



DESERT TORTOISE COUNCIL

3807 Sierra Highway #6-4514

Acton, CA 93510

www.deserttortoise.org

eac@deserttortoise.org

Via email only

23 August 2022

Attn: James Holden
Bureau of Land Management
Hassayampa Field Office
21605 North 7th Avenue
Phoenix, Arizona 85027
jwholden@blm.gov

RE: Aguila Wells Project Environmental Assessment (DOI-BLM-AZ-P010-2022-0020-EA)

Dear Mr. Holden,

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, which was brought to our attention by a third party, member of the Council, not by the Bureau of Land Management (BLM). Given the location of the proposed project in habitats likely occupied by

Sonoran desert tortoise (*Gopherus morafkai*) (synonymous with Morafka's desert tortoise), our comments pertain to enhancing protection of this species during activities funded, authorized, or carried out by the BLM, 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 and attachments for the proposed project.

Unless otherwise noted, the page numbers referenced below pertain to the BLM's Aquila Wells Environmental Assessment (DOI-BLM-AZ-P010-2022-0020-EA) (EA), dated August 5, 2022. Page 1 indicates, "Deganahl Cattle Company submitted an application to the Bureau of Land Management (BLM) for the installation of three new supplemental livestock waters [wells, pipelines, and troughs] at existing livestock [dirt] stock tanks located on the Aguila grazing allotment...Additional livestock handling facilities [e.g., new larger corrals] are also proposed at these supplemental waters. Total area for the project is expected to be less than 10 acres in size, with 5 acres at each proposed well location. The proposed facilities are located in priorly disturbed areas, with the only new disturbance related to installation of wildlife watering facilities." Well depths are expected to be between 500-800 feet. Water would be piped 140 or 240 feet from wells to new troughs for livestock.

Page 4 indicates that wildlife water sources would be installed and "consist of pipe fenced areas between one half and one acre in size, located a minimum of 330 feet from livestock handling facilities. Each wildlife water will consist of a 500-gallon storage tank feeding a wildlife-friendly drinker. Livestock will be excluded from these facilities at all times."

We note on page 2 that the following Resource Management Plan (RMP) decisions apply: "TE-12: Evaluate on a case-by-case basis all proposed activities, including the following, for impact to desert tortoise population or habitats: Range improvements." Also, on page 3, "WF-12: New wildlife waters will be built when needed to maintain, restore, or enhance native wildlife populations or distributions."

In Section 1.1 on page 1, BLM says, "A third location [for new supplemental waters] at Twin Tanks was determined to be located on AZ State Trust lands. The applicant has applied to place this facility on State Trust lands. " This information suggests the applicant needs three permanent waters/wells in this grazing allotment. In the EA, BLM only discusses the two permanent waters/wells but does not consider the Twin Ranks waters/well in the Environmental Consequences section. The Council considers the Twin Tanks waters/well to be a connected, cumulative, and/or similar action to the two waters/wells on BLM land in the same grazing allotment and requests that it be included in the environmental analysis of cumulative impacts in the revised, final EA.

Section 1.5 on page 3 lists five bulleted items pertaining to "Relationships to Statues, Regulations, Manuals, and Other Plans," which includes U. S. Fish and Wildlife Service (USFWS) and Cooperating Agencies comprising the Arizona Interagency Desert Tortoise Team. 2015. Candidate Conservation Agreement for the Sonoran Desert Tortoise (*Gopherus morafkai*) in Arizona. We understand that the following additional guidelines, standards, policies, and agreements also apply to this project, should be enforced by the BLM, and implemented by the project proponent, Deganahl Cattle Company, and their consultants and contractors as official, nondiscretionary requirements:

- Arizona Game and Fish Department. 2010. Desert Tortoise Survey Guidelines for Environmental Consultants.
- Arizona Game and Fish Department. 2014. Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects.
- Arizona Interagency Desert Tortoise Team. 2008. Recommended Standard Mitigation Measures for Projects in Sonoran Desert Tortoise Habitat. June 2008.
- Bureau of Land Management. 2008. Special Status Species Management – Manual 6840. Washington, D.C. December 12, 2008.
- Bureau of Land Management. 2008. H-1790-1 - National Environmental Policy Act Handbook. National Environmental Policy Act Program, Office of the Assistant Director, Renewable Resources and Planning, Washington, D.C. January 2008.
- Bureau of Land Management. 2012. Desert Tortoise Mitigation Policy. Instructional Memorandum IM-AZ-2012-031.
- Bureau of Land Management. 2021. Mitigation Handbook (H-1794-1). https://www.blm.gov/sites/default/files/docs/2021-10/IM2021-046_att2.pdf.
- Bureau of Land Management. 2021. Mitigation Manual (MS-1794). Bureau of Land Management, September 22, 2021. https://www.blm.gov/sites/default/files/docs/2021-10/IM2021-046_att1_0.pdf.

Proposed Project

In Section 2, Proposed Action and Alternatives, and subsequent sections, BLM uses the terms “project area” and “analysis area,” but we were not able to find a definition for these terms. Our interpretation is BLM considers the project area and analysis area to be the project footprint during construction. However, the project area and analysis area should be larger than the project footprint as impacts, especially indirect and cumulative impacts, extend beyond the project footprint. Please revise the EA to define these terms and ensure the area analyzed in the final EA is sufficiently broad to include the areas of indirect and cumulative impacts. When this is implemented, we contend the impacts to tortoises/tortoise habitat and other sensitive species from the Proposed Action Alternative would be greater than currently described/analyzed in the draft EA.

In Section 2.1.1 Proposed Action - Management Actions, BLM says, “Well construction will conform to ADWR and ADEQ requirements.” We were unable to find in the EA what these requirements are nor could we find a reference that the public could access to determine what these requirements are. The Council’s concerns are (1) there is no requirement to implement the Arizona Interagency Desert Tortoise Team’s Recommended Standard Mitigation Measures for Projects in Sonoran Desert Tortoise Habitat (Arizona Interagency Desert Tortoise Team 2008), and (2) there is no information provided on the impacts of drilling wells would be on the tortoise/tortoise habitat. For example, will drilling occur 24 hours a day until the desired groundwater stratum is reached? How will the drilling muds be captured and disposed of?

On page 10, Section 3.3.1, Affected Environment and Environmental Consequences, “the Aguila grazing allotment is a perennial grazing allotment encompassing approximately 207,000 acres of public lands with a year-long grazing season. The allotment is permitted for 427 head of livestock, however, numbers on the allotment are varied based on forage condition and water availability.”

Further in this section, BLM states, “the invasive red brome is present through the project area.” As previously mentioned, we are unsure of the boundaries of the project area. Is red brome (*Bromus rubens*) only found near the existing dirt tanks or throughout the allotment? Are other invasive non-native plants present in the allotment, much of which appears to be tortoise habitat? We request that BLM provide data from their rangeland health assessment for this allotment in the final EA so the public can determine the condition and trend of the allotment. This information would assist BLM in its analysis of the impacts of the Preferred Action Alternative to show changes that may be needed/may occur to vegetation and soils from its implementation.

On page 8 in this section, BLM says, “There are no hibernacula or suitable shelter sites [sic] occur in the vicinity of the project area. There is potential however, that desert tortoise could use the project areas for foraging or dispersal.” From these statements we infer that BLM had a qualified biologist conduct protocol level surveys for the tortoise in the project area. We request that the report describing these surveys and the results be provide in the final EA.

To support BLM’s statement of potentially using the project area for foraging or dispersal, we provide the following data. Annual home ranges of Sonoran desert tortoises range from an overall length of 135 meters to almost 1,000 meters (Zylstra and Swann 2008) with a mean of 15.7 hectares. They reported tortoises will make occasional long-distance movements with one female tortoise moving more than 30 kilometers in one year. Averill-Murray (2020) reported that in addition to steep, rocky slopes and bajadas, Sonoran desert tortoises also use inter-mountain valleys as part of their home ranges and for dispersal at all age classes.

On page 9 in Section 3.2.2 Environmental Consequences Wildlife Resources, BLM provides the following wording as the complete analysis of the impacts of the Proposed Action Alternative to the Sonoran desert Tortoise:

“**Sonoran Desert Tortoise** - Short term impacts to desert [sic][tortoise] could occur during project implementation when increased human activity including increased presence of vehicles and machinery. Long term impacts to tortoise would be negligible as new fencing and other features associated with the project would not impede the movement of tortoise through the area. However, tortoise may avoid the project areas during times that livestock are present at the sites.

“The Proposed Action may impact individuals but would not lead toward listing or loss of viability of Sonoran Desert [sic] tortoise.”

In the first paragraph, we found no description of impacts to the tortoise and consequently no analysis of these impacts. In the second paragraph, BLM states a conclusion, but we were unable to find data and analysis earlier in the EA including in the paragraph preceding it that supports this conclusion by BLM. For example, we found no demographic data in the EA that indicate the status of the Sonoran desert tortoise’s viability. Please use scientific data and analysis to support concluding statements (see 40 Code of Federal Regulations 1500.1(b), 1502.8, 1502.16, and 1502.24 and BLM National Environmental Policy Act (NEPA) Handbook section 6.8.1.2 Analyzing Effects). Please provide data from scientific sources and analysis of the data before developing a conclusion regarding impacts to the tortoise.

On page 5, Section 1.5 Relationships to Statutes, Regulations, Manuals and Other Plans, because of BLM's commitment to implementing the Candidate Conservation Agreement for the Sonoran desert tortoise in Arizona, we request that BLM analyze in the final EA how the construction, operation, and maintenance of these perennial waters and larger corrals that would be authorized by BLM and their resulting impacts would ensure that adequate cover and forage for the Sonoran desert tortoise are maintained or improved in the allotment.

In section 6.8.2, Direct and Indirect Effects of the BLM NEPA Handbook (BLM 2008), BLM says, "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). The value in requiring analysis of both direct and indirect effects is to make certain that no effects are overlooked."

We were unable to find a description and analysis of the direct and indirect effects of the three phases of the proposed action – construction, operations, and maintenance. For example, during the construction phase, direct impacts to tortoises would include possible mortality or injury from encounters with vehicles and/or machinery, becoming trapped or overturned in trenches excavated for the pipelines, etc. Depending on the diameter of the water pipes and casings used for the wells, if stored onsite, tortoises could use them as sheltersites, and the tortoises inside the pipes/casings would be killed during installation. During operations, a larger number of livestock would be brought to one site and held for processing that may result in greater impacts to soils, air quality from dust generation, dust deposition on plants that would affect growth, reproduction, and forage availability (Sharifi et al. 1997), etc. During maintenance, pipelines may need to be excavated and replaced resulting in impacts to tortoises similar to those during construction. These new actions would result in impacts that should be discussed and analyzed in the final EA.

Because the direct and indirect impacts from implementing the Proposed Action have not been described and analyzed in the EA, the appropriate mitigation to avoid, minimize, reduce, rectify, and compensate for these impacts has not been recommended/required in the EA. We have provided Appendix A to inform BLM of some of the indirect impacts that should have been analyzed in the draft EA. Examples of appropriate mitigation include but are not limited to: (1) pipes and casings should have their ends covered to prevent tortoises of any size from entering them. (2) Trenches should be covered to prevent any wildlife from entering them and inspected each morning, evening, and throughout the day to ensure no wildlife are trapped in them. (3) For BLM sensitive species, the preferred mitigation for the construction phase for the Proposed Action Alternative would be to implement and complete the construction phase during the inactive season for the tortoise, purple martin, and gilded flicker to avoid these impacts.

Both common ravens and coyotes are known predators of desert tortoises. Ravens will also feed on salt, mineral, and protein blocks placed out that enhances cattle use, which is not revealed in the draft EA. Clearly, there will be more damage with such enhancements at water sources. We ask that provision(s) be identified and added to the list of eight bulleted Management Actions in 2.1.1 on pages 4 and 5 to minimize the availability of water sources to these known predators, and to ensure that neither existing nor proposed water sources serve as traps in which desert tortoises may drown. If there is to be a final EA, the short paragraph comprising Section 3.3.2 on page 9, "Environmental Consequences Wildlife Resources – Proposed Action," should be augmented with predator attraction as an additional indirect impact and effective mitigation required and implemented. We request that BLM develop and implement a monitoring program to ensure that tortoise predation is not increasing after installation of these wildlife waters. We recommend that maintenance occur more frequently during the tortoise active season and bird nesting season than BLM's proposed semi-annual occurrence.

Whereas the following sentence appears on page 8, “The Sonoran Desert tortoise is a candidate for endangered species listing,” it is our understanding that there was a recent decision to not list the Sonoran desert tortoise as threatened or endangered, and this sentence is no longer accurate. Please confirm in the final EA.

On page 11, Section 3.4.2 Environmental Consequences for Livestock Grazing. BLM says, “[u]nder the Proposed Action, water availability will increase at Sunset Tank and Desert Tank. These waters are in areas of lower annual vegetation production, and livestock predominantly use ephemeral forage in these areas during years with enough rainfall to support an ephemeral bloom. Livestock distribution on the allotment is expected to slightly improve with the additional water availability. With improved livestock distribution, grazing pressure on vegetation will be reduced in areas with existing perennial waters as livestock are rotated to the new perennial water sources.”

We found no data or analysis of data in the EA to support this conclusion. For example, there should be an analysis of what the grazing pressure would be on vegetation near the proposed perennial waters where livestock could now remain year-round, that is, areas that were not grazed because of the lack of water nearby. We request that BLM revise the EA and provide data and analysis of what the conversion of ephemeral water sites to perennial water sites would have to the soils, vegetation, and wildlife, specifically sensitive species such as the Sonoran desert tortoise. Each source of water creates a new “piosphere” that can extend for a 0.5 mile or more (Brooks, et al. 2006). Even if the area is already "disturbed," was it cleared and what was the radius of the clearing? This information should be in the final EA.

We provide the following data to assist BLM in their analysis of impacts. Lovich and Bainbridge (1999) reported soil compaction, erosion, and plant community alteration from grazing. Cattle grazing can have locally significant effects on vegetation and soils, at cattle watering areas and corrals, noting almost total destruction of perennial plants in the immediate area. The visual effect is greatly diminished as distance from the watering area increases. Brooks et al. (2006) studied the effects of livestock watering sites on native and nonnative vegetation. Increased livestock densities occur near artificial watering sites. Absolute and proportional cover of some non-native annual plants increased with proximity to watering sites. Cover and species richness of native annual plants decreased with proximity to watering sites. Perennial plant cover and species richness also declined with proximity to watering sites, as did the structural diversity of perennial plant cover classes. Significant effects were focused within 200 meters of the watering sites.

On pages 6-12, Section 3.0 Affected Environment & Environmental Consequences, in this section of the EA, we found no mention of the impacts of the Proposed Action Alternative on climate change. We request that the final EA address the effects of the Proposed Action Alternative on global warming/reduced soil moisture and the effects that global warming/reduced soil moisture may have on the Proposed Action Alternative.

We have been experiencing a megadrought since 2000 in the southwestern United States (Stahle 2020, Williams et al. 2022), the worst long-term drought in more than 1,200 years. Also documented has been a strong decline in vegetation cover, with the drier locations showing the strongest decline (Hantson et al. 2021). Dryland ecosystems may be more susceptible to changing climate than previously thought (Hantson et al. 2021). As noted by Archer and Predick (2008),

vegetation in arid lands that live near their physiological limits are experiencing additional stressors from climate change. Consequently, native vegetation that has received little or no impacts from livestock grazing because of limited water availability provided to livestock during the drought may not be able to survive the additional impacts of grazing. This would adversely impact the quantity and quality of tortoise forage and cover needed for protection from predators and temperature extremes.

On page 10, 3.4.1, Livestock Grazing, BLM says, “The allotment is permitted for 427 head of livestock, however, numbers on the allotment are varied based on forage condition and water availability.” And on page 1, Section 1.2, BLM says, “existing improvements are inadequate especially during extended dry periods and drought.” From this information, the need for the Proposed Action Alternative is to provide a year-round or reliable source of water as existing water sources are no longer reliable. This need appears to coincide with the megadrought that is currently affecting the southwestern United States and caused by climate change.

Cattle production is a major producer of greenhouse gas emissions and a significant contributor to climate change (IPCC 1990, Dijkstra et al. 2011, McGregor et al. 2021). It appears the purpose of the water development is to enhance livestock production (i.e., limited water availability meant fewer numbers of livestock using the allotment and/or fewer days grazing in the allotment) that would add to greenhouse gas emissions. The livestock sector is responsible for 18% of global anthropogenic greenhouse gas emissions, with enteric CH₄ of livestock being 25% of the livestock related greenhouse gases (Dijkstra et al. 2011). Please explain in the final EA how the Proposed Action Alternative, which would be approved by the federal government, complies with the President’s Executive Order 14008 on “Tackling the Climate Crisis at Home and Abroad” (e.g., section 204, etc.).

We recommend including an analysis of habitats within the action area. This includes areas that would experience indirect impacts from the Proposed Action Alternative that may provide use/occupancy for the tortoise population in the allotment; an analysis of how the Proposed Action Alternative 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 availability of sufficient quantity and quality of forage for survival, and recruitment and frequency and size of human-caused fires); and how the Proposed Action Alternative may affect the likelihood of human-caused fires.

Pages 6 – 12, Section 3.0 Affected Environment & Environmental Consequences. We found no analysis of cumulative impacts to the tortoise or any resource carried forward for analysis in the EA.

Please see *Grand Canyon Trust v. F.A.A.*, 290 F.3d 339, 345-46 (D.C. Cir. 2002) in which the court decided that agencies must analyze the cumulative impacts of actions in environmental assessments. In the cumulative effects analysis of the EA, please ensure that Section 6.8.3 on Cumulative Effects in BLM’s NEPA Handbook (2008) and the CEQs “Considering Cumulative Effects under the National Environmental Policy Act” (1997) is followed, including the eight principles, when analyzing cumulative effects of the proposed action to the tortoise and its habitats. CEQ states, “Determining the cumulative environmental consequences of an action requires

delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. The range of actions that must be considered includes not only the project proposal but all connected and similar actions that could contribute to cumulative effects.” The analysis “must describe the response of the resource to this environmental change.” Cumulative impact analysis should “address the sustainability of resources, ecosystems, and human communities.”

CEQs guidance on how to analyze cumulative environmental consequences, which contains eight principles listed below:

1. Cumulative effects are caused by the aggregate of past, present, and reasonable future actions.

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

2. Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, non-federal, or private) has taken the actions.

Individual effects from disparate activities may add up or interact to cause additional effects not apparent when looking at the individual effect at one time. The additional effects contributed by actions unrelated to the proposed action must be included in the analysis of cumulative effects.

3. Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.

Environmental effects are often evaluated from the perspective of the proposed action. Analyzing cumulative effects requires focusing on the resources, ecosystem, and human community that may be affected and developing an adequate understanding of how the resources are susceptible to effects.

4. It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.

For cumulative effects analysis to help the decision maker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly or the effects are no longer of interest to the affected parties.

5. Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.

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

6. Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.

Repeated actions may cause effects to build up through simple addition (more and more of the same type of effect), and the same or different actions may produce effects that interact to produce cumulative effects greater than the sum of the effects.

7. Cumulative effects may last for many years beyond the life of the action that caused the effects.

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

8. Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

Analysts tend to think in terms of how the 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.

The impacts from the implementation of the Proposed Action Alternative that would allow for increased and sustained numbers of grazing animals and periods of use greater than recent uses, especially during drought conditions, should not be allowed. The impacts to the tortoise and habitats of the tortoise, including soils, soil crusts, and vegetation, from livestock are summarized from the scientific literature in The Nature Conservancy (2005). There are a myriad of adverse impacts. Consequently, the Council does not support implementation of the Proposed Action Alternative. Rather, we support a substantial reduction or curtailment of grazing in tortoise habitat used for feeding, breeding, sheltering, and dispersal during drought conditions, especially during megadroughts. We request that BLM use this and other scientific data to describe and analyze the direct, indirect, and cumulative impacts of the Proposed Action Alternative to these resources.

Section 4.2, "Public Review," on page 13 states "This 'draft' EA has been made available to the public for review and comment for 15-days. The comment period was conducted between August 5 to August 20, 2022. The BLM sent notification of this document's availability to individuals, organizations, or agencies by postcard or email." First, despite continued requests of the BLM to consider the Council as an Affected Interest, including a letter to the Phoenix District Office¹, it was a third party, not the BLM that contacted us about this project. Also please note that the final date for comments on the BLM's eplanning website (<https://eplanning.blm.gov/eplanning-ui/project/2020252/510>) is August 23, not August 20 as given on page 13. Consequently, this comment letter is dated August 23, and we trust that BLM will accept it as being on time.

¹ <https://www.dropbox.com/s/dzsh3feh6ys3qv/BLM%20AZ%20District%20Managers%20DTC%20as%20an%20Affected%20Interest%20202019-11-8.pdf?dl=0>

Page 18, Table 2: We suggest that BLM state whether they accessed the Arizona's Natural Heritage Program Heritage Data Management System (HDMS) and the On-line Environmental Review Tool (ERT) and what the results were from this search with respect to the wildlife and plants that may occur near the Proposed Project. If BLM did not access these resources, we suggest that they do so and that the results be published in the final EA.

Page 19, Table 2: Soils and Vegetation were "carried forward for analysis" in the EA. However, we found little science-based analysis in the EA for these resources, especially with respect to their impacts on the Sonoran desert tortoise. Please include this analysis in the final EA.

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: BLM Director, Tracy Stone-Manning tstonemanning@blm.gov
BLM Deputy Director of Policy, Nada L. Culver nculver@blm.gov
BLM, Assistant Director, Resources & Planning, David Jenkins djenkins@blm.gov
BLM Arizona State Director, Raymond Suazo rsuazo@blm.gov

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Appendix A: Summary of Impacts from Livestock Grazing to the Sonoran Desert Tortoise and Its Habitat (from The Nature Conservancy. 2005. The impacts of livestock grazing in the Sonoran Desert: a Literature review and synthesis. February 2005.)

Where livestock and desert tortoise habitat overlap, livestock can cause direct impacts to juvenile and adult tortoises by trampling and crushing individuals (Grover and DeFalco 1995, Howland and Rorabaugh 2002). Indirect impacts of livestock grazing to desert tortoise are primarily due to potential competition for forage. The desert tortoise is a generalist feeder that has been documented to consume 199 species of plants associated with the Arizona Upland Subdivision of the Sonoran Desert (Van Devender and others 2002). The desert tortoise, however, is on the physiological edge of survival in the desert and must maintain optimal levels of blood hydration, salt, and mineral levels through its diet (Ofstedal 2002) or run the risk of dehydration, starvation, or liver and kidney disease (Dickinson and others 2002).

Where livestock and tortoise overlap in habitat, competition for nutritionally important forage species can be a threat, particularly in the spring after high winter rainfall years (Ofstedal 2002). Major forage species in the Sonoran Desert include native grasses, desert vine (*Janusia gracilis*), and mallows, including desert rose mallow (*Hibiscus coulteri*), globe mallow (*Sphaeralcea ambigua*), and Indian mallow (*Albutilon* sp.). Competition with livestock for forage has the potential to impact desert tortoise nutritional condition and water balance. Spring forage availability is associated with female reproduction and hatchling emergence. As a result, ephemeral grazing systems may be particularly detrimental to desert tortoise because their growth and reproduction depends on years of above average annual forage production (Grover and DeFalco 1995). In the eastern portions of the Sonoran Desert and especially within the Arizona Upland Subdivision, warm season plants, including C4 grasses, may usurp the dietary importance of winter annuals (Ofstedal 2002).

Non-native plants including filaree (*Erodium cicutarium*), Malta starthistle (*Centaruea melitensis*), Mediterranean grass (*Schismus barbatus*), red brome (*Bromus rubens*), Sahara mustard (*Brassica tournefortii*), and Russian thistle (*Salsola tragus*) have been documented as generally a minor part of the diet, with only red brome and filaree at times reported as a major component (Ofstedal 2002, Van Devender and others 2002). Although the nutrient value of some non-native plants that are used by desert tortoise are similar to native plants when compared within the same taxonomic groups and life forms, the presence of non-native plants that are invasive—and in particular alter fire regimes—may have an indirect effect on desert tortoise diet by causing a reduction in the abundance and richness of native forage plants (Van Devender and others 2002 and references therein). Therefore, a concern exists that desert tortoise nutrition and long-term condition may be compromised with shifts in plant communities from predominantly native species to increased abundance of invasive non-native species. For example, the replacement of C4 grasses by annual non-native C3 grasses may impact the nutritional status of tortoises given the lower protein and potassium excretion potential content of C3 desert grasses and the associated rapid decline in such content due to rapid phenological maturation (Ofstedal 2002). Livestock grazing has been implicated as a cause of the occurrence and spread of many invasive non-native species.

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