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Via email only

September 12, 2023

Attn: James Lee Kirk, Nickolas Pay
Bureau of Land Management, Southern Nevada District Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130.
jkirk@blm.gov, blm_nv_sndo_web_mail@blm.gov

RE: GridLiance West Core Upgrades Project – Scoping (DOI-BLM-NV-S030-2023-0008-RMP-EIS)

Dear Mr. Kirk, Mr. Pay,

The Desert Tortoise Council (Council) is a non-profit organization comprised of 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 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 projects in habitats known to be occupied by 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 authorized by the Bureau of Land Management (BLM), which we recommend be added to project terms and conditions in the authorizing document (e.g., right of way grant, etc.) as appropriate. Please accept, carefully review, and include in the relevant project file the Council's following comments and attachments for the proposed project.

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), habit 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 Council to join Defenders of Wildlife and Desert Tortoise Preserve Committee (Defenders of Wildlife et al. 2020) to petition the California Fish and Game Commission in March 2020 to elevate the listing of the Mojave desert tortoise from threatened to endangered in California.

We appreciate that Mr. Kirk contacted the Council on August 8, 2023 via email with a link to the project notice and availability of a virtual public meeting on August 30, 2023, which was attended by Ed LaRue of the Council. The meeting was informative and the BLM's Pahrump field manager, Nicholas Pay, did a good job of answering the questions presented by myself and other participants.

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" [40 Code of Federal Regulations (CFR) 1501.7]. The Draft Environmental Impact Statement (DEIS) should discuss how this proposed project fits within the management structure of the current land management plan for the area [e.g., Las Vegas Resource Management Plan (BLM 1998) and Programmatic Solar EIS (BLM DOE 2012; herein "Solar PEIS")]. It should provide maps of critical habitat for the Mojave desert tortoise (USFWS 1994a), Areas of Critical Environmental Concern (ACECs), and other areas identified for special management by BLM [e.g., National Conservation Lands (NCLs)]; U.S. Fish and Wildlife Service (USFWS) (e.g., linkage habitats between desert tortoise populations); Nevada Department of Wildlife (NDOW); other federal, state, and local agencies; and tribal lands.

The following project information is taken from the BLM's National Environmental Policy Act (NEPA) Register announcing the opportunity to provide scoping comments on the project: "GridLiance West, LLC (Applicant), a subsidiary of NextEra Energy Resources, LLC, submitted a right-of-way (ROW) application to the BLM Southern Nevada District Office to amend four segments of the existing single-circuit 230-kV transmission system rights-of-way (ROW) grants for the construction, operation, maintenance, and decommissioning of approximately 155 miles of a double-circuit 230-kV or 500-kV transmission system upgrade extending between the Sloan Canyon Switchyard and the Northwest Substation. The upgraded transmission line facilities will generally be located parallel to the existing transmission facilities and other linear facilities or within the existing utility corridor.

"The project is located in Nye and Clark Counties, Nevada. The existing 230-kV single-circuit transmission system, substations, and switchyards proposed to be upgraded by the project starts southeast of Las Vegas, then loops around the Spring Mountains to the northwest, before connecting back to a substation located northwest of Las Vegas, Nevada. The majority of the project is located on federal land managed by the BLM, but also includes lands managed by the Las Vegas Paiute Snow Mountain Reservation, the Department of Defense, and State of Nevada, as well as private lands. The Applicant is pursuing the issuance of a Title V Federal Lands Policy and Management Act of 1976 (FLPMA) ROW grant from the BLM in compliance with FLPMA, BLM ROW regulations, and other applicable Federal laws. The Applicant and the BLM will also be pursuing a Resource Management Plan Amendment to the 1998 Las Vegas Resource Management Plan [Las Vegas RMP Amendment] in the BLM Southern Nevada District Office to allow for the project to conform with the Resource Management Plan."

We are concerned that, with this and other recent projects in southern Nevada, the BLM is planning to amend a management plan (BLM 1998) that is outdated and no longer reflects the current status and population trends of desert tortoises occurring within the Northeastern and Eastern Mojave Recovery Units (USFWS 2011) where the project would occur. When asked about BLM's intent to update the Las Vegas RMP at the virtual meeting, Mr. Pay indicated that BLM is considering revising the Las Vegas RMP, but is not actively doing so at this time, and has not identified an initiation date to revise this outdated, obsolete RMP. For example, the Las Vegas RMP did not anticipate the unprecedented conversion of prime tortoise habitats into sterile solar fields, particularly in the Pahrump Valley and around Stateline. Note that this is one of the primary reasons we have asked BLM to describe the relationship between this project and the Solar PEIS in this DEIS.

When asked, Mr. Pay indicated that a total of 38 living tortoises were found during surveys, presumably within the ROW that corresponds to the preferred alternative, although survey methods were not elucidated. This is a substantial number of animals, presumably found within a limited area of several hundred feet wide (please be sure to include methodologies and results of these surveys so we can see the actual survey area and methodologies used). This does not bode well for the loss of tortoises to new solar facilities and growth-inducing impacts that would not happen "but for" this project. Please be sure that both the biological assessment and the project-specific biological opinion, if available, are included as attachments to the DEIS. Mr. Pay indicated that a project-specific biological opinion will be required for the project.

Section 7(a)(1) of the Federal Endangered Species Act (FESA) states that all federal agencies "…shall… utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to Section 4 of this Act [FESA]." In Section 3 of the FESA, "conserve," "conserving," and "conservation" mean "to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition…"

The Council believes that available data demonstrate that BLM's management of the Mojave desert tortoise throughout southern Nevada, including Pahrump Valley, has not been effective in meeting BLM's Section 7(a)(1) mandate of carrying out programs for its conservation. To meet its Section 7(a)(1) responsibilities, the BLM needs to adopt and implement management actions that result in stable and eventually increasing tortoise populations.

We request that BLM require the project proponent to comply with BLM's (2021a) Mitigation Manual (MS-1794) and Mitigation Handbook (H-1794-1; BLM 2021b). The Mitigation Manual and Handbook provide policy and guidance on implementing mitigation to address impacts to resources from public land uses. Specifically, we request that the project proponent be required to mitigate all direct and indirect impacts of the proposed project to the tortoise and tortoise habitat and conscientiously implement effectiveness monitoring.

The Council provides information in Appendix A so the BLM can ensure that the proponent fully addresses the current plight of the tortoise in the region, the Northeastern and Eastern Mojave Recovery Units, and throughout the listed Mojave population. The Council believes that BLM's failure to implement effective recovery actions for the Mojave desert tortoise as given in the recovery plan (both USFWS 1994b and 2011) has contributed to tortoise declines between 2004 to 2014 (Appendix A) that was not foreseen in the Las Vegas RMP, which was written 20 years before serious, ubiquitous declines of tortoises were revealed in Allison and McLuckie (2018).

Furthermore, we also expect this DEIS, in particular, to document the unprecedented loss of suitable and occupied desert tortoise habitats throughout southern Nevada where thousands of acres of public lands managed by the BLM have been converted into sterile habitats, disrupting linkage corridors, and displacing hundreds of desert tortoises, many of which have subsequently died from predation and other foreseen and unforeseen consequences. Unlike a single solar facility that will convert thousands of acres of occupied tortoise habitats into unoccupied habitats, this project has the unprecedented capability to result in both growth-inducing impacts and even more solar development, which at some point (possibly already achieved), will be unstainable in the Pahrump Valley and other portions of southern Nevada. Mr. Pay indicated, for example, that the project would likely result in "economic opportunities" in the rural communities of Goodsprings and Sandy Valley, which we equate to the potential to develop even more suitable and occupied tortoise habitats.

For these reasons (if not already), the BLM must create a database and geospatial tracking system for impacts to sensitive species, including Mojave desert tortoises, that track cumulative impacts (e.g., vegetation/surface disturbance, paved and unpaved routes (both authorized and unauthorized/ad hoc), linear projects, invasive species occurrence, herbicide/pesticide use, wildfires, etc.), management decisions, and effectiveness of mitigation for each project. Without such a tracking system, BLM is unable to analyze cumulative impacts to sensitive species (e.g., desert tortoises) with any degree of confidence.

When asked during the scoping meeting, Mr. Pay indicated that this project would not only accommodate existing solar development, but it will also predictably result in even more solar development throughout a region that has already been bombarded with what seems like unrestrained solar development and impacts to public lands that are irreversible within any of our lifetimes, if ever. Therefore, we expect the DEIS to document those foreseeable projects that would not happen "but for" this transmission line, which are considered connected actions.

Pursuant to Section 1508.25 of the Council on Environmental Quality's (CEQ) regulations (40 CFR 1508.25), a DEIS must cover the entire scope of a proposed action, considering all connected, cumulative, and similar actions in one document. Pursuant to Section 1506.1(a) of these regulations, an agency action cannot "[l]imit the choice of reasonable alternatives" before reaching a final decision in a published [Record of Decision] (ROD). These regulations ensure agencies will prepare a complete environmental analysis that provides a "hard look" at the environmental consequences of all proposed actions instead of segmenting environmental reviews (Novack 2015). Please explain whether any current proposed actions within the region are connected to this transmission line and if not, why.

We appreciate that the proposed project is an upgrade to an existing set of transmission lines that would be augmented and that these lines mostly occur within existing utility corridors, although not all of them. Please be sure that the DEIS documents which reaches of the lines are inside and outside BLM-designated utility corridors. Are the corridors currently identified in the Las Vegas RMP, and is this among the ways the RMP would need to be amended to accommodate the project?

The NEPA notice does not reveal that there would be substantial differences in the levels of impacts, depending on whether the double-circuit 230-kV or 500-kV transmission system is developed, which was fortunately revealed in the virtual scoping meeting. During the meeting, information was revealed that a 230-kV system could result in a 150-foot-wide impact area while a 500-kV line could result in a 300-foot-wide impact. It is not clear why there may be twice as much impact with development of the larger voltage system, so please be sure to explain that in the DEIS, and to estimate direct, indirect, cumulative, and growth-inducing impacts associated with one versus the other system.

When asked, Mr. Pay indicated that most of the existing transmission lines are associated with existing access roads, but not all of them. And the implication is that the access roads would need to be substantially widened to accommodate either one of the proposed systems. Please be sure that the DEIS documents how much of the lines will use existing access roads and how much habitat would be lost to constructing new access roads or widening existing roads.

We request that the DEIS include information on the locations, sizes, and arrangements of new and improved access roads, who will have access to them, whether the project area will be secured to prevent human access or vandalism, and if so, what methods would be used. The presence of roads even with low vehicle use has multiple adverse effects on the desert tortoise and its habitats. These include the deterioration/loss of wildlife habitat, hydrology, geomorphology, and air quality; increased competition and predation (including by humans); and the loss of naturalness or pristine qualities, all of which must be analyzed in the DEIS. Herein, we provide Appendix B, which is an extensive bibliography of literature that identifies problems and solutions associated with existing roads and new roads that will provide new access into otherwise inaccessible areas.

Please include in the DEIS analyses of the five major categories of primary road effects to the tortoise and special status species: (1) wildlife mortality from collisions with vehicles; (2) hindrance/barrier to animal movements thereby reducing access to resources and mates; (3) degradation of habitat quality; (4) habitat loss caused by disturbance effects in the wider environment and from the physical occupation of land by the road; and (5) subdividing animal populations into smaller and more vulnerable fractions (Jaeger et al. 2005a, 2005b, Roedenbeck et al. 2007).

The DEIS should comply with the Council on Environmental Quality's (2023) "Guidance for Federal Departments and Agencies on Ecological Connectivity and Wildlife Corridors." For the tortoise, this would include data (Dutcher et al. 2020, USFWS 2020, etc.) on areas identified/needed as habitats for connectivity for tortoises and an analysis of the impacts of the proposed project including indirect, cumulative, and growth-inducing impacts from the proposed project and future projects authorized by BLM.

The DEIS must analyze if the upgrade of this transmission line would result in an increase of common ravens and other predators of the desert tortoise in the region. Will new nesting substrates result from developing the preferred alternative, introducing new tower structures that will be used by nesting ravens? Please be sure that growth-inducing impacts are also addressed, assuming that expanded development in the region resulting from this project will provide new subsidies that would not occur "but for" this project. Future operations must include provisions for monitoring and managing raven predation on tortoises as a result of the proposed action. The monitoring and management plan must include reducing human subsidies for food, water, and sites for nesting, roosting, and perching to address local impacts. The Proponent must contribute to the National Fish and Wildlife Foundation's Raven Management Fund for regional and cumulative impacts. It is very important that the Project should use transmission towers that prevent raven nesting. For example, the tubular design with insulators on horizontal cross arms is preferable to lattice towers, which should not be used.

Please ensure that all standard measures to mitigate the local, regional, and cumulative impacts of raven predation on the tortoise are included in this DEIS, including developing a raven management plan for this specific project. USFWS (2010) provides a template for a project-specific management plan for common ravens. This template includes sections on construction, operation, maintenance, and decommissioning (including restoration) with monitoring and adaptive management during each project phase (USFWS 2010).

We request that the DEIS address the effects of the proposed action on global warming and the effects that global warming may have on the proposed action. For the latter, we recommend including: an analysis of habitats within the region affected by the project that may provide refugia for tortoise populations; an analysis of how the proposed action would contribute to the spread and proliferation of nonnative invasive plant species; how this spread/proliferation would affect the desert tortoise and its habitats (including the frequency and size of human-caused fires); and how the proposed action may affect the likelihood of human-caused fires. We strongly urge the proponent to develop and implement a management and monitoring plan using this analysis and other relevant data that would reduce the transport to and spread of nonnative seeds and other plant propagules within the project area and eliminate/reduce the likelihood of human-caused fires. The plan should integrate vegetation management with fire management and fire response.

The DEIS should include appropriate mitigation and monitoring plans for all direct, indirect, and cumulative effects to the tortoise and its habitats; the mitigation and monitoring plan should use the best available science with a commitment to implement the mitigation commensurate to impacts to the tortoise and its habitats. Mitigation and monitoring should include a fully-developed desert tortoise translocation plan; raven management plan; weed management plan; fire management plan; compensation plan for the degradation and loss of tortoise habitat that includes protection of the acquired, improved, and restored habitat in perpetuity for the tortoise from future development and human use; a plan to protect tortoise translocation area(s) from future development and human use in perpetuity; and habitat restoration plan when the lease is terminated and the proposed project is decommissioned.

These mitigation and monitoring plans should include an implementation schedule that is tied to key actions of the construction, operation, maintenance, decommissioning, and restoration phases of the project so that mitigation occurs concurrently with or in advance of the impacts. The plans should specify success criteria, include a monitoring plan to collect data to determine whether success criteria have been met, and identify actions that would be required if the mitigation measures do not meet the success criteria. Because transmission lines may be a source of fire, we request that the DEIS include a fire prevention plan in addition to a fire management plan.

Cumulative Effects

With regards to cumulative effects, the DEIS should list and analyze all project impacts within the region including future state, federal, and private actions affecting listed species on state, federal, and private lands. The Council asks that the relationship between this proposed project and the Solar PEIS (BLM and DOE 2012) and Las Vegas RMP be analyzed. We also expect that the environmental documents will provide a detailed analysis of the growth-inducing development that will result in adjacent areas throughout the region, and particularly how the Mojave desert tortoise will be affected by this new development.

In the cumulative effects analysis of the DEIS, please ensure that the CEQs "Considering Cumulative Effects under the National Environmental Policy Act" (1997) is followed, including the eight principles, when analyzing cumulative effects of the proposed action to the tortoise and its habitats. CEQ states, "Determining the cumulative environmental consequences of an action requires delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. The range of actions that must be considered includes not only the project proposal but all connected and similar actions that could contribute to cumulative effects." The analysis "must describe the response of the resource to this environmental change." Cumulative impact analysis should "address the sustainability of resources, ecosystems, and human communities." For example, the DEIS should include data on the estimated number of acres of tortoise habitats degraded/lost and the numbers of tortoises that may be lost to growth-inducing impacts in the region.

CEQs guidance on how to analyze cumulative environmental consequences is given in the eight principles listed below:

1. Cumulative effects are caused by the aggregate of past, present, and reasonable future actions.
The effects of a proposed action on a given resource, ecosystem, and human community, include the present and future effects added to the effects that have taken place in the past. Such cumulative effects must also be added to the effects (past, present, and future) caused by all other actions that affect the same resource.

2. Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, non-federal, or private) has taken the actions.
Individual effects from disparate activities may add up or interact to cause additional effects not apparent when looking at the individual effect at one time. The additional effects contributed by actions unrelated to the proposed action must be included in the analysis of cumulative effects.

3. Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
Environmental effects are often evaluated from the perspective of the proposed action. Analyzing cumulative effects requires focusing on the resources, ecosystem, and human community that may be affected and developing an adequate understanding of how the resources are susceptible to effects.

4. It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
For cumulative effects analysis to help the decision maker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly or the effects are no longer of interest to the affected parties.

5. Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
Resources are typically demarcated according to agency responsibilities, county lines, grazing allotments, or other administrative boundaries. Because natural and sociocultural resources are not usually so aligned, each political entity actually manages only a piece of the affected resource or ecosystem. Cumulative effects analysis on natural systems must use natural ecological boundaries and analysis of human communities must use actual sociocultural boundaries to ensure including all effects.

6. Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
Repeated actions may cause effects to build up through simple addition (more and more of the same type of effect), and the same or different actions may produce effects that interact to produce cumulative effects greater than the sum of the effects.

7. Cumulative effects may last for many years beyond the life of the action that caused the effects.
Some actions cause damage lasting far longer than the life of the action itself (e.g., acid mine damage, radioactive waste contamination, species extinctions). Cumulative effects analysis need to apply the best science and forecasting techniques to assess potential catastrophic consequences in the future.

8. Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.
Analysts tend to think in terms of how the resources, ecosystem, and human community will be modified given the action's development needs. The most effective cumulative effects analysis focuses on what is needed to ensure long-term productivity or sustainability of the resource.

To help BLM understand the complexity of the cumulative and interactive nature of multiple anthropogenic threats to desert tortoise populations and to help develop BLM's analysis of cumulative impacts in the DEIS for this project, we have included a map of some of these multiple threats and their relationships to other threats (Tracy et al. 2004) (please see Figure 1).

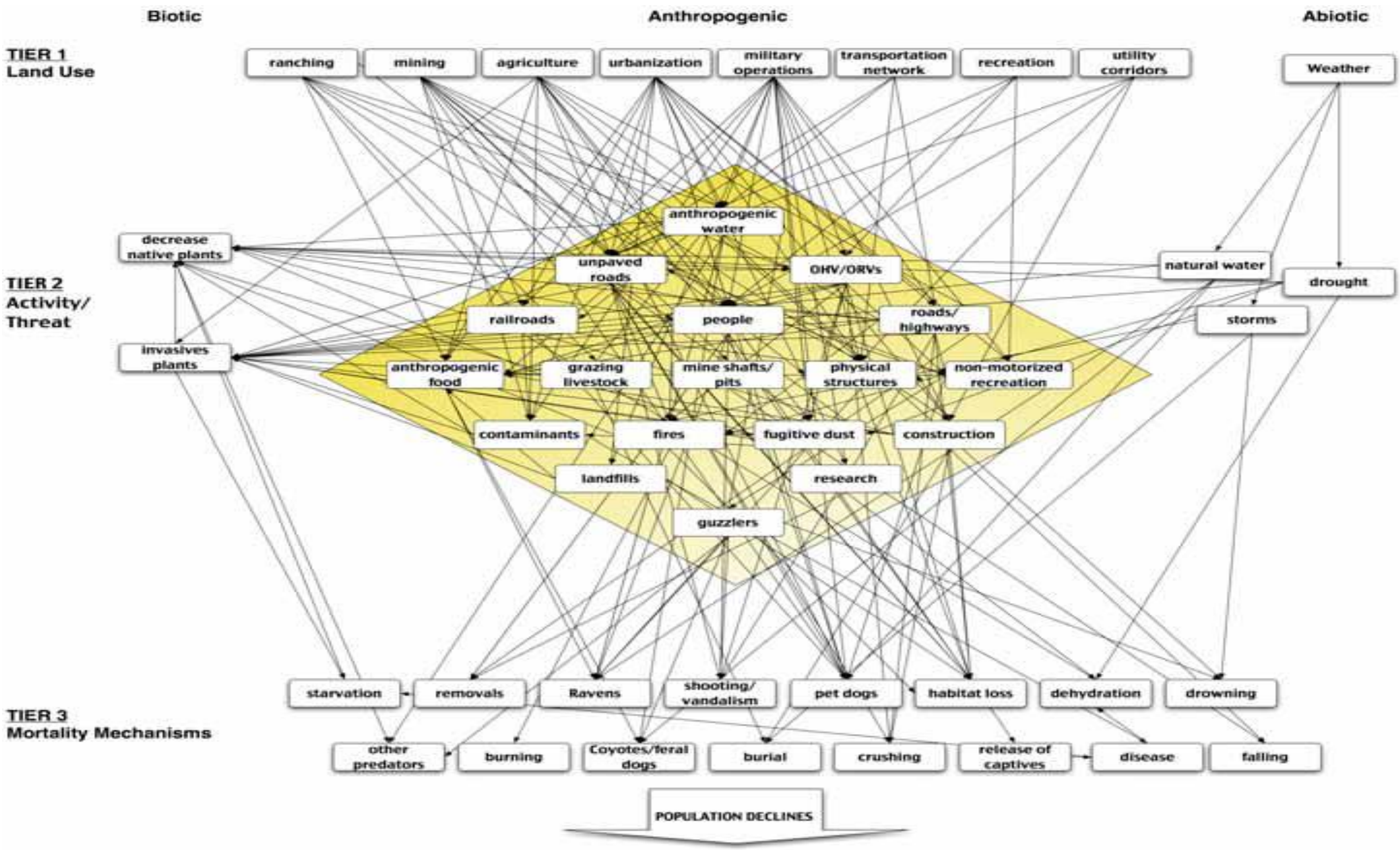
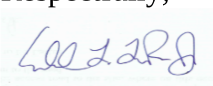


Figure 1. Network of threats demonstrating the interconnectedness between multiple human activities that interact to cause mortality and prevent recovery of tortoise populations. Tier 1 includes the major land use patterns that facilitate various activities (Tier 2) that impact tortoise populations through a suite of mortality factors (Tier 3). Just one land use results in several activities that are threats to the tortoise and cause numerous mortality mechanisms (from Tracy et al. 2004).

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 Desert Tortoise Council wants to be identified as an Affected Interest for this and all other projects funded, authorized, or carried out by the 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 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 these Projects.

Respectfully,



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

cc. Glen Knowles, Field Supervisor, Southern Nevada Field Office (Las Vegas), U.S. Fish and Wildlife Service, glen_knowles@fws.gov
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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 to assist the 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 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^2 (3.9 adult tortoises per km^2). 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 since 2004 (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^2 (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^2 and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 adults/km^2 (10 adults per mi^2) (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^2)	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/km^2 (SE)	% 10-year change (2004–2014)
Western Mojave, CA	**6,294**	**24.51**	**2.8 (1.0)**	**–50.7 decline**
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
Colorado Desert, CA	**11,663**	**45.42**	**4.0 (1.4)**	**–36.25 decline**
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
Northeastern Mojave	**4,160**	**16.2**	**4.5 (1.9)**	**+325.62 increase**
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
Eastern Mojave, NV & CA	**3,446**	**13.42**	**1.9 (0.7)**	**–67.26 decline**
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
Upper Virgin River	**115**	**0.45**	**15.3 (6.0)**	**–26.57 decline**
Red Cliffs Desert	115	0.45	15.3 (6.0)	–26.57 decline
Total amount of land	**25,678**	**100.00**		**–32.18 decline**

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 2021 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^2 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^2 (10 breeding individuals per mi^2) (assumes a 1:1 sex ratio) (USFWS 1994a, 2015) or showing a decline from 2004 to 2014 are in **red.**

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

Recovery Unit: Designated CHU/TCA	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/km^2 (SE)	% 10-year change (2004–2014)	2015	2016	2017	2018	2019	2020	2021
Pinto Mtn, CA	1.98	2.4 (1.0)	–60.30 decline	No data	2.1	2.3	No data	1.7	2.9	No data
Piute Valley, NV	3.61	5.3 (2.1)	+162.36 increase	No data	4.0	5.9	No data	No data	No data	3.9
Northeastern Mojave AZ, NV, & UT	**16.2**	**4.5 (1.9)**	**+325.62 increase**							
Beaver Dam Slope, NV, UT, & AZ	2.92	6.2 (2.4)	+370.33 increase	No data	5.6	1.3	5.1	2.0	No data	No data
Coyote Spring, NV	3.74	4.0 (1.6)	+ 265.06 increase	No data	4.2	No data	No data	3.2	No data	No data
Gold Butte, NV & AZ	6.26	2.7 (1.0)	+ 384.37 increase	No data	No data	1.9	2.3	No data	No data	2.4
Mormon Mesa, NV	3.29	6.4 (2.5)	+ 217.80 increase	No data	2.1	No data	3.6	No data	5.2	5.2
Eastern Mojave, NV & CA	**13.42**	**1.9 (0.7)**	**–67.26 decline**							
El Dorado Valley, NV	3.89	1.5 (0.6)	–61.14 decline	No data	2.7	5.6	No data	2.3	No data	No data
Ivanpah Valley, CA	9.53	2.3 (0.9)	–56.05 decline	1.9	No data	No data	3.7	2.6	No data	1.8

Recovery Unit: Designated CHU/TCA	**% of total habitat area in Recovery Unit & CHU/TCA**	**2004 density/ km^2**	**2014 density/km^2 (SE)**	**% 10-year change (2004–2014)**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Upper Virgin River, UT & AZ	**0.45**		**15.3 (6.0)**	**–26.57 decline**							
Red Cliffs Desert**	0.45	29.1 (21.4-39.6)**	15.3 (6.0)	–26.57 decline	15.0	No data	19.1	No data	17.2	No data	
Range-wide Area of CHUs - TCAs/Range-wide Change in Population Status	**100.00**			**–32.18 decline**							

*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^2 so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires (e.g., 576.2 km^2 of critical habitat that burned in 2005), development of utility-scale solar facilities (as of 2015, 194 km^2 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^2)	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%
Total	**68,501**	**336,393**	**212,343**	**-124,050**	**-37%**

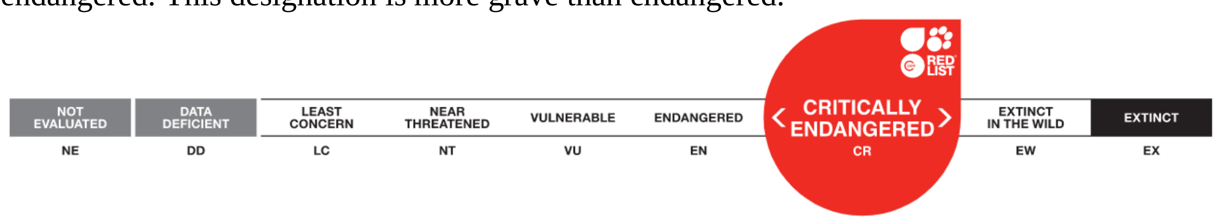
Habitat Availability: Data on population density or abundance does not indicate population viability. The area of protected habitat or reserves for the subject species is a crucial part of the viability analysis along with data on density, abundance, and other population parameters. In the Desert Tortoise (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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