essential to the species' conservation within those areas, such as space, food, water, nutrition, cover, shelter, reproductive sites, and special habitats. The specific primary constituent elements of desert tortoise critical habitat are:

a. sufficient space to support viable populations within each of the six recovery units, and to provide for movement, dispersal, and gene flow;

b. sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species;

c. suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites;

d. sufficient vegetation for shelter from temperature extremes and predators; and

e. habitat protected from disturbance and human-caused mortality.

The CHUs were based on recommendations for DWMAs outlined in the *Draft Recovery Plan for the Desert Tortoise (Mojave Population)* (Service 1993). These DWMAs are also identified as desert tortoise ACECs by BLM. Because the critical habitat boundaries were drawn to optimize reserve design, the critical habitat unit may contain both "suitable" and "unsuitable" habitat. Suitable habitat can be generally defined as areas that provide the primary constituent elements.

Although recovery of the desert tortoise will focus on DWMAs/ACECs, section II.A.6. of the 1994 Recovery Plan and section 2(b) of the Act provide for protection and conservation of ecosystems on which federally-listed threatened and endangered species depend, which includes both recovery and non-recovery areas. The Mojave Desert ecosystem, of which the desert tortoise and its habitat are an integral part, consists of a dynamic complex of plant, animal, fungal, and microorganism communities and their associated nonliving environment interacting as an ecological unit (Noss and Cooperrider 1994). Actions that adversely affect components of the Mojave Desert ecosystem may directly or indirectly affect the desert tortoise. The 1994 Recovery Plan further states that desert tortoises and habitat outside recovery areas may be important in recovery of the tortoise. Healthy, isolated desert tortoise populations outside recovery areas may have a better chance of surviving catastrophic effects such as disease, than large, contiguous populations (Service 1994).

The 1994 Recovery Plan recommended DWMAs and subsequently the Service designated CHUs based on these proposed DWMAs (Service 1993). When designated, desert tortoise critical habitat contained all the primary constituent elements of desert tortoise critical habitat. The following seven principles of conservation biology serve as the standards by which the Service determines whether or not the CHUs are functioning properly:

a. *Reserves should be well-distributed across the species' range.* The entire range of the Mojave desert tortoise occurs within one of the six recovery units identified in the 1994 Recovery Plan and at least one DWMA and CHU occurs within each recovery unit. The reserves remain well-distributed across the range of the desert tortoise.

b. *Reserves should contain large blocks of habitat with large populations of target species.* The desert tortoise requires large, contiguous areas of habitat to meet its life requisites. Each DWMA and its associated CHUs that were designated to conserve contiguous blocks of habitat that exceed 500,000 acres, with the exception of the Upper Virgin River Recovery Unit (Table 2). The Upper Virgin River Recovery Unit does not meet the minimum size requirement identified in the 1994 Recovery Plan; however, the Service anticipates that reserve-level management will adequately conserve the desert tortoise

within this recovery unit. Designation of CHUs were based largely on transect data and included areas with the largest populations of desert tortoises.

c. *Blocks of habitat should be close together.* This principle was met when CHUs were designated and remains valid.

d. *Reserves should contain contiguous rather than fragmented habitat.* This principle was met when CHUs were designated and generally continue to be met. Desert tortoise-proof fencing has been constructed along major roads and highways that traverse critical habitat including Interstate 15 in Nevada and California (Ivanpah Valley DWMA/CHU), U.S. Highway 95 (US 95) in Nevada (Piute-Eldorado DWMA/CHU), and Highway 58 in California (Fremont-Kramer DWMA/CHU). Major roads and highways alone constitute a barrier to desert tortoise movements without fencing; however, the fencing minimized take of desert tortoises and culverts or underpasses allow for limited desert tortoise movement across the road or highway.

e. *Habitat patches should contain minimal edge-to-area ratios.* This principle was met when CHUs were designated and generally continue to be valid. Notable exceptions include the northern Gold Butte-Pakoon CHU, and the southern termini of the Mormon Mesa, Ivanpah Valley, and Chuckwalla CHUs which have large edge-to-area ratios and further compromised by highways that traverse these relatively narrow areas within the CHUs.

f. *Blocks should be interconnected by corridors or linkages connecting protected, preferred habitat for the target species.* Most CHUs are contiguous with another CHU with the exception of Ord-Rodman, Ivanpah Valley, Gold Butte Pakoon, and Upper Virgin River CHUs. Interstate 15 and the Virgin River separate the Gold Butte-Pakoon CHU from other CHUs in the Northeastern Mojave Recovery Unit. Similarly, Interstate 40 separates the Piute-Eldorado and Chemehuevi CHUs, and Ord Rodman and Superior-Cronese CHUs.

g. *Blocks of habitat should be roadless or otherwise inaccessible to humans.* Achieving this principle is the most problematic. A 2001 inventory of roads in the western Mojave Desert suggests that road density increased from the mid-1980s. Further evaluation should be conducted as some of the recently mapped roads were actually historical roads especially with the advent of effective mapping capabilities (Tracy et al. 2004). Roads are abundant in desert tortoise habitat rangewide and may be increasing in density (Tracy et al. 2004).

The 1994 Recovery Plan contains conservation recommendations for desert tortoise critical habitat. The recommendations include the elimination of grazing by livestock, feral burros and horses on desert tortoise critical habitat. Since approval of the 1994 Recovery Plan, livestock grazing in desert tortoise critical habitat has been substantially reduced. BLM and the National

Park Service (NPS) manage for zero burros in Nevada in critical habitat and the California Desert Managers Group developed a burro management plan in 2004.

The status of the desert tortoise and its critical habitat has been impacted by decades of human activities. In their 1991 report, the GAO found that livestock grazing practices of the late 1880s and early 1990s badly damaged desert lands in the southwest. Domestic livestock grazing on BLM's hot desert allotments continue to pose the greatest risk of long-term environmental damage to a highly fragile resource. The GAO offered several options for consideration by Congress including the discontinuation of livestock grazing in hot desert areas. They concluded that BLM did not have the resources to properly manage the intensity of livestock grazing in hot deserts. Without sufficient monitoring data, BLM will not have the necessary data to change active preference levels and overgrazing may occur (GAO 1991).

Many of the threats to the desert tortoise exist across broad portions of the species' range. We have developed a prototype decision support system that uses the best data that could be obtained within the planning process and provides a guide as to what additional data are most needed. The initial datasets provide a structure and way to prioritize the next round of data gathering, particularly including impacts to critical habitat. These data, including future updates, will be made publicly available through the Recovery Implementation Team (RIT) process. Data are not readily available to quantify the number of acres of critical habitat that have been degraded; however, we are currently in the process of assembling various spatial data layers, such as aerial photography and satellite-derived land cover data, to complete these sorts of analyses as part of the RITs' prioritization and evaluation of recovery actions. To date, protection of these lands has not been sufficient to recover the species and lands outside critical habitat have become more important for recovery.

Table 2. Desert Tortoise CHUs, DWMAs, and Recovery Units—Size and Location

CHU	SIZE (ac.)	STATE	DWMA	RECOVERY UNIT
Chemehuevi	937,400	CA	Chemehuevi	Northern Colorado
Chuckwalla	1,020,600	CA	Chuckwalla	Eastern Colorado
Fremont-Kramer	518,000	CA	Fremont-Kramer	Western Mojave
Ivanpah Valley	632,400	CA	Ivanpah Valley	Eastern Mojave
Pinto Mtns.	171,700	CA	Joshua Tree	Western Mojave/ Eastern Colorado
Ord-Rodman	253,200	CA	Ord-Rodman	Western Mojave
Piute-Eldorado- CA Piute-Eldorado- NV	453,800 516,800	CA NV	Fenner Piute-Eldorado	Eastern Mojave Northeastern & Eastern Mojave
Superior-Cronese	766,900	CA	Superior-Cronese Lakes	Western Mojave
Beaver Dam:	87,400 74,500 42,700	NV UT AZ	Beaver Dam Beaver Dam Beaver Dam	Northeastern Mojave (all)
Gold Butte-Pakoon	192,300 296,000	NV AZ	Gold Butte-Pakoon Gold Butte-Pakoon	Northeastern Mojave (all)

Mormon Mesa	427,900	NV	Mormon Mesa Coyote Spring	Northeastern Mojave
River	54,600	UT	Upper Virgin River	Upper Virgin River

Further information on desert tortoise critical habitat can be found in the following documents:

- Desert Tortoise Recovery Plan Assessment Report (Tracy et al. 2004)—all CHUs
- Final Environmental Impact Report and Statement for the West Mojave Plan (BLM 2005)— Fremont-Kramer CHU, Superior-Cronese CHU, Ord-Rodman CHU, and Pinto Mountains CHU
- Mojave National Preserve General Management Plan (NPS 2002)—Ivanpah Valley CHU and Piute-Eldorado CHU
- Northern and Eastern Colorado Coordinated Management Plan (BLM 2002a)—Chemehuevi CHU, Pinto Mountains CHU, and Chuckwalla CHU
- Northern and Eastern Mojave Desert Management Plan (BLM 2002b)—Ivanpah Valley CHU, Piute-Eldorado CHU, and Chemehuevi CHU
- Clark County Multiple Species HCP (RECON 2000)—Beaver Dam Slope CHU, Mormon Mesa CHU, Gold Butte-Pakoon CHU, and Piute-Eldorado CHU
- Washington County HCP (Washington County Commission 1995)—Upper Virgin River CHU
- Desert Tortoise (Mojave Population) Recovery Plan and Proposed Desert Wildlife Management Areas for Recovery of the Mojave Population of the Desert Tortoise (companion document to the Desert Tortoise Recovery Plan) (Service 1994)—all CHUs

ENVIRONMENTAL BASELINE

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 and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion, we consider the action area to include the 75-foot-wide footprint and right-of-way of the rail alignment, the Victorville passenger station, Baker MOW, Victorville OMSF, utility corridor right-of-way, TCAs, the 162.5-foot temporary construction area along the permanent rail alignment (when appropriate), and the 300-foot-wide buffer around all project facilities and work areas to account for effects associated with construction noise, dust, and the potential relocation of desert tortoises. For most of the project areas for the rail alignment, this 300-foot-wide area extends only on one side of Interstate 15 because desert tortoises would not be moved to the opposite side of the freeway from where they are found, and construction noise and dust would be masked by the freeway. Within Segment 4c, and where the alignment would deviate far enough from the freeway, the 300-foot-wide area extends to both sides of the project right-of-way.

Habitat Characteristics of the Action Area

The biological assessment (ICF International 2010) provides a more detailed description of the action area. In general, creosote bush and saltbush shrub complexes characterize a majority of the action area within desert tortoise habitat; desert holly shrub, Joshua tree woodland, blackbrush shrub, and mesquite shrub are also present. Dry lake beds are also present in the action area. The action area also crosses several urbanized and rural areas.

Where the right-of-way is adjacent to the freeway, habitat is generally disturbed by activities associated with the freeway. The amount of disturbance generally decreases as the distance from the freeway increases. The proposed right-of-way is least disturbed where it is most distant from Interstate 15 in the Ivanpah Valley.

Environmental Baseline for Each Segment of the Proposed Right-of-way

In the following paragraphs, we have provided information on the likely status of desert tortoises, status of critical habitat, land status, and previous consultations in the action area in a segment-by-segment manner. Unless otherwise cited, the following discussion is based on the aerial photographs of the right-of-way in the biological assessment (ICF International 2010) and general knowledge of Service staff.

Segment 1

The proposed right-of-way and most of its ancillary facilities are located on the north side of Interstate 15 from its western terminus until just west of Halloran Summit in Segment 3.

Abundance of Desert Tortoises. Generally, we expect that desert tortoises would be more abundant in the eastern portion of this segment, as the distance from the urbanized area of Victorville increases. We expect that relatively few desert tortoises occur within this segment because of its proximity to the freeway, the amount of unauthorized off-road vehicle use that occurs, and the presence of sheep grazing.

We expect that few desert tortoises occur along the route of the proposed utility corridor that would extend from west of the Mojave River to the Victorville OMSF.

Critical Habitat. This segment does not contain any critical habitat.

Previous Consultations in the Action Area. In a biological opinion issued to the Federal Highway Administration on March 29, 2001, we determined that the widening of the southbound side of Interstate 15 from Barstow to Victorville was not likely to jeopardize the continued existence of the desert tortoise (1-8-00-F-37, Service 2001a). We estimated that few desert tortoises were likely to be killed or injured in the 263 acres that would be temporarily disturbed or permanently lost as a result of this project. To the best of our knowledge, no desert tortoises

were killed or injured during construction.

On November 7, 2001, we issued a biological opinion to the Federal Highway Administration for the widening of the northbound side of Interstate 15 from Victorville to Barstow (1-8-01-F-58, Service 2001b). We concluded that the few desert tortoises likely to be killed or injured and the disturbance or permanent loss of 355 acres of habitat was not likely to jeopardize the continued existence of the desert tortoise. To the best of our knowledge, no desert tortoises were killed or injured during construction.

On June 30, 2003, the Service issued a biological opinion to the BLM regarding the effects of the designation of routes of travel in the western Mojave Desert on the desert tortoise and its critical habitat (1-8-03-F-21, Service 2003). As a result of the proposed action, the BLM designated routes of travel on public lands as open, closed, or limited to vehicular use. The proposed action resulted in a reduction in the mileage of open routes on public lands; additionally, any route that was not designated as open was considered to be an unauthorized route. The Service concluded that the BLM's designation of routes of travel was not likely to jeopardize the continued existence of the desert tortoise or adversely modify its critical habitat. Although the Service did not estimate the number of desert tortoises that could be killed or injured by the project because of the large size of the action area and the patchy distribution of desert tortoises, it required the BLM to contact the Service to determine if re-initiation was necessary if more than 5 desert tortoises were found dead or injured in a 12-month period.

On January 9, 2006, the Service issued a biological opinion to the BLM regarding the effects of a proposed amendment to the California Desert Conservation Area Plan for the western Mojave Desert on the desert tortoise and its critical habitat (1-8-03-F-58, Service 2006b). The BLM's proposed action was a substantial revision of the California Desert Conservation Area Plan, with the fundamental goal of adopting numerous management prescriptions that were intended to promote the recovery of the desert tortoise. These prescriptions addressed grazing, land use classification, recreation, and numerous other elements of the BLM's management of the western Mojave Desert, including a minor revision of the route network considered in the consultation discussed in the previous paragraph. Of particular note to this segment, the BLM reaffirmed its previous decision, made under the Western Mojave Land Tenure Adjustment Project, to make most of the public land between Victorville and Barstow available for disposal. The Service concluded that the BLM's amendment of the California Desert Conservation Area Plan for the western Mojave Desert was not likely to jeopardize the continued existence of the desert tortoise or adversely modify its critical habitat because the vast majority of changes addressed in the amendment reduced the intensity of use and were protective of the desert tortoise.

As a result of projects that they have undertaken in this area, the Federal Highway Administration and California Department of Transportation have installed fencing to prevent desert tortoises from entering Interstate 15 from Barstow to approximately half way to Victorville.

Segment 2C

Abundance of Desert Tortoises. We expect that relatively few desert tortoises occur within the right-of-way between Lenwood and Barstow because of the development associated with these two areas. Desert tortoises are absent from the proposed right-of-way where it traverses the developed areas of Lenwood and Barstow.

East of Barstow, the proposed right-of-way crosses the Mojave River. From the eastern side of the Mojave River to the western edge of Calico Dry Lake, the right-of-way likely supports a small number of tortoises; this number may increase as the right-of-way approaches the dry lake because the distance between the right-of-way and the freeway increases in this area. Desert tortoises do not occur on the dry lake. East of Calico Dry Lake to the end of the segment, the number of desert tortoises within the right-of-way likely decreases as it moves closer to the freeway in this area.

Critical Habitat. This segment enters the Superior-Cronese Critical Habitat Unit east of Barstow, for approximately 5.5 miles (3 miles west of Calico Dry Lake and 2 miles at the eastern end of the segment). The primary constituent elements of critical habitat are likely degraded to some degree where the right-of-way is adjacent to Interstate 15. Fort Irwin Road (located to the west of Calico Dry Lake) probably fragments this portion of the critical habitat unit to some degree. East of the dry lake, the primary constituent elements of critical habitat may be disrupted to some degree, in the west, by the scattered residences and, in the east, by proximity of the right-of-way to Interstate 15.

Previous Consultations in the Action Area. The biological opinions regarding route designation and the amendment of the California Desert Conservation Area Plan for the western Mojave Desert also apply to this segment. The BLM manages a relatively small amount of land in this segment; lands within the Superior-Cronese Critical Habitat Unit and Desert Wildlife Management Area are to be retained, under the provisions of the amendment to the California Desert Conservation Area Plan.

On May 3, 2002, the Service determined that the proposed widening of Fort Irwin Road from Interstate 15 to Fort Irwin was not likely to jeopardize the continued existence of the desert tortoise or adversely modify its critical habitat. As part of the proposed action, the County of San Bernardino installed fencing to prevent desert tortoises from entering the road. The proposed DesertXpress right-of-way crosses Fort Irwin Road and the fence near Interstate 15.

Segment 3B

Abundance of Desert Tortoises. Generally, we expect that desert tortoises would be relatively more abundant in this segment than in the more westerly segments because this area is more isolated from development. Desert tortoises are likely to be most abundant in two portions of this segment. First, the area from just west of Minneola Road to the western edge of the Cronese

Basin generally supports appropriate habitat, with the exceptions of a few small developed areas, primarily near freeway exits. Second, from the western edge of the Cronese Basin to slightly east of the community Baker, we expect relatively few desert tortoises to be present because of the development around Baker and, outside of the developed area, the abundance of sandy habitat that is at lower elevations than desert tortoises usually occur.

TCA 6 is located south of Interstate 15, to the east of Yermo. We are unfamiliar with this area in relation to desert tortoises. Based on our experience with this general location, it may be too sandy to support desert tortoises.

Desert tortoises are likely absent along the route of the proposed utility corridor near the community of Baker because of the low elevation in this area. As the distance from Baker increases to the east and the elevation increases, sandy substrates transition to ones more suitable for desert tortoises. We expect that this area would support a relatively higher number of desert tortoises, except in areas adjacent to freeway off ramps, where service stations or other disturbed areas occur and as the elevation increases at Halloran Summit and near Mountain Pass. Segment 3 ends south of the Clark Mountains, in Mountain Pass. Generally, we expect desert tortoises to be absent from the area around Mountain Pass because of the higher elevation, disturbance associated with the Molycorp Mine, and the proximity of the right-of-way to the freeway. We note, however, that a few desert tortoises have been found near the western perimeter of the mine, at elevations over 4,000 feet.

The proposed right-of-way crosses to the south side of Interstate 15 near the western edge of Shadow Valley. It returns to the northern side of the freeway at the Halloran Summit Road.

Critical Habitat. This segment passes through the Superior-Cronese Critical Habitat Unit, from its end to the western edge of the Cronese Basin for approximately 30 miles. This entire reach is adjacent to the freeway; consequently, the primary constituent elements of critical habitat are degraded to some degree in the area adjacent to Interstate 15.

East of Baker and west of Mountain Pass, this segment passes through the Ivanpah Critical Habitat Unit for approximately 25 miles. Again, the proposed alignment is adjacent to Interstate 15, which likely contributes to some degree of degradation of the primary constituent elements of critical habitat.

Previous Consultations in the Action Area. In 2001, the Service issued a biological opinion to the Federal Highway Administration for the construction of a southbound truck-descending lane and widening of Interstate 15 between Baker and Mountain Pass (1-8-02-F-3, Service 2001c). In this biological opinion, the Service concluded that the proposed action was not likely to jeopardize the continued existence of the desert tortoise or adversely modify its critical habitat and that few, if any, desert tortoises would be killed or injured by the proposed action. As a result of this consultation, the California Department of Transportation installed fencing to prevent desert tortoises from entering the freeway from just east of Baker to Mountain Pass.

The previously described biological opinions regarding route designation and the amendment of the California Desert Conservation Area Plan apply to the western portion of this segment. The BLM's western Mojave Desert planning area, to which these documents apply, ends a few miles west of Baker. Public lands in this segment are to be retained, under the provisions of amendments to the California Desert Conservation Area Plan.

The BLM's northern and eastern Mojave Desert planning area begins where the western planning area ends and extends to the Nevada border. The Service issued a biological opinion regarding the effects of route designation for areas outside of critical habitat for this planning area on June 7, 2004 (1-8-04-F-11, Service 2004). We concluded that the BLM's proposed action, which was similar to that described for the western Mojave Desert planning area, was not likely to jeopardize the continued existence of the desert tortoise. Although the Service did not estimate the number of desert tortoises that could be killed or injured by the project because of the large size of the action area and the patchy distribution of desert tortoises, it required the BLM to contact the Service to determine if re-initiation was necessary if more than 5 desert tortoises were found dead or injured in a 12-month period. To date, we are aware of one desert tortoise that was likely killed as a result of casual use of an open route in this area. In late 2010, a desert tortoise was found dead in the road near a construction area in Ivanpah Valley; given the circumstances surrounding the carcass, the BLM determined that the desert tortoise was likely killed by someone using the road under its causal use provisions.

On March 31, 2005, the Service concluded that the BLM's proposed amendment to the California Desert Conservation Area Plan for the northern and eastern Mojave Desert planning area was not likely to jeopardize the continued existence of the desert tortoise or adversely modify its critical habitat (1-8-04-F-43R, Service 2005). This consultation addressed essentially the same issues we discussed previously for the California Desert Conservation Area Plan amendment for the western Mojave Desert; route designation in this consultation addressed only those routes within critical habitat.

The Army installed fencing along the southbound side of Interstate 15 from near the Minneola Road exit in the west to near the Afton Canyon Road exit in the east to prevent desert tortoises from entering Interstate 15. The Army undertook this action as part of its overall plan to add maneuver lands at Fort Irwin; this action was discussed in a biological opinion that the Service issued to the Army on December 29, 2006 ((1-8-05-F-43, Service 2006c).

Segment 4C

Abundance of Desert Tortoises. We expect that desert tortoises would be absent or extremely rare in the area around Mountain Pass, because of the higher elevation and the disturbance associated with the rare earth mine on the eastern side of the pass. As the segment crosses the alluvial fan in Ivanpah Valley, we expect that desert tortoises would be relatively abundant because of the higher quality habitat and distance from the freeway. As the segment moves closer to Ivanpah Dry Lake and the community of Primm, we expect the number of desert

tortoises to decrease because the substrate becomes more silty and human disturbance increases. Although the quality of habitat improves north of Primm, the proximity of the segment in this area to Interstate 15 likely causes the number of desert tortoises to remain low.

Critical Habitat. This segment does not contain any critical habitat.

Previous Consultations in the Action Area. The biological opinions regarding route designation and the amendment of the California Desert Conservation Area Plan for the eastern Mojave Desert also apply to this segment.

On October 1, 2010, the Service issued a biological opinion to the BLM for the construction, operation, and maintenance of a solar power plant in the northern portion of Ivanpah Valley (8-8-10-F-24, Service 2010a). As a result of this biological opinion, which concluded that the proposed action was not likely to jeopardize the continued existence of the desert tortoise, the project proponent was required to translocate numerous desert tortoises from the project site into surrounding areas. In March, 2011, the BLM re-initiated formal consultation on the proposed action because, in part, it believed that the number of desert tortoises likely to be found during the second and third phases of construction of the solar power plant is likely to exceed that which we predicted in our biological opinion. If DesertXpress proceeds with construction in this area, the proposed right-of-way is likely to cross areas into which desert tortoises from the solar power plant have been translocated.

Segment 5B

Abundance of Desert Tortoises. North of the Sloan Interchange on Interstate 15, we expect desert tortoises would be relatively uncommon because of degraded habitat conditions immediately adjacent to the freeway.

Critical Habitat. This segment does not contain any critical habitat.

Previous Consultations in the Action Area. On November 22, 2000, the Service issued an incidental take permit (TE-034927) to Clark County, Nevada; this incidental take permit also included cities within the county and the Nevada Department of Transportation. The incidental take permit allows incidental take of desert tortoise for a period of 30 years on 145,000 acres of non-federal land in Clark County and within the Nevada Department of Transportation's rights-of-way, south of the 38th parallel in Nevada. The multispecies habitat conservation plan and environmental impact statement (RECON 2000) serves as the permittees' habitat conservation plan and details their proposed measures to minimize, mitigate, and monitor the effects of covered activities. The action area is included within the covered area for the habitat conservation plan and includes the Nevada Department of Transportation's actions without a Federal nexus within the Interstate 15 right-of-way.

Segment 6B

Abundance of Desert Tortoises. Approximately 7 miles of the northern end of this segment occurs in the urbanized Las Vegas area; desert tortoise habitat adjacent in this area is highly degraded or absent. We anticipate that very few desert tortoises occur in this section.

Critical Habitat. This segment does not contain any critical habitat.

Previous Consultations in the Action Area. The incidental take permit discussed in the previous section also applies to this area.

Summary

Abundance of Desert Tortoises. We expect few desert tortoises to be present in the right-of-way where the alignment is adjacent to Interstate 15. Where the alignment is adjacent to the freeway, we expect the portions of the proposed rail line that are within or adjacent to developed areas to support fewer desert tortoises than areas that are more distant. We expect desert tortoises to be absent from dry lake beds and areas with low (e.g., Baker) or high (e.g., Mountain Pass) elevations.

The alignment leaves the freeway at Calico Dry Lake and through Ivanpah Valley. We expect desert tortoises to be more abundant in these areas because they are farther from Interstate 15. Because of the greater length of the Ivanpah Valley segment and generally higher quality habitat (i.e., the presence of a dry lake in the Calico segment), we expect this segment supports more desert tortoises.

Critical Habitat. Segment 2c crosses two portions of the Superior-Cronese Critical Habitat Unit for a total of approximately 5.5 miles. Segment 3B continues through the same portion of the Superior-Cronese Critical Habitat Unit as Segment 2c for approximately 30 miles. Segment 3B crosses the Ivanpah Critical Habitat Unit for approximately 25 miles. For most of these distances, the proposed right-of-way is adjacent to Interstate 15.

Previous Consultations in the Action Area. In California, the action area for the proposed right-of-way crosses the action areas of numerous previous consultations; in Nevada, the action area for the incidental take permit for Clark County overlaps the entire action area of the proposed action. Although actions upon which we previously consulted (including the incidental take permit) affected the current action area in many ways, we expect that, where Interstate 15 is adjacent to the proposed DesertXpress right-of-way, the primary factor influencing desert tortoises and their critical habitat in the action area is the freeway. We expect that, at least where desert tortoise fencing has not been installed, the density of desert tortoises is reduced in these areas; where it has been installed, densities are unlikely to have recovered to the extent that they are the same as the overall densities of desert tortoises in the regions. We also expect that the quality of critical habitat in the portions of the proposed alignment that are adjacent to the

freeway have been degraded to some degree by the use of freeway.

Estimated Number of Desert Tortoises in the Action Area

The Service uses line-distance sampling to estimate the density of desert tortoises greater than 180 millimeters in length in monitored areas within recovery units. We averaged the densities from sampling years 2007 through 2010 in the Western, Eastern, and Northeastern Recovery Units (Service 2009, 2010b, 2010c). We do not have extensive data on the density of desert tortoises in the areas of the recovery units that le outside desert wildlife management areas and critical habitat. In areas outside of desert wildlife management areas and critical habitat, data were generally collected using methods other than line-distance sampling and are not comparable to the numbers obtained through line-distance sampling. Consequently, for the purposes of this biological opinion, we are basing the number of desert tortoises likely to occur in the action area solely on data collected within desert wildlife management areas and critical habitat. This number is likely an overestimate of the actual number of animals in the action area.

We used the densities derived from line distance sampling for the Western Mojave, Eastern Mojave, and Northeastern Recovery Units as the primary source of information to arrive at our estimate. The assumptions we used to derive our estimate are:

1. Although these densities were derived from areas that generally supported the highest densities of desert tortoises (i.e., desert wildlife management areas, critical habitat), we have used the same densities for areas outside of these managed areas.

2. We have not attempted to adjust the number of desert tortoises to account for the depressed densities that generally occur adjacent to freeways or for animals that may remain in habitat undisturbed by the proposed action between the rail line and the freeway.

3. We have not developed a separate estimate for desert tortoises smaller than 180 millimeters; instead, we will use the number of animals based on the average densities of desert tortoises larger than 180 millimeters to estimate the total number of desert tortoises.

The following table shows the average densities of desert tortoises in the three recovery units and the total number of individuals we estimate to be present within the action area.

Rail Line Segments by Recovery Unit	Average Density (tortoises per square mile)	Acreage Lost (square miles)	Number of Desert Tortoises
Western Mojave	10.1	4.05	41
Eastern Mojave	13.5	1.98	27
Northeastern Mojave	6.0	2.79	17

Estimating the number of desert tortoises in any large action area is difficult; when the action

area extends across numerous habitat types, several regions of the desert, and both disturbed and undisturbed areas, any estimate has a substantial probability of inaccuracy. Given the best available information regarding the density of desert tortoises in the region and adjacent to freeways, we expect that the number of desert tortoises depicted in the table is very likely an overestimate of the numbers of animals in the action area. However, we believe that this estimate provides a reasonable data point from which to analyze the effects of the proposed action on the desert tortoise.

We have not attempted to quantify the number of nests and eggs that may be present in the action area. The decreased density of desert tortoises adjacent to the freeway would likely result in a decreased number of nests; given the various assumptions needed to derive the number of nests in any given area and the greater number of assumptions we used to derive the estimated number of desert tortoises for this action area, we predict little value in carrying through with these assumptions to estimate the number of nests and eggs.

EFFECTS OF THE ACTION

We will conduct our analysis in a step-wise manner. First, we will consider the general effects of the construction, operation, and maintenance of a rail line and its ancillary facilities on the desert tortoise and its critical habitat. In the second step, we will consider how these general impacts are likely to affect the specific segments of the proposed action.

Additionally, because the proposed action is a design-build project, the FRA cannot, at this time, provide specific information on some aspects of the rail line. For example, although the right-of-way would generally be located immediately adjacent to Interstate 15 for most of its alignment, we do not know where it would be in relation to existing facilities, including any desert tortoise fencing that is currently in place along Interstate 15. Consequently, some areas that are identified as being temporarily disturbed in the biological assessment may be located between the freeway and the rail line and, thus, would be unusable by desert tortoises even if the plant community is restored. In other cases, small patches of undisturbed habitat would remain between the freeway and the rail line; depending on whether these areas are connected to the opposite site of the rail line by bridges or culverts of a sufficient size, these areas may also be unavailable to desert tortoises. To address these issues, for the purpose of the analysis in this biological opinion, we will assume all temporary disturbance identified in the biological assessment is permanent. Upon completion of the detailed design of the rail line, the FRA will re-assess the amount of temporary and permanent disturbance and undisturbed but isolated fragments of habitat. If the amount of disturbance and isolated habitat exceeds the amount we analyzed in this biological opinion to a degree that the overall effects upon the desert tortoise and its critical habitat trigger the re-initiation criteria defined at 50 CFR 402.16, the FRA will re-initiate formal consultation. If the FRA's re-assessment reveals new effects that can be adequately addressed through additional protective measures (e.g., additional culverts to reduce fragmentation, etc.), any additional consultation required may be addressed through the Service's written concurrence. The FRA and Service discussed and agreed upon this approach in a

telephone conversation and exchange of electronic mail on April 1, 2011 (Steinwert 2011).

Effects to Desert Tortoises

Capture and Relocation of Desert Tortoises

DesertXpress will capture and relocate all desert tortoises from the fenced (temporary and permanent) project areas and any other portion of the action area when the animal is in harm's way due to project-related activities. DesertXpress will move all project site desert tortoises approximately 300 feet from the limit of disturbance (i.e., beyond the 162-foot-wide temporary construction area) to reduce the potential for animals walking the fence (in an attempt to return to the capture site) or being indirectly affected by construction activities within the project area. Animals moved in this manner may attempt to return to the portions of their territory on the far side of the fence. In past studies, at least a small percentage of translocated desert tortoises that had been radio-tagged tried to return to their capture sites (Nussear 2004). We expect that these animals would eventually become acclimated to the new boundaries of their territories and cease attempts to return.

Releasing a desert tortoise outside of its home range, far from known burrows, or away from shade may be detrimental to its health (Stewart 1993 in Boarman 2002); such a release could be particularly hazardous during hot, dry weather or late in the afternoon when the body temperatures of stressed desert tortoises could reach fatal levels. However, we expect that most desert tortoises along the proposed alignment are likely to be moved short distances and, therefore, are likely to be familiar with the release areas.

The movement of desert tortoises into areas adjacent to the project area could potentially affect the home ranges of desert tortoises already outside of the project area, but within the release area. This movement could slightly increase the density within the release area. However, we do not expect that relocated animals would be so concentrated that it would substantially alter the density of desert tortoises in the relocation area. Given that Saethre et al. 2003 (in Esque et al. 2005) did not observe possible effects until densities reached 1,295 desert tortoises per square mile and the densities within the project area are already far below this number, we expect that the translocation is unlikely to affect resident animals in a substantial manner as a result of increased densities. In addition, we anticipate all desert tortoises moved from the proposed alignment are likely to be moved a short distance and, therefore, are likely to be familiar with the adjacent area and the desert tortoises that reside in the area.

A potential exists that desert tortoises would be relocated into isolated sections of habitat, such as when an existing rail line is parallel to but not immediately adjacent to the new alignment . Small sections of habitat would also be isolated when the rail alignment deviates slightly from the freeway. Because DesertXpress will ensure movement of desert tortoises can persist by installing culverts underneath the rail alignment, these animals will likely be able to access adjacent habitat.

An elevated level of transmission of disease is also unlikely to occur because the relocated animals would likely have previous contact with other individuals in the area. For this reason, these short-distance relocations are unlikely to affect desert tortoises in the action area in a substantial manner.

Handling desert tortoises sometimes causes them to void the contents of their bladder, which may represent loss of important fluids and this loss could be fatal (Averill-Murray 1999 in Boarman 2002). Averill-Murray 1999 (in Boarman 2002) provided some evidence that handling-induced voiding may adversely affect survivability, although the amount of fluid discharged is usually small. In addition, disease transmission could occur if people handle more than one desert tortoise without sterilizing their hands or using different clean or sterilized gloves for each handling (Rosskopf 1991, and Berry and Christopher 2001 in Boarman 2002). Because DesertXpress will hire Service-approved biologists (i.e., individuals that are aware of the most current protocols and guidelines and that demonstrate substantial field experience and training to safely and successfully conduct their required duties) to relocate the animals, these occurrences are unlikely.

Because disturbance areas on this project are small or linear in shape, movement of desert tortoises immediately outside of the work area is not likely to remove them from their current home ranges. Consequently, any desert tortoise moved will likely continue to occupy familiar territory and use known shelter sites and is unlikely to suffer post-translocation mortality associated with displacement from the work area.

Subadult and adult desert tortoises are generally large enough to be observed during clearance surveys. Juvenile desert tortoises are less likely to be found during surveys and as a result are more likely to be injured or killed during project activities.

Construction of Facilities and Rail Alignment

DesertXpress will permanently fence with desert tortoise exclusion fencing the Victorville Passenger Station, the Victorville OMSF, and the 75-foot permanent right-of-way. They will temporarily fence with desert tortoise exclusion fencing all construction site areas that are beyond the perimeter of the right-of-way, including the TCAs. After the fences are installed, DesertXpress will remove all desert tortoises from the sites prior to ground disturbance. During construction of the perimeter fencing and during other ground-disturbing activities that are outside of the fenced facilities (i.e., utility line corridor), DesertXpress will perform pre-activity clearance surveys and employ monitors to move desert tortoises out of harm's way if they re-enter work areas. All personnel on site will be given environmental awareness training, will inspect for animals underneath vehicles and other equipment before moving, and will not exceed 15 miles per hour when driving within the action area. For these reasons, we anticipate that construction, including construction access, is unlikely to kill larger desert tortoises. Some potential always exists that surveyors may miss an individual during clearance surveys and

construction monitoring. We cannot predict how many adult desert tortoises that clearance surveys and construction monitoring would miss. However, because DesertXpress will use qualified biologists, authorized by the Service for clearance surveys, we anticipate that the number is likely to be small.

Juvenile desert tortoises and eggs are difficult to detect during surveys and construction monitoring; therefore, the potential exists that surveyors may miss them and they may remain in the work areas during construction activities. We cannot predict how many juvenile desert tortoises or eggs surveyors may miss because we cannot predict how many would be in the action area at the time of project implementation; eggs are particularly vulnerable because they are buried. Ground-disturbing activities, such as grading and trenching, may crush desert tortoises and eggs missed during pre-clearance surveys or bury eggs so deep that they may not hatch. Because DesertXpress will use qualified biologists, authorized by the Service, for clearance surveys, we anticipate that the few, if any, individuals will remain after the clearance surveys. As a caveat to this discussion, desert tortoise eggs are not present throughout the entire year; consequently, if construction occurs after eggs have hatched and before desert tortoises have laid the next year's clutches, eggs would not be destroyed by the project's activities.

Construction of the rail line would, in some places, separate areas of habitat that would otherwise not be directly affected by the proposed project from larger blocks of habitat. In such cases, any desert tortoises that may reside in these areas would be isolated and effectively lost from the population. Because the proposed action is a design-build project, we cannot fully assess, at this time, whether culverts intended to maintain the integrity of washes would be sufficient to maintain connectivity between desert tortoises across the rail alignment. The number, type, and location of culverts installed across the alignment as it deviates from the freeway would determine, to a large degree, whether adequate connectivity would persist; the presence of the alignment may still hinder their ability to disperse if the culverts are not sited and constructed appropriately in relation to the existing territories of resident desert tortoises. In some cases, depending on various factors, such as the condition and amount of habitat and number of desert tortoises that would be isolated, an attempt to maintain connectivity may be inappropriate or infeasible. For example, if the area that would be isolated by the alignment is small and contained degraded habitat and no or few desert tortoises, the benefits of designing, building, and maintaining adequate culverts to promote connectivity may not be reasonable.

Operation and Maintenance Activities

The biological assessment lists numerous measures that will be implemented during construction. The biological assessment, however, does not include details of what operation and maintenance activities will occur or what minimization measures will be implemented to reduce impacts to the desert tortoise during these activities.

Operation and maintenance activities within permanently fenced areas are unlikely to directly injure or kill any desert tortoises. Over the life of this project, DesertXpress may need to perform some ground-disturbing maintenance activities outside of fenced areas (i.e., repairing desert tortoise exclusion fence, maintaining utility corridor components, removing debris from culverts). These activities have the potential to injure or kill desert tortoises primarily as a result of vehicles strikes, as workers travel to and from work sites outside of the fenced areas; a limited possibility exists that animals could be injured or killed by equipment or workers moving around a work site.

We do not have extensive information regarding the types of operation or maintenance activities. We anticipate that the potential for injury or mortality of desert tortoises to result from these activities would generally be low because most of these activities would occur within the desert tortoise-proof fence. We expect that activities occurring outside the fence would be infrequent and fairly limited in size and duration. If such activities occurred outside the fence, desert tortoises would be exposed to threats similar to those we described for construction.

Passengers and employees would access the Victorville station via Dale Evans Parkway. Desert tortoises attempting to cross the road may be killed or injured by their vehicles; however, we expect that few individuals will be killed or injured in this manner. We expect few desert tortoises to be killed or injured at this location because of its proximity to Victorville and to the freeway.

Boarman (2002) describes the manner in which rail lines can affect desert tortoises. Because DesertXpress will fence, with permanent exclusion fencing, the 75-foot-wide right-of-way, desert tortoises will be prevented from accessing the rail bed and tracks. If desert tortoises breach the fence or the fence is damaged by flood events, desert tortoises can enter the right-of-way and become trapped between the rails; they then may be injured or killed.

Desert tortoises may become trapped inside the culverts that will be installed throughout the rail alignment if a debris flow occurs while they are in the culvert. Improperly designed riprap or other devices to control erosion can block passage of desert tortoises by making the culverts inaccessible or entrap desert tortoises that may fall into spaces between rocks.

The operation of the high-speed passenger train will generate increased noise and vibration throughout the action area. The recovery plan for the desert tortoise (Service 1994) notes that noise can mask the approach of predators and disrupt communication between individuals; loud noises may damage a desert tortoise's hearing permanently. In a laboratory study, Bowles et al. (1999) demonstrated that most of the subject desert tortoises responded to noise (such as jet noise and sonic booms) by ceasing activities, such as foraging or digging, for periods of time. We cannot assess how far away from the train desert tortoises would be affected and whether or not it will change their behavior. Operation of the train could potentially prevent desert tortoises from re-occupying the area immediately adjacent to the desert tortoise fence. Conversely, the animals, after some time, may become habituated and move back into the area.

Where the alignment is immediately adjacent to the freeway, the fenced right-of-way may provide some benefit to desert tortoises. Currently, drivers along Interstate 15 drop trash from their vehicles, which attracts common ravens; they also pull off the road and disturb habitat and potentially spread non-native weeds. Finally, overheated or burning vehicles can start fires that spread far beyond the freeway right-of-way. These effects are may be eliminated in areas where the freeway is no longer immediately adjacent to desert tortoise habitat.

Increased Predation by Common Ravens and Coyotes

The construction, operation, and maintenance of the proposed rail line may cause some increased use of the area by common ravens and coyotes because they will be attracted to the human activity. Common ravens are likely to use the newly constructed utility lines and other structures for perching, roosting, and nesting. Increased use of the area by common ravens and coyotes is likely to lead to increased predation of desert tortoises.

Common ravens and coyotes may also be attracted to carcasses of small animals that are killed by trains. We cannot determine whether the train would kill small animals (e.g., kangaroo rats, pocket mice, etc.) that the fence would not prevent from entering the area or that may reside within the fenced area. If carcasses are present, common ravens would certainly be able to find and access them. We are unable to predict if the train operations would have a greater effect on the amount of small animals killed in relation to the highway. Coyotes may also be able to enter the fenced right-of-way; they routinely breach other fences intended to prevent their access to landfills.

DesertXpress has proposed numerous measures to address predation by common ravens and coyotes associated with the project site. These measures include a litter-control program and prompt removal of road-killed animals. Despite these measures, common ravens are likely to use the proposed structures for perching, roosting, and nesting. We cannot assess the degree to which the number of common ravens and coyotes would increase or reasonably predict the amount of predation by common ravens and coyotes that construction, operation, and maintenance of this project is likely to add to baseline levels within the action area. We anticipate that the measures proposed by DesertXpress will likely be somewhat effective in controlling common raven and coyote use of the action area.

General Effects on Critical Habitat of the Desert Tortoise

In this section, we will consider the general effects of the proposed action on habitat of the desert tortoise. We will use the primary constituent elements of critical habitat as a starting point for this discussion because they provide a thorough description of the habitat components necessary for desert tortoises to thrive. However, we will consider how impacts to the primary constituent elements affect critical habitat with regard to its potential destruction or adverse modification only in those areas where the Service has designated critical habitat. The primary constituent elements of critical habitat for the desert tortoise are: 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; suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites; sufficient vegetation for shelter from temperature extremes and predators; and habitat protected from disturbance and human caused mortality.

With regard to the first primary constituent element, the proposed action would result in the reduction of the space available to support viable populations and to provide for movement, dispersal, and gene flow. The degree that the reduction of the amount of space would affect desert tortoises is a function of the location and quality of the lost habitat. In general, habitat that is of lower quality is not as important for supporting viable populations.

The degree to which movement, dispersal, and gene flow would be affected is related primarily to the location of the lost habitat. For example, lost habitat at an edge beyond which individuals of the species can no longer survive would generally not impede movement, dispersal, and gene flow; conversely, the creation of a barrier in the center of a species' range could severely impede movement, dispersal, and gene flow.

The second through fifth primary constituent elements (sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species; suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites; sufficient vegetation for shelter from temperature extremes and predators) are related to the plant species desert tortoises require for food and shelter, the substrates that are necessary for these plants to grow and for desert tortoises to construct burrows, and the burrows and other shelter sites they use. In short, these features are the components of the environment that relate to a desert tortoise's need for food and shelter. These features would be eliminated in all areas where the rail line or its ancillary structures would be constructed and in temporary construction areas. (Because of the nature of utility corridors for electrical powerlines, we anticipate that relatively small areas of habitat loss would be distributed along a corridor in which most habitat remains undisturbed.) Where DesertXpress would maintain its right-of-way and construct buildings, the loss of habitat would be permanent; in staging and temporary construction areas, these four elements of desert tortoise habitat would be removed on a long term basis; depending on the type of the substrate, the degree of compaction resulting from work activities, weather, and subsequent use, the recovery of these areas could vary from complete (albeit over a period of decades) to non-existent.

Non-native plant species currently occur on the proposed project site and are likely to occur in other portions of the action area at varying densities. Construction, maintenance, and operation of the proposed project have the potential to increase the distribution and abundance of non-native species within the action area due to ground-disturbing activities that favor the establishment of non-native species. In addition, access to the project site and other project features by construction and operations personnel is likely to increase the volume and

distribution of non-native seed carried into the action area. The increased abundance in non-native species associated with this project may result in an increased fire risk, which may result in future habitat loss beyond the action area.

We cannot reasonably predict the increase in non-native species abundance that this project will create within the action area. DesertXpress has proposed measures to monitor for and control invasive species during construction and throughout the operational life of the project; consequently, these measures may reduce the spread of non-native weeds and the related increased risk of fire.

Effects to the sixth primary constituent element, habitat protected from disturbance and human caused mortality, would likely vary, depending upon several factors. The noise and vibration associated with construction would disrupt this element to some degree. This potential exists that this effect would be masked by the noise that currently emanates from Interstate 15, both in terms of the freeway's noise and vibration being indistinguishable to desert tortoises from that of construction and through the habituation to noise and vibration of animals currently residing near the freeway. The introduction of this level of disturbance into habitat that is not adjacent to the freeway may affect desert tortoises in a more substantial manner.

We do not know if the vibration and noise from a train passing by would be substantially different than that currently generated by the freeway. Noise and vibration from the freeway are relatively constant, which may lead to desert tortoises habituating to this disturbance more easily. During operation, the FRA (2010) estimates that trains would pass by any given point fewer than 70 times per day. The potential exists that desert tortoises would habituate to this frequency of disturbance.

We have no information regarding the long-term effects of the operation of rail lines on the distribution of desert tortoises; however, we have not observed an obvious depression in the density of desert tortoises adjacent to rail lines, as has been observed adjacent to roads. The noise and vibration from a high speed train may differ from that emitted by a freight train; we do not know whether these differences, if they occur, would affect desert tortoises differently.

Effects of Each Segment on the Desert Tortoise and its Critical Habitat

Segment 1

Desert Tortoise. Construction of the Victorville utility line would affect desert tortoises. Because we expect that few desert tortoises occur in this area and the overall amount of disturbance would be relatively minor, we expect that few desert tortoises are likely to be killed or injured; most individuals encountered are likely to be moved from harm's way. Operation and maintenance of the utility line are also likely to affect few desert tortoises, because of the relatively few individuals present and the low intensity of the activities. Common ravens would use the utility line towers for perching, roosting, and nesting.

Construction of the Victorville OMSF and the passenger station would isolate a small amount of habitat between the facilities and Interstate 15 that would not be disturbed by construction. This area would no longer be available for desert tortoises to use and animals already occupying this patch of habitat could become isolated. Because few occur in close proximity to the urbanized are of Victorville and Interstate 15, we anticipate few tortoises would be affected.

Any other areas of habitat between the proposed alignment and the freeway would be considered lost because desert tortoises would no longer be able to access them if adequate connections to habitat north of the rail line are not maintained; such areas may occur where the proposed right-of-way crosses freeway offramps. These areas are considered to be relatively degraded because of the close proximity to the freeway and very few desert tortoises would likely be present. For these reasons, we anticipate the loss of habitat to be minimal in relation to existing suitable habitat and the number of desert tortoises affected to be very few.

Construction of Segment 1, including its ancillary facilities, would result in a habitat loss of approximately 762.18 acres. This loss of habitat is not substantial in relation to the existing amount of suitable habitat available in large part because it is mostly distributed in a linear manner, adjacent to 17 miles of Interstate 15. The linear nature of the habitat loss and its location adjacent to the freeway decrease, at least to some degree, the severity of the impact for several reasons. First, because the freeway has already severely fragmented habitat in this portion of the desert, the proposed action would not contribute substantially to additional fragmentation. Second, because the habitat loss extends a relatively short distance from the freeway, we expect that most of a desert tortoise's home range would remain in place after construction. This assumption is based on the premise that most home ranges are likely not linear in nature, at least in part because of the decreased amount of desert tortoise sign that is generally found adjacent to freeways (Hoff and Marlow 2002). Third, habitat adjacent to freeways is often degraded for some distance from the edge of the road because of trash, routine maintenance, casual use by drivers, and fires.

Finally, this area is not considered essential for the survival and recovery of the species because it is located outside of critical habitat and does not provide an important linkage between any such areas.

Critical Habitat. This section does not cross any areas of critical habitat. Consequently, none will be affected by this segment.

Segment 2C

Desert Tortoises. Very few desert tortoises would be affected between Lenwood and Barstow because of the development associated with these two areas. In addition, the habitat lost as a result of the construction of the rail alignment is considered to be relatively degraded because of the close proximity to the freeway. For these reasons, we expect few desert tortoises would be present and few would be affected.

The potential exists that more desert tortoises would be affected within the right-of way from Fort Irwin Road to the west side of Calico Dry Lake and from the east side of the dry lake to where the rail alignment reconnects with Interstate 15, because habitat becomes more suitable as distance from the freeway increases. This portion of the project would also fragment habitat between the alignment and the freeway and possibly isolate desert tortoises within this area, if they are present. We understand that DesertXpress will install culverts in washes in this area, but we have no information on how many culverts will be installed. Consequently, the home ranges of some desert tortoises will be bisected by the rail alignment.

The amount of suitable habitat that would be isolated where the rail alignment deviates from the freeway would be approximately 405.56 acres. This amount includes a small portion of designated critical habitat (discussed below); however, the remaining areas are not crucial for the survival and recovery of the species because they are located outside of critical habitat and do not provide an important linkage between any such areas.

Construction of Segment 2C would result in the direct loss of approximately 563.64 acres of habitat, some of which would include critical habitat (discussed below). This loss of habitat is not substantial in relation to the existing amount of suitable habitat available in large part because it is mostly distributed in a linear manner, adjacent to 11 miles of Interstate 15. In addition, this area (excluding designated critical habitat) is not considered essential for the survival and recovery of the species or to provide an important linkage between any such areas.

Critical Habitat. This segment, along with Segment 3b, would cross the Superior-Cronese Critical Habitat Unit and result in a loss of a total of approximately 1,118.78 acres of critical habitat. The affected area would account for 0.15 percent of the total acreage (766,900) within the critical habitat unit.

As the segment deviates from Interstate 15 at Fort Irwin Road and across Calico Dry Lake, the proposed action would affect the first primary constituent element (sufficient space to support viable populations and provide for movements, dispersal, and gene flow) as it separates one portion of the critical habitat unit from another. DesertXpress will install culverts where washes occur along the alignment. As we discussed in the Effects to Desert Tortoises - Construction of Facilities and Rail Alignment section of this biological opinion, many factors would affect whether these culverts adequately maintain connectivity. Because the rail alignment would be, at the most, 0.5 mile from the freeway and the isolated areas are partially developed, we anticipated the habitat would already be degraded, to some degree. In addition, the affected habitat would be a small percentage of the entire habitat within the Superior-Cronese Unit and would not appreciably reduce the function and conservation value of the critical habitat unit.

The potential also exists for this portion of the rail alignment (separated from the freeway right-of-way) to eliminate the primary constituent element from downstream habitat as a result of altered hydrology and, therefore, modified soil conditions and available forage species. Because culverts would be constructed along the alignment to ensure each wash remains active, the

existing hydrological patterns would likely remain. For this reason, and because the habitat is already partially developed, we do not anticipate habitat downstream from the rail alignment to be altered to an extent that would eliminate the second primary constituent element.

The second through sixth primary constituent elements (sufficient quantity and quality of forage species and the proper soil conditions to provide for the growth of such species; suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites; sufficient vegetation for shelter from temperature extremes and predators; and habitat protected from disturbance and human caused mortality) would be eliminated from the entire segment's construction area. This loss would not appreciably diminish the function and conservation value of the critical habitat unit, because a majority of the loss of habitat would occur in a linear manner through habitat that has already been degraded to some degree, due to its proximity to the freeway.

In summary, the effects on the Superior-Cronese Critical Habitat Unit from constructing the proposed action would likely be minimal. Only a small portion (0.15 percent) of the entire critical habitat designation for the desert tortoise would be affected. Habitat that would be affected is already degraded to some degree and culverts would be used to ensure connectivity across the proposed project; therefore, the survival and recovery function within designated critical habitat would not be substantially affected by the proposed project activities.

Segment 3B

Desert Tortoises. The potential exists that more desert tortoises would be affected in this segment than in the previous two because it is more isolated from development and high quality habitat is present. The alignment would be adjacent to the freeway for its entire length; therefore, we continue to expect the number of affected desert tortoises to be small. Culverts will be installed throughout the alignment in the same locations where culverts are located underneath Interstate 15, to promote connectivity with the far side of Interstate 15.

This segment also includes a few areas where the habitat undisturbed by the proposed project would remain between the rail line and the freeway. This potential isolation of habitat would affect desert tortoises in the same as we discussed for Segment 1; however, because we expect more desert tortoises to be present in this segment, the overall impact may be somewhat greater.

Construction of the Baker utility line would affect very few, if any, desert tortoises because they would likely be absent in this area because of existing disturbance associated with the community of baker and the generally unsuitable habitat in this area.

Construction of Segment 3b, including ancillary facilities, would result in a habitat loss of approximately 2,536.04 acres (including critical habitat; we will discuss the effects on critical habitat later in this section). We consider the affected areas to be relatively degraded because of their proximity to the freeway and not essential for the survival and recovery of the species or to

provide an important linkage between any such area. The fact that this habitat loss would be mostly distributed in a linear manner along 85 miles of Interstate 15 also decreases its overall value for the desert tortoise.

Critical Habitat. The western part of this segment would pass through the Superior-Cronese Critical Habitat Unit. We discussed the general effects on the primary constituent elements of critical habitat and the scale of the impacts in the General Effects on Critical Habitat of the Desert Tortoise and Segment 2C – Critical Habitat sections of this biological opinion, respectively.

The habitat loss in the Superior-Cronese Critical Habitat Unit as a result of constructing Segment 3 would not appreciably diminish the conservation value and function of critical habitat because most of the loss would occur in a linear manner, over approximately 33 miles of the critical habitat unit. Additionally, a portion of this area has already been degraded to some degree, due to its proximity to Interstate 15.

This segment would also pass through the Ivanpah Critical Habitat Unit and result in a loss of approximately 734.46 acres. The affected area would account for 0.12 percent of the total acreage (632,400 acres) within the critical habitat unit.

In both Segments 2c and 3, the proposed action would not appreciably affect the first primary constituent element (sufficient space to support viable populations and provide for movement, dispersal, and gene flow) because the freeway already constitutes a substantial barrier; desert tortoises can cross the freeway only at existing culverts. The proposed action may not increase the barrier to gene flow because the existing culverts under Interstate 15 would be extended under the rail alignment. Research along Highway 58 has demonstrated that desert tortoises will use long culverts under roads; we are not aware of whether the length of a culvert may ultimately pose a barrier in and of itself.

The second through sixth primary constituent elements (sufficient quantity and quality of forage species and the proper soil conditions to provide for the growth of such species; suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites; sufficient vegetation for shelter from temperature extremes and predators; and habitat protected from disturbance and human caused mortality) would be eliminated from the construction area. This loss would not appreciably diminish the conservation value and function of critical habitat, because the loss of habitat would occur in a linear manner through habitat that has already been degraded to some degree, due to its proximity to the freeway.

The effects on the Ivanpah Critical Habitat Unit from constructing the proposed action would likely be minimal because only a small portion (0.12 percent) of the critical habitat unit would be affected. Therefore, this loss would not appreciably diminish the conservation value and function of critical habitat because it would occur in a linear manner over approximately 25

miles of the critical habitat unit. Additionally, a portion of the habitat that would be lost has already been degraded to some degree, due to its proximity to the freeway.

Segment 4C

Desert Tortoises. In the Mountain Pass area, where the elevation is higher and the terrain is rockier, we expect that very few, if any, desert tortoises would be affected because very few would be present.

As the segment crosses the alluvial fan in Ivanpah Valley, we expect more desert tortoises to be affected because the proposed alignment is located far from Interstate 15 through most of this area. Consequently, construction, operation, and maintenance of this segment of the proposed rail line would likely have the greatest effect on desert tortoises of the entire right-of-way. Culverts and over crossing structures will be installed throughout this segment (at every natural drainage and at regular intervals) to attempt to ensure that construction and operation of the alignment does not alter the existing hydrology and plant communities of the alluvial fan, either uphill or downhill of the right-of-way. We anticipate the number of crossings that would be installed across the alignment throughout the valley, to be sufficient enough to allow for continued movement of desert tortoises across the project.

The potential effect of the proposed rail line on the function and habitat quality of the alluvial fan in the Ivanpah Valley is another area of the proposed action where the design-build nature of the project presents challenges to a thorough analysis. Consequently, the Service will conduct this analysis under the assumption that habitat quality in the Ivanpah Valley will not be altered by the proposed rail line, except for areas that are directly affected by construction. Upon completion of the final design, the FRA and Service will conduct an independent review of the potential effects of that design upon the alluvial fan; this review will be conducted by someone who is familiar with the geomorphological process of alluvial fans. If this review indicates that the effects of the rail line would be different than that considered in this biological opinion, the FRA would re-initiate formal consultation. The FRA and Service discussed and agreed upon these approaches to these issues in a telephone conversation and exchange of electronic mail on April 1, 2011 (Steinwert 2011).

If the function of the alluvial fan is disrupted, we expect that the effects would be similar to what's visible in other situations that may be similar to the proposed action. For example, structures built across alluvial fans (e.g., dikes constructed to protect roads, large canals in Imperial County) have resulted in the pooling of water against the uphill side of the structure. This pooling generally results in the accumulation of finer materials against the structure; these materials tend to reduce infiltration of water into the ground, the growth of numerous species of weedy plants, and a reduction in the diversity of plants normally found on alluvial fans. Effects on the downhill side of the structure are generally even more extensive. The reduction in the amount of sheet flow across the alluvial fan alters the plant community as large areas of the fan receive less water during rainstorms. Conversely, washes that are downstream of culverts receive more water and the plant community in these areas is converted to species that require

more water.

Desert tortoises are distributed across the alluvial fans in Ivanpah Valley; consequently, they are likely deriving their ecological needs at least in part from the dynamic processes that occur on alluvial fans. If the proposed alignment alters these processes, the habitat quality of the alluvial fans could be severely diminished. Decreased habitat value would likely lead to an overall decrease in the number of desert tortoises in this area.

As the segment moves closer to Ivanpah Dry Lake and the community of Primm, we expect few desert tortoises to be affected because fewer animals would occur in this area. Although the quality of habitat improves north of Primm, as the distance from the dry lake bed increases, the proximity of the segment in this area to Interstate 15 would likely cause the number of desert tortoises present to remain low; therefore, we anticipate few would be affected.

In Nevada, the rail alignment would be constructed within the Nevada Department of Transportation right-of-way for Interstate 15, which is fenced to exclude desert tortoises. This section includes the adjacent Large-Scale Translocation Site where over 7,000 desert tortoises have been translocated beginning in 1997. Tortoise densities within this fenced section should be very low; desert tortoises present would have entered through breaches in the fence from adjacent habitat.

Construction of Segment 4, including ancillary facilities, would result in a habitat loss of approximately 890.09 acres. Although this area is not within critical habitat, it provides important connectivity between the Ivanpah Critical Habitat Unit to the southwest and the Piute-El Dorado Critical Habitat Unit to the east. The proposed rail line is likely to decrease connectivity to some degree within a portion of Ivanpah Valley, where it leaves the freeway and travels across the alluvial fan. We do not expect connectivity to be completely severed in this area because DesertXpress intends to install numerous culverts and over crossing structures. Given that desert tortoises are relatively conservative genetically, the proposed alignment is unlikely to result in severe long-term effects with regard to gene flow because at least some individuals would cross the alignment over time.

The effect of the rail line on desert tortoises whose home ranges are severed or reduced would be more immediate. Desert tortoises that lose part of their home range may shift their range, which could bring them into conflict with neighboring desert tortoises. If they are unable to shift their home range because of dominant neighbors or because unsuitable habitat bars prevents it, these animals may not breed and may eventually become stressed and die.

Finally, desert tortoises that have been translocated from the solar power plant that is currently under construction in Ivanpah Valley may have moved into the proposed alignment of the rail line. Some potential exists that the movement of these animals out of harm's way during construction may cause levels of stress that are greater than those that would be experienced by a desert tortoise being moved for the first time. If these individuals experience additional stress, their translocation may kill or injure them.

Critical Habitat. This segment would not cross any areas of critical habitat. Consequently, none would be affected by this segment.

Segment 5b

Desert Tortoise. North of the Sloan Interchange on Interstate15, we expect desert tortoises would be relatively uncommon because of degraded habitat conditions immediately adjacent to the highway and a long history of mortalities along the unfenced section of the freeway.

Construction of Segment 5, including ancillary facilities, would result in a habitat loss of approximately 740.18 acres. We consider this to be a relatively small amount in relation to the existing amount of suitable habitat available, especially because this disturbance would occur in a linear manner along 25 miles of the freeway. In addition, the area is not considered essential for the survival and recovery of the species and is not important as a linkage between such areas.

Critical Habitat. This segment would not cross any areas of critical habitat. Consequently, none would be affected by this segment.

Segment 6

Desert Tortoise. From 1.5 miles south of Sloan Road to the interchange of Interstate 15/St. Rose Parkway, the segment would be adjacent to Interstate 15 and the habitat would be highly degraded or absent. Because of the proximity to the freeway and to the urbanized area of Las Vegas, we anticipate very few desert tortoises to be present.

The remainder of the segment, east of Interstate 15/St. Rose Parkway interchange, would be within the greater Las Vegas area and desert tortoise habitat would be absent. Consequently, desert tortoises would not be affected by this segment.

Construction of Segment 6, including ancillary facilities, would result in a habitat loss of approximately 152.9 acres. We consider this to be a relatively small amount in relation to the existing amount of suitable habitat available. In addition, the area is not considered essential for the survival and recovery of the species and is not important as a linkage between such areas.

Critical Habitat. This segment would not cross any areas of critical habitat. Consequently, none would be affected by this segment.

Effects of Compensatory Measures

DesertXpress proposes to provide funds to the BLM to implement management actions to benefit desert tortoises over time. These actions could involve habitat acquisition, population or habitat enhancement, research, reducing loss of individual animals, funding of line distance sampling, and preserving distinct population attributes. The implementation of these measures would benefit desert tortoises by promoting their long-term conservation and providing us with

additional information to guide future recovery actions. Some potential exists that the implementation of these actions may have short-term adverse effects on desert tortoises. Because we do not know the specific manner in which these funds would be expended, we cannot analyze these effects at this time. Instead, the BLM would need to consult with us when it begins planning to implement these actions.

Summary

Desert Tortoise

Based upon the best information, we estimate that approximately 85 desert tortoises occur within the areas to be disturbed as a result of construction of the proposed rail line and its ancillary facilities. Because of the measures proposed by the FRA and DesertXpress, we expect that most of these desert tortoises would be moved from harm's way. Because they would be moved a short distance from their point of capture, we do not expect that these desert tortoises would be exposed to substantially elevated levels of stress or threat of exposure to disease. Because we expect the most of the action area to support few desert tortoises, we expect that desert tortoises moved from harm's way into adjacent habitat are unlikely to experience overcrowding because of the presence of resident animals.

We expect that some desert tortoises may be killed or injured by construction, operation, and maintenance of the proposed rail line and its ancillary facilities. Because we do not know that precise number of desert tortoises in the action area, the specific instances when proposed measures would fail to protect desert tortoises, and the circumstances when workers engaged in operation and maintenance activities would encounter desert tortoises, we cannot predict how many desert tortoises are likely to be killed or injured as a result of the proposed action. Because of the protective measures and the fact that most of the rail line would be sited adjacent to Interstate 15, we expect that relatively few desert tortoises would be killed or injured. The loss of these individuals would not appreciably affect the reproduction or numbers of desert tortoises in the wild.

The proposed project may result in a slight increase in subsidies to common ravens as a result of new utility lines and structures. We cannot determine, at this time, whether the new train would alter the number of carcasses that would be available for scavenging (i.e., the train may result in more or fewer vehicle strikes of small animals than currently occurs along Interstate 15).

In general, the loss of habitat would not appreciably diminish the distribution of the desert tortoise because most of the habitat loss would occur along Interstate 15 in an area that is disturbed by ongoing activity. The segment of rail line that traverses the alluvial fans in Ivanpah Valley is likely to decrease connectivity within the valley to some degree because it introduces a new barrier (with numerous openings) into an area. The potential also exists that the rail line may alter geomorphological processes on the alluvial fan, which could result in further degradation of habitat and, over time, a decrease in the number of desert tortoises.

Critical Habitat

The proposed action would result in the loss of approximately 1853.24 acres of critical habitat. Most of this loss would occur immediately adjacent to Interstate 15, where ongoing activities have degraded the primary constituent elements of critical habitat to some degree. For example, the freeway currently fragments habitat to a large degree (although in the Superior-Cronese Critical Habitat Unit, critical habitat is located only on the north side of the freeway) and the plant community and substrates immediately adjacent to the road are often degraded by road maintenance and vehicles pulling to the side of the road.

Approximately 1118.78 acres in the Superior-Cronese Critical Habitat Unit and 734.46 acres in the Ivanpah Critical Habitat Unit are likely to be lost. These losses represent approximately 0.15 and 0.12 percent of these units, respectively, and 0.03 percent of the entire designated area of critical habitat (6,446,200 acres). Because of the relatively small area of critical habitat that would be lost and the location of most of this area adjacent to Interstate 15, the proposed action is unlikely to appreciably reduce the conservation value and function of critical habitat of the desert tortoise.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered to have cumulative effects because they require separate consultation pursuant to section 7 of the Act. Much of the proposed right-of-way crosses land managed by the Bureau or Federal Highway Administration; because any activities undertaken in these areas would require Federal approval, they would not be considered in this section. We are unaware of any future non-federal projects that are reasonably certain to occur in the action area that lie outside of Bureau lands or the Federal Highway Administration right-of-way.

CONCLUSION

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the desert tortoise. We have reached this conclusion because:

1. Project activities are likely to kill or injure few desert tortoises because the FRA and DesertXpress will implement numerous measures to reduce the potential that desert tortoises will occupy project work sites (i.e., clearance surveys, exclusion fencing, moving desert tortoises from harm's way, qualified biologists).

2. The FRA and DesertXpress will implement measures to reduce the potential for increased predation by common ravens and spread of non-native plant species.

3. This proposed project would not result in a substantial loss of desert tortoise habitat in areas that the Service considers crucial for the conservation of desert tortoises (e.g., desert wildlife management areas, critical habitat, etc.).

4. The proposed project would disrupt connectivity to a small degree in an area that serves as an important linkage between two critical habitat units.

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the proposed action is not likely to adversely modify the critical habitat of the desert tortoise. We have reached this conclusion because:

1. Most of the critical habitat that would be lost as a result of the proposed action lies adjacent to Interstate 15 and the primary constituent elements within these areas have been degraded to some degree by their proximity to the freeway.

2. The amount of critical habitat that would be lost comprises a small portion of the total amount of critical habitat; this lost would not compromise the conservation function and value of critical habitat of the desert tortoise.

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. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, 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 an incidental take statement.

The measures described in this document are non discretionary. The FRA has a continuing duty to regulate the activities covered by the incidental take statement in this biological opinion, which are applicable to that agency's project. If the FRA fails to include the terms and conditions of this incidental take statement as enforceable conditions of its authorization of the rail line, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the FRA must report the progress of its action and its impact on the desert tortoise to the Service as specified in the incidental take statement [50 Code of Federal

Regulations 402.14(i)(3)].

Construction of the Rail Line and its Ancillary Facilities

We anticipate that all desert tortoises within the right of way of the proposed rail line, the temporary construction areas, and areas used for ancillary facilities are likely to be taken during construction. Most of these individuals will be captured (the form of take) and moved from harm's way. Based on the best available information, we anticipate that up to 85 desert tortoises will be taken in this manner.

We anticipate that a few desert tortoises within the right of-way of the proposed rail line, the temporary construction areas, and areas used for ancillary facilities will be killed or wounded (the form of take) during construction. We cannot quantify this amount in large part because the protective measures undertaken during the construction are likely to reduce the number of desert tortoises that would otherwise be killed or wounded. Because we cannot quantify (i.e., predict) the amount of take associated with the construction of the project, we will include a threshold for re initiation of formal consultation for this form of take in the terms and conditions of this biological opinion.

We anticipate that construction of the rail line and its ancillary facilities will result in the take of desert tortoise eggs. As we discussed in this biological opinion, we have not attempted to quantify the number of eggs or nests that may be present because of the numerous assumptions such an estimate would require. All desert tortoise eggs within the action area are likely to be taken, either by being destroyed (killed) or moved from harm's way (capture).

Operations and Maintenance of the Rail Line and its Ancillary Facilities

We anticipate that desert tortoises will be taken in the form of capture, injury, or mortality during the operational phase of the proposed rail line. We expect few desert tortoises will be taken during this time but cannot quantify this amount for several reasons. We cannot predict how often the operations or maintenance would occur, whether desert tortoises would be present when these activities occurred, or if desert tortoises would be present when these activities occurred. Finally, protective measures undertaken during these activities are likely to reduce the number of desert tortoises that would otherwise be killed or injured. Because we cannot quantify (i.e., predict) the amount of take associated with the operation and maintenance of the rail line, we will include a threshold for re initiation of formal consultation for this potential source of take in the terms and conditions of this biological opinion.

The exemption to the prohibition against take provided by this incidental take statement applies only to activities authorized by the FRA and conducted by DesertXpress within the action area defined in this biological opinion.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of desert tortoises during the implementation (i.e., construction, operation, and maintenance) of the DesertXpress high speed train project:

1. FRA and DesertXpress must ensure that the level of incidental take anticipated in this biological opinion is commensurate with the analysis contained herein.

2. FRA and DesertXpress must ensure that desert tortoises do not enter fenced project facilities for the life of the project.

3. FRA and DesertXpress must ensure that culverts remain clear of debris for the life of the project and are constructed and maintained to ensure desert tortoises may safely use them.

4. FRA and DesertXpress must assess whether to move desert tortoises from areas of habitat that are completely or partially isolated as a result of construction of the proposed project.

5. FRA and DesertXpress must ensure that the rail line and its ancillary facilities do not provide subsidies to common ravens.

6. FRA and DesertXpress must ensure that they coordinate with the BLM if desert tortoises that have been translocated from the Ivanpah solar plant are encountered during construction.

Our evaluation of the proposed action includes consideration of the protective measures proposed by FRA and DesertXpress in the biological assessment and re iterated in the Description of the Proposed Action section of this biological opinion. Consequently, any changes in these protective measures may constitute a modification of the proposed action that causes an effect to the desert tortoise that was not considered in the biological opinion and require re initiation of consultation, pursuant to the implementing regulations of the section 7(a)(2) of the Act (50 Code of Federal Regulations 402.16). The reasonable and prudent measures and terms and conditions are intended to complement the protective measures proposed by FRA and DesertXpress.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the FRA and DesertXpress must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions implement reasonable and prudent measure 1:

   a. To ensure that the measures proposed by the FRA and DesertXpress are effective and are being properly implemented, the FRA or DesertXpress must contact the Service immediately if it becomes aware that a desert tortoise has been killed or injured by project activities. At that time, the FRA or DesertXpress must review the circumstances surrounding the incident with the Service to determine whether additional protective measures are required. Project activities may continue during the review, provided that the proposed protective measures in the project description and any appropriate terms and conditions of this biological opinion have been and continue to be fully implemented.

   b. If five desert tortoises are injured or killed as a result of construction of the DesertXpress project, consultation must be re initiated on the proposed action, pursuant to the implementing regulations for section 7(a)(2) of the Endangered Species Act at 50 Code of Federal Regulations 402.16.

   c. If two desert tortoises are injured or killed as a result of operation and maintenance of the DesertXpress project in any calendar year, consultation must be re initiated on the proposed action, pursuant to the implementing regulations for section 7(a)(2) of the Endangered Species Act at 50 Code of Federal Regulations 402.16. We have not established a re initiation threshold for moving desert tortoises from harm's way during operation and maintenance because we cannot predict, with an accuracy, how many desert tortoises may be encountered over the life of the proposed rail line; additionally, the short-distance movement of these animals from harm's way by authorized biologists is unlikely to kill or wound these individuals.

2. The following term and condition implements reasonable and prudent measure 2:

   The FRA must ensure that DesertXpress monitors, during construction and operation, the integrity of all desert tortoise exclusion fencing on a regular basis and following any rain events that result in surface flow of water in washes within the action area.

3. The following terms and conditions implement reasonable and prudent measure 3:

   a. The FRA must ensure that DesertXpress uses culverts that allow effective passage of desert tortoises but are large enough that desert tortoises are unlikely to use the culverts as burrows. At this time, we estimate that any box culvert must be 3 feet on a side and pipe culverts 3 feet in diameter; we strongly recommend that box culverts be used because desert tortoises are less likely to use them as burrows. At a minimum, culverts would need to be large enough. The FRA must ensure regular maintenance of the culverts so desert tortoises do not use accumulated debris to construct burrows. If a culvert under the rail line is tied to an existing culvert under

Interstate 15 or the Union Pacific Railroad, the FRA may forego these specifications if they are incompatible with the existing culverts.

b. The FRA must ensure that DesertXpress uses culverts that will not entrap desert tortoises or block their passage. Specifically, all erosion control devices must be constructed and maintained in a manner that allows desert tortoises to enter and leave them freely.

4. The following terms and conditions implement reasonable and prudent measure 4:

   a. The FRA must ensure that DesertXpress installs a sufficient number of culverts in Segment 2c where it deviates from Interstate 15 (excluding on the dry lake bed), to ensure any desert tortoise whose home range occurs across the action area could continue to access both sides easily. In general, the distance between culverts must be no greater than 0.25 mile unless topography is an obstacle.

   b. Authorized biologists must survey areas that could become isolated from the main body of habitat where the alignment deviates slightly from the freeway (e.g., at offramps). If desert tortoises are present and construction of the project may disrupt their behavior or if a culvert or other access to the main body of habitat does not exist or will not be provided, the authorized biologist must relocate them to the side of the rail line that is adjacent to the main body of habitat. In any event of uncertainty, the authorized biologist must contact the Service for guidance prior to moving the desert tortoise; during this time, the authorized biologist may install fencing around the area of the desert tortoise's burrow so he or she may find it again.

5. The following term and condition implements reasonable and prudent measure 5:

   All new utility lines and ancillary structures associated with the DesertXpress project must be designed in a manner that will reduce the likelihood of nesting by common ravens. The FRA or DesertXpress, as appropriate, must monitor these utility lines and ancillary structures to ensure the effectiveness of their measures and implement adaptive management, in coordination with the Service, if the initial measures are unsuccessful. The FRA and DesertXpress must ensure that any common ravens nests established on new utility lines and ancillary structures are removed within one year at a time when they are inactive.

6. The following term and condition implements reasonable and prudent measure 6:

   During construction of the rail line, if desert tortoises that have been translocated from the Ivanpah solar plant site need to be moved from harm's way, the FRA and DesertXpress must coordinate their capture and movement with the BLM to ensure that the health and welfare of these animals is not compromised. Prior to the onset of construction, the FRA or DesertXpress must contact the BLM to establish appropriate

protocols to follow in the event these animals are encountered.

REPORTING REQUIREMENTS

By January 31 of any year the proposed action is under construction and during its operation, the FRA must provide a report to the Service that provides details on the effects of the action on the desert tortoise. Within 60 days of the completion of the proposed action, FRA must provide a summary report that provides, in addition to the following information, a complete overview of the amount of habitat disturbed and the number of desert tortoises that were taken. These reports must include information on any instances when desert tortoises were killed, injured, or handled, the circumstances of such incidents, and any actions undertaken to prevent similar instances from re occurring. We recommend that FRA provide us with any recommendations that would facilitate the implementation of the protective measures while maintaining protection of the desert tortoise. We also request that FRA provide us with the names of any monitors who assisted the authorized biologist and an evaluation of the experience they gained on the project. The qualifications form on our website (http://www.fws.gov/ventura/sppinfo/protocols/deserttortoise_monitor-qualifications-statement.pdf), filled out for this project, along with any appropriate narrative would provide an appropriate level of information. This information would provide us with additional reference material in the event these individuals are submitted as potential authorized biologists for future projects.

DISPOSITION OF DEAD OR INJURED DESERT TORTOISES

Within 3 days of locating any dead or injured desert tortoises, you must notify the Ventura Fish and Wildlife Office by telephone (805 644 1766) and by facsimile (805 644 3958) or electronic mail. The report must include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

Injured desert tortoises must be taken to a qualified veterinarian for treatment. If any injured desert tortoises survive, FRA or DesertXpress must contact the Service regarding their final disposition. DesertXpress must develop and maintain, for the duration of the project, a list of veterinarians qualified to work with desert tortoises.

FRA and DesertXpress must take care in handling dead desert tortoises to preserve biological material in the best possible state for later analysis. If desert tortoises are killed by project activities, the Service will instruct the FRA or DesertXpress regarding the final disposition of the carcass.

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.

We recommend that the FRA select Segment 4a, which would be located on the opposite side of Interstate 15 from the currently proposed route. This route would have far fewer impacts to desert tortoise and habitat within Ivanpah Valley that the currently suggested route because it would be closer to the freeway, cause less fragmentation of habitat, and likely affect far fewer desert tortoises. We recognize that selection of this route after conclusion of this consultation would require re initiation of formal consultation; however, we have written this biological opinion in a manner that would facilitate completion of a new biological opinion in an expedited time frame, if this alternative is ultimately selected.

We recommend that the FRA and DesertXpress work with the Desert Tortoise Recovery Office to design and implement a study that would investigate effects to the desert tortoise generated by the high speed train in relation to the freeway, including the distance out from the sources that effects would impact desert tortoises.

We recommend that the FRA and DesertXpress monitor whether the operation of the high speed train results in a change in the number of small animals that are killed by Interstate 15 and whether the train itself results in the mortality of small animals. If the overall amount of mortality increases, this increase would provide an additional subsidy to common ravens. If this subsidy is present, we would recommend that the FRA and DesertXpress attempt to reduce the amount of mortality. If this effort is not successful, we recommend that DesertXpress contribute to the regional management fund for common ravens; this fund will be used to control and manage common ravens throughout the California desert.

We recommend that DesertXpress contribute a small portion of the cost of each ticket to implement recovery actions for the desert tortoise. We have discussed this concept with DesertXpress and its consultants during informal consultation. If DesertXpress is agreeable to this recommendation, we suggest that DesertXpress work with the Desert Tortoise Recovery Office to consider a specific action or actions to fund. We further recommend that DesertXpress work with the Desert Managers Group to use its literature and advertising space to promote awareness of the desert's resources and how to protect them.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on FRA's proposal to authorize and permit the DesertXpress high speed passenger train project along a 200-mile corridor from Victorville, California, to Las Vegas, Nevada. Re-initiation of formal consultation is required where discretionary federal involvement or control over the action has been retained or is authorized by law and: if the amount or extent of taking specified in the incidental take statement is exceeded; if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; if the identified 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 if a new species is listed or critical habitat designated that may be affected by the identified action (50 Code of Federal Regulations 402.16).

If you have any questions regarding this biological opinion, please contact Danielle Dillard of my staff at (805)644 1766, extension 315.

Sincerely,

/s/: Diane K. Noda

Diane K. Noda
Field Supervisor

LITERATURE CITED

Avery, H.W. 1998. Nutritional ecology of the desert tortoise (*Gopherus agassizii*) in relation to cattle grazing in the Mojave Desert. Ph.D. Dissertation, Department of Biology, University of California. Los Angeles, California.

Berry, K.H. 1984. The status of the desert tortoise (*Gopherus agassizii*) in the United States. Report to the U.S. Fish and Wildlife Service from the Desert Tortoise Council. Order No. 11310 0083-81.

Berry, K.H. 1986. Desert tortoise (*Gopherus agassizii*) relocation: implications of social behavior and movements. Herpetologica 42(1): 113 125.

Berry, K.H. 1996. Summary of the results of long term study plots for the desert tortoise in California. Letter to Molly Brady, Bureau of Land Management, Riverside, California. Dated October 1. Riverside Field Station, U.S. Geological Survey. Riverside, California.

Berry, K.H. 1997. Demographic consequences of disease in two desert tortoise populations in California. Proceedings: conservation, restoration, and management of tortoises and turtles an international conference. Pages 91 99.

Berry, K.H. 1999. Preliminary report from the 1999 spring survey of the desert tortoise long-term study plot in Chemehuevi Valley and Wash, California. Box Springs Field Station, Western Ecological Research Center, U.S. Geological Survey. Riverside, California.

Berry, K.H. 2003. Declining trends in desert tortoise populations at long term study plots in California between 1979 and 2002: multiple issues. Abstract of paper presented at the twenty eighth annual meeting of the Desert Tortoise Council.

Berry, K.H. and B.L. Burge. 1984. The desert tortoise in Nevada. Chapter 8 *In:* the status of the desert tortoise *(Gopherus agassizii)* in the United States. Report to U.S. Fish and Wildlife Service from the Desert Tortoise Council. Order No. 11310 0083-81.

Berry, K.H., E.K. Spangenberg, B.L. Homer, and E.R. Jacobson. 2002. Deaths of desert tortoises following periods of drought and research manipulation. Chelonian Conservation and Biology 4: 436 448.

Bjulin, C.D. and J.A. Bissonette. 2004. Survival during early life stages of the desert tortoises (*Gopherus agassizii*) in the south-central Mojave Desert. Journal of Herpetology 38:527-535.

Boarman, W.l. 1993. When a native predator becomes a pest: a case study. For: conservation and resource management (S X. Majumdar, *el al.*, eds.), pages 186 201. Pennsylvania. Academy of Science, Easton, PA.

Boarman, W.l. 2002. Threats to desert tortoise populations: a critical review of the literature. Unpublished report prepared for the West Mojave Planning Team, Bureau of Land Management. Western Ecological Research Center, U.S. Geological Survey, Sacramento, California. 86 pages.

Boarman, W.I. and K.H. Berry. 1995. Common ravens in the southwestern United States, 1968-92. Pages 73 75 in E. T. LaRoe, G. F. Farris, C. E. Puckett, P. D. Doran, and M. 1. Mac, editors. Our living resources: A report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. National Biological Service. Washington, D.C.

Boarman, W.l. and W.B. Kristan. 2006. Trends in common raven populations in the Mojave and Sonora deserts: 1968 2004. Draft report to U. S. Fish and Wildlife Service, Ventura CA 93003. Contract No. 814405M055.

Borysenko, M., and S. Lewis. 1979. The effect of malnutrition on immunocompetence and whole body resistance to infection in *Chelydra serpenlina.* Developmental and Comparative Immunology 3: 89-100.

Bowles, A.E., S. Eckert, L. Starke, E. Berg, L. Wolski, and J. Matesic, Jr. 1999. Effects of flight noise from jet aircraft and sonic booms on hearing, behavior, heart rate, and oxygen consumption of desert tortoises (*Gopherus agassizii*). Report by United States Air Force Research Laboratory. San Diego, California.

Brooks, M.L. 1998. Alien annual grass distribution, abundance, and impact on desert tortoise habitat in the western Mojave Desert. Ph.D. Dissertation. University of California at Riverside.

Brooks, M.L., and T.E. Esque. 2002. Alien plants and fire in desert tortoise (*Gopherus agassizii*) habitat of the Mojave and Colorado deserts. Chelonian Conservation and Biology 4:330 340.

Brown, D.E., and R.A. Minnich. 1986. Fire and changes in creosote bush scrub of the western Sonoran Desert, California. American Midland Naturalist 116(2):411422.

Brown, M.B., I.M. Schumacher, P.A. Klein, K. Harris, T. Correll, and E.R. Jacobson. 1994. *Mycoplasma agassizii* causes upper respiratory tract disease in the desert tortoise. Infection and Immunity 62: 4580-4586.

Brown, D.R. , I.M. Sehumaeher, G.S. MeLaughlin, L.D. Wendland, M.B. Brown, P.A. Klein, and E.R. Jacobson. 2002. Application of diagnostic tests for mycoplasmal infections of the desert and gopher tortoises, with management recommendations. Chelonian Conservation and Biology 4: 497-507.

Bulova, S.J. 1994. Patterns of burrow use by desert tortoises: gender differences and seasonal trends. Herpetological. Monographs 8: 133-143.

Bureau of Land Management. 2002a. Northern and Eastern Colorado Desert Coordinated Management Plan. California Desert District. http://www.blm.gov/ca/news/pdfs/neco2002/.

Bureau of Land Management. 2002b. Final environmental impact statement: proposed Northern and Eastern Mojave Desert Management Plan – amendment to the California Desert Conservation Area Plan. California Desert District. Moreno Valley, California.

Bureau of Land Management. 2005. Final environmental impact report and statement for the West Mojave Plan. California Desert District. Moreno Valley, California.

Bury, R.B. (ed.) 1982. North American Tortoises: Conservation and Ecology. U.S. Fish and Wildlife Service, Wildlife Research Report 12, Washington, D.C.

Bury, R.B. 1987. Off road vehicles reduce tortoise numbers and well-being. U. S. Department of the Interior, Fish and Wildlife Service, National Ecology Research Center, Fort Collins, Colorado. Research Information Bulletin Number 87 6.

Bury, R.B. and OJ. Germano. 1994. Biology of North American tortoises: introduction. In: R.B. Bury and OJ. Germano, editors. Biology of the North American tortoises. National Biological Survey, Fish and Wildlife Research 13: 1 7.

Christopher, M.M., K.H. Berry, B.T. Henen, and K.A. Nagy. 2003. Clinical disease and laboratory abnormalities in free ranging desert tortoises in California (19901995). Journal of Wildlife Diseases 39: 35-56.

Congdon, J.D., A.E. Dunham, and R.C. Van Loben Sels. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoidea blandingii*): implications for conservation and management of long lived organisms. Conservation Biology 7:826-833.

Ernst, C.H., R.W. Barbour, and J.E. Lovich. 1994. Turtles of the United States and Canada. Smithsonian Institute Press, Washington and London. 578 pages.

Esque, T.C., K.E. Nussear, and P.A. Medica. 2005. Desert tortoise translocation plan for Fort Irwin's land expansion program at the U.S. Army National Training Center (NTC) and Fort Irwin. Report to the U.S. Army National Training Center, Directorate of Public Works. U.S. Geological Survey, Las Vegas, Nevada.

Evans, R. 2001. Free roaming dog issues at the United States Marine Corps Air Ground Combat Center, Twentynine Palms, California. Proceedings of the 2001 Desert Tortoise Council Symposium.

General Accounting Office. 1991. Rangeland management: Bureau of Land Management's hot desert program merits reconsideration. RCED 92 12. Washington, DC.

General Accounting Office. 2002. Endangered species: research strategy and long term monitoring needed for the Mojave desert tortoise recovery program. GAO 03 23. Washington, DC.

Gardner, T. J. and E.D. Brodie, Jr. 2000. The occupation of steep slopes by desert tortoises (*Gopherus agassizii*) in the western Mojave Desert: a description of occupied habitats, habitat use, and desert tortoise density. Final report.

Goodlett, G., and A.P. Woodman. 2003. Desert tortoise population survey at Virgin Slope desert tortoise study plot, spring 2003. Unpublished report prepared for Arizona Game and Fish Department, Nongame Branch, Contract G90040-K, Phoenix, Arizona.

Harless, M.L., A.D. Walde, D. K. Delaney, L.L. Pater, and WK. Hayes. 2007. The effect of sampling effort on home range estimates of desert tortoises from the West Mojave Desert. Abstract of paper presented at the Thirty Second Annual Meeting of the Desert Tortoise Council, Las Vegas, Nevada.

Henen, B.T. 1997. Seasonal and annual energy budgets of female desert tortoises (*Gopherus agassizii*). Ecology 78:283 296.

Hoff, K.S., and R.W. Marlow. 2002. Impacts of vehicle road traffic on desert tortoise populations with consideration of conservation of tortoise habitat in southern Nevada. Chelonian Conservation and Biology 4:449–456.

ICF International. 2010. Biological assessment for the DesertXpress project. Prepared for U.S. Department of Transportation, Federal Railroad Administration. Dated December. Sacramento, California.

Jacobson, E.R., T.1. Wronski, J. Schumacher, C. Reggiardo, and K.H. Berry. 1994. Cutaneous dyskeratosis in free ranging desert tortoises, *Gopherus agassizii*, in the Colorado Desert of Southern California. J. Zoo and Wildlife Medicine 25(1): 68 81.

Jennings, W.B. 1993. Foraging ecology of the desert tortoise (*Gopherus agassizii*) in the western Mojave Desalt. Master's thesis. University of Texas, Arlington.

Jennings, W.B. 1997. Habitat use and food preferences of the desert tortoise, *Gopherus agassizii*, in the western Mojave Desert and impacts of off-road vehicles. In Van Abbema, J., (Ed.). Proceedings: Conservation, restoration, and management of tortoises and turtles – an international conference. New York Turtle and Tortoise Society. Purchase, New York.

Knight, R.L, H.A.L. Knight, and R. J. Camp. 1993. Raven populations and land use patterns in the Mojave Desert, California. Wildlife Society Bulletin 22: 469 471.

Longshore, K.M., J.R. Jaeger, and J.M. Sappington. 2003. Desert tortoise (*Gopherus agassizii*) survival at two eastern Mojave Desert sites: death by short term drought? Journal of Herpetology 37: 169-177.

Luckenbach, R.A. 1982. Ecology and management of the desert tortoise (*Gopherus agassizii*) in California. In: R.B. Bury (ed.). North American Tortoises: Conservation and Ecology. U.S. Fish and Wildlife Service, Wildlife Research Report 12. Washington, D.C.

Luke, C., A. Karl, and P. Garcia. 1991. A status review of the desert tortoise. Biosystems Analysis, Inc., Tiburon, California.

McLuckie, A.M. and R.A. Fridell. 2002. Reproduction in a desert tortoise population on the Beaver Dam Slope, Washington County, Utah. Chelonian Conservation and Biology 4(2): 288-294.

McLuckie, A. M., M. R. M. Bennion, and R. A. Fridell. 2006. Draft regional desert tortoise monitoring in the Red Cliffs Desert Reserve, 2005. Salt Lake City: Utah Division of Wildlife Resources, Publication Number 06 06. 44 pages.

McLuckie, A.M., M.M. Reitz, and R.A. Fridell. 2008. Regional desert tortoise monitoring in the Red cliffs Desert Reserve, 2007. Salt Lake City: Utah Division of Wildlife Resources, Publication Number 08 19.

Messenger, W. 2011a. Electronic mail: responses to additional request from U.S. Fish and Wildlife Service. Dated March 31. Project manager, Federal Railroad Administration. Washington, DC.

Messenger, W. 2011b. Electronic mail: comments on draft biological opinion from Federal Railroad Administration and DesertXpress. Dated April 19. Project manager, Federal Railroad Administration. Washington, DC.

Morafka, D.J., K.H. Berry, and E.K. Spangenberg. 1997. Predator proof field exclosures for enhancing hatching success and survivorship of juvenile tortoises: a critical evaluation. Pages 147 165 in Proceedings: conservation, restoration, and management of tortoises and turtles an international conference (J. Van Abemma, ed.). New York Turtle and Tortoise Club, New York.

Mueller, J.M., K.R. Sharp, K.K. Zander, D.L. Rakestraw, K.P. Rautenstrauch, and P.E. Lederle. 1998. Size-specific fecundity of the desert tortoise (*Gopherus agassizii*). Journal of Herpetology 32: 313-319.

Naegle, S. 1976. Physiological response of the desert tortoise, *Gopherus agassizii*. Master of Science thesis, University of Nevada, Las Vegas, Nevada.

Nagy, K.A. and P.A. Medica. 1986. Physiological ecology of desert tortoises in southern Nevada. Herpetological 42: 73-92.

National Park Service. 2002. Mojave National Preserve General Management Plan. Dated April. San Bernardino County, California.

Niblick, H.A., D.C. Rostal, and T. Classen. 1994. Role of male male interactions and female choice in the mating system of the desert tortoise, *Gopherus agassizii.* Herpetological Monographs 8: 124-132.

Noss, R.F., and A . Cooperrider. 1994. Saving Nature's legacy: protecting and restoring biodiversity. Defenders of Wildlife and Island Press, Washington, D.C. 416 pages.

Nussear, K.E. 2004. Mechanistic investigation of the distributional limits of the desert tortoise *Gopherus agassizii* . Dissertation. University of Nevada. Reno, Nevada.

Nussear, K.E., T.C. Esque, R.D. Inman, L. Gass, K.A. Thomas, C.S.A. Wallace, J.B. Blainey, D.M. Miller, and R.H.Webb. 2009. Modeling habitat of the desert tortoise (*Gopherus agassizii*) in the Mojave and parts of the Sonoran Deserts of California, Nevada, Utah, and Arizona. U.S. Geological Survey Open File Report 2009-1102.

Origgi, R., C.H. Romero, P.A. Klein, K.B. Berry, and E.R. Jacobson. 2002. Serological and molecular evidences of herpesvirus exposure in desert tortoises from the Mojave Desert of California. Abstract of paper presented at the twenty seventh annual meeting of the Desert Tortoise Council.

Peterson, C.C. 1994. Different rates and causes of high mortality in two populations of the threatened desert tortoise, *Gopherus agassizii.* Biological Conservation 70: 101-108.

Peterson, C.C. 1996. Ecological energetics of the desert tortoise (*Gopherus agassizii*): effects of rainfall and drought. Ecology 77: 1831-1844.

RECON. 2000. Clark County multispecies habitat conservation plan. Prepared for Clark County, Nevada. Las Vegas, Nevada.

Sazaki, M., W.l. Boarman, G. Goodlett, and T. Okamoto. 1995. Risk associated with long distance movements by desert tortoises. Proceedings of the 1994 Desert Tortoise Council Symposium. Pages 33-48.

Spotila, J.R., L.C. Zimmerman, C.A. Binckley, J.S. Grumbles, D.C. Rostal, A. List, Jr., E.C. Beyer, K.M. Philips, and SJ. Kemp. 1994. Effects of incubation conditions on sex determination, hatching success, and growth of hatchling desert tortoises, *Gopherus agassizii.* Herpetological Monographs 8: 103-116.

Steinwert, S. 2011. Electronic mail: notes over telephone conversation between U.S. Fish and Wildlife Service and FRA, and agreement effects analysis approach. Dated April 1. Circlepoint. San Francisco, California.

Tracy, C.R., R. Averill Murray, W.I. Boarman, D. Delehanty, J. Heaton, E. McCoy, D. Morafka, K. Nussear, B. Hagerty, and P. Medica. 2004. Desert Tortoise Recovery Plan Assessment. Prepared for the U.S. Fish and Wildlife Service. Reno, Nevada.

TRW Environmental Safety Systems Inc. 1997. Patterns of burrow use by desert tortoises at Yucca Mountain, Nevada. Unpublished report to U.S. Department of Energy. TRW Environmental Safety Systems Inc., Las Vegas, Nevada.

Turner, R.M. 1982. Mohave desertscrub. In: Biotic communities of the American southwest-United States and Mexico (D. E. Brown, ed.). Special issue of desert plants 4: 157 168.

Turner, F.B., and D.E. Brown. 1982. Sonoran desertscrub. In: Biotic communities of the American Southwest - United States and Mexico (D.E. Brown, ed.). Desert Plants 4: 181 222.

Turner, F.B., P.A. Medica, and C.L. Lyons. 1984. Reproduction and survival of the desert tortoise (*Scaptochelys agassizii*) in Ivanpah Valley, California. Copeia 4: 811-820.

Turner, F.B., P. Hayden, B.L. Burge, and J.B. Robertson. 1986. Egg production by the desert tortoise (*Gopherus agassizii*) in California. Herpetological 42: 93 104.

Turner, F.B., K.H. Berry, D.C. Randall, and G.C. White. 1987. Population ecology of the desert tortoise at Goffs, California, in 1983 1986. Annual report to Southern California Edison Company, Rosemead, California. 101 pages.

U.S. Department of Transportation, Federal Railroad Administration. 2010. DesertXpress high-speed passenger train supplemental draft environmental impact statement and 4(f) evaluation. Dated August. Washington, DC.

U.S. Department of Transportation, Federal Railroad Administration. 2011. DesertXpress high-speed passenger train final environmental impact statement and 4(f) evaluation. Dated March. Washington, DC.

U.S. Fish and Wildlife Service. 1993. Draft recovery plan for the desert tortoise (Mojave population). Portland, Oregon.

U.S. Fish and Wildlife Service. 1994. Desert tortoise (Mojave population) recovery plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 2001a. Revised biological opinion for widening of Interstate 15 between Barstow and Victorville, San Bernardino County, California (1 8 00 F-37). Dated March 29. Letter to Michael G. Ritchie, Division Administrator, California Division, Federal Highway Administration, Sacramento, California. Ventura, California.

U.S. Fish and Wildlife Service. 2001b. Biological opinion for the northbound widening of Interstate 15 between Barstow and Victorville, San Bernardino County, California (HDA-CA, File #: 08 Sbd-15PM 41.9-70.6, Add Northbound Mixed Flow Lane, EA 355570, Document #: P36300) (1 8 01-F-58). Dated November 7. Letter to Michael G. Ritchie, Division Administrator, California Division, Federal Highway Administration, Sacramento, California. Ventura, California.

U.S. Fish and Wildlife Service. 2001c. Biological opinion for the southbound truck-descending lane and roadway rehabilitation and widening of Interstate 15 between Baker and Mountain Pass, San Bernardino County, California (HDA-CA. File #: 08 Sbd 15 PM 137.5/163.3, Document #: P37903) (1 8 02-F 3). Dated December11. Letter to Michael G. Ritchie, Division Administrator, California Division, Federal Highway Administration, Sacramento, California. Ventura, California.

U.S. Fish and Wildlife Service. 2003. Biological opinion for the designation of routes of travel in the Western Mojave Desert, California (6842 CA 063.50) (1 8-03 F 21). Dated June 30. Memorandum to District Manager, California Desert District, Bureau of Land Management, Moreno Valley, California. Ventura, California.

U.S. Fish and Wildlife Service. 2004. Biological opinion for the designation of routes of travel in the northern and eastern Mojave Desert, California (CA 610 1510(P)) (1 8 04-F 11). Dated June 7. Memorandum to District Manager, California Desert District, Bureau of Land Management, Moreno Valley, California. Ventura, California.

U.S. Fish and Wildlife Service. 2005. Biological opinion for the California Desert Conservation Area Plan [desert tortoise] (6840 CA930(P)) (1 8 04-F 43R). Dated March 31. Memorandum to State Director, Bureau of Land Management, Sacramento, California. Ventura, California.

U.S. Fish and Wildlife Service. 2006a. Range wide monitoring of the Mojave population of the desert tortoise: 2001-2005 summary report. Desert Tortoise Recovery Office. Reno, Nevada.

U.S. Fish and Wildlife Service. 2006b. Biological opinion for the California Desert Conservation Area Plan [West Mojave Plan] (6840(P) CA 063.50) (1 8-03 F-58). Dated January 9. Memorandum to District Manager, California Desert District, Bureau of Land Management, Moreno Valley, California. Ventura, California.

U.S. Fish and Wildlife Service. 2006c. Biological opinion for Translocation of Desert Tortoises from the Southern Expansion Area of Fort Irwin to Occupied Habitat, San Bernardino County, California (1 8 05-F 43). Dated December 29. Letter to District Manager, Raymond H. Marler, Director, Strategic Programs, Headquarters, National Training Center and Fort Irwin, California. Ventura, California.

U.S. Fish and Wildlife Service. 2008. Draft revised recovery plan for the Mojave population of the desert tortoise (*Gopherus agassizii*). Pacific Southwest Region. Sacramento, California.

U.S. Fish and Wildlife Service. 2009. Range wide monitoring of the Mojave population of the desert tortoise: 2007 annual report. Desert Tortoise Recovery Office. Reno, Nevada.

U.S. Fish and Wildlife Service. 2010a. Biological opinion on BrightSource Energy's Ivanpah Solar Electric Generating System Project, San Bernardino County, California [CACA-48668, 49502, 49503, 49504] (8 8 10-F-24). Dated October 1. Memorandum to District Manager, California Desert District, Bureau of Land Management, Moreno Valley, California. Ventura, California.

U.S. Fish and Wildlife Service. 2010b. Range wide monitoring of the Mojave population of the desert tortoise: 2008-2009 reporting. Desert Tortoise Recovery Office. Reno, Nevada.

U.S. Fish and Wildlife Service. 2010c. Range wide monitoring of the Mojave population of the desert tortoise: 2010 reporting. Desert Tortoise Recovery Office. Reno, Nevada.

U.S. Fish and Wildlife Service. 2011. Electronic mail: Service's responses to comments from Federal Railroad Administration on final DesertXpress biological opinion. Dated April 21. Ventura Fish and Wildlife Office.

Van Devender, T.R. 2002. The Sonoran desert tortoise, natural history, biology, and conservation. The University of Arizona Press and Arizona Sonora Desert Museum, Tucson, Arizona. 388 pages.

Walde, A., L. Bol, D. Delaney, and L. Pater. 2003. The desert tortoise: a preliminary analysis of operative and environmental temperatures. Unpublished report submitted to the U.S. Fish and Wildlife Service.

Walker, M. and P. Woodman. 2002. Desert tortoise population survey at Beaver Dam Slope exclosure desert tortoise study plot; spring, 2001. Report to Arizona Game and Fish Department. Phoenix, Arizona.

Washington County Commission. 1995. Washington County, Utah desert tortoise incidental take permit application/documents. Unpublished report submitted to the U.S. Department of Interior, Fish and Wildlife Service. Dated December.

Wilson, D.S., K. A. Nagy, C. R. Tracy, D.J. Morafka, and R.A. Yates. 2001. Water balance in neonate and juvenile desert tortoises, *Gopherus agassizii*. Herpetological Monographs 15: 158-170.

Woodman, P. 2004. Summary report for line distance transects conducted in spring, 2003 in the Mojave Desert, California. Prepared for U.S. Fish and Wildlife Service, Las Vegas, Nevada. Inyokern, California.

Woodman, P. 2005. Summary report for line distance transects conducted in spring, 2004 in the Mojave Desert, California. Prepared for U.S. Fish and Wildlife Service, Reno, Nevada. Inyokern, California.

Young, R., C. Halley, and A.P. Woodman. 2002. Desert tortoise population survey at Littlefield desert tortoise study plot, spring 2002. Unpublished report prepared for Arizona Game and Fish Department, Nongame Branch, Contract G40088 00 1. Phoenix, Arizona.

Zimmerman, L.C., M.P. O'Connor, S.J. Kemp, and J.R. Spotila. 1994. Thermal ecology of desert tortoises in the Eastern Mojave Desert: seasonal patterns of operative and body temperatures and microhabitat utilization. Herpetological Monographs 8: 45 59.