



**DESERT TORTOISE COUNCIL**

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**Via email and BLM NEPA eplanning portal**

May 2, 2023

Reno to Las Vegas Fiber Optic Project  
Attn: Katy Paiva, Nancy Army, Wendy Seley, and Carolyn Shreve  
Bureau of Land Management  
Carson City District Office  
5665 Morgan Mill Rd, Carson City, NV 89701  
[BLM\\_NV\\_RenotoLasVegasFiberOpticProject@blm.gov](mailto:BLM_NV_RenotoLasVegasFiberOpticProject@blm.gov)  
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RE: Reno to Las Vegas Fiber Optic Project; DOI-BLM-NV-C000-2023-0003-EA

Dear Ms. Paiva, Ms. Army, Ms. Seley, and Ms. Shreve,

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.

As of June 2022, our mailing address has changed to:

Desert Tortoise Council  
3807 Sierra Highway #6-4514  
Acton, CA 93510.

Our email address has not changed. Both addresses are provided above in our letterhead for your use when providing future correspondence to us.

We appreciate this opportunity to provide comments on the above-referenced project. Given the location of the Southern Nevada portion of the project within habitat likely occupied by Mojave desert tortoise (*Gopherus agassizii*) (synonymous with Agassiz's desert tortoise), our comments

pertain to enhancing protection of this species during activities funded, authorized, or carried out by the Bureau of Land Management (BLM), which we assume will be added to the National Environmental Policy Act (NEPA) document for this project as needed. 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 had 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." It is one of three turtle and tortoise species in the United States to be critically endangered.

This status, in part, prompted the Council to join Defenders of Wildlife and the Desert Tortoise Preserve Committee (Defenders 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 did not receive notification from the BLM about this proposed project part of which occurs in the range of the tortoise. For several years, in the Council's comment letters submitted to the BLM for projects in tortoise habitat in Arizona, California, Nevada, and Utah, we have requested that the Council be considered an Affected Interest for projects funded, authorized, or carried out by the BLM that may affect species of desert tortoises. Recently we have sent copies of these comment letters to the BLM State Directors in these four states. Please see the last paragraph of this letter for our continuing request to be considered an Affected Interest for this project and all other projects that may affect tortoises in the southwest.

### **Description of Proposed Project**

The BLM is conducting public scoping on the proposed construction, operation, and maintenance of the Reno to Las Vegas Fiber Optic Project (Project), an approximately 450-mile-long underground fiber optic line from Reno to Las Vegas, Nevada, including in-line amplifier buildings along the proposed route. The fiber optic cable is designed to transmit data across a long distance on a high-speed and high-capacity networking cable. Proposed by Vero Fiber Networks, this Project would cross through Washoe, Lyon, Storey, Churchill, Mineral, Nye, Esmeralda, and Clark Counties in Nevada and would be located within existing highway rights-of-way that predominantly follow U.S. Highways 50 and 95; Nevada State Highways 160, 839, and 439; and County-maintained roads from Reno to Las Vegas. The Project would provide the option for service providers to branch off the line to provide service to local communities.

Installation of the buried portions of the fiber optic line would be accomplished by plowing, trenching, or boring techniques. The Project is designed to be as far off the roadways as possible within the Right-of-Way, which is often 50 to 100+ feet from the edge of the road, so that traffic lane closures would not be required during construction and maintenance activities. It is anticipated that the project would be entirely underground, approximately 36 to 42 inches below grade, except for the potential use of above-ground bridge attachments where necessary.

Construction of the entire project would last less than three years and would include several construction teams operating concurrently, each with its own crew or crews of construction workers and equipment. Sequencing of construction would be implemented to accommodate snowmelt and runoff conditions and efficiencies in crew coordination, depending on site-specific requirements along certain sections of the route. Construction would typically take place during daytime hours unless an exception is pre-arranged.

### **Project Specific Comments**

As the Southern Nevada portion of the proposed Project is known to be located within habitat for the Mojave desert tortoise, we request a thorough analysis of impacts to these desert tortoises and their habitat as associated with construction, and operation, and maintenance of this Project. This includes all direct, indirect, and cumulative impacts, impacts to connectivity of populations and habitats (for example, see Averill-Murray et al. 2013, Gray et al. 2019, Averill-Murray et al. 2021, etc.) as well as any connected actions and growth-inducing effects.

While we recognize the long term, minimal impact nature of this Project and proximity to existing roadways, the cumulative increase of desert tortoise habitat degradation over the past decades has resulted in the precipitous decline in Mojave desert tortoise populations throughout their range, especially in the Eastern Mojave Recovery Unit where the southern portion of the Project would be located. Please see “Appendix A. Status and Trend of the Mojave Desert Tortoise (*Gopherus agassizii*) including the Eastern Mojave Recovery Unit” (attached). USFWS data indicate a 67 percent decline in tortoise abundance and density occurred between 2004 and 2014 and both tortoise populations monitored in this recovery unit are below the threshold for population viability (USFWS 1994).

For these reasons, we request that BLM include these established guidelines (see below) during analysis of impacts of this proposed Project on the tortoise.

### **Connected Actions**

The Council on Environmental Quality’s (CEQ) Regulations for Implementing the National Environmental Policy Act require that “connected actions” be considered together during a NEPA environmental impact analysis (40 Code of Federal Regulations (CFR) 1508.25).

### **Cumulative Effects Analysis**

CEQ (1997) 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.” This CEQ document is referred to in BLM’s National Environmental Policy Act Handbook (BLM 2008).

The CEQ provides eight principles of cumulative impacts analysis (CEQ 1997, Table 1-2). These are:

**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.

Note that CEQ recognizes that synergistic and interactive impacts as well as cumulative impacts should be analyzed in the NEPA document for each the resource issue.

Please ensure that the CEQ's "Considering Cumulative Effects under the National Environmental Policy Act" (1997) is followed, including all eight principles, when analyzing the cumulative effects of the Project to the tortoise, its habitat as well as the other affected resources. When conducting this analysis, ensure that the conclusions are supported with scientific data. The NEPA regulations and BLM (2008) direct that science will be used in conducting analyses.

- 40 CFR 1507(2)(a) - "insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on the human environment."
- 40 CFR 1500.1(b) - "The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA."
- 40 CFR 1502.24 Methodology and scientific accuracy - Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement.

### **Growth-inducing Impacts**

According to the BLM NEPA Handbook (2008), "[i]ndirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on water and air and other natural systems, including ecosystems" (40 CFR 1508.8(b))." The removal of obstacles to population growth (e.g.,

availability of water supply), or actions that encourage and facilitate other activities beyond those proposed by the project are examples of growth-inducing effects. According to CEQ, “EAs and EISs must analyze and describe the direct effects and indirect effects of the proposed action and the alternatives on the quality of the human environment (40 CFR 1508.8, as cited in BLM 2008). “‘Human environment’ shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. (See the definition of "effects" (§1508.8)” (40 CFR 1508(25)). We request that the NEPA document include an analysis of the growth-inducing effects associated with the proposed fiber optic line from the additional human population growth, development, and activities.

We appreciate this opportunity to provide comments on this Project 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 species of 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 this project.

Respectfully,



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

Cc: Kim Dow, District Manager, BLM Carson City District, [BLM\\_NV\\_CCDOwebmail@blm.gov](mailto:BLM_NV_CCDOwebmail@blm.gov)  
John Raby, State Director, BLM Nevada State Office, [BLM\\_NV\\_NVSO\\_web\\_mail@blm.gov](mailto:BLM_NV_NVSO_web_mail@blm.gov)

### Literature Cited

- Averill-Murray, R.C., C.R. Darst, N. Strout, and M. Wong. 2013. Conserving Population Linkages for the Mojave Desert Tortoise (*Gopherus agassizii*). *Herpetological Conservation and Biology* 8(1):1 – 15.
- Averill-Murray, R.C., T.C. Esque, L.J. Allison, S. Bassett, S.K. Carter, K.E. Dutcher, S.J. Hromada, K.E. Nussear, and K. Shoemaker. 2021. Connectivity of Mojave Desert tortoise populations—Management implications for maintaining a viable recovery network. U.S. Geological Survey Open-File Report 2021–1033, 23 p., <https://doi.org/10.3133/ofr20211033>.
- Berry, K.H., L.J. Allison, A.M. McLuckie, M. Vaughn, and R.W. Murphy. 2021. *Gopherus agassizii*. The IUCN Red List of Threatened Species 2021: e.T97246272A3150871. <https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T97246272A3150871.en>

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Defenders of Wildlife, Desert Tortoise Preserve Committee, and Desert Tortoise Council. 2020. A Petition to the State of California Fish And Game Commission to move the Mojave desert tortoise from listed as threatened to endangered.

[https://defenders.org/sites/default/files/2020-03/Desert%20Tortoise%20Petition%203\\_20\\_2020%20Final\\_0.pdf](https://defenders.org/sites/default/files/2020-03/Desert%20Tortoise%20Petition%203_20_2020%20Final_0.pdf)

Gray, M.A., B.G Dickson, K.E. Nussear, T.C. Esque, and T. Chang. 2019. A range-wide model of contemporary, omni-directional connectivity for the threatened Mojave desert tortoise, Ecosphere 10(9)e02847. 10.1002/ecs2.2847.

[USFWS] U.S. Fish and Wildlife Service. 1994. Desert tortoise (Mojave population) Recovery Plan. U.S. Fish and Wildlife Service, Region 1, Portland, Oregon. 73 pages plus appendices.

[https://ecos.fws.gov/docs/recovery\\_plan/940628.pdf](https://ecos.fws.gov/docs/recovery_plan/940628.pdf)

## **Appendix A. Status and Trend of the Mojave Desert Tortoise (*Gopherus agassizii*) including the Eastern Mojave Recovery Unit**

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. In reviewing the data presented below, note that the location of the proposed project is within the Colorado Desert Recovery Unit, which has experienced a decline in tortoise density and abundance of –36%, since 2004.

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.

Below are tables with data collected since 2004 on changes to Mojave desert tortoise densities and abundance. Important points from these tables include the following:

### *Change in Status for the Mojave Desert Tortoise Range-wide*

- Ten of 17 populations of the Mojave desert tortoise declined from 2004 to 2014.
- Eleven of 17 populations of the Mojave desert tortoise are below the population viability threshold through 2021. These 11 populations represent 89.7 percent of the range-wide habitat in CHUs/TCAs.

### *Change in Status for the Eastern Mojave Recovery Unit – Nevada and California*

- This recovery unit had a 67 percent decline in tortoise density from 2004 to 2014, the highest rate of decline of the five recovery units.
- All tortoise populations in this recovery unit have densities that are below the viability level established by the USFWS (1994a).
- The Eastern Mojave Recovery Unit provides population and habitat connectivity between the Western Mojave and Colorado Desert recovery units and the Northeastern and Upper Virgin River recovery units. Continued development that fragments tortoise populations and habitats eventually severs the genetic connection between the two recovery units to the west and two to the east.

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



morphological diversity necessary for the recovery of the entire listed species (Allison and McLuckie 2018).

Range-wide, densities of adult Mojave desert tortoises declined more than 32% between 2004 and 2014 (Table 1) (USFWS 2015). At the recovery unit level, between 2004 and 2014, densities of adult desert tortoises declined, on average, in every recovery unit except the Northeastern Mojave (Table 1). Adult densities in the Northeastern Mojave Recovery Unit increased 3.1% per year (SE = 4.3%), while the other four recovery units declined at different annual rates: Colorado Desert (−4.5%, SE = 2.8%), Upper Virgin River (−3.2%, SE = 2.0%), Eastern Mojave (−11.2%, SE = 5.0%), and Western Mojave (−7.1%, SE = 3.3%)(Allison and McLuckie 2018). However, the small area and low starting density of the tortoises in the Northeastern Mojave Recovery Unit (lowest density of all Recovery Units) resulted in a small overall increase in the number of adult tortoises by 2014 (Allison and McLuckie 2018). In contrast, the much larger areas of the Eastern Mojave, Western Mojave, and Colorado Desert recovery units, plus the higher estimated initial densities in these areas, explained much of the estimated total loss of adult tortoises 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<sup>2</sup> (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<sup>2</sup> and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 adults/km<sup>2</sup> (10 adults per mi<sup>2</sup>) (assumes a 1:1 sex ratio) and showing a decline from 2004 to 2014 are in red (Allison and McLuckie 2018, USFWS 2015).

<b>Recovery Unit</b> Designated Critical Habitat Unit/Tortoise Conservation Area	Surveyed area (km <sup>2</sup> )	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/km <sup>2</sup> (SE)	% 10-year change (2004– 2014)
<b>Western Mojave, CA</b>	<b>6,294</b>	<b>24.51</b>	<b>2.8 (1.0)</b>	<b>−50.7 decline</b>
Fremont-Kramer	2,347	9.14	2.6 (1.0)	−50.6 decline
Ord-Rodman	852	3.32	3.6 (1.4)	−56.5 decline
Superior-Cronese	3,094	12.05	2.4 (0.9)	−61.5 decline
<b>Colorado Desert, CA</b>	<b>11,663</b>	<b>45.42</b>	<b>4.0 (1.4)</b>	<b>−36.25 decline</b>
Chocolate Mtn AGR, CA	713	2.78	7.2 (2.8)	−29.77 decline
Chuckwalla, CA	2,818	10.97	3.3 (1.3)	−37.43 decline

Chemehuevi, CA	3,763	14.65	2.8 (1.1)	-64.70 decline
Fenner, CA	1,782	6.94	4.8 (1.9)	-52.86 decline
Joshua Tree, CA	1,152	4.49	3.7 (1.5)	+178.62 increase
Pinto Mtn, CA	508	1.98	2.4 (1.0)	-60.30 decline
Piute Valley, NV	927	3.61	5.3 (2.1)	+162.36 increase
<b>Northeastern Mojave</b>	<b>4,160</b>	<b>16.2</b>	<b>4.5 (1.9)</b>	<b>+325.62 increase</b>
Beaver Dam Slope, NV, UT, AZ	750	2.92	6.2 (2.4)	+370.33 increase
Coyote Spring, NV	960	3.74	4.0 (1.6)	+ 265.06 increase
Gold Butte, NV & AZ	1,607	6.26	2.7 (1.0)	+ 384.37 increase
Mormon Mesa, NV	844	3.29	6.4 (2.5)	+ 217.80 increase
<b>Eastern Mojave, NV &amp; CA</b>	<b>3,446</b>	<b>13.42</b>	<b>1.9 (0.7)</b>	<b>-67.26 decline</b>
El Dorado Valley, NV	999	3.89	1.5 (0.6)	-61.14 decline
Ivanpah, CA	2,447	9.53	2.3 (0.9)	-56.05 decline
<b>Upper Virgin River</b>	<b>115</b>	<b>0.45</b>	<b>15.3 (6.0)</b>	<b>-26.57 decline</b>
Red Cliffs Desert	115	0.45	15.3 (6.0)	-26.57 decline
<b>Total amount of land</b>	<b>25,678</b>	<b>100.00</b>		<b>-32.18 decline</b>

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

Declining adult tortoise densities through 2014 have left the Eastern Mojave Desert adult numbers at 64% (a 36% 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 (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).

**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

**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 Critical Habitat Units (CHUs)/Tortoise Conservation Areas (TCAs). The table includes the area of each Recovery Unit and CHU/TCA, percent of total habitat for each Recovery Unit and CHU/TCA, density (number of breeding adults/km<sup>2</sup> and standard errors = SE), and percent change in population density between 2004-2014 (USFWS 2015). Populations below the viable level of 3.9 breeding individuals/km<sup>2</sup> (10 breeding individuals per mi<sup>2</sup>) (assumes a 1:1 sex ratio) (USFWS 1994a, 2015) or showing a decline from 2004 to 2014 are in **red**.

Recovery Unit: Designated CHU/TCA &	% of total habitat area in Recovery Unit & CHU/TCA	2004 density/ km <sup>2</sup>	2014 density/ km <sup>2</sup> (SE)	% 10-year change (2004–2014)	2015 density/ km <sup>2</sup>	2016 density/ km <sup>2</sup>	2017 density/ km <sup>2</sup>	2018 density/ km <sup>2</sup>	2019 density/ km <sup>2</sup>	2020 density/ km <sup>2</sup>	2021 density/ km <sup>2</sup>
<b>Western Mojave, CA</b>	<b>24.51</b>		<b>2.8 (1.0)</b>	<b>-50.7 decline</b>							
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
<b>Colorado Desert, CA</b>	<b>45.42</b>		<b>4.0 (1.4)</b>	<b>-36.25 decline</b>							
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
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

Recovery Unit: Designated CHU/TCA	% of total habitat area in Recovery Unit & CHU/TCA	2004 density/ km <sup>2</sup>	2014 density/km <sup>2</sup> (SE)	% 10-year change (2004–2014)	2015	2016	2017	2018	2019	2020	2021
<b>Northeastern Mojave AZ, NV, &amp; UT</b>	<b>16.2</b>		<b>4.5 (1.9)</b>	<b>+325.62 increase</b>							
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
<b>Eastern Mojave, NV &amp; CA</b>	<b>13.42</b>		<b>1.9 (0.7)</b>	<b>-67.26 decline</b>							
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
<b>Upper Virgin River, UT &amp; AZ</b>	<b>0.45</b>		<b>15.3 (6.0)</b>	<b>-26.57 decline</b>							
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	
<b>Range-wide Area of CHUs - TCAs/Range- wide Change in Population Status</b>	<b>100.00</b>			<b>-32.18 decline</b>							

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

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

numbers because of their habitat calculation method. They used area estimates that removed only impervious surfaces created by development as cities in the desert expanded. They did not consider degradation and loss of habitat from other sources, such as the recent expansion of military operations (753.4 km<sup>2</sup> so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires ( e.g., 576.2 km<sup>2</sup> of critical habitat that burned in 2005), development of utility-scale solar facilities (as of 2015, 194 km<sup>2</sup> have been permitted) (USFWS 2016), or other sources of degradation or loss of habitat (e.g., recreation, mining, grazing, infrastructure, etc.). Thus, the declines in abundance of Mojave desert tortoise are likely greater than those reported in Table 3.

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

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

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

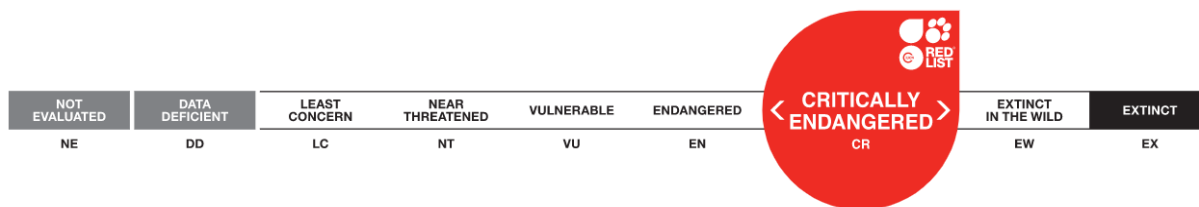
Habitat loss would also disrupt the prevailing population structure of this widely distributed species with geographically limited dispersal (isolation by resistance Dutcher et al. 2020). Allison and McLuckie (2018) anticipate an additional impact of this habitat loss/degradation is decreasing resilience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

reduce tortoise habitat in the desert are anticipated to continue (Allison and McLuckie 2018) as are other sources of habitat loss/degradation.

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

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

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



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