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Via email only

1 June 2022

Gregory L. Helseth
Branch Chief Renewable Energy
Bureau of Land Management Nevada State Office
Greenlink West Project
1340 Financial Blvd.
Reno, NV 89520
ghelseth@blm.gov

RE: Scoping Comments in Response to the Notice of Intent To Prepare an Environmental Impact Statement and Potential Resource Management Plan Amendments for the Greenlink West Project in Clark, Nye, Esmeralda, Mineral, Lyon, Storey, and Washoe Counties in Nevada (DOI-BLM-NV-0000-2022-0004-EIS)

Dear Mr. Helseth:

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.

We appreciate this opportunity to provide comments on the above-referenced project. Given the location of the proposed project in habitats likely occupied by Mojave desert tortoise (*Gopherus agassizii*) (synonymous with Agassiz's desert tortoise), our comments and the attachment pertain to enhancing protection of this species during activities authorized by the Bureau of Land Management (BLM), which we assume will be added to the Decision Record. Please accept, carefully review, and include in the relevant project file the Council's following comments and attachment for the proposed project.

The Council was informed by a third party, not the BLM, of the opportunity to provide scoping comments in response to the BLM's publication of its Notice of Intent (NOI) to prepare a draft environmental impact statement on the Greenlink West project. In our November 7, 2021 comment letter to the BLM on the proposed project, we reminded BLM of our request "to be identified as an Affected Interest for this and all other BLM projects that may affect species of desert tortoises, and that any subsequent environmental documentation for this project is provided to us at the contact information listed above." In addition, a copy of this letter with this request was sent to the Nevada State Director of BLM. As stated in our November 2021 letter, "As the Council has made similar requests to the BLM in Nevada at the field and district office levels, including sending certified letters to managers that have been ignored, we are copying the Nevada State Director with the hope that he will direct BLM in southern Nevada to inform the Council of public comment opportunities for this and future proposed projects in the range of the Mojave desert tortoise. We remind BLM that our email address is eac@deserttortoise.org." Because our request has been ignored at the field, district, and state office levels of BLM, we are sending a copy of this letter to the Director of BLM.

The following comments and attachment are in response to the NOI. They should be added to the comments provided to the BLM in a letter dated November 7, 2021.

Proposed Project

Project information in the NOI indicated that "the BLM will be preparing an Environmental Impact Statement (EIS) for the right-of-way application submitted by NV Energy (Proponent) for the Greenlink West Project. The Greenlink West Project includes a proposed 525-kV transmission line that would begin approximately 10 miles north of Yerington in Lyon County, traverse approximately 360 miles through portions of Lyon, Mineral, Esmeralda, Nye, and Clark counties, and terminate at the Harry Allen Substation approximately 10 miles north of North Las Vegas, Clark County. Three proposed 345-kV facilities would begin 10 miles north of Yerington in Lyon County and traverse through portions of Lyon, Storey, and Washoe counties. Two of the 345-kV lines would terminate approximately 12 miles northwest of Silver Springs in Lyon County, and the third would terminate approximately 7 miles southeast of Reno in Washoe County. The proposed 345-kV facilities cross approximately 10,308 acres of BLM-administered land and 3,712 acres of private land. The four expanded substations (Comstock Meadows, Mira Loma, Fort Churchill, and Harry Allen) and the two new substations (Esmeralda and Amargosa) for the Greenlink West Project would include fiber optic cable and microwave antennae towers for control and operation of the transmission system."

Purpose and Need - New transmission infrastructures are required to deliver the anticipated increased demand for electricity in northern Nevada. The Greenlink West Project would alleviate some of the capacity issues on existing transmission lines, and enhance electric grid reliability, by allowing interconnections to occur throughout the State.

1. Proposed Action and Alternatives Considered – We note that a federal appellate court has previously ruled that in an EIS, a federal agency must evaluate a reasonable range of alternatives to the project including other 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)]. Therefore, the Council requests that the BLM develop and analyze other viable alternatives, which we believe constitute "other reasonable courses of actions" (40 CFR 1508.25). Other viable alternatives should include at least one environmentally preferred alternative that avoids and substantially reduces impacts to biological resources and thus provides a greater level of ecological protection especially for the threatened Mojave desert tortoise and its habitat, including linkage habitat needed for survival and recovery (see Averill-Murray et al. 2013, 2021). For example, one alternative analyzed in the DEIS would be a route that follows and is located immediately adjacent to existing major highways.

2. Placement of Transmission Lines – In California, the BLM has designated utility corridors in which to consolidate the location of new with existing transmission lines and pipelines, but we are unsure if similar designations exist in Nevada. It is also the practice in California to locate new transmission lines on the same side of the road as existing lines to consolidate direct and indirect impacts. Please be sure that the DEIS (1) documents the location of the proposed project relative to designated utility corridors, if any, and (2) for each stretch of the right-of-way (ROW) describes existing utility lines and the new line as to whether one or both are on the same side of the highway, which appears to be US Highway 95. We request that the proposed utility line be placed on the same side of the highway as existing utility lines.

3. Land Designations – Please indicate various land designations along each stretch of the ROW. Given our mission statement and expressed concerns, we are particularly concerned that the BLM in the DEIS documents where the proposed alignment enters desert tortoise critical habitats (USFWS 1994) and any designated Areas of Critical Environmental Concern (ACEC) managed by the BLM. As given in point 4 below, please identify protective measures that may be unique to these and any other designated conservation areas. Similarly, please be sure that as the ROW enters different BLM management areas that pertinent management plans are referenced and that specific protective measures and other policies specific to those regions are implemented for those portions of the ROW, especially with respect to the Mojave desert tortoise and other BLM special status species.

4. Protocol Surveys for Mojave Desert Tortoise – It is our assumption that BLM will consult with the United States Fish and Wildlife Service (USFWS) to determine portions of the ROW that are in tortoise habitat and therefore warrant protocol desert tortoise pre-project and, if constructed in tortoise habitat, clearance surveys (USFWS 2019). Given that the central and northern parts of the ROW are outside tortoise habitats, it is important to determine those areas that would and would not be surveyed, which should be verified by knowledgeable biologists from the USFWS, likely the Southern Nevada Fish and Wildlife Office in Las Vegas.

5. Tortoise Protective Measures – Once protocol surveys for the tortoise are completed and all tortoise sign has been mapped, it is important that these results be shared with the contractor and particularly field-based construction personnel. In those areas that are apparently occupied by denser tortoise concentrations, BLM should increase protective measures during construction and operations and maintenance, like reduced speed limits (15 miles per hour is recommended), designated routes of travel blocked from public access and no vehicle travel by the public would be allowed, and perhaps structurally-different facilities. An example of the last type of protective measure would be in those portions of the ROW in tortoise habitats, we recommend that transmission poles or towers be designed to limit new raven nesting opportunities (see point 11 below).

6. Growth-inducing Impacts – In the NOI, the BLM says the demand for electricity is expected to increase substantially in northern Nevada and the proposed project would help deliver this increased demand from southern Nevada. This wording in the NOI indicates that the proposed project will have growth-inducing impacts. These impacts should be described and analyzed in the DEIS. In addition, it suggests that the overall energy plan is to develop addition solar energy

facilities in southern Nevada to provide energy to both southern and northern Nevada. As such, the DEIS should describe and analyze tortoise habitats that may be lost to future residential, commercial, renewable energy, and other human development resulting from this project that will take solar energy generated from southern Nevada to northern Nevada.

7. Connected Projects – Please include in your impacts analyses those foreseeable projects that would not occur *but for* this project. Too often analyses limit direct and indirect impacts to the physical disturbances at the bases of transmission poles or as the result of new access roads, for example, and report acreages for those obvious project-related losses. For this project, we ask that the DEIS divulge the full extent of impacts and report acreages of all tortoise habitats, including linkage habitats, that will be temporarily and permanently degraded/lost as the direct result of this project, including renewable energy development that is contingent upon completion of the transmission line. The EIS should include the time needed for degraded/lost habitats to return to pre-project conditions with respect to functions and values. Frequently temporal loss is not included in the analysis of impacts and therefore not considered in the development of appropriate mitigation to offset those impacts.

The future use of access roads by the public should be analyzed in the EIS. In other parts of the Mojave Desert, the construction of utility access roads has resulted in public use of these now deemed OHV roads and establishment of new unauthorized OHV roads diverting from access roads into previously undisturbed tortoise habitat. The myriad of impacts of human access using vehicles to the tortoise and tortoise habitat are well-documented in the scientific literature and summarized in Tracy et al. (2004) as part of the "threats network" to the tortoise. BLM should ensure that all impacts from creation and use of access roads by the Proponent and other are analyzed as part of the *but for* analysis, and that appropriate mitigation is implemented to prevent public use of access roads and establishment of new roads.

8. Mitigation Required – The DEIS should include appropriate mitigation for all direct, indirect, and cumulative effects to the tortoise and its habitats, including temporal impacts; the mitigation should use the best available science with a commitment to implement the mitigation commensurate with or prior to impacts to the tortoise and its habitats both within the ROW and in affected adjacent areas. Mitigation should include a fully-developed desert tortoise translocation plan; predator (e.g. raven, coyote, etc.) management plan; invasive weed management plan; tortoise habitat fire prevention 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.

The invasive species management plan covers more than noxious plant species. BLM is mandated by Executive Order 13112, Invasive Species, section 2(a)(2) and 2(a)(3) to "detect and respond rapidly to and control populations of such [invasive] species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded;" and "that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions." BLM policy (BLM 2008a) that states "multiple use and sustained

yield principles are best served by healthy and productive land, of which vegetation is a key component. By focusing programs on maintaining and restoring native plant communities on public land, BLM can be more successful at fulfilling a vital part of the agency and DOI mission."

9. Mitigation Implementation, Success Criteria, and Monitoring – These mitigation plans should include an implementation schedule that is tied to key actions of the construction, operation, maintenance, 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.

Monitoring is crucial to determining the effectiveness of mitigation measures. Consequently, we request that BLM demonstrate throughout the EIS how it is complying with its monitoring requirements (see Chapter 11 Monitoring in BLM's NEPA Handbook – BLM 2008b) especially for indirect impacts to the tortoise and tortoise habitat.

10. Analysis of Status and Trend of Mojave Desert Tortoise – The DEIS should include a thorough analysis and discussion of the status and trend of the tortoise in the action area, which extends beyond the ROW, tortoise conservation area(s), recovery unit(s), and range wide. Tied to this analysis should be a discussion of all likely sources of mortality for the tortoise and degradation and loss of habitat both within the ROW and on lands that will be developed as a result of this project. Please see the Attachment, **Appendix A. Status of the Mojave Desert Tortoise (*Gopherus agassizii*)**, for a summary of the status including data from USFWS and Allison and McLuckie 2018.

11. Raven Management Plan – The DEIS should analyze whether this new transmission line would result in an increase of common ravens and other predators of the desert tortoise in the affected regions. For example, common ravens are known predators of the tortoise, and use transmission and distribution lines as structures for nesting and hunting (Lovich and Bainbridge 1999). During construction, operations and maintenance, and if appropriate, decommissioning of the proposed action, BLM should require science-based monitoring of tortoise predation and managing it to pre-project levels. The monitoring and management plan should implement actions that would eliminate human subsidies associated with transmission lines such as food, water, and sites for nesting, roosting, and perching and address its effectiveness at a local, regional, and range wide level for the tortoise. It is very important that in tortoise habitats, the Proponent use towers for transmission and distribution lines with a design that prevent raven nesting. For example, the tubular design or monopole with insulators on horizontal or downward sloping cross arms is preferable, as this design reduces the availability of nesting and roosting substrates for common ravens that lattice towers provide. Lattice towers 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).

12. Impacts to Be Analyzed – 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 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, and how the proposed action would increase the occurrence of off-highway vehicle use on the access roads and unauthorized roads. 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 and other impacts associated with authorized and unauthorized vehicle use in the desert off of highways. The plan should integrate vegetation management with fire management and fire response.

13. Cumulative Effects Analysis – In the cumulative effects analysis of the DEIS, please ensure that the Council on Environmental Quality's (CEQ) "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 and the numbers of tortoises that may be lost to growth-inducing impacts along the entire length of the alignment.

These 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 needs 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 resource, 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.

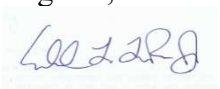
We request that this analysis focus especially on numbers 3, 6, 7, and 8 for the Mojave desert tortoise.

14. BLM's Requirement to Conserve the Tortoise – Assuming that tortoises occur along/near the alignment and that a formal Section 7 consultation results in issuance of a biological opinion, please be aware of the following requirements. 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." 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 tortoise trend data (Allison and McLuckie 2018) demonstrate that BLM's management of the Mojave desert tortoise and its habitat 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 similar to those of the National Park Service (NPS). The NPS' land management practices are closer to managing areas of land as reserves, which is what the 1994 Recovery Plan (USFWS 1994b) described as part of the recovery strategy for the Mojave desert tortoise. While BLM designated Desert Wildlife Management Areas (DWMAs) as one part of the recovery strategy, it has not thoroughly implemented other parts of the recovery strategy. According to the Recovery Plan, DWMAs were to be managed as reserves; that is, they were areas of land to keep, save, preserve, or protect. BLM did not identify and implement needed recovery actions within each DWMA to manage the DWMAs as protected areas for the Mojave desert tortoise.

We appreciate this opportunity to provide input and trust that our comments 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 BLM projects that may affect species of desert tortoises. We would like to receive notification from the BLM when an action that is proposed in the range of the tortoise and may be authorized, funded, or carried out by BLM. In addition, we request 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 this project.

Regards,



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

cc: Tracy Stone-Manning, Director, Bureau of Land Management, tstonemanning@blm.gov
John Raby, State Director, BLM, Carson City, NV BLM_NV_NVSO_web_mail@blm.gov

Attachment: **Appendix A. Status of the Mojave Desert Tortoise (*Gopherus agassizii*)**

Literature Cited

Allison, L.J. and A.M. McLuckie. 2018. Population trends in Mojave desert tortoises (*Gopherus agassizii*). Herpetological Conservation and Biology 13(2):433–452.

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[USFWS] U.S. Fish and Wildlife Service. 2010. Common raven predation on the desert tortoise. USFWS, Ventura Fish and Wildlife Office, Ventura, CA.

[USFWS] U.S. Fish and Wildlife Service. 2019. Preparing for any action that may occur within the range of the Mojave desert tortoise (*Gopherus agassizii*). USFWS Desert Tortoise Recovery Office. Reno, NV.

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

To assist the Agencies with their analysis of the direct, indirect, and cumulative impacts of the Proposed Project on the Mojave desert tortoise, we provide the following information on its status and trend.

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 Tortoise Conservation Areas (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^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 a density that is less than 3.9 adult tortoises per km^2 (USFWS 2015). The Fremont-Kramer population is near the Proposed Project and has a population below the minimum viable density, and an 11-year declining trend (–50.6%)(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 Critical Habitat Units (CHU)/Tortoise Conservation Areas (TCA) for the Mojave desert tortoise, *Gopherus agassizii* (=Agassiz's desert tortoise). The table includes the area of each Recovery Unit and Critical Habitat Unit (CHU)/Tortoise Conservation Area (TCA), percent of total habitat for each Recovery Unit and Critical Habitat Unit/Tortoise Conservation Areas, 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 Critical Habitat Unit/Tortoise Conservation Area	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, 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 by 23% decline of their representation since 2004 (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 trend data for Agassiz's desert tortoise, *Gopherus agassizii* (=Mojave desert tortoise) from 2004 to present for 5 Recovery Units and 17 Critical Habitat Units (CHU)/Tortoise Conservation Areas (TCA). 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**	**2004 density/ km^2**	**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**	**5.95**	**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**	**6.38-7.86**	**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	2004 density/ km^2	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**	**2.15**	**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**	**5.54**	**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**	**21.77**	**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.

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).

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%**

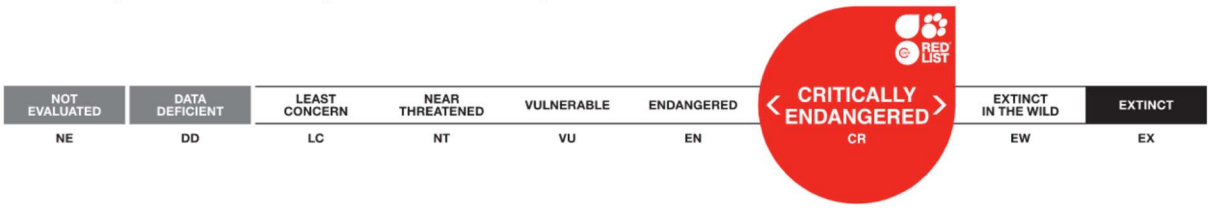
Habitat loss would also disrupt the prevailing population structure of this widely distributed species with geographically limited dispersal (isolation by resistance Dutcher et al. 2020). Allison and McLuckie (2018) anticipate an additional impact of this habitat loss/degradation is decreasing

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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