

**DESERT TORTOISE COUNCIL**

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**Via email only**

January 23, 2026

Att. Central Reuse System Scoping Comments  
Bureau of Reclamation, Provo Area Office  
302 East Lakeview Parkway  
Provo, UT 84606  
[comments@baxterenvllc.com](mailto:comments@baxterenvllc.com)

RE: Washington County Central Reuse System – Scoping Comments

Dear Bureau of Reclamation and Bureau of Land Management,

The Desert Tortoise Council (Council) is a non-profit organization comprising hundreds of professionals and laypersons who share a common concern for wild desert tortoises and a commitment to advancing the public’s understanding of desert tortoise species. Established in 1975 to promote conservation of tortoises in the deserts of the southwestern United States and northern Mexico, the Council routinely provides information and other forms of assistance to individuals, organizations, and regulatory agencies on matters potentially affecting desert tortoises within their geographic ranges.

Both our physical and email addresses are provided above in our letterhead for your use when providing future correspondence to us. When given a choice, we prefer to receive emails for future correspondence, as mail delivered via the U.S. Postal Service may take several days to be delivered. Email is an “environmentally friendlier way” of receiving correspondence and documents rather than “snail mail.”

We appreciate this opportunity to provide comments on the above-referenced project. Given the location of the proposed project in habitats potentially occupied by the Mojave desert tortoise (*Gopherus agassizii*) (synonymous with Agassiz’s desert tortoise), our comments include recommendations intended to enhance protection of this species and its habitat during activities that may be authorized by the Bureau of Reclamation (BR) and Bureau of Land Management

(BLM), which we recommend be added to project terms and conditions in the authorizing documents [e.g., monetary grants, issuance of rights-of-way (ROW) grants, management plan and decision document, etc.] as appropriate. Please accept, carefully review, and include in the relevant project file the Council's following comments for the proposed action.

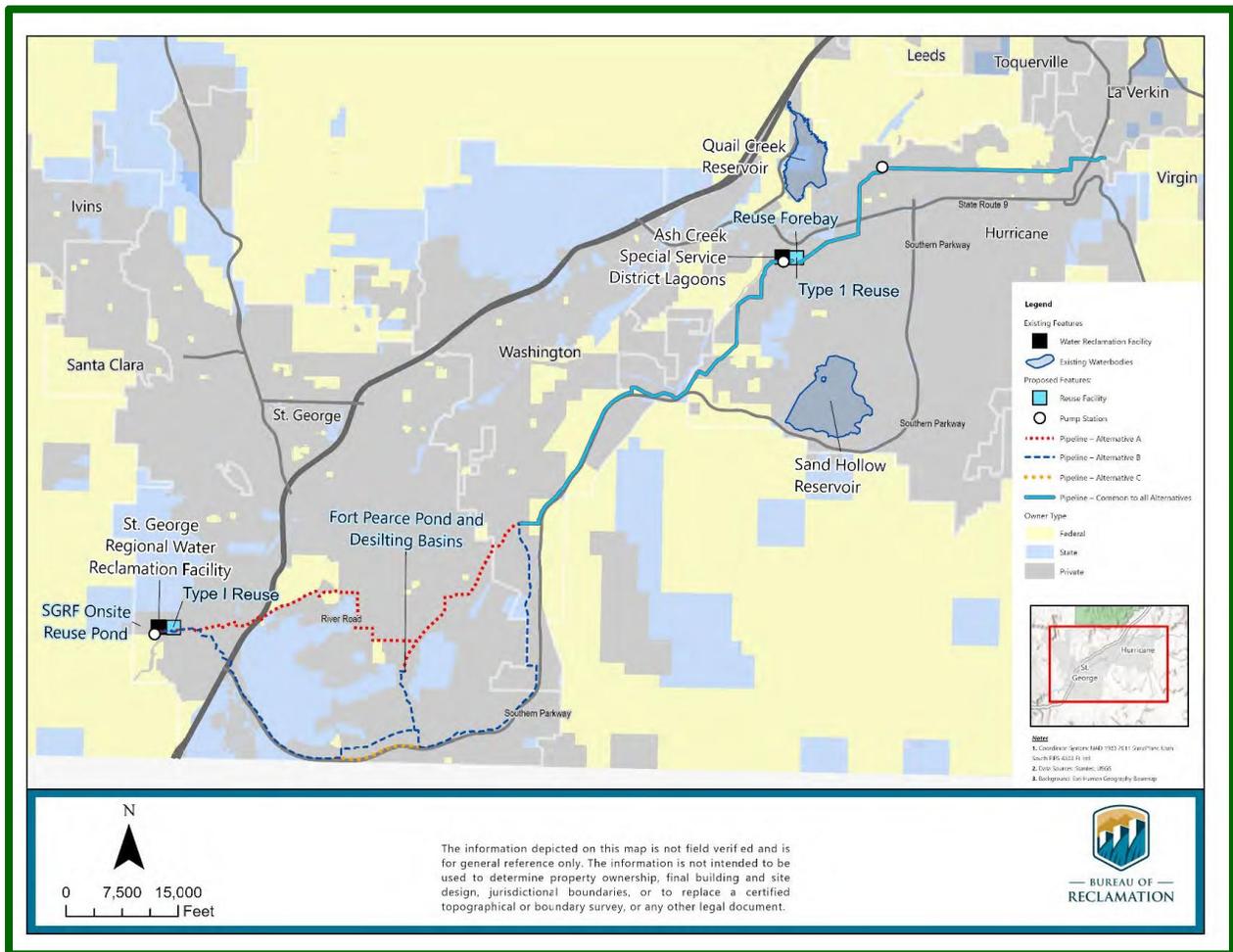
The Mojave desert tortoise is among the top 50 species on the list of the world's most endangered tortoises and freshwater turtles. The International Union for Conservation of Nature's (IUCN) Species Survival Commission, Tortoise and Freshwater Turtle Specialist Group, now considers the Mojave desert tortoise to be Critically Endangered (Berry et al. 2021), "... based on population reduction (decreasing density), habitat loss of over 80% over three generations (90 years), including past reductions and predicted future declines, as well as the effects of disease (upper respiratory tract disease/mycoplasmosis). *Gopherus agassizii* (sensu stricto) comprises tortoises in the most well-studied 30% of the larger range; this portion of the original range has seen the most human impacts and is where the largest past population losses have been documented. A recent rigorous rangewide population reassessment of *G. agassizii* (sensu stricto) has demonstrated continued adult population and density declines of about 90% over three generations (two in the past and one ongoing) in four of the five *G. agassizii* recovery units and inadequate recruitment with decreasing percentages of juveniles in all five recovery units."

This status, in part, prompted the DTC to join Defenders of Wildlife and the Desert Tortoise Preserve Committee (DTPC) to petition the California Fish and Game Commission (Commission) in March 2020 to elevate the listing of the Mojave desert tortoise from Threatened to Endangered under the California Endangered Species Act (CESA) (Defenders of Wildlife et al. 2020). Importantly, following California Department of Fish and Wildlife's (CDFW) (2024a) status review, in their April 2024 meeting the California Fish and Game Commission voted unanimously to accept the CDFW's petition evaluation and recommendation to uplist the tortoise from threatened to endangered under the CESA based on the scientific data provided on the species' status, declining trend, numerous threats, and lack of effective recovery implementation and land management (CDFW 2024b). On July 15, 2025, the tortoise was officially uplisted to endangered status under the CESA (Commission 2025).

### **Description of the Proposed Action**

The BR provides a brief description of the proposed action. The BR and BLM (collectively = Agencies), on behalf of the U.S. Department of the Interior, plan to develop a Draft Environmental Assessment (draft EA) for the Washington County Central Reuse Water System (Project). In the BR's "Draft Scoping Report Washington County Central Reuse System, Washinton County, Utah (December 2025)," BR described the components and functions of the Project. The general functions of the Project would be to deliver secondary irrigation water supplies and augment potable water supplies by conveying non-potable reuse water to municipal and agricultural users in exchange for current outdoor irrigation sources. The source of the non-potable reuse water is reclaimed water.

Components of the Project include treatment facilities to produce Type I reuse water, conveyance facilities (e.g., pipelines) to move the reuse supply for delivery or exchange, and small storage facilities (e.g., reservoirs) for operational flexibility. More than 25 miles of buried pipeline would be needed including a 100-ft-wide ROW for the action alternatives with associated air valves, blowoff/drain valves, isolation valves, and access points for control of flow and pressure. Several pumping stations would be needed along the pipelines. Four locations are proposed for water storage – St. George Reuse Facility Onsite Reuse Pond (25 acres), Fort Pearce Pond and Desilting Basins (16 acres), Reuse Forebay and Pump Station (18 acres), and Warner Valley Stilling Pond and Pump Station (12 acres). These facilities would be located south, east, and northeast of St. George (Figure 1). Construction would take approximately 3.5 to 4 years to complete.



**Figure 1.** Action alternatives suggested by the BR during public scoping for the Washington County Central Water Reuse System.

Environmental Protection Measures (EPMs) will be developed as part of the scoping process and will be included in the Draft EA.

This Project is disconnected from and independent of the proposed Eastside Reuse (Water) System, which is being evaluated in a separate National Environmental Policy Act (NEPA) process. Both projects will ultimately contribute to Washington County's overarching Regional Reuse Purification System.

BR's involvement is to comply with NEPA for the Large-Scale Water Recycling Projects Competitive Grant Program. BLM is involved because the proposed locations of the Project would require BLM to issue right-of way (ROWs) grants for the construction, operations, and maintenance of the Project that includes facilities to convey reuse water from water reclamation facilities to various storage reservoirs to meet the growing demands for water in Washington County, Utah.

In the scoping information, the Agencies displayed three alternatives (Figure 1):

- Alternative A would be shorter and would be within more residential and commercially developed areas.
- Alternative B would be longer and would mostly be adjacent to State Highway 7 (Southern Parkway) except for an alternate path along White Dome Drive for over 1.5 miles before tying back into State Highway 7. This alternative would traverse less developed areas.
- Alternative C would be similar to Alternative B, except it would not deviate from State Highway 7 near White Dome Drive.

### **Scoping Comments**

Despite a primary written request dated 11/7/2019 and sent via certified mail and numerous additional written requests sent to the BLM to identify the Council as an Affected Interest for proposed projects that may affect the tortoise, and a letter on the Lake Powell Pipeline Project Draft Environmental Impact Statement sent to the BR's Provo Office on 9/8/2020 with the same request, it was a third party, not the BLM, that alerted the Council to this opportunity to comment on the above-referenced Project. We remind BR and BLM that the purpose of scoping is to allow the public to participate in an "early and open process for determining the scope of issues to be addressed, and for identifying the significant issues related to a proposed action." Consequently, for this and future projects, we again ask BR and BLM to notify the Council of any opportunities to provide input on proposed actions that may affect the tortoise or its habitat, including habitat not occupied but needed for connectivity. Notification should be made via our email address provided in our letterhead above.

**Complete Project Description:** Electricity will be needed to operate the various facilities of the proposed Project. All facilities that are needed to implement the proposed Project, including a new/upgraded power line, should be described and their locations mapped in the draft NEPA document along with all other components of the proposed Project (e.g., access roads, staging areas, storage sites, etc.). It would help the Council and other affected interests to assess impacts of each alternative if the BLM depicts both developed and undeveloped lands associated with each project. Perhaps this can be accomplished with aerials at sufficient resolution to show barren versus vegetated areas. It is equally important that disturbed versus undisturbed portions of each alternative ROW be tabulated.

**Listed, Proposed, and Special Status Species:** U.S. Fish and Wildlife Service (USFWS) pre-project survey protocols (USFWS 2019) and tortoise clearance surveys (USFWS 2009) should be implemented prior to any surface disturbance. It is important that protocol surveys be performed in the action areas associated with each alternative. It is advisable that the BR and BLM contact the USFWS to determine the extent of the action area and discuss acceptable survey methodologies for each alternative. At the very least, suitable habitats within the 100-ft-wide ROWs associated with each alternative should be surveyed along transects spaced at 30-foot intervals. The results of these surveys should either be published in the Draft EA or made available to conscientious entities (i.e., to protect tortoises in concentration areas). The final alternative should be chosen, in part, based on an alternative that has fewest impacts to individual tortoises and results in fewer impacts of occupied and suitable habitats. Given the broad resolution associated with them, we do not believe that the available models that estimate tortoise densities (Gray et al. 2019, Nussear et al., 2009) should be used in lieu of pedestrian protocol surveys.

On December 12, 2024, the USFWS proposed to list the Monarch butterfly (*Danaus plexippus*) as a threatened species and designate critical habitat under the Federal Endangered Species Act (FESA). Please add this species and the yellow-billed cuckoo (*Coccyzus americanus*) to the list of species analyzed in the NEPA document. Please include an analysis of all special status species that may be affected by the proposed Project with respect to each species’ “action area” (50 Code of Federal Regulations 402.2).

**Resource Issues and Their Significance:** As presented in the Scoping Report (BR 2025), all three alternatives would be developed to support the ongoing rate of growth and projected demand for water in Washington County (Purpose and Need and Table 2-2, from BR 2025). The Report projected 3.5 times the current residential water connections by 2075. This would result in substantial new development and associated cumulative adverse impacts to biological resources including listed, proposed, and special status species such as the tortoise.

**Table 2-2. Projected Water Demands for Washington County, Utah**

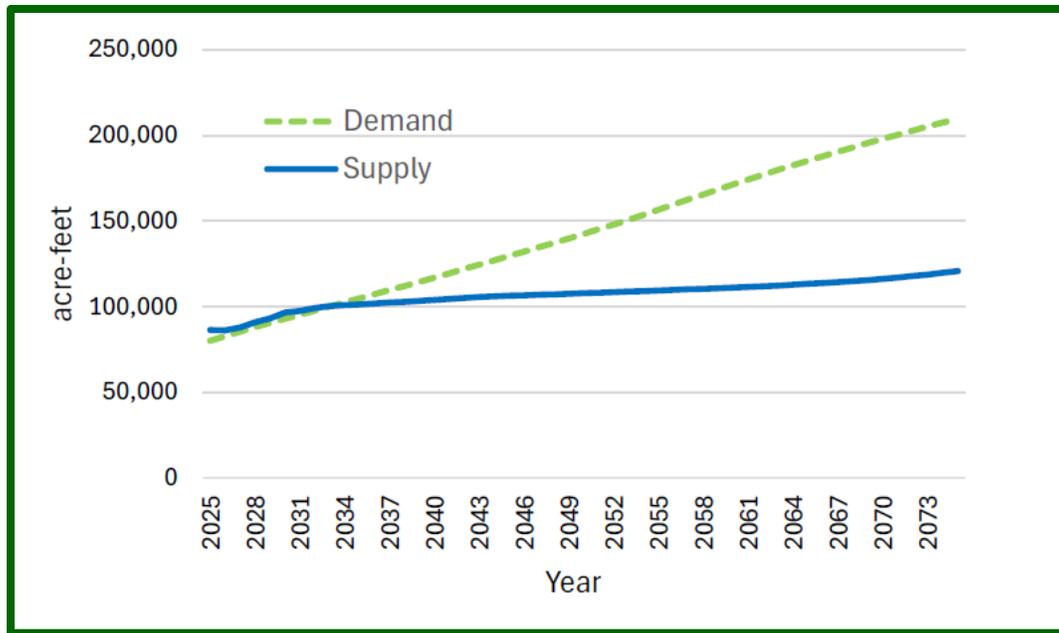
| Year | Equivalent Residential Connections Served by District <sup>1</sup> | Total Water Demand (acre-foot/year) <sup>2</sup> |
|------|--|--|
| 2025 | 110,211  | 80,008   |
| 2030 | 135,194  | 92,838   |
| 2035 | 158,438  | 104,857  |
| 2040 | 180,857  | 116,837  |
| 2045 | 204,236  | 129,507  |
| 2050 | 227,772  | 142,482  |
| 2055 | 253,132  | 156,595  |
| 2060 | 279,867  | 171,335  |
| 2065 | 305,355  | 185,219  |
| 2070 | 329,093  | 197,924  |
| 2075 | 350,333  | 209,617  |

It is appropriate that the BR and BLM are proposing to analyze direct and indirect impacts of the Project in a Draft EA, but the growth-inducing and cumulative impacts of the Project will result in significantly more impacts to the human environment in Washington County by providing resources that will allow for substantial growth and development in the County well into the future without concomitant levels of conservation to offset those impacts. Significance under NEPA applies to beneficial as well as adverse impacts. The proposed Project would result in a significant beneficial impact to the socio-economics of the County and significant adverse impacts to special status species including the tortoise by providing resources that would guarantee this growth and development to occur in the occupied and connectivity habitats of these species. This level of impact should require the preparation of an environmental impact statement (EIS) for the Project, not an environmental assessment. In addition, both of these resource issues should be analyzed in the NEPA document.

With its 1/21/2026 biologically controversial decision to undermine conservation of essential critical habitat as a means to counterbalance the take of tortoises and loss of habitat throughout Washington County by allowing the Northern Corridor to be developed through the center of the Red Cliffs Reserve where conservation was mandated, we contend that the 2024 revised Washington County habitat conservation plan will no longer serve its intended purpose. This is an interrelated decision to the proposed project, regardless of which alternative is chosen, because growth-inducing impacts associated with the project will affect the future of tortoises throughout Washington County, especially now that the BLM has demonstrated its inability to protect and enforce mandated tortoise conservation in the face of political pressure.

**Other Alternatives:** A federal appellate court has previously ruled that a federal agency must evaluate a reasonable range of alternatives to the project in an EIS including other project and mitigation sites, and must give adequate consideration to the public's needs and objectives in balancing ecological protection with the purpose of the proposed project, along with adequately addressing the proposed project's impacts on the desert's sensitive ecological system [National Parks & Conservation Association v. Bureau of Land Management, Ninth Cir. Dkt Nos. 05-56814 et seq. (11/10/09)].

Consequently, we recommend that the BR and BLM analyze a fourth alternative — constructing, operating, and maintaining facilities that would result in limited growth in Washington County, that is, growth that is limited to the resources available and sustainable. According to information presented in the Scoping Report (BR 2025), Figure 2-2 indicates that the demand for water in Washington County will exceed the supply around 2034. The American public should not subsidize population growth in an area that does not have the resources (e.g., water) to support and sustain that rate of growth. The growth and development of Washington County should not be subsidized by the American public and at the expense of public trust resources including substantially diminished likelihood of the survival and recovery of the tortoise and other special status species. Therefore, the Council requests that the BR and BLM develop and analyze a reasonable range of other viable alternatives including at least one alternative that substantially minimizes direct, indirect, and cumulative impacts to special status species including the tortoise. We request that one or more alternatives be analyzed in the NEPA document that meets the current and future needs of the population under limited growth that matches resource availability and sustainability rather than developing alternatives that match past human growth projected into the future (Table 2-2, from BR 2025).



**Figure 2-2.** Projected total water supply deficit in Washington County, Utah (BR 2025)

**Compliance with Directives:** We fully expect that BR and BLM will comply with all applicable statutes, regulations, Executive and Departmental Orders, policies and manuals (e.g., BLM’s H-1790-1 – National Environmental Policy Act Handbook; Advancing Science in the BLM: An Implementation Strategy IB 2015-040; Habitat Connectivity on Public Lands Instruction Memorandum 2023-005; Special Status Species Management. Handbook 6840, dated 2024) and other requirements as they pertain to this Project. The Agencies should demonstrate in the NEPA document that the proposed Project meets all these requirements with respect to the tortoise, and that the proposed Project will:

- conform with decisions in current land use plan(s) and the Federal Land Policy and Management Act (FLPMA) with respect to sustained yield for the tortoise/tortoise habitat;
- be consistent with priority conservation, restoration, and/or adaptation objectives in the best available landscape-scale information (e.g., for tortoise population connectivity; management of native plant species and reduction/elimination of non-native, invasive species; elimination of wildfire sources; etc.) during all phases of the Project;
- be in an area with low or comparatively low resource conflicts and where conflicts can be resolved;
- be located in, or adjacent to, previously disturbed lands;
- avoid, minimize, and compensate adverse impacts to fish and wildlife habitats and migration/movement habitats including those of the desert tortoise;
- ensure that actions are implemented that will result in a benefit to the tortoise/tortoise habitat (i.e., contribute to the conservation of the tortoise as directed under Section 7(a)(1) of the FESA). Projects whose net result is to degrade or destroy tortoise habitat, or kill, injure or harm tortoises, places the tortoise on a certain path to extirpation and violates section 2 of the FESA.

- ensure that significant cumulative impacts on resources of concern would not occur as a result of the proposed Project (e.g., exceeding an established threshold such as population viability density for the tortoise or connectivity between tortoise populations).
- analyze, using current data on the tortoise for the action area of the proposed Project, the tortoise population in the Upper Virgin River Recovery Unit, and range-wide, as population numbers and densities have substantially declined in many areas along with the recent destruction of habitat from fires and various types of development.

**Impacts:** After a complete Project description is developed, including descriptions of all facilities that would need to be constructed/upgraded (e.g., access roads, staging areas, storage sites, etc.), the Agencies should analyze the direct, indirect, growth-inducing, synergistic, and cumulative impacts from the construction, operations, and maintenance of these facilities with respect to the tortoise and other special status species; and describe the effective mitigation that would be implemented and the monitoring that would be implemented to determine the effectiveness of the mitigation. The goal would be to fully offset the impacts to the tortoise and other special status species.

As stated above, the indirect and cumulative impacts from the implementation of the proposed Project would likely be significant. The primary reason for the substantial decline in the abundance and densities of adult tortoises and minimal recruitment into the adult population in the Upper Virgin River Recovery Unit as well as range-wide (Allison and McLuckie 2018) has been from increased mortality caused by indirect impacts from human activities. These include human activities that result in the destruction, degradation and/or fragmentation of tortoise habitat; surface disturbance and introduction of non-native invasive plant species via construction equipment, vehicles, and other sources; replacement of native forbs with high nutritional and water value with low nutritional non-native invasive grasses (Drake et al. 2016); increased occurrence of wildfire size, intensity, and frequency of human-caused wildfires from fuels provided by non-native invasive plant species (Brooks and Esque 2002); increased predation from substantially increased numbers of predators that utilize subsidies of food, water, and nesting locations (Boarman 2003); increased human access that provides opportunities for vandalism and collecting tortoises for pets; and drought (more intensive and longer lasting periods of below average precipitation) and climate change.

The NEPA document should analyze the demographic status and trend of the tortoise in the action area, Upper Virgin River Recovery Unit (UVR Recovery Unit), and range-wide. Information similar to that in Appendix A would be appropriate to satisfy this request. The Agencies should use this information as a baseline in the NEPA document and apply the analysis of direct and indirect impacts from the proposed Project along with the impacts from all other approved and proposed plans, projects, and development plans in the action area and UVR Recovery Unit. This analysis would determine the cumulative impacts to the tortoise/tortoise habitat in the action area and UVR Recovery Unit. If the tortoise is unable to survive and persist in the Recovery Unit, the tortoise would not be able to survive and persist range-wide and could not be recovered (USFWS 1994, 2011). A similar analysis should be conducted for each special status species.

**Mitigation, Monitoring, and Adaptive Management:** In the Scoping Report, BR (2025) states that “Environmental protection measures (EPMs) would be used to avoid or minimize environmental effects during construction and operation. Lands temporarily disturbed during construction would be stabilized and restored after construction activities. Multiple other measures would be used to protect the public, wildlife, and other resources. EPMs will be developed as part of the scoping process and will be included in the Draft EA.”

We request that EPMs, otherwise known as mitigation, be developed and implemented effectively, monitored for effectiveness, and modified when not fully effective for all special status species and their habitats including the tortoise. Mitigation of direct, indirect, and cumulative impacts should include, in priority order, avoidance, followed by minimization and compensation for unavoidable and residual impacts. Mitigation should at a minimum offset all functions and values that would be lost or degraded from implementation of all phases of the Project with respect to the direct, indirect, and cumulative impacts for the particular species. For example, if the impacts of the Project would reduce or impede the connectivity between tortoise populations in the UVR Recovery Unit (indirect impact), or result in future development and loss of tortoise habitat that would not occur but for the Project (a cumulative impact), these impacts should be analyzed and fully mitigated. Compensation should be applied only in areas where the lands are effectively managed for the benefit of the tortoise for both the short-term and long-term. Consequently, compensation should be implemented on lands with a durable conservation designation, or on privately owned lands with a conservation easement or other legal instrument that ensures conservation in perpetuity.

Mitigation and monitoring plans should be included in the Draft EA. The requirement that an EIS contain a detailed discussion of possible mitigation measures flows from the language of NEPA. Without such a discussion, the public would be unable to adequately evaluate the severity of the adverse effects. The mitigation plans should be completed and provided in the Draft EA so the public and the decisionmaker can review them and determine the effectiveness of the proposed mitigation. Stating that a mitigation plan will be developed even if this statement includes “using the best available science” is not adequate or appropriate, as the preparers are not always experts on the best available science for that specific subject. When mitigation plans are included in the public review process, this provides the public with the opportunity to submit comments based on their diverse knowledge and experience regarding the adequacy and soundness of the proposed mitigation plans. This public review process increases the likelihood that the mitigation plans when reviewed and finalized will be effective when implemented.

These mitigation plans should include an implementation schedule that is tied to key actions of the construction, operation, and maintenance phases of the Project so that mitigation occurs concurrently with or in advance of the impacts. The mitigation plans should specify success criteria, include an effective monitoring plan that is science-based to collect appropriate data to determine whether success criteria have been met, and identify/implement actions that would be required if the mitigation measures do not meet the success criteria.

Appropriate mitigation plans for the tortoise that should be included in the Draft EA include:

- Predator management plan (especially for common ravens and coyotes)
- Invasive species management plan
- Habitat restoration plan
- Population connectivity/linkage habitat plan
- Fire prevention and management plan
- Habitat compensation plan
- Hazardous materials management plan.

In addition, BR and BLM should implement the best management practices that BLM implements during the construction and maintenance phases of projects in the range of the tortoise that include surface disturbance, trenches, powerlines, and/or pipelines.

We appreciate this opportunity to provide the above comments and trust they will help protect tortoises during any resulting authorized activities. Herein, we reiterate that the Council wants to be identified as an Affected Interest for this and all other projects funded, authorized, or carried out by the BR or BLM that may affect desert tortoises, and that any subsequent environmental documentation for this project is provided to us at the contact information listed above. Additionally, we ask that you notify the DTC at [eac@deserttortoise.org](mailto:eac@deserttortoise.org) of any proposed projects that the BR or BLM may authorize, fund, or carry out in the range of any species of desert tortoise in the southwestern United States (i.e., *Gopherus agassizii*, *G. morafkai*, *G. berlandieri*, *G. flavomarginatus*) so we may comment on them to ensure that the BR and BLM fully consider and implements actions to conserve these tortoises as part of its directive to conserve biodiversity and implement actions to help recover threatened and endangered species rather than contribute to their decline.

Please respond in an email that you have received this comment letter so we can be sure our concerns have been registered with the appropriate personnel and office for this Project.

Respectfully,



Edward L. LaRue, Jr., M.S.  
Desert Tortoise Council, Ecosystems Advisory Committee, Chairperson

Cc: Senator Alex Padilla, [scheduling\\_padilla@padilla.senate.gov](mailto:scheduling_padilla@padilla.senate.gov)  
Senator Adam Schiff, <https://www.schiff.senate.gov/contact/get-in-touch/>

**Appendix A.** Demographic Status and Trend of the Mojave Desert Tortoise (*Gopherus agassizii*)

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[https://www.fws.gov/sites/default/files/documents/Mojave%20Desert%20Tortoise\\_Pre-project%20Survey%20Protocol\\_2019.pdf](https://www.fws.gov/sites/default/files/documents/Mojave%20Desert%20Tortoise_Pre-project%20Survey%20Protocol_2019.pdf)

## Appendix A. Demographic Status and Trend of the Mojave Desert Tortoise (*Gopherus agassizii*)

We provide the following information on the status and trend of the listed population of the desert tortoise (*Gopherus agassizii*) to assist the BR and BLM with its analysis of the direct, indirect, and cumulative impacts of the Proposed Project on the Mojave desert tortoise.

BLM's implementation of a conservation strategy for the Mojave desert tortoise in its resource management plans through 2020 has resulted in the following changes in the status for the tortoise throughout its range and in Nevada from 2004 to 2014 (Table 1; USFWS 2015) and 2004 to 2020 (Table 2). There are 17 populations of Mojave desert tortoise described below that occur in the Critical Habitat Units (CHUs) and Tortoise Conservation Areas (TCAs); 14 are on lands managed by the BLM.

The Desert Tortoise Council (Council) has serious concerns about direct, indirect, and cumulative sources of human mortality for the Mojave desert tortoise given the status and trend of the species range-wide, within each of the five recovery units, and within the TCAs that comprise each recovery unit.

Densities of Adult Mojave Desert Tortoises: A few years after listing the Mojave desert tortoise under the Federal Endangered Species Act (FESA), the U.S. Fish and Wildlife Service (USFWS) published a Recovery Plan for the Mojave desert tortoise (USFWS 1994a). It contained a detailed population viability analysis. In this analysis, the minimum viable density of a Mojave desert tortoise population is 10 adult tortoises per mile<sup>2</sup> (3.9 adult tortoises per km<sup>2</sup>). This assumed a male-female ratio of 1:1 (USFWS 1994a, page C25) and certain areas of habitat with most of these areas geographically linked by adjacent borders or corridors of suitable tortoise habitat. Populations of Mojave desert tortoises with densities below this density are in danger of extinction (USFWS 1994a, page 32). The Revised Recovery Plan (USFWS 2011) designated five recovery units for the Mojave desert tortoise that are intended to conserve the genetic, behavioral, and morphological diversity necessary for the recovery of the entire listed species (Allison and McLuckie 2018).

Range-wide, densities of adult Mojave desert tortoises declined more than 32% between 2004 and 2014 (Table 1) (USFWS 2015). At the recovery unit level, between 2004 and 2014, densities of adult desert tortoises declined, on average, in every recovery unit except the Northeastern Mojave (Table 1). Adult densities in the Northeastern Mojave Recovery Unit increased 3.1% per year (SE = 4.3%), while the other four recovery units declined at different annual rates: Colorado Desert (-4.5%, SE = 2.8%), Upper Virgin River (-3.2%, SE = 2.0%), Eastern Mojave (-11.2%, SE = 5.0%), and Western Mojave (-7.1%, SE = 3.3%) (Allison and McLuckie 2018). However, the small area and low starting density of the tortoises in the Northeastern Mojave Recovery Unit (lowest density of all Recovery Units) resulted in a small overall increase in the number of adult tortoises by 2014 (Allison and McLuckie 2018). In contrast, the much larger areas of the Eastern Mojave, Western Mojave, and Colorado Desert recovery units, plus the higher estimated initial densities in these areas, explained much of the estimated total loss of adult tortoises between 2004 and 2014 (Allison and McLuckie 2018).

At the population level, represented by tortoises in the TCAs, densities of 10 of 17 monitored populations of the Mojave desert tortoise declined from 26% to 64% and 11 have densities less than 3.9 adult tortoises per km<sup>2</sup> that is densities below population viability (USFWS 2015).

Population Data on Mojave Desert Tortoise: The Mojave desert tortoise was listed as threatened under the FESA in 1990. The listing was warranted because of ongoing population declines throughout the range of the tortoise from multiple human-caused activities. Since the listing, the status of the species has changed. Population numbers (abundance) and densities continue to decline substantially (please see Tables 1 and 2).

**Table 1.** Summary of 10-year trend data for 5 Recovery Units and 17 CHUs/TCAs for the Mojave desert tortoise, *Gopherus agassizii* (=Agassiz’s desert tortoise). The table includes the area of each Recovery Unit and CHU/TCA, percent of total habitat for each Recovery Unit and CHU/TCA, density (number of breeding adults/km<sup>2</sup> and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 adults/km<sup>2</sup> (10 adults per mi<sup>2</sup>) (assumes a 1:1 sex ratio) and showing a decline from 2004 to 2014 are in red (Allison and McLuckie 2018, USFWS 2015).

| Recovery Unit Designated CHU/TCA   | Surveyed area (km <sup>2</sup> ) | % of total habitat area in Recovery Unit & CHU/TCA | 2014 density/km <sup>2</sup> (SE) | % 10-year change (2004–2014) |
|------------------------------------|----------------------------------|--|-----------------------------------|------------------------------|
| <b>Western Mojave, CA</b>          | <b>6,294</b>                     | <b>24.51</b>                                       | <b>2.8 (1.0)</b>                  | <b>-50.7 decline</b>         |
| Fremont-Kramer                     | 2,347                            | 9.14   | 2.6 (1.0)                         | -50.6 decline                |
| Ord-Rodman                         | 852                              | 3.32   | 3.6 (1.4)                         | -56.5 decline                |
| Superior-Cronese                   | 3,094                            | 12.05  | 2.4 (0.9)                         | -61.5 decline                |
| <b>Colorado Desert, CA</b>         | <b>11,663</b>                    | <b>45.42</b>                                       | <b>4.0 (1.4)</b>                  | <b>-36.25 decline</b>        |
| Chocolate Mtn AGR, CA              | 713                              | 2.78   | 7.2 (2.8)                         | -29.77 decline               |
| Chuckwalla, CA                     | 2,818                            | 10.97  | 3.3 (1.3)                         | -37.43 decline               |
| Chemehuevi, CA                     | 3,763                            | 14.65  | 2.8 (1.1)                         | -64.70 decline               |
| Fenner, CA                         | 1,782                            | 6.94   | 4.8 (1.9)                         | -52.86 decline               |
| Joshua Tree, CA                    | 1,152                            | 4.49   | 3.7 (1.5)                         | +178.62 increase             |
| Pinto Mtn, CA                      | 508                              | 1.98   | 2.4 (1.0)                         | -60.30 decline               |
| Piute Valley, NV                   | 927                              | 3.61   | 5.3 (2.1)                         | +162.36 increase             |
| <b>Northeastern Mojave</b>         | <b>4,160</b>                     | <b>16.2</b>  | <b>4.5 (1.9)</b>                  | <b>+325.62 increase</b>      |
| Beaver Dam Slope, NV, UT, AZ       | 750                              | 2.92   | 6.2 (2.4)                         | +370.33 increase             |
| Coyote Spring, NV                  | 960                              | 3.74   | 4.0 (1.6)                         | + 265.06 increase            |
| Gold Butte, NV & AZ                | 1,607                            | 6.26   | 2.7 (1.0)                         | + 384.37 increase            |
| Mormon Mesa, NV                    | 844                              | 3.29   | 6.4 (2.5)                         | + 217.80 increase            |
| <b>Eastern Mojave, NV &amp; CA</b> | <b>3,446</b>                     | <b>13.42</b>                                       | <b>1.9 (0.7)</b>                  | <b>-67.26 decline</b>        |
| El Dorado Valley, NV               | 999                              | 3.89   | 1.5 (0.6)                         | -61.14 decline               |
| Ivanpah Valley, CA                 | 2,447                            | 9.53   | 2.3 (0.9)                         | -56.05 decline               |
| <b>Upper Virgin River</b>          | <b>115</b>                       | <b>0.45</b>  | <b>15.3 (6.0)</b>                 | <b>-26.57 decline</b>        |
| Red Cliffs Desert                  | 115                              | 0.45   | 15.3 (6.0)                        | -26.57 decline               |
| <b>Total amount of land</b>        | <b>25,678</b>                    | <b>100.00</b>                                      |                                   | <b>-32.18 decline</b>        |

Density of Juvenile Mojave Desert Tortoises: Survey results indicate that the proportion of juvenile desert tortoises has been decreasing in all five recovery units since 2007 (Allison and McLuckie 2018). The probability of encountering a juvenile tortoise was consistently lowest in the Western Mojave Recovery Unit. Allison and McLuckie (2018) provided reasons for the decline in juvenile desert tortoises in all recovery units. These included decreased food availability for adult female tortoises resulting in reduced clutch size, decreased food availability resulting in increased mortality of juvenile tortoises, prey switching by coyotes from mammals to tortoises, and increased abundance of common ravens that typically prey on smaller desert tortoises.

Declining adult tortoise densities through 2014 have left the Eastern Mojave adult numbers at 33% (a 67% decline of their 2004 levels) (Allison and McLuckie 2018, USFWS 2015). Such steep declines in the density of adults are only sustainable if there are suitably large improvements in reproduction and juvenile growth and survival. However, the proportion of juveniles has not increased anywhere in the range of the Mojave desert tortoise since 2007, and in the Eastern Mojave Recovery Unit the proportion of juveniles in 2014 declined from 14 to 11 percent (a 21% decline) of their representation since 2007 (Allison and McLuckie 2018).

The USFWS and Utah Division of Wildlife Resources have continued to collect density data on the Mojave desert tortoise since 2014. The results are provided in Table 2 along with the analysis USFWS (2015) conducted for tortoise density data from 2004 through 2014. These data show that adult tortoise densities in most Recovery Units continued to decline in density since the data collection methodology was initiated in 2004. In addition, in the Northeastern Mojave Recovery Unit that had shown an overall increase in tortoise density between 2004 and 2014, subsequent data indicate a decline in density since 2014 (USFWS 2016, 2018, 2019, 2020, 2022a, 2022b).

**Table 2.** Summary of data for Agassiz’s desert tortoise, *Gopherus agassizii* (=Mojave desert tortoise) from 2004 to 2023 for the 5 Recovery Units and 17 CHUs/TCAs. The table includes the area of each Recovery Unit and CHU/TCA, percent of total habitat for each Recovery Unit and CHU/TCA, density (number of breeding adults/km<sup>2</sup> and standard errors = SE), and percent change in population density between 2004-2014 (USFWS 2015). Populations below the viable level of 3.9 breeding individuals/km<sup>2</sup> (10 breeding individuals per mi<sup>2</sup>) (assumes a 1:1 sex ratio) (USFWS 1994a, 2015) or showing a decline from 2004 to 2014 are in **red**.

| Recovery Unit:<br>Designated<br>CHU/TCA & | % of total<br>habitat area<br>in Recovery<br>Unit &<br>CHU/TCA | 2014<br>density/<br>km <sup>2</sup><br>(SE) | % 10-year<br>change<br>(2004–<br>2014) | 2015<br>density/<br>km <sup>2</sup> | 2016<br>density/<br>km <sup>2</sup> | 2017<br>density/<br>km <sup>2</sup> | 2018<br>density/<br>km <sup>2</sup> | 2019<br>density/<br>km <sup>2</sup> | 2020<br>density/<br>km <sup>2</sup> | 2021<br>density/<br>km <sup>2</sup> | 2023<br>density/<br>km <sup>2</sup> |
|---|--|---|--|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <b>Western<br/>Mojave, CA</b>             | <b>24.51</b>   | <b>2.8 (1.0)</b>                            | <b>-50.7<br/>decline</b>               |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |
| Fremont-Kramer                            | 9.14   | 2.6 (1.0)                                   | -50.6<br>decline                       | 4.5                                 | No data                             | 4.1                                 | No data                             | 2.7                                 | 1.7                                 | No data                             | No data                             |
| Ord-Rodman                                | 3.32   | 3.6 (1.4)                                   | -56.5<br>decline                       | No data                             | No data                             | 3.9                                 | 2.5/3.4*                            | 2.1/2.5*                            | No data                             | 1.9/2.5*                            | No data                             |
| Superior-<br>Cronese                      | 12.05  | 2.4 (0.9)                                   | -61.5<br>decline                       | 2.6                                 | 3.6                                 | 1.7                                 | No data                             | 1.9                                 | No data                             | No data                             | No data                             |
| <b>Colorado<br/>Desert, CA</b>            | <b>45.42</b>   | <b>4.0 (1.4)</b>                            | <b>-36.25<br/>decline</b>              |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |
| Chocolate Mtn<br>AGR, CA                  | 2.78   | 7.2 (2.8)                                   | -29.77<br>decline                      | 10.3                                | 8.5                                 | 9.4                                 | 7.6                                 | 7.0                                 | 7.1                                 | 3.9                                 | 6.9                                 |
| Chuckwalla, CA                            | 10.97  | 3.3 (1.3)                                   | -37.43<br>decline                      | No data                             | No data                             | 4.3                                 | No data                             | 1.8                                 | 4.6                                 | 2.6                                 | No data                             |
| Chemehuevi, CA                            | 14.65  | 2.8 (1.1)                                   | -64.70<br>decline                      | No data                             | 1.7                                 | No data                             | 2.9                                 | No data                             | 4.0                                 | No data                             | No data                             |
| Fenner, CA                                | 6.94   | 4.8 (1.9)                                   | -52.86<br>decline                      | No data                             | 5.5                                 | No data                             | 6.0                                 | 2.8                                 | No data                             | 5.3                                 | No data                             |
| Joshua Tree, CA                           | 4.49   | 3.7 (1.5)                                   | +178.62<br>increase                    | No data                             | 2.6                                 | 3.6                                 | No data                             | 3.1                                 | 3.9                                 | No data                             | No data                             |
| Pinto Mtn, CA                             | 1.98   | 2.4 (1.0)                                   | -60.30<br>decline                      | No data                             | 2.1                                 | 2.3                                 | No data                             | 1.7                                 | 2.9                                 | No data                             | No data                             |
| Piute Valley, NV                          | 3.61   | 5.3 (2.1)                                   | +162.36<br>increase                    | No data                             | 4.0                                 | 5.9                                 | No data                             | No data                             | No data                             | 3.9                                 | No data                             |

| Recovery Unit:<br>Designated<br>CHU/TCA  | % of total<br>habitat area in<br>Recovery Unit<br>& CHU/TCA | 2014<br>density/km <sup>2</sup><br>(SE) | % 10-year<br>change<br>(2004–2014) | 2015<br>density/<br>km <sup>2</sup> | 2016<br>density/<br>km <sup>2</sup> | 2017<br>density/<br>km <sup>2</sup> | 2018<br>density/<br>km <sup>2</sup> | 2019<br>density/<br>km <sup>2</sup> | 2020<br>density/<br>km <sup>2</sup> | 2021<br>density/<br>km <sup>2</sup> | 2023<br>density/<br>km <sup>2</sup> |
|--|---|---|------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <b>Northeastern Mojave<br/>AZ, NV, &amp; UT</b>  | <b>16.2</b>   | <b>4.5 (1.9)</b>                        | <b>+325.62<br/>increase</b>        |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |
| Beaver Dam Slope, NV,<br>UT, & AZ  | 2.92  | 6.2 (2.4)                               | +370.33<br>increase                | No data                             | 5.6                                 | 1.3                                 | 5.1                                 | 2.0                                 | No data                             | No data                             | No data                             |
| Coyote Spring, NV  | 3.74  | 4.0 (1.6)                               | + 265.06<br>increase               | No data                             | 4.2                                 | No data                             | No data                             | 3.2                                 | No data                             | No data                             | No data                             |
| Gold Butte, NV & AZ  | 6.26  | 2.7 (1.0)                               | + 384.37<br>increase               | No data                             | No data                             | 1.9                                 | 2.3                                 | No data                             | No data                             | 2.4                                 | No data                             |
| Mormon Mesa, NV  | 3.29  | 6.4 (2.5)                               | + 217.80<br>increase               | No data                             | 2.1                                 | No data                             | 3.6                                 | No data                             | 5.2                                 | 5.2                                 | No data                             |
| <b>Eastern Mojave, NV &amp;<br/>CA</b>   | <b>13.42</b>  | <b>1.9 (0.7)</b>                        | <b>-67.26<br/>decline</b>          |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |
| El Dorado Valley, NV   | 3.89  | 1.5 (0.6)                               | -61.14<br>decline                  | No data                             | 2.7                                 | 5.6                                 | No data                             | 2.3                                 | No data                             | No data                             | No data                             |
| Ivanpah Valley, CA   | 9.53  | 2.3 (0.9)                               | -56.05<br>decline                  | 1.9                                 | No data                             | No data                             | 3.7                                 | 2.6                                 | No data                             | 1.8                                 | No data                             |
| <b>Upper Virgin River,<br/>UT &amp; AZ</b>   | <b>0.45</b>   | <b>15.3 (6.0)</b>                       | <b>-26.57<br/>decline</b>          |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |
| Red Cliffs Desert**  | 0.45  | 29.1 (21.4-<br>39.6)**                  | -26.57<br>decline                  | 15.0                                | No data                             | 19.1                                | No data                             | 17.2                                | No data                             | No data                             | 17.5                                |
| <b>Rangewide Area of<br/>CHUs -<br/>TCAs/Rangewide<br/>Change in Population<br/>Status</b> | <b>100.00</b>   |   | <b>-32.18<br/>decline</b>          |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |

\*This density includes the adult tortoises translocated from the expansion of the MCAGCC, that is resident adult tortoises and translocated adult tortoises.

\*\*Methodology for collecting density data initiated in 1999.

Abundance of Mojave Desert Tortoises: Allison and McLuckie (2018) noted that because the area available to tortoises (i.e., tortoise habitat and linkage areas between habitats) is decreasing, trends in tortoise density no longer capture the magnitude of decreases in abundance. Hence, they reported on the change in abundance or numbers of the Mojave desert tortoise in each recovery unit (Table 2). They noted that these estimates in abundance are likely higher than actual numbers of tortoises, and the changes in abundance (i.e., decrease in numbers) are likely lower than actual numbers because of their habitat calculation method. They used area estimates that removed only impervious surfaces created by development as cities in the desert expanded. They did not consider degradation and loss of habitat from other sources, such as the recent expansion of military operations (753.4 km<sup>2</sup> so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires ( e.g., 576.2 km<sup>2</sup> of critical habitat that burned in 2005), development of utility-scale solar facilities (as of 2015, 194 km<sup>2</sup> have been permitted) (USFWS 2016), or other sources of degradation or loss of habitat (e.g., recreation, mining, grazing, infrastructure, etc.). Thus, the declines in abundance of Mojave desert tortoise are likely greater than those reported in Table 3.

**Table 3.** Estimated change in abundance of adult Mojave desert tortoises in each recovery unit between 2004 and 2014 (Allison and McLuckie 2018). Decreases in abundance are in red.

| Recovery Unit       | Modeled Habitat (km <sup>2</sup> ) | 2004 Abundance | 2014 Abundance | Change in Abundance | Percent Change in Abundance |
|---------------------|------------------------------------|----------------|----------------|---------------------|-----------------------------|
| Western Mojave      | 23,139                             | 131,540        | 64,871         | -66,668             | -51%                        |
| Colorado Desert     | 18,024                             | 103,675        | 66,097         | -37,578             | -36%                        |
| Northeastern Mojave | 10,664                             | 12,610         | 46,701         | 34,091              | 270%                        |
| Eastern Mojave      | 16,061                             | 75,342         | 24,664         | -50,679             | -67%                        |
| Upper Virgin River  | 613                                | 13,226         | 10,010         | -3,216              | -24%                        |
| <b>Total</b>        | <b>68,501</b>                      | <b>336,393</b> | <b>212,343</b> | <b>-124,050</b>     | <b>-37%</b>                 |

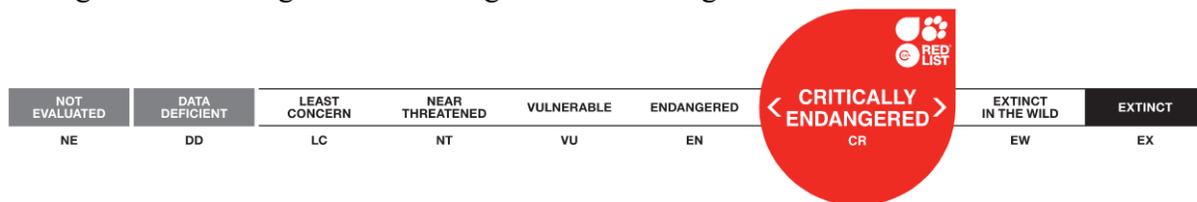
Habitat Availability: Data on population density or abundance does not indicate population viability. The area of protected habitat or reserves for the subject species is a crucial part of the viability analysis along with data on density, abundance, and other population parameters. In the Desert Tortoise (Mojave Population) Recovery Plan (USFWS 1994a), the analysis of population viability included population density and size of reserves (i.e., areas managed for the desert tortoise) and population numbers (abundance) and size of reserves. The USFWS Recovery Plan reported that as population densities for the Mojave desert tortoise decline, reserve sizes must increase, and as population numbers (abundance) for the Mojave desert tortoise decline, reserve sizes must increase (USFWS 1994a). In 1994, reserve design (USFWS 1994a) and designation of critical habitat (USFWS 1994b) were based on the population viability analysis from numbers (abundance) and densities of populations of the Mojave desert tortoise in the early 1990s. Inherent in this analysis is that the lands be managed with reserve level protection (USFWS 1994a, page 36) or ecosystem protection as described in section 2(b) of the FESA, and that sources of mortality be reduced so recruitment exceeds mortality (that is,  $\lambda > 1$ ) (USFWS 1994a, page C46).

Habitat loss would also disrupt the prevailing population structure of this widely distributed species with geographically limited dispersal (isolation by resistance Dutcher et al. 2020). Allison and McLuckie (2018) anticipate an additional impact of this habitat loss/degradation is decreasing resilience of local tortoise populations by reducing demographic connections to neighboring populations (Fahrig 2007). Military and commercial operations and infrastructure projects that reduce tortoise habitat in the desert are anticipated to continue (Allison and McLuckie 2018) as are other sources of habitat loss/degradation.

Allison and McLuckie (2018) reported that the life history of the Mojave desert tortoise puts it at greater risk from even slightly elevated adult mortality (Congdon et al. 1993; Doak et al. 1994), and recovery from population declines will require more than enhancing adult survivorship (Spencer et al. 2017). The negative population trends in most of the TCAs for the Mojave desert tortoise indicate that this species is on the path to extinction under current conditions (Allison and McLuckie 2018). They state that their results are a call to action to remove ongoing threats to tortoises from TCAs, and possibly to contemplate the role of human activities outside TCAs and their impact on tortoise populations inside them.

Densities, numbers, and habitat for the Mojave desert tortoise declined between 2004 and 2014 and densities continue to decline in most Recovery Units since 2014. As reported in the population viability analysis, to improve the status of the Mojave desert tortoise, reserves (area of protected habitat) must be established and managed. When densities of tortoises decline, the area of protected habitat must increase. When the abundance of tortoises declines, the area of protected habitat must increase. We note that the Desert Tortoise (Mojave Population) Recovery Plan was released in 1994 and its report on population viability and reserve design was reiterated in the 2011 Revised Recovery Plan as needing to be updated with current population data (USFWS 2011, p. 83). With lower population densities and abundance, a revised population viability analysis would show the need for greater areas of habitat to receive reserve level of management for the Mojave desert tortoise. In addition, we note that none of the recovery actions that are fundamental tenets of conservation biology has been implemented throughout most or all of the range of the Mojave desert tortoise.

IUCN Species Survival Commission: The Mojave desert tortoise is now on the list of the world’s most endangered tortoises and freshwater turtles. It is in the top 50 species. The International Union for Conservation of Nature’s (IUCN) Species Survival Commission, Tortoise and Freshwater Turtle Specialist Group, now considers Mojave desert tortoise to be Critically Endangered (Berry et al. 2021). As such, it is a “species that possess an extremely high risk of extinction as a result of rapid population declines of 80 to more than 90 percent over the previous 10 years (or three generations), a current population size of fewer than 50 individuals, or other factors.” It is one of three turtle and tortoise species in the United States to be critically endangered. This designation is more grave than endangered.



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