

DESERT TORTOISE COUNCIL

3807 Sierra Highway #6-4514

Acton, CA 93510

www.deserttortoise.org

eac@deserttortoise.org

Via email only

12 December 2022

Attn: Mr. Gabriel Perez, Development Services Director
City of Coachella, Development Services Department
53990 Enterprise Way
Coachella, CA 92236
gperez@coachella.org

RE: Notice of Preparation of a Draft Environmental Impact Report for KPC Coachella Specific Plan, Coachella, Riverside County

Dear Mr. Perez,

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 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 that you email to us future correspondence, as mail delivered via the U.S. Postal Service may take several days to be delivered. Email is an “environmentally friendlier way” of receiving correspondence and documents rather than “snail mail.”

We appreciate this opportunity to provide comments on the above-referenced project. Given the location of the Proposed Project in habitats known to be 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 City of Coachella (City), which we assume will be added to the Decision Record for this project as needed. Please accept, carefully review, and include in the relevant project file the Council's following comments 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), as 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), population size fewer than 50 individuals, other factors." 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 Desert Tortoise Preserve Committee (Desert Tortoise Council 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.

Proposed Project

According to the Notice of Preparation (NOP) of the Draft Environmental Impact Report (DEIR), the City is proposing to authorize the development of a master planned mixed-use community (Project) on approximately 2,807 (conceptual) acres of currently undeveloped land, entirely located within the City of Coachella. The Specific Plan for the Project proposes the following land uses:

- A mixture of residential product types totaling approximately 9,536 dwelling units;
- Approximately 305 acres of mixed-use areas, which include commercial retail, high-density residential, resort, and entertainment uses;
- A college/university overlay to allow for institutions of higher learning with an emphasis on healthcare;
- Approximately 71 acres of schools (3 elementary schools and 1 middle school);
- Approximately 395 acres of parks, greenways, and amenity centers;
- Approximately 179 acres of circulation uses, including arterials, major, and secondary roadways;
- Approximately 68 acres of Agricultural Production areas;
- Approximately 754 acres of natural open space, including drainage channels and trails;
- A potential multi-story, high-rise building; and,
- A proposed entertainment center/venue and performing arts theater.

The Proposed Project will also require various on-site and off-site infrastructure improvements, including water, wastewater, dry utilities (i.e., electricity, natural gas, telephone, cable) roadways, and a non-vehicular trail connection under Interstate-10 to connect with the La Entrada Specific Plan.

According to the NOP, the Project site consists of undisturbed, open, hilly, and undeveloped desert area with minimal vegetation, except for small native trees, shrubs, and annual grassland. Broad natural drainage corridors traverse the Project site diagonally. These drainages would be incorporated into the Specific Plan to facilitate the movement of water throughout the site from the northeast to southwest as well as along the perimeter of the area of the Specific Plan. These are undisturbed open space areas that allow for hiking, walking, cycling, and other activities such as nature photography or educating residents and visitors on the local ecosystem through signage programs.

The Proposed Project is located north of the I-10 freeway and east of the All American Canal on the northeast portion of Coachella City limits.

Existing Authorizations

The Proposed Project occurs within the Permit Area of the Coachella Valley Multi-species Incidental Take Permit (ITP) that was issued by the U.S. Fish and Wildlife Service (USFWS), [and associated Coachella Valley Multi-species Habitat Conservation Plan (HCP)] and Natural Community Conservation Plan (NCCP) Permit (and associated Coachella Valley NCCP) issued by the California Department of Fish and Game (CDFG; CDFW since 2012) in 2008. The term of these two incidental take permits is 75 years. Both permits authorized the incidental take of the Mojave desert tortoise and 26 other Covered Species under the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA). In exchange for development of 178,509 acres in the Coachella Valley area, the City and other signatories of the two permits agreed to conserve 723,480 acres and create a Reserve System that will be managed and protected in perpetuity. Conservation of the Covered Species will be achieved through the management of 557,000 acres of existing conservation lands, acquisition of 166,380 acres, and protection of land use processes.

Alternatives

The City should conduct USFWS presence-absence protocol surveys for the tortoise (USFWS 2019a) so that USFWS and CDFW will be able to estimate the amount of incidental take from the proposed development. In addition, the City would be able to better plan the relocation/translocation activities that would be needed to move tortoises from the development area to the designated relocation/translocation area(s).

The City should use the results of the pre-construction surveys to design the development to avoid the areas with higher densities of tortoises and higher quality habitat, and ensure these areas are connected to conservation lands that would remain in a natural state east and northeast of the Project area. These undeveloped areas within the Project area would be designated as natural open space areas. This designation and arrangement of land uses would provide both recreational and wildlife viewing opportunities for residents and natural habitats for tortoises and other wildlife species.

Affected Environmental and Environmental Consequences

For the DEIR to fully assess the effects and identify potentially significant impacts, the following surveys should be performed to determine the extent of rare plant and animal populations occurring within the Project area. Results of the surveys will determine appropriate minimization and mitigation measures.

- Prior to conducting surveys, a knowledgeable biologist must perform a records search of the California Natural Diversity Data Base (CNDDDB; CDFW 2022) for rare plant and animal species reported from the region. The results of the CNDDDB review would be reported in the DEIR with an indication of suitable and occupied habitats for all rare species reported from the region based on performing species specific surveys described below.

- Formal presence-absence protocol surveys for Mojave desert tortoise (USFWS 2019a) should be conducted and at the proper times of year. Because the Project area is larger than 500 acres, the protocol requires that surveys be performed in the time periods of April-May or September-October so that a statistical estimate of tortoise densities can be determined for the Project area and reported in the DEIR. We strongly recommend that the City require that only experienced biologists perform protocol surveys, and that CDFW and USFWS biologists review the credentials of the consulting biologists prior to conducting the surveys.

- A jurisdictional waters analysis should be performed for all potential impacts to washes, streams, and drainages. This analysis should be reviewed by the CDFW as part of the permitting process and a Streambed Alteration Agreement acquired, if deemed necessary by CDFW.

- If there are any loose, shifting sands within the Project area, focused surveys for Coachella Valley fringe-toed lizards (*Uma inornata*) should be performed (University of California Riverside, Center for Conservation Biology 2005). Results and pertinent mitigation measures, as needed, should be published in the DEIR.

- Protocol surveys for western burrowing owl (*Athene cunicularia*) (CDFG 2012) should be completed. Note that the protocol (CDFG 2012) requires that peripheral transects be surveyed at 30-, 60-, 90-, 120-, and 150-meter intervals in all suitable habitats adjacent to the Project area to determine the potential indirect impacts of the project on this species. If burrowing owl sign is found, CDFG (2012) describes appropriate minimization and mitigation measures that would be required.

- There are likely to be special status plant species found in the region of the Project area as determined by a CNDDDB (CDFW 2022) literature review that should be sought during field surveys and their presence/absence discussed in the DEIR. Surveys should be completed at the appropriate time of year by qualified biologists (preferably botanists) using the latest acceptable methodologies (CDFG 2009).

Direct and Indirect Impacts: The following direct and indirect impacts to the tortoise in the Project area and adjacent Conservation/Connectivity Areas should be described and analyzed in the DEIR:

- Impacts regarding future survival and recovery of tortoise population, and impacts to the nearest Tortoise Conservation Area (TCA) population, recovery unit, and range-wide, especially regarding population viability analysis (i.e., minimum viable density, abundance growth rate, mortality, habitat size, edge effect on the population and habitat, fragmentation of the population and habitat, and degradation/reduction in habitat quality);
- impacts to tortoises/tortoise habitat from production of dust during construction activities and utility/road maintenance activities;
- impacts to cryptobiotic crusts and their effects on native vegetation growth, soil moisture, etc.;
- impacts to the introduction spread and change in abundance of non-native invasive plants;
- impacts from new and expanded nitrogen sources from increased number and use of equipment burning fossil fuels (e.g., automobiles) on non-native invasive plant species;
- impacts on frequency, magnitude, and occurrence of fires and their effects on tortoises/tortoise habitat;
- impacts from increased subsidies of tortoise predators and predators of other wildlife species;
- impacts from increased occurrence and use of environmental contaminants (e.g., pesticides, etc.) in the Project area;
- impacts from creation and use of roads and the “road effect zone,” especially for tortoises;
- impacts to lifetime home range sizes/needs of tortoises;
- impacts from using tortoise exclusion fencing to prevent tortoises from entering the developed portion of the Project area versus no exclusion fencing (if exclusion fencing is not constructed and maintained, the Project will become an ecological sink that “drains” tortoises from adjacent Conservation/Connectivity Areas undermining the purpose of these areas); and,
- impacts from new sources of noise during construction, operations, maintenance, and use of the Project area.

Take Authorized under the ITP and NCCP Permit: The ITP and NCCP Permit authorized the incidental take for Covered Activities – urban development and operation and maintenance of utilities permitted or approved by the City within certain areas. For the tortoise, the incidental take is for tortoises that occur on 68,453 acres in the Coachella Valley. The language in the ITP and NCCP Permit authorized take from development of identified acreage and operation and maintenance of utilities. Incidental take is not authorized for the tortoise or other Covered Species in areas not identified for development.

Under the FESA, take is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Harm is further defined in the regulations as “any act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering” (50 Code of Federal Regulations 17.3). Thus, take can occur from indirect impacts such as reduction in availability of nutritious food or an increase in predation. Additionally, this take can occur at locations away from the source of the threat. Examples of sources of threats originating at one location but impacting the tortoise at another location include mortality from human subsidized predators (e.g., common raven and coyote, etc.) and free-roam dogs that are pets of residents. *But for* the City’s approved and permitted development, the incidental take of tortoises from the use of these permitted or approved developments would not occur. We consider the operation and use of permitted or approved developments equivalent to the operations and maintenance of other activities/facilities such as utilities.

To avoid or minimize incidental take that would occur outside the Permit Area, for activities not covered by the ITP and NCCP Permit that may result from the City's permitted/authorized developments, the City should implement and enforce appropriate mitigation including ordinances that:

- prohibit unleashed dogs, require licensing, and assist other entities in monitoring and capturing free-roaming dogs and finding suitable permanent homes for them.
- Require all trash containers (including garbage, recycle, yard waste, and compostable materials) at residential, commercial, industrial and agricultural facilities to be predator proof for terrestrial and avian predators of the tortoise. This action would benefit other wildlife species.

Climate Change

Vegetation sequesters carbon. Studies around the world have shown that desert ecosystems can play an important role in sequestering carbon. For example, the California deserts account for nearly 10 percent of the state's carbon sequestration; below ground in soil and root systems, and above ground in biomass. Protecting this biome can contribute to securing carbon stores in the state (MDLT 2021). However, when plants die, they release carbon from their roots, stems, and leaves into the atmosphere and contribute to climate change. Given the current climate change conditions, there is an increasing need for carbon sequestration, not carbon release, therefore, an increasing need to, at a minimum, maintain native plants.

The Proposed Project would result in the loss/degradation of native plants and their ability to sequester carbon for decades or longer. In addition, the Proposed Project when combined with the numerous actions that have occurred in the Coachella Valley and deserts of southern California that destroy vegetation means it would be contributing to climate change. Consequently, the City should conduct a cumulative impacts analysis of the Proposed Project with respect to climate change. Analyzing alternatives and implementing ones that avoid or minimize the reduction/loss of native vegetation is important to combat climate change; it is imperative that the Proposed Project minimize the loss of native vegetation. Because of the City's ongoing discretionary actions and those in the foreseeable future that would likely contribute to climate change, these impacts should be addressed with respect to their effects on the Mojave desert tortoise at the population level, recovery unit, and range-wide.

The City should develop and implement mitigation to avoid or fully offset the contributions to climate change from the Proposed Project. Besides minimizing the loss of native vegetation, the City should require on-site solar production such as mandating parking lots covered with solar panels and rooftop solar for the Proposed Project.

Cumulative Impacts

The Council is concerned that when the ITP and NCCP Permit were issued for the tortoise, the data on the substantial declines in tortoise numbers and densities throughout most of the range of the tortoise were not available. Consequently, we request that the DEIR analyze the impacts of the Proposed Project with respect to the future survival/viability of the tortoise. We request that the

DEIR analyze the impacts of the Proposed Project with respect to the cumulative impacts of all other past, present, and future actions in the nearby Joshua Tree and Chuckwalla TCAs, Colorado Desert Recovery Unit, and range-wide of the tortoise, and present a conclusion of future tortoise viability/survival using the best available scientific information. To assist the City in this effort we have attached data on tortoise density and abundance (Appendix A).

Mitigation

The City should document in the DEIR how it has/is fully mitigating under California Fish and Game Code and has/is mitigating to the maximum extent practicable under section 10(a)(1)(B) of the FESA for the take of the tortoise and the loss of tortoise habitat from development (= construction) phase and the use phase from the Proposed Project. This description/analysis would include how much of the 2,708 acres is used by tortoises for feeding, breeding, shelter and movement/linkage habitat. Per the USFWS ITP (USFWS 2008), we request that the City condition development and grading “projects to conduct desert tortoise clearance surveys per the Service’s protocol” (USFWS 2009).

In addition, per the ITP, the City should require that a “biological resources monitor shall be onsite during construction of the Project. The duties of the biological resources monitor shall include, but are not limited to: conducting desert tortoise clearance surveys per the Service’s [USFWS] protocol; directing where to install temporary fencing that avoids sensitive areas such as the riparian habitat; and conducting an education program for the construction crew regarding sensitive habitat and listed species. The monitor shall have the authority to stop construction activities, if necessary, to ensure compliance with any of the conservation measures discussed herein.”

After these areas are identified and mapped, the DEIR should describe the actions the City will implement to fully mitigate for the loss of these tortoises/habitats from the development of the Proposed Project. We request that mitigation be implemented prior to initiation of activities that would likely result in take. If not possible, mitigation should be implemented commensurate with take.

Because take of the tortoise will likely occur from residential impacts resulting from the Proposed Project after it is completed, and this take will be offsite from various indirect activities such as free-roaming dogs and increased number of tortoise predators from human subsidies, the DEIR should include mitigation for this ongoing take of tortoises.

Translocation of Tortoises: The Coachella Valley Multi-species Habitat Conservation Plan calls for clearance surveys prior to ground disturbance and relocation of any tortoises found. Moving tortoises to a new location would require the development and implementation of a relocation or translocation plan approved by the USFWS and CDFW. The DEIR should include this plan and demonstrate how it is compatible with USFWS guidance documents on translocation plans (USFWS 2019b, 2020, 2021).

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 City 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 this project.

Respectfully,



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

cc: California State Clearinghouse, state.clearinghouse@opr.ca.gov
Rollie White, Assistant Field Supervisor, Palm Spring Fish and Wildlife Office, U.S. Fish and Wildlife Office, rollie_white@fws.gov
Kristina Drake, Desert Tortoise Recovery Office Coordinator, U.S. Fish and Wildlife Service, karla_drake@fws.gov
Heidi Calvert, Regional Manager, Region 6 – Inland and Desert Region, California Department of Fish and Wildlife, Heidi.Calvert@wildlife.ca.gov
Trisha A. Moyer, Region 6 – Desert Inland Region, Habitat Conservation Program Supervisor, California Department of Fish and Wildlife, Bishop, CA, Patricia.Moyer@wildlife.ca.gov

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

Literature Cited

- 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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<https://www.fws.gov/media/translocation-guidance-attachment-1-clearance-survey-protocol-0>
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[USFWS] U.S. Fish and Wildlife Service. 2021. Mojave desert tortoise population augmentation strategy. <https://www.fws.gov/media/mojave-desert-tortoise-population-augmentation-strategy>

Appendix A. Status and Trend 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. 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.

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 mile² (3.9 adult tortoises per km²). 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 km² (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/km² and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 adults/km² (10 adults per mi²) (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 Colorado 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).

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/km² 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/km² (10 breeding individuals per mi²) (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		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	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		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	2004 density/ km ²	2014 density/km ² (SE)	% 10- year change (2004– 2014)	2015	2016	2017	2018	2019	2020	2021

	Unit & CHU/TCA										
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 km² so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires (e.g., 576.2 km² of critical habitat that burned in 2005), development of utility-scale solar facilities (as of 2015, 194 km² 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%

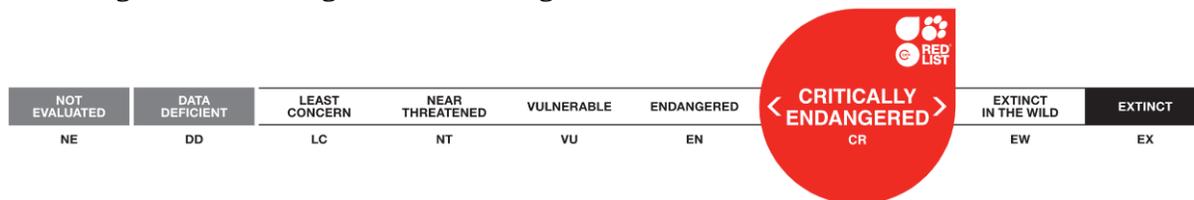
Habitat loss would also disrupt the prevailing population structure of this widely distributed species with geographically limited dispersal (isolation by resistance Dutcher et al. 2020). Allison and McLuckie (2018) anticipate an additional impact of this habitat loss/degradation is decreasing

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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