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Via Certified / Signature Required Priority Mail

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Public Comments Processing
Attn.: [FWS-R2-ES-2009-0032]
Division of Policy and Directives Management
U.S. Fish & Wildlife Service
4401 N. Fairfax Drive, Suite 222
Arlington, VA 22203

Re: Submission of Information in Response to Solicitation by the Fish & Wildlife Service Relative to the Status Review and 12-Month Finding on a Petition to List the Sonoran Desert Tortoise under the ESA as Endangered with Critical Habitat

These comments and the information provided herein and in attachment, submitted on behalf of the Altar Valley Conservation Alliance (AVCA), the Sourthern Arizona Cattlemen's Protection Association (SACPA), the Pima Natural Resource Conservation District (Pima NRCD), and the Pima County Farm Bureau respond to the Fish & Wildlife Service's solicitation of information relative to its Status Review and subsequent 12-Month Finding on a petition to list the Sonoran Desert Tortoise as endangered with critical habitat under the Endangered Species Act (ESA). More specifically, these comments and attachments address and analyze the petitioners' claim that livestock grazing poses a per se threat to the Sonoran Desert Tortoise while also providing clear and convincing scientific evidence supportive of an opposite conclusion – that light to moderate levels of grazing practiced on Private, State, Tohono O'Odham, and BLM and Forest Service multiple use lands, and on similarly situated lands in Sonora, pose no threat to the existence of Sonoran Desert Tortoises.

The AVCA is a 501(c)3 not-for-profit conservation organization committed to the purpose of leaving the next generation with a healthy and productive watershed, a thriving agricultural community, and a rural quality of life enriched by the culture and history of the Altar Valley. Led by nine major ranches located southwest of Tucson, Arizona, the AVCA pursues this mission by maintaining and restoring, and by seeking to maintain and restore, desert grasslands across 610,000 acres stretching from Arizona State Route 86 to the international boundary with Mexico. The Altar Valley is the largest watershed unfragmented by development remaining in Pima County. It is also home, under sustainable agricultural land use, to many of the Priority Vulnerable Species identified in the Pima County Sonoran Desert Conservation Plan.

The SACPA is an organization representing some 180 families ranching in Pinal, Pima, and Santa Cruz Counties, Arizona. The organization was founded in 1955 in response to cattle rustling, specifically to offer rewards for information leading to the conviction of persons vandalizing any member's property or stealing, killing or maiming livestock. While the SACPA continues to offer such rewards today, and law enforcement remains the primary mission, the organization has broadened its scope to address other industry-related issues of concern to its members, including environmental stewardship, sustainable range management, animal welfare, and rancher safety issues among many others.

The Pima NRCD is an Arizona natural resources conservation agency under the natural resources conservation division of the Arizona State Lands Department and operates under the authority and direction of the Arizona State Land Commissioner per A.R.S. Title 37, Chapter 6. The mission of the Pima NRCD is to identify natural resource problems and opportunities, and to formulate working plans to address those problems and opportunities. In pursuit of that mission, the Pima NRCD promotes the responsible management and use of natural resources, encourages voluntary solutions to natural resource problems, anticipates key natural resource issues and proposes effective policies to address them, develops human and other resources to address natural resource needs and issues, creates a forum for communication between diverse natural resource producers and other interested groups, obtains financial and staff support for conservation, and identifies key natural resource issues and proposes effective resolution of them. The Pima NRCD serves cooperators that reside within the geographic boundaries of Pima County, Arizona, excluding the sovereign lands of the Tohono O'Odham. A Pima NRCD cooperator is any person who has entered into a cooperative agreement with the Pima NRCD for the purpose of protecting, conserving and practicing wise use of the natural resources under his or her control. Cooperators may include landowners, lessees, managers and private or governmental entities interested in appropriate, scientifically supported natural resources management in southern Arizona.

The Pima County Farm Bureau is one of 13 active county Farm Bureaus that form the grassroots basis of the Arizona Farm Bureau. Each county Farm Bureau, including the Pima County Farm Bureau, is an independent entity governed by local farmer and rancher volunteer leaders. The Pima County Farm Bureau represents its local farmer and rancher members in Pima and Santa Cruz Counties. The mission of the Pima County Farm Bureau, shared by the Arizona Farm Bureau, is to preserve and improve the Agriculture industry through grassroots member involvement in education, political activities, programs and services. The purpose of the Pima County Farm Bureau, also shared by the Arizona Farm Bureau, is to be an independent, non-governmental grassroots organization that analyzes problems and formulates action to achieve educational improvement, economic opportunity, and social advancement in order to promote the financial and overall well being of agriculture and its members.

Like the AVCA, the SACPA and the Pima NRCD, the Pima County Farm Bureau advocates the application of sound scientific range management principles to all assessments of the effects of livestock grazing. Like those entities, the Pima County Farm Bureau also supports the use of sound scientific range management methods which consider weather trends (both long and short-term), livestock distribution patterns, plant frequency, species composition, range

condition and trend, and annual monitoring data in determining the effects that various levels of livestock grazing might have on Sonoran Desert Tortoises.

Adherence to this sound scientific approach, although apparently shunned by the petitioners, is shared by the authors and editors of research representing the best scientific and commercial data available relative to livestock grazing and Texas and Desert Tortoises (Avery and Neibergs (1997), Oldemeyer et al. (2000), Kazmaier et al (2001), Kazmaier et al (2001), Averill-Murray (2002), Boarman (2002)). Moreover, as the Fish & Wildlife Service appropriately points out in its 90-Day finding for this petition (FR Vol. 74, No. 166 at p. 44336), the ESA also adheres to the use of this approach by requiring that only scientific evidence drawn solely from the best scientific and commercial information available may be used by the Service in determining whether livestock grazing poses a threat to Sonoran Desert Tortoises on a 12-month petition finding. Thus, unlike its arguable allowance of face-value consideration of the petitioners' claims made in petition relative to livestock grazing for purposes of a 90-Day substantial information finding, the ESA (Section 4(b)(1)(A)) clearly prohibits consideration of the petitioners' claims not supported by relevant, reliable scientific evidence drawn solely from the best scientific and commercial information available for purposes of a 12-Month status review and 12-Month finding on that petition (ESA Sec. 4(b)(3)(B)).

Further, as the Fish & Wildlife Service also importantly points out in its 90-Day finding (*Id.* at p. 44344), the burden of proof that must be met is also higher for purposes of a 12-Month finding than it is for a 90-Day substantial information finding. Because the burden of proof on a 90-Day finding is "substantial information," or "more than a scintilla but somewhat less than a preponderance" of the evidence, *Marker v. Finch,* 322 F. Supp. 905 (D.Ct. Del. 1971), and because a 12-Month finding is subject to a higher burden of proof, *Moden v. United States Fish and Wildlife Service,* 281 F. Supp. 2d 1193 (D.Ct. Ore. 2003), a 12-Month finding requires support by a preponderance of the scientific evidence drawn solely from the best scientific and commercial information available at the least.

Relative to livestock grazing, this means that the petitioners, and the Service, must show by at least a preponderance of the best scientific evidence available (i.e., that scientific evidence which is both relevant and reliable) that livestock grazing poses a threat to the Sonoran Desert Tortoise. These requirements of the ESA are particularly important where, as here, livestock grazing has been occurring in occupied Sonoran Desert Tortoise habitat in Arizona since the 1680s, in occupied habitat in Sonora since the 1530s, and continues to nurture the historic and traditional agrarian cultures and customs common to both of these areas today.

Here, the petitioners claim that livestock grazing in occupied habitat adversely affects the Sonoran Desert Tortoise in a number of ways including competition for forage, vegetative trampling, alteration of plant community structure, introducing or enhancing the establishment of nonnative plant species, altering fire ecology, damaging burrows and cover sites and altering tortoise behavior. According to the Fish & Wildlife Service in 90-Day finding (at p. 44340), the petitioners' citations of Bostick (1990), Fleischner (1994), Oldemeyer (1994), Averill-Murray (2000b), Kazmaier et al. (2001), Boarman (2002), and Esque et al. (2002) provide substantial information supportive of those claims. Such, however, does not appear to be the case based on the scrutiny of those sources offered herewith.

For example, while Esque et al. (2002) is cited as a source of substantial information relative to livestock grazing as a threat to desert tortoises, such is not the case. This is because the Esque et al. (2002) study relates to fire ecology, not livestock grazing, and includes no hard data or other scientific evidence relative to livestock grazing indicating that such poses a threat to Sonoran Desert Tortoises within the area studied.

While Fleischner (1994) is cited by the petitioners and the Fish & Wildlife Service as a source of substantial information relative to the threat posed to desert tortoises by livestock grazing, again, such is not the case. Fleischner (1994) reviewed a wide variety of grazing versus grazing exclusion studies which show that livestock grazing has adverse impacts on vegetation density, vegetation structure, plant succession, soil stability, nutrient cycling, wildlife diversity, and riparian health.

However, none of the more than 120 studies reviewed by Fleischner (1994) takes into account critical details that greatly influence experimental outcomes such as grazing intensity, timing and frequency. Moreover, Fleischner (1994) fails to consider any of the 35 long term controlled grazing studies identified as the foundations of range management by Van Poollen and Lacey (1979), Holechek et al. (1999) and Holechek et al. (2001) (see Holechek (2005), attached) while inaccurately describing the actual state of scientific knowledge relative thereto as "rudimentary." (Fleischner, 1994, at p. 630).

Further, nearly all the studies Fleischner did consider have serious flaws, including inadequate descriptions of grazing treatments and practices, weak study designs, and/or lack of pre-treatment data. The Berry (1978) and Campbell (1988) studies are among the large group that did not provide sufficient information about livestock grazing to support any conclusions relative to the threat that livestock grazing might pose to desert tortoises. Yet, both are errantly offered as scientific proof by Fleischner (1994, Table 2, p. 632) that livestock grazing poses a threat to desert tortoises.

While there can be no argument with Fleischner (1994) that poorly controlled grazing can be destructive of rangeland ecosystems, Fleischner's review is misleading because it overlooks more than 35 controlled grazing studies from North America and over 50 more studies from other parts of the world which show that livestock grazing managed by use of scientific principles is sustainable and generally results in rangeland improvement. (Holechek, 2005, attached). Fleischner's (1994) review is also misleading because it advocates a "one size fits all" approach to categorizing livestock grazing as a threat to various species while failing to recognize that severe, heavy, moderate, conservative, and light grazing intensities each have different and scientifically measurable impacts on rangeland ecosystems. As a result, Fleischner (1994) cannot and does not provide any scientific evidence, let alone substantial information, supportive of the claim that livestock grazing poses a per se threat to the existence of the Sonoran Desert Tortoises of Arizona and Sonora.

Similarly, the petitioners can present no relevant and reliable scientific evidence supportive of their claim that livestock grazing at any level poses a threat to the survival of Sonoran Desert Tortoises. Instead, as clearly shown below, the petitioners' claims in this regard

are based on snippets of information taken out of context or are directly contradicted by the actual findings of the researchers and editors they cite.

For example, while the petitioners cite Bostick (1990) as scientific support for their livestock grazing / threat to desert tortoises claims (petition at p. 52), they also conversely misrepresent Bostick's (1990) publication (petition at p. 53) as a "nonscientific article" when it suits them for purpose of disparaging Bostick's (1990) intriguing and scientifically supported finding that cow dung may be an important source of protein to desert tortoises within the area studied.

Similarly, the petitioners pull snippets they like, while ignoring overall study results they apparently don't, from Avery (1998). While the petitioners cite to Avery (1998) for proof of a myriad of claims relative to threats allegedly posed to desert tortoises by livestock grazing, the petitioners neglect to mention that Avery and Niebergs (1997), or the scientifically conducted field work on which Avery's 1998 Ph.D dissertation is based, does not support those claims. In a paper titled *Effects of Cattle Grazing on the Desert Tortoise, Gopherus agassizii: Nutritional and Behavioral Interactions*, reported in *Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles – An International Conference*, pp. 13-20, New York Turtle and Tortoise Society, 1997, Avery and Neibergs (1997) compared tortoise habitat in a grazed area with an area that had been excluded from all grazing for eleven years.

Avery and Neibergs (1997) found no significant difference in annual plant cover, biomass or density, or total cover of perennial plants between the area grazed by livestock and that subjected to total livestock exclusion. Importantly, densities and individual volumes of a palatable perennial grass species, *Hilaria rigida*, were found by Avery and Neibergs (1997) to be greater in the grazed area versus the ungrazed area. Equally important (and equally contrary to the petitioners' p. 52 petition claims), Avery and Neibergs (1997) also found no measurable difference in hydraulic conductivity of soils between the grazed and ungrazed areas, indicating that soil compaction was not sufficient to reduce the rate of water transit into the soil. Avery and Neibergs (1997) also specifically caution that dietary overlap of forage species does not necessarily imply food competition.

Also of scientifically relevant and reliable substance are the results of a study, titled *The Effect of Cattle Grazing on Desert Tortoise (Gopherus agassizii) Abundance and Habitat in the Northeastern Mojave Desert,* presented by Oldemeyer, Medica and Korn at the *25th Annual Meeting and Symposium of the Desert Tortoise Council, April 21-24, 2000.* Oldemeyer, Medica and Korn (2000) sampled at 11 water sources in southern Nevada and southeastern California. This approach using a water device as a center of study has been used in Australia and published as a piosphere. For their design, Oldemeyer, Medica and Korn (2000) used five lines radiating out 4800 – 6400 meters from a water source and avoided major highways, other water, and other factors that may have influenced cattle or tortoise distribution. They sampled one-hectare plots at ten distances from water, starting at 200 meters and ending at 6400 meters in 1993 and 4800 meters in 1994 and 1995, for burrow density, density of perennial grasses and soil types. Oldemeyer, Medica and Korn (2000) also hypothesized that abundance data would fit a logistic curve with distance from water as the horizontal axis. That is, for perennial grass density as an example, Oldemeyer, Medica and Korn (2000) hypothesized that density would increase further

from water if livestock grazing was indeed affecting perennial grass abundance. They also believed that 50 – 100 years of grazing would result in the patterns hypothesized.

Based on the scientific data obtained and testing of their hypotheses by logistic, polynominal and straight-line regressions, Oldemeyer, Medica and Korn (2000) could not detect any impact due to grazing within their area of survey. Instead of citing Oldemeyer, Medica and Korn (2000), or the best scientific and commercial data available relative to livestock grazing and the desert tortoise in the Northeastern Mojave Desert, however, the petitioners misplace their reliance on Oldemeyer's 1994 contribution made to the National Biological Survey while this research study was ongoing and before Oldemeyer, Medica and Korn published their findings relative to such in 2000.

The petitioners' reliance on Kazmaier et al. (2001) for scientific support of their claim that livestock grazing threatens desert tortoises is also clearly misplaced. That 2001 research publication by Kazmaier, Hellgren, Ruthven and Syatzske, titled *Effects of Grazing on the Demography and Growth of the Texas Tortoise,* Conservation Biology 15(4): 1091-1101, does not stand for the proposition that livestock grazing threatens Sonoran Desert Tortoises. Instead, Kazmaier et al. (2001) found that moderate grazing by cattle is apparently not incompatible with the maintenance of Texas tortoise populations.

Kazmaier et al. (2001) evaluated the effects of moderate grazing by cattle (short-duration, winter-spring rotational grazing regime; 6-28 animal-unit days / ha / year) on the Texas Tortoise by comparing two grazed and two ungrazed sites in the Western Rio Grande Plains, Texas, from April 1994 to October 1997. They made 132 captures of 106 individuals in the ungrazed pastures and 324 captures of 237 individual tortoises in the grazed pastures. Kazmaier et al. (2001) also radio-tracked 22 tortoises in the ungrazed pastures and 25 tortoises in the grazed pastures. Comparisons of relative abundance, body-size distribution, body mass, sex ratio, adult survival, proportion of juveniles, and growth rates revealed no differences between tortoises on grazed and ungrazed areas.

Based on these results, Kazmaier et al. (2001) suggest that moderate grazing by cattle is not incompatible with maintenance of Texas Tortoise populations. Kazmaier et al's. (2001) data were consistent with a general model of tortoise biogeography and tolerance of disturbance. Importantly, Kazmaier et al. (2001) also caution that generalities about the effect of cattle grazing on the four North American tortoises should be avoided unless they can be placed in the context of grazing regime, precipitation, habitat quality, and tortoise requirements. In sum, unmentioned by the petitioners, Kazmaier et al. (2001) specifically caution against the use of precisely the generalized and unscientific methodology used by the petitioners and Boarman and Kristan (2008) to posit that livestock grazing poses a per se threat to the existence of the Sonoran Desert Tortoises of Arizona and Sonora.

Also unmentioned by the petitioners, is another research publication by Kazmaier et al. (2001) of relevance to the issue of tortoises and livestock grazing. That research publication by Kazmaier, Hellgren and Synatzske, titled *Patterns of behavior in the Texas tortoise, Gopherus berlandieri: a multivariate ordination approach,* Can. J. Zool. 79(8): 1363 – 1371 (2001) is similarly unsupportive of the petitioners' generalized allegations of threat posed to tortoises by

livestock grazing. In this research study, Kazmaier et al. (2001) compared the distribution of 19 categories of behavior exhibited by 47 adult Texas tortoises over three years with the use of detrended correspondence analysis (DCA) and canonical correspondence analysis (CCA). DCA revealed a gradient from passive to active behavior along axis 1. Tortoises were found to be more active in 1994 and less active in 1996, and this pattern was likely due to the extremely hot and dry conditions in 1996. Year was the most significant variable explaining variability in behavior when sex, age, size, year, and grazing treatment (pastures grazed versus ungrazed by cattle) were used as environmental variables in CCA. Kazmaier et al. (2001) also found that tortoises used proportionally more burrows, shallow surface depressions termed "pallets," and cavity pallets, and ate more cactus in 1996. More foraging and active behaviors, like courtship, were observed by Kazmaier et al. (2001) in 1994. After the effects of year were controlled for, sex was also found to be a significant variable in explaining behavioral variability. Males tended to exhibit more active behaviors than females. Importantly, Kazmaier et al. (2001) found that their analyses suggest that the grazing regime used in the Chaparral Wildlife Management Area did not affect the patterns of behavior exhibited by the Texas tortoise.

Standing in stark departure from the sound scientific methodologies practiced by Kazmaier, Bostick, Avery, Niebergs, Oldemeyer, Medica, and Korn, however, is the less than scientifically credible methodology employed by Boarman and Kristan (2008) to conclude the contrary for the petitioners -- that livestock grazing at any and all current levels poses a threat to the existence of the Sonoran Desert Tortoises of Arizona and Sonora. Review of Boarman's and Kristan's (2008) claims relative to desert tortoises and livestock grazing reveals that those claims are unsupported by any semblance of scientific objectivity, any collection and/or analysis of hard scientific data, and that such claims were reached in stark departure from the scientifically credible and objective methodology of livestock grazing / desert tortoise assessment advocated by Boarman for the USGS in 2002.

In a publication titled *Threats to desert tortoise populations: a critical review of the literature,* U.S. Geological Survey, Western Ecological Research Center, San Diego, CA, Boarman (2002) states, relative to livestock grazing and Mojave Desert Tortoises, that "the reductions [in Mojave Desert Tortoises] have been attributed to grazing, but another cause may include the potential spread of disease from captive tortoises released in the area (Luke et al. 1991)" and that "no [Mojave Desert Tortoise] population trends in California have been attributed with hard data to livestock grazing."

In his Summary, Boarman (2002) further states that "surprisingly little information is available on the effects of grazing on the Mojave Desert ecosystem (Oldemeyer 1994, Rundel and Gibson 1996, Lovich and Bainbridge 1999). Differences in rainfall patterns, nutrient cycling, and foraging behavior of herbivores and how these three factors interact make applications of research from other areas of limited value in understanding the range ecology of the Mojave Desert. The paucity of information is surprising given the controversy surrounding grazing in the Mojave and the importance of scientific information for making resource management decisions affecting grazing. Studies mostly from other arid and semi-arid regions tell us that grazing can alter community structure, compact soil, disturb cryptogamic soils, increase fugitive dust and erosion. Some impacts to tortoises or their habitat have been demonstrated, but the evidence is not overwhelming."

As shown herein and in attachment, scientific evidence of negative impacts to desert tortoises or their habitats caused by livestock grazing is actually either nonexistent or extremely underwhelming at best. Moreover, as cautioned by Avery and Niebergs (1997), merely because livestock grazing *can* alter the aspects of tortoise habitat identified by Boarman (2002), does not imply that it actually does in any particular situation or, if it does alter some aspects of tortoise habitat in any particular situation, that those alterations are necessarily negative to desert tortoises and their habitat.

To the contrary, the claim that livestock grazing at any and all levels has negative effects on Sonoran Desert Tortoises or their habitat is an assumption that can be viewed as nothing more than mere speculation until subjected to specific, scientifically credible testing to determine whether that claim is actually supported by scientific information at various grazing levels. Because the aspects of tortoise habitat identified by Boarman (2002) – community structure, soil compaction, cryptogamic soils disturbance, amounts of fugitive dust and rates of erosion – are capable of credible scientific measurement, collection of scientific data relative to each of those habitat aspects, analyzed in tandem with hard scientific data relative to rainfall and quantification of livestock use, management and grazing regimes (see attached analysis) within the particular areas at issue is prerequisite before the speculation that livestock grazing at any and all levels poses a threat to Sonoran Desert Tortoises can be supported by scientific evidence and thus qualify for consideration by the Fish & Wildlife Service in the making of its12-Month finding on this petition.

As shown herein and in attachment, however, neither the petitioners nor Boarman and Kristan (2008) conducted any such scientific analyses. Nor did they collect or attempt to collect any relevant or reliable hard scientific data relative to the testing of their shared speculation that livestock grazing at any and all levels poses a threat to Sonoran Desert Tortoises. Instead, both the petitioners and Boarman and Kristan (2008) chose, in disregard of Boarman's own (2002) caution about the importance of using scientific information for making resource management decisions affecting grazing, to presuppose – without benefit of necessary testing or analysis of any scientific data or scientific evidence whatsoever – that livestock grazing poses a threat to Sonoran Desert Tortoises and their habitat on and around 16 of 17 permanent survey plots, and, that a level of threat posed by livestock grazing to tortoises on and around each of those survey plots can be both assigned and reliably used for computer modeling purposes nonetheless. As amply shown herein and in attachment, this speculative approach lacks scientific credibility.

Nonetheless, based on nothing more than pure speculation, the petitioners boldly pronounce (petition at p. 52), without benefit of any citation to source, that "livestock degrade habitat quality for a large suite of desert species, and the desert tortoise is among them." In fact, as shown herein and in attachment, the best scientific and commercial information available relative to the effects of controlled livestock grazing on a host of Southwestern species and their habitats, including Texas and desert tortoises, does not support that uncited claim (see also citations to publications showing the benefits of controlled grazing, attached).

Similarly, based on nothing more than sheer speculation, Boarman and Kristan (2008) boldly state (at p. 2) that current domestic livestock grazing poses a threat to the persistence of Sonoran Desert Tortoise populations. Like the petitioners, Boarman and Kristan fail to provide a

citation to scientific source of support for this bold claim because no scientific source supportive of that claim apparently exists. Instead, the best scientific and commercial information available relative to desert tortoises and livestock grazing, as shown graphically herein, clearly and convincingly contradicts that claim.

Neither does the best scientific and commercial information available support Boarman's and Kristan's (2008) further claim (at p. 37) that they used "what was known about the relative levels of threats to tortoises on the survey plots" for purpose of allegedly scientifically credible, computerized threat modeling. Rather, the facts reveal that Boarman and Kristan (2008) ignored all available rainfall data, hard data about actual stocking levels, grazing regime, grazing monitoring data, and any other form of available scientific data, in assigning "threat scores" allegedly posed to Sonoran Desert Tortoises by livestock grazing on 16 of 17 permanent survey plots.

The facts also reveal that what information Boarman and Kristan (2008) did actually use, relative to livestock grazing as a threat to desert tortoises, consisted entirely of generalized numbers, presented without context or citation to source, and second-hand speculations and subjective, anecdotal observations of livestock, livestock presence and livestock non-presence apparently passed on to them by the petitioners. (see Analysis, attached).

Moreover, Boarman and Kristan (2008) do not identify drought as a threat to Sonoran Desert Tortoises despite Averill-Murray's (2002) finding of severe mortality of these tortoises likely due to drought at Ragged Top on the Ironwood Forest National Monument (IFNM) in 1995-96. Instead, Boarman and Kristan (2008) selectively ignore drought, along with the further fact that Averill-Murray (2002) does not mention livestock grazing in the IFNM as having any effect on Sonoran Desert Tortoises, for purposes of computerized livestock grazing "threat modeling."

Boarman's and Kristan's (2008) biased and generalized conclusions relative to livestock grazing as a threat to Sonoran Desert Tortoises are also particularly troubling because they stand in stark contradiction of Kazmaier et al's. (2001) sound, scientific admonition that generalities about the effect of cattle grazing on desert tortoises should be avoided unless they can be placed in the context of grazing regime, precipitation, habitat quality, and tortoise requirements. As clearly shown both herein and in attachment, neither the petitioners nor Boarman and Kristan (2008) made any attempt to place livestock grazing in any of those contexts.

Instead, both chose to indulge in wild speculations and generalities about the pre-supposed threat and pre-supposed degree of threat livestock grazing allegedly poses to Sonoran Desert Tortoises on each of 17 permanent survey plots. Accordingly, because Boarman's and Kristan's (2008) threat modeling methodology is purely speculative, and because speculation by definition is not scientific evidence, those modeling results, and the methodology employed in obtaining them, are clearly precluded from any consideration by the Fish & Wildlife Service in the making of a 12-Month finding on the petition to list the Sonoran Desert Tortoise by the Endangered Species Act.

As shown clearly and convincingly herein, the best scientific evidence available reveals that livestock grazing at light to moderate levels does not pose a threat to the Sonoran Desert Tortoises of Arizona and Sonora. While the Fish & Wildlife Service seems to recognize this fact, by stating in its press release on this subject matter that "improper" livestock grazing may threaten the Sonoran Desert Tortoise, that is not the qualified position it took relative to livestock grazing in its 90-Day finding for this petition. Moreover, the Service's use of the term "improper," as a descriptor of the kind of livestock grazing that may pose a threat to Sonoran Desert Tortoises, is not a term of scientific art defined by the Society for Range Management. Nor does the Fish & Wildlife Service offer any definition of the kind of livestock grazing it might view as "improper" relative to Sonoran Desert Tortoises.

At the least, therefore, the Fish & Wildlife Service must come up with a scientifically defensible definition of what "improper livestock grazing" is for purpose of 12-Month finding on this petition, or, in the alternative, adopt a term of description that is a term of scientific art which is defined and accepted by the range management scientific discipline. We urge the Fish & Wildlife Service to adopt the latter approach and to properly find upon 12-Month status review that, based on clear and convincing scientific evidence drawn from the best scientific and commercial information available, light to moderate levels of livestock grazing practiced on Private, State, Tohono O'Odham, and Federal lands in the United States and on similarly situated lands in Sonora do not pose a threat to the existence of the Sonoran Desert Tortoises of Arizona and Sonora.

Analysis of Boarman's and Kristan's (2008) and the Petitioners' Appendix 1 Claims Relative to Livestock Grazing as a Threat to Sonoran Desert Tortoises On Each of 17 Permanent Study Plots

Arastra -- 1987 & 1997, 60, 35 Person Days respectively, 2 coverages (13 adults, 13 adults & subadults; 15, 13 respectively); 2002, 35 Person Days, 2 coverages (6, 7); 2006, 18 Person Days, 3 coverages (7, 8). **Comment:** Despite a 49% reduction in Person Days expended on survey between 2002 & 2006, no current negative population trend is shown. According to Boarman and Kristan (at p. 28-29), this population is likely stable or perhaps only slightly declining. Nonetheless, Boarman and Kristan speculate (at p. 33) – in the absence of scientific evidence or any attempt at scientific quantification – that "heavy" grazing is among the "problems" facing Sonoran Desert Tortoises on this study plot. Use of such baseless speculation is not only expressly precluded from consideration in the making of a 12 month finding on a petition to list by the Endangered Species Act, but is also clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

Nevertheless, on an artificial "threat scale" of 0 – 4, Boarman and Kristan subjectively assign livestock grazing an arbitrary "threat score" of "4," or the greatest "threat" to Sonoran Desert Tortoises on the Arastra study plot, for purpose of computerized "threat modeling." While the petitioners state (Appendix 1, p. 141 of petition) that grazing in the area of the Arastra survey plot consists of 1,674 AUMs over 34,967 acres, they neither identify the grazing allotment(s) to which these figures might apply nor provide citation to source for those figures which, even if accurate, tell us nothing of scientific value on their own relative to any possible benefit or threat livestock grazing might represent to Sonoran Desert Tortoises on or around the Arastra study plot.

Similarly, the petitioners' comments describing the livestock presence they observed on and around the area of this study plot tell us nothing of scientific evidentiary value because those comments are merely subjective speculations and/or anecdotal observations incapable of replication by use of credible scientific methodology and are unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of forage utilization, type of cattle, or timing of grazing on and around the Arastra study plot. As a result neither Boarman and Kristan (2008) nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted on and around the Arastra study plot is "heavy," or that such grazing poses a threat to the Sonoran Desert Tortoise.

Bonanza – 1992, 60 PDs, 2 coverages (13, 14); 1997 35 PDs, 2 coverages (10, 10); 2002, 35 PDs, 4 coverages (10, 11); 2006, 18 PDs (11, 12). **Comment:** Despite a 49% decrease in Person Days expended in monitoring between 2002 & 2006, no current negative population trend is shown. According to Boarman and Kristan (at p. 29), this population showed some increase, although that increase was not statistically significant. Also, according to Boarman and Kristan

(at p. 34), "Bonanza Wash was considered of great concern in 1992, but since then the evidence of high losses has abated, there is little evidence of disease or mortality, and some indication of immigration from outlying areas (Woodman et al. 2007)."

Notwithstanding these conclusions, Boarman and Kristan then speculate (at p. 34) – again, without benefit of any scientific evidence or any attempt at scientifically credible quantification – that the existence of "active heavy livestock grazing" warrants possible concern for the population. Not only is the use of such baseless speculation expressly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, it is also clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

Nonetheless, on their artificial "threat scale" of 0 - 4, Boarman and Kristan subjectively assign livestock grazing an arbitrary "threat score" of "4," categorizing such as the threat of greatest magnitude to Sonoran Desert Tortoises on the Bonanza survey plot, for purpose of computerized "threat modeling." The petitioners state (Appendix 1 at p. 139) in comment supporting this "threat score" that cattle were seen many times in 1997 and 2006 in the Bonanza study plot, and that tracks and droppings were common throughout it.

Like Boarman's and Kristan's speculations relative to livestock grazing on the Bonanza, the petitioners' subjective and anecdotal observations relative to such are unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle, or timing of grazing on and around the Bonanza study plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence in support of their claim that grazing as currently conducted on and around the Bonanza study plot is "heavy," or that such grazing poses a threat to the Sonoran Desert Tortoise.

Buck – Not surveyed until 2002; 2002, 35 PDs, 2 coverages (20, 23); 2005, 35 PDs, 5 coverages (15, 15). **Comment:** Limited sampling and use of inconsistent monitoring methodologies preclude reliable trend results. Although Boarman and Kristan state (at p. 28) that no significant results exist for this study plot, they then speculate that this plot yielded a negative trend sufficiently great that it might portend problems for this population's future viability. They then further qualify that speculation (at p. 28) by stating that because the negative trend is not significant, additional years of study would be needed to confirm that this decline is not merely a sampling artifact.

Livestock grazing is not identified as a threat to the tortoise on this study plot by Boarman and Kristan in discussion. Apparently, this is the only one of the 17 survey plots on which grazing does not occur. This is reflected by Boarman and Kristin assigning livestock grazing an artificial "threat score" of "0" as a threat to the tortoises on this survey plot, and the petitioners' silence in comment (Appendix 1, p. 135).

Eagletail – 1987 & 1990, 60 PDs, 2 coverages (34, 34 and 27, 29 respectively); 1991, 36 PDs, 2 coverages (28, 29); 1991, 1992, 1993, 1994, 1998, 2003, 35 PDs, 2 coverages (23, 23; 23, 23; 27, 28; 30, 31; 26, 26). **Comment:** No statistically relevant trend of decline. According to Boarman and Kristan (at p. 28-29) the trend of this population is likely stable or perhaps only slightly declining.

Nonetheless, Boarman and Kristan speculate (at p. 33) that one of the greatest potential "problems" on this study plot is "active grazing," which, they also conversely state, appears to have little effect on this population's stability. How an activity that appears to have little effect on this population's stability could possibly be viewed in the absence of scientific evidence or investigation as one of the greatest potential problems for this tortoise population, as speculated by Boarman and Kristan, is a mystery clearly indicative of these editors' personal biases against livestock, livestock grazing, range science and the practice of scientifically credible methodology relative thereto.

Nevertheless, Boarman and Kristan subjectively assign livestock grazing an arbitrary "threat score" of "3," categorizing such as the greatest threat to the Sonoran Desert Tortoise on the Eagletail study plot, for purpose of computerized threat modeling. According to the petitioners in comment supporting this "threat score," the ranch on which the Eagletail survey plot is located "used its full allotment of 2,100 AUMs. There were 380 head grazed on the 179,000 acre allotment; Cattle usage on the Eagletail plot in the winter of 2003 was light, judging from the amount and color of dung present. Cattle have utilized all of the slopes used by desert tortoises, as evidenced by cattle dung."

First, utilization levels cannot be scientifically determined judging from the amount and color of dung subjectively observed at an isolated point in time any more than such can be determined by merely reciting numbers without more, as the petitioners apparently seem to believe. Second, the petitioners' recitation of AUMs, numbers of head, and the number of acres does not include either the name of the ranch or the grazing allotment to which those figures might apply or any citation as to their source, and third, the petitioners' comments relative to the Eagletail, like their previous ones, are merely subjective speculations and/or anecdotal observations unsupported by any semblance of scientific data.

In fact, neither Boarman and Kristan nor the petitioners (Appendix 1 at p. 138) present any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and forage utilization levels, type of cattle, or the timing of grazing on or around the Eagletail survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that "active grazing" as conducted in and around the Eagletail study plot poses a threat to the Sonoran Desert Tortoise.

East Bajada – 1990, 1993 and 1997, 60 PDs, 2 coverages (35, 36; 45, 47; 38, 43); 2002, 60 PDs, 3 coverages (8, 8). **Comment:** The 2002 results represent either a sharp decline in tortoise numbers on this study plot since 1997, or, in the alternative, are a false artifact of the survey

methodology used on this survey plot for the first time in 2002, when at the least 33% less time was spent in the field surveying tortoises.

Nonetheless, Boarman & Kristan (at p. 25) seize on the 2002 results – again, without benefit of scientific evidence or any attempt at scientific quantification -- to speculate that "heavy cattle grazing" is a primary threat to the Sonoran Desert Tortoise on this study plot, and to subjectively assign an arbitrary "threat score" of "3" to livestock grazing on the East Bajada study plot for computerized threat modeling purposes. Use of such baseless speculation is not only expressly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of scientifically credible methodology relative thereto.

In comment supporting Boarman's and Kristan's "threat score" for the East Bajada study plot, the petitioners state (Appendix 1, p. 132) that there are 1,247 AUMs over an unidentified area of 81,434 acres (presumably, including the survey plot), that there is "heavy recent use" in some parts of that 81,434 acre area, and that dung was sporadically encountered throughout that area. As with the Arastra and Eagletail survey plots, the petitioners' mere recitation of AUMs and acreage tells us nothing of scientific value about the level of grazing actually occurring in this area.

The petitioners' further comments describing the livestock presence they observed on and around the area of this survey plot are similarly scientifically valueless. This is because, like Boarman & Kristan's speculations, the petitioners' anecdotal observations relative to livestock grazing on and around the East Bajada study plot are also subjective and similarly unsupported by any necessary scientific evidence relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of forage utilization, type of cattle, or timing of grazing on and around the East Bajada survey plot. As a result, neither Boarman and Kristan nor the petitioners provide any scientific evidence whatsoever in support of their claim that livestock grazing as currently practiced in and around the East Bajada study plot is "heavy," or that such grazing poses a threat to the Sonoran Desert Tortoise.

Four Peaks – 1992, 1995, 56 PDs, 2 coverages (41, 44; 43, 46); 2001 60 PDs, 2 coverages (37, 40). **Comment:** No statistically relevant trend of decline. Although Boarman and Kristan state (at p. 28) that no significant results exist for this study plot, they then speculate that this plot yielded a negative trend that was sufficiently great that it might portend problems for this population's future viability. They then qualify that speculation (at p. 28) by stating that because that negative trend is not significant, additional years of study would be needed to confirm that this decline is not merely a sampling artifact. Boarman and Kristan also point out (at p. 31) that there is inconsistency in information about the number of coverages each survey entailed and that Woodman et al. (2002) believe that this population is stable. Boarman and Kristan further state (at p. 31) that while human impacts on this study plot are quite low, threats are high surrounding the plot. Boarman and Kristan identify those threats as Highway 87, hunting, and

off-road vehicle activity nearby, while offering neither elaboration nor data in support of those claims.

Similarly, although Boarman and Kristan do not identify livestock grazing as a "threat" to the Sonoran Desert Tortoise on this study plot in discussion, they nonetheless subjectively assign livestock grazing an arbitrary "threat score" of "1" for purpose of computerized threat modeling. Use of such baseless speculation is not only expressly precluded from consideration in the making of a 12-Month finding on a petition to list by the ESA, but also clearly indicative of Boarman's and Kristan's apparent biases against livestock, livestock grazing, range science and the practice of scientifically credible methodology relative thereto.

In comment supporting this "threat score," the petitioners merely state (Appendix 1, at p. 136) that there is a "history of cattle grazing" on the Four Peaks survey plot area. Like Boarman's and Kristan's speculations relative to livestock grazing on and around the Four Peaks survey plot, the petitioners' speculation -- that a history of livestock grazing threatens the Sonoran Desert Tortoise on and around the Four Peaks study plot -- is also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Four Peaks survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as historically practiced or currently conducted in and around the Four Peaks study plot poses a threat to the Sonoran Desert Tortoise.

Granite Hills – 1990, 1991, 1992, 1993, 1994 & 1998, 60 PDs, 2 coverages (27, 31; 40, 49; 35, relevant trend of decline. Most recent survey shows increase. According to Boarman and Kristan (at p. 28-29), this population is likely stable or perhaps only slightly declining. Also, according to Boarman and Kristan (at p. 33-34) there has been little documented mortality, some evidence of reproduction, and very little sign of disease in this population.

While livestock grazing is not identified as a threat to the tortoise on this study plot in discussion, Boarman and Kristan nonetheless subjectively assign an arbitrary "threat score" of "2" to livestock grazing on the Granite Hills study plot for purpose of computerized "threat modeling." Use of such baseless speculation is not only clearly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also once again further evidence of these editors' apparent biases against livestock, livestock grazing, range science and the practice of scientifically credible methodology relative thereto.

According to the petitioners in comment supporting this "threat score" (Appendix 1, at p. 139), no cattle were observed within the Granite Hills study plot boundaries during the survey, evidence of past grazing in the form of cattle dung is throughout the plot, and dung was found even in surprisingly rugged terrain. Like Boarman's and Kristan's speculations relative to livestock grazing on the Granite Hills study plot, the petitioners' anecdotal observations relative to such are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management

strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Granite Hills survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted on and around the Granite Hills study plot poses a threat to the Sonoran Desert Tortoise.

Harcuvar – 1988, 65 PDs, 2 coverages (51, 55); 1993 & 1997, 60 PDs, 2 coverages (40, 44; 49, 50); 2002, 60 PDs, 3 coverages (41, 42); 2006, 40 PDs, 4 coverages (45, 46). **Comment:** No statistically relevant or discernable trend of decline. According to Boarman and Kristan (at p. 28-29), this population is likely stable or perhaps only slightly declining. Boarman and Kristin then contradict themselves (at p. 33) by speculating that while this population is relatively safe, the trend they discern from the data "suggests a relatively steady, but mild decrease." Livestock grazing is not specifically identified as a "problem" to the tortoise on this study plot by Boarman and Kristan in discussion.

Nonetheless, Boarman and Kristan subjectively assign livestock grazing an arbitrary "threat score" of "2" on the Harcuvar study plot for purpose of computerized threat modeling. Use of such baseless speculation is not only clearly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also once again indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

In comment supporting this "threat score," the petitioners state (Appendix 1 at p. 138) that a maximum of "211 animals year long; 2,532 AUM's," apparently exist within an unspecified area that presumably includes the Harcuvar study plot. The petitioners also state that "no cattle observations occurred during the 2006 survey," and that "cattle sign (droppings and trails) were restricted to the ridges and low rolling areas in the southeast corner, as well as some of the benches on the more shallow sloped hillsides."

Again, like Boarman's and Kristan's speculations relative to livestock grazing on the Harcuvar survey plot, the petitioners' recitation of numbers is scientifically meaningless without more, and their anecdotal observations relative to livestock grazing are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Harcuvar study plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted in and around the Harcuvar study plot poses a threat to the Sonoran Desert Tortoise.

Harquahala – 1988, 65 PDs, 2 coverages (17, 17); 1994, 60 PDs, 2 coverages (17, 17); 2001, 35 PDs, 2 coverages (7, 7); 2004, 28 PDs, 3 coverages (6, 7). **Comment:** Reduction of Person Days spent in survey, by 42% and 53% in 2001 and 2004, respectively, precludes statistically relevant or reliable conclusion relative to trend. Nonetheless, Boarman and Kristan (at p. 27) speculate that the tortoise population on the Harquahala Mountains study plot may have

experienced declines, but the trend was not significant. Conversely, Boarman and Kristan also state in discussion (at p. 28) that there is little evidence that human-associated impacts are causing tortoise decline and there is some evidence that the population may be denser.

Nonetheless, for purpose of computerized "threat modeling," Boarman and Kristan subjectively assign an arbitrary "threat score" of "2" to livestock grazing on the Harquahala study plot. Not only is the use of such speculation clearly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, it is also further evidence of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific smethodology relative thereto.

In comment supporting this "threat score," the petitioners state (Appendix 1 at p. 135) that the 10-year average was 1,502 AUMs within an area they do not define but presumably includes the Harquahala survey plot. The petitioners also state that cattle, mostly in the form of dung and trails, were observed on approximately half of the study plot, with burro sign more pervasive and widespread, and that no cattle were seen in 2004 [other] than cattle sign. Again, the petitioners' recitation of an average of 1,502 AUMs over a 10 year period in an undefined area, without more, tells us absolutely nothing of scientifically credible value relative to the actual level of livestock grazing that may be occurring on and around the Harquahala study plot.

Like Boarman's and Kristan's speculations relative to livestock grazing on the Harquahala survey plot, the petitioners' further anecdotal observations relative thereto are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Harquahala survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently practiced on and around the Harquahala study plot poses a threat to the Sonoran Desert Tortoise.

Hulapai – 1991, 1996, 60 PDs, 2 coverages (32, 32; 36, 37); 2001, 60 PDs, 4 coverages (15, 15); 2005, 35 PDs, 5 coverages (11, 11). **Comment:** 50% less time spent in the field per visit in 2001 and 42% fewer Person Days expended in 2005 (and >60% less time spent in the field per visit than in 1991 and 1996) preclude scientifically relevant or reliable conclusion relative to trend. Nonetheless, Boarman and Kristan (at p. 26) speculate that tortoise declines on this plot have been "steady" since 1990. Impacts noted by Boarman and Kristan in discussion, however, do not include livestock grazing.

Nonetheless, Boarman and Kristan subjectively assign an arbitrary "threat score" of "2" to livestock grazing on the Hulapai study plot for computerized threat modeling purpose in the absence of scientific support. Use of such baseless speculation is not only expressly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also once again clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

In comment supporting this "threat score," the petitioners state (Appendix 1 at p. 132) that cattle were not directly observed on the Hulapai survey plot during the 2005 survey, although tracks were seen on the plot once. The petitioners also state in comment that old cattle droppings were present throughout the plot except for on the steepest and rockiest slopes. They then also state their opinion, without benefit of scientific support and in direct contradiction of their previous statements, that "some areas, particularly in the washes and under the larger trees, were heavily impacted by cattle apparently seeking shade."

Like Boarman's and Kristan's speculations relative to livestock grazing on the Hulapai survey plot, the petitioners' speculations and anecdotal observations relative to such are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Hulapai study plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted in and around the Hulapai study plot poses a threat to the Sonoran Desert Tortoise.

Little Shipp – 1990, 1991, 1992, 1993, 1994 and 1998, 60 PDs, 2 coverages (64, 67; 66, 68; 69, 79; 74, 83; 59, 62; 45, 48); 2003, 60 PDs, 3 coverages (55, 58). **Comment:** No currently discernible or statistically relevant trend of decline. According to Boarman and Kristan (at p. 28-29), this population is likely stable or perhaps only slightly declining, and there is evidence of reproduction and recruitment (at p. 32).

Although livestock grazing is not identified as a threat to the tortoise in discussion, Boarman and Kristan – without any elaboration or presentation of necessary scientific data – nonetheless subjectively characterize (at p. 32) the grazing level on the Little Shipp study plot as "high." Boarman and Kristan then subjectively assign an arbitrary "threat score" of "4" to livestock grazing, or the threat of greatest magnitude to Sonoran Desert Tortoises, on the Little Shipp study plot for purpose of computerized threat modeling.

Use of such baseless speculation, and subsequent bootstrapping thereof, are not only clearly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also clear and substantial evidence of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto. In comment supporting this "threat score," the petitioners simply state that cattle were observed daily on the plot, and that there were 8 AUMs per section in an overall area they again fail to identify.

Like Boarman's and Kristan's speculations relative to livestock grazing on the Little Shipp study plot, the petitioners anecdotal observations relative thereto are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of livestock grazing on and around the Little Shipp survey plot. As a result, neither Boarman and Kristan nor the petitioners present any

scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted on and around the Little Shipp survey plot is "high," or that such grazing poses a threat to the Sonoran Desert Tortoise.

Maricopa -- 1987, 1990, 2000, 60 PDs, 2 coverages (51, 52; 14, 14; 15, 17); 2005, 40 PDs, 4 coverages (18, 19). **Comment:** No currently discernible or statistically relevant trend of decline. 1987 results may be viewed as suspect when considered in comparison to 1990, 2000 and 2005 survey results. Nonetheless, Boarman and Kristan speculate (at p. 25) that this study plot "suffered statistically significant declines averaging 9.6% per year for adults and subadults" and "an 87% decline since monitoring the population commenced in 1987."

However, Boarman and Kristan then qualify those speculations by use of disclaimer in stating (at p. 25) that the type of population model they chose to employ for determining statistically significant decline "may not be applicable to the Maricopa Mountains desert tortoise population, which experienced declines for unknown reasons during a major drought shortly after the first survey in 1987." When the 1987 survey results are excluded from consideration, 1990 through 2005 survey results establish a small but consistently discernible trend of increase, not decrease, of Sonoran Desert Tortoises on this study plot.

Livestock grazing is not identified as a threat to the tortoise on this study plot by Boarman and Kristan in discussion. Instead, Boarman and Kristan do state (at p. 25-26), that "the plot is within a wilderness area . . . and currently experiences very little human impacts."

Nonetheless, Boarman and Kristan – again without benefit of scientific evidence or any attempt at scientific quantification – subjectively assign an arbitrary "threat score" of "1" to livestock grazing on the Maricopa Mountains study plot for purpose of computerized threat modeling. Use of such subjective and arbitrary speculation is not only precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

In comment supporting this "threat score" (Appendix 1, at p. 133) the petitioners simply state that within the Big Horn allotment in 2005, no cattle were seen on or in the vicinity of the Maricopa Mountains survey plot. They then contradict themselves immediately thereafter by speculating, in familiar absence of any supporting scientific evidence, that grazing on this survey plot "seems to have been relatively light" in 2005.

Like Boarman's and Kristan's speculations relative to livestock grazing on the Maricopa Mountains survey plot, the petitioners' anecdotal observations regarding such are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Maricopa Mountains survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing poses a threat to the Sonoran Desert Tortoise on or around the Maricopa Mountains study plot.

New Water – 1988, 50 PDs, 2 coverages (13, 15); 1999, 35 PDs, 2 coverages (16, 17); 2003, 25 PDs, 2 coverages (20, 23). **Comment:** Discernable increase over time. No decreases noted and no trend of decline, despite use of inconsistent survey methodologies. According to Boarman and Kristan (at p. 29), this population showed some increases, although those increases were not statistically significant. Boarman and Kristan further elaborate (at p. 36) that the New Water population estimates "suggest a strongly increasing trend," that "there is a low level of anthropogenic threat," and that "evidence of mortality is fairly inconsequential," although there is some evidence of disease in this population. Livestock grazing is not identified as a threat to the tortoise on this study plot by Boarman and Kristan in discussion.

Nonetheless, for purpose of computerized threat modeling and in the absence of scientific support, Boarman and Kristan subjectively assign an arbitrary "threat score" of "1" to livestock grazing on the New Water study plot. Use of such subjective and arbitrary speculation is not only precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also again clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

In comment supporting this "threat score" (Appendix 1, at p. 136), the petitioners state that while prior cattle usage was evident on the New Water survey plot, "judging from the amount and color of dung present, usage was nonexistent or very light in 2003." The petitioners also state that "no cattle were seen on or near the New Water survey plot during the survey." Nonetheless, they support the "threat score" assigned to livestock grazing on the New Water study plot by Boarman and Kristan.

Like Boarman's and Kristan's speculations relative to livestock grazing on the New Water study plot, the petitioners' anecdotal observations relative thereto are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of forage utilization, type of cattle or timing of grazing on and around the New Water survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing poses a threat to the Sonoran Desert Tortoise on or around the New Water study plot.

San Pedro Valley – 1991 and 1995, 60 PDs, 2 coverages (31, 41; 65, 85); 2001, 60 PDs, 3 coverages (20, 21); 2004, 60 PDs, 5 coverages (22, 28). **Comment:** No discernible or statistically relevant trend of decline after 2001. However, the large decrease noted between 1995 and 2001, followed by subsequent increase in 2005, is evidence against the claim that livestock grazing currently poses a threat to the Sonoran Desert Tortoise on or around the San Pedro Valley study plot.

According to Boarman and Kristan (at p. 26), the apparent increase of tortoises observed on this survey plot between 1991 and 1995 most likely represents a sampling artifact rather than a demonstrable tortoise population increase. Livestock grazing is not identified as a threat to the

Sonoran Desert Tortoise on the San Pedro Valley study plot by Boarman and Kristan in discussion.

Nonetheless, and in familiar absence of scientific support, Boarman and Kristan subjectively assign an arbitrary "threat score" of "1" to livestock grazing on the San Pedro Valley study plot for purpose of computerized threat modeling. Use of such subjective and arbitrary speculation is not only expressly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also again clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

In comment supporting this "threat score" (Appendix 1, at p. 134), the petitioners state that no cattle were observed on the San Pedro survey plot itself. While the petitioners also state that there are 34 AUMs per section, they do not identify the area or grazing allotment(s) to which this figure might apply. Instead, the petitioners merely state that cattle "frequented" lands near the San Pedro study plot and that "old, dry droppings were found on much of the plot."

Like Boarman's and Kristan's speculations relative to livestock grazing on the San Pedro study plot, the petitioners' anecdotal observations relative to such are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the San Pedro study plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted in and around the San Pedro study plot poses a threat to the Sonoran Desert Tortoise.

Tortilla – 1992, 1996 and 2001, 60 PDs, 2 coverages (45, 49; 59, 60; 47, 48); 2006, 40 PDs, 4 coverages (58, 68). **Comment:** Slight population increase over time. No discernible trend of decline. According to Boarman and Kristan (at p. 29), this population showed some increase, although that increase was not statistically significant. Boarman and Kristan further elaborate (at p. 36) that the Tortilla Mountains' estimated tortoise population size has increased nearly consistently every year it was surveyed, that there is evidence of reproduction, and that both recruitment and abundance are high.

Nevertheless, Boarman and Kristan then arbitrarily speculate (at p. 36) – again, without benefit of scientific evidence or any attempt at scientific quantification -- that livestock grazing poses an ongoing threat to Sonoran Desert Tortoises on and around the Tortilla study plot. Use of such baseless and subjective speculation is not only precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also once again clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

Nonetheless, Boarman and Kristan subjectively assign an arbitrary "threat score" of "3" to livestock grazing on and around the Tortilla study plot for purpose of computerized threat modeling. In comment supporting this "threat score" (Appendix 1, at p. 140), the petitioners

state that 1,080 AUMs are allowed on an unidentified 200,000 acre area which presumably includes the Tortilla survey plot. They also state that no cattle were grazed on the Tortilla survey plot during the 2006 survey, "although use in the past appears to have been heavy," and, that "cattle dung and trails were on all but the steepest slopes and washes."

Like Boarman's and Kristan's speculations relative to livestock grazing on and around the Tortilla study plot, the petitioners' anecdotal observations relative thereto are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Tortilla survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted in and around the Tortilla study plot poses a threat to the Sonoran Desert Tortoise.

West Silverbells – 1991, 1995 and 2000, 60 PDs, 2 coverages (51, 59; 69, 75; 92, 101); 2004, 60 PDs, 5 coverages (90, 97). **Comment:** No evidence of discernible or statistically relevant trend of decline. According to Boarman and Kristan (at p. 29), this population showed some increase, although that increase was not statistically significant. Boarman and Kristan further elaborate (at p. 35) that the "West Silverbell Mountains population has the highest number of tortoises of any given plot, and estimates show a strongly positive slope" and (at p. 36) "there is evidence to suggest that the current population health is relatively secure." Livestock grazing is not identified as a threat to the tortoise on this study plot by Boarman and Kristan in discussion.

Nonetheless, in familiar absence of scientific evidence or any attempt at scientific quantification of livestock grazing in the West Silverbells, Boarman and Kristan subjectively assign an arbitrary "threat score" of "2" to livestock grazing on the West Silverbells study plot for purpose of computerized threat modeling. Use of such baseless speculation is not only expressly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also clearly indicative of these editors' apparent biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

In comment supporting this "threat score" (Appendix 1, at p. 137) the petitioners simply state that "cattle were seen on the plot on a number of occasions, both north and south of the main ridge," and, that "grazing on the hillsides is light and seems to be generally restricted to the lower slopes of the hills and bajadas." Like Boarman's and Kristan's speculations relative to livestock grazing on and around the West Silverbell study plot, the petitioners' anecdotal observations relative thereto are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the West Silverbell study plot. As a result neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted on and around the West Silverbells survey plot poses a threat to the Sonoran Desert Tortoise.

Wickenburg – 1991, 60 PDs, 3 coverages (15, 15); 2000, 35 PDs, 2 coverages (13, 15); 2004, 35 PDs, 5 coverages (18, 18). **Comment**: No evidence of decline. According to Boarman and Kristan (at p. 29), this population showed some increase, although that increase was not statistically significant, and that evidence of recent tortoise reproduction suggests that this population may be healthy and perhaps relatively stable (at p. 34-35). Boarman and Kristan then directly contradict themselves by also speculating (at p. 34), without benefit of scientific support, that this population "appears to be declining."

While livestock grazing is not specifically identified in discussion as a threat to the tortoise on this study plot, Boarman and Kristan nonetheless characterize livestock grazing (at p. 34) – again, without benefit of scientific evidence or any attempt at scientific quantification – as "considerable," and imply that such grazing may pose a problem for this tortoise population. Boarman and Kristan then subjectively assign an arbitrary "threat score" of "4," or the maximum magnitude of threat possible, to livestock grazing on the Wickenburg survey plot for purposes of computerized threat modeling. Use of such unscientific and baseless speculation is not only expressly precluded from consideration in the making of a 12 month finding on a petition to list by the ESA, but is also again clearly indicative of these editors' unscientific biases against livestock, livestock grazing, range science and the practice of credible scientific methodology relative thereto.

In comment supporting this "threat score" (Appendix 1, at p. 142), the petitioners state that "the influence of cattle was evident over much of the plot," and, that "observations of cows occurred daily as they traveled up and down the wash as part of their morning and afternoon movements." Like Boarman's and Kristan's speculations relative to livestock grazing on and around Wickenburg study plot, the petitioners' anecdotal observations are also subjective and similarly unsupported by any necessary scientific data relative to recency and frequency of livestock presence, season of use, number of pastures, management strategy, forage production, actual numbers and levels of utilization, type of cattle or timing of grazing on and around the Wickenburg survey plot. As a result, neither Boarman and Kristan nor the petitioners present any scientific evidence whatsoever in support of their claim that livestock grazing as currently conducted on and around the Wickenburg survey plot is "considerable," or that such grazing poses a threat to the Sonoran Desert Tortoise.

Threats to Tortoise Populations

Although Boarman and Kristan claim (at p. 37) that they tested by model several major threats to the Sonoran Desert Tortoise, including livestock grazing, they also admit (at p. 37) that their subjective ranking of the level of each "threat," combined with the fact that the surveys were not designed to test for the effect of "threats" on these tortoise populations, limited the accuracy of their analysis – so much so that Boarman and Kristan "hesitate" (at p. 38) to conclude that these "threats" are impacting Sonoran Desert Tortoise populations. Moreover, although Boarman and Kristan also claim (at p. 37) that they conducted their "analysis" (= modeling) of threats as an attempt to try to explain patterns of change over time using "what was known about relative levels of threats to tortoises on the survey plots," as shown above, this is

clearly not the methodology Boarman and Kristan chose to apply relative to livestock grazing on those survey plots.

Instead of using "what was known" about relative levels of livestock grazing and the possible effects of such on Sonoran Desert Tortoises, Boarman and Kristan arbitrarily chose to reject that information in its entirety and speculatively presuppose (at p. 37) – without benefit of any scientific evidence or any attempt at scientific quantification -- that "cattle grazing" is among the most prevalent threats to the Sonoran Desert Tortoise on the survey plots. The facts reveal that Boarman and Kristan also chose to arbitrarily and subjectively assign levels of livestock grazing for these study plots -- as "heavy," "active heavy," "active," "high," "considerable," or without descriptive qualifier -- nonetheless.

Those choices, along with Boarman's and Kristan's further choice to subjectively assign arbitrary, unsupported and incoherent "threat scores" to livestock grazing on all but one survey plot (where grazing does not occur), are directly contradictory of the principles of range science and established scientific methodology (see Holechek) for determining actual livestock grazing levels and assessing the effects of grazing on other species at those levels. As a result, because the information fed into their computerized "threat model" by Boarman and Kristan relative to livestock grazing was subjective, speculative, biased, arbitrary, and not drawn from or supported by the best scientific information available relative to livestock grazing, the results of Boarman's and Kristan's computerized threat modeling relative to livestock grazing are not scientific, but rather, biased, baseless and fatally flawed speculations that are clearly precluded from consideration by the Fish & Wildlife Service in the making of a 12 month finding on the petition to list the Sonoran Desert Tortoise by the Endangered Species Act.

Illustration of Criteria Used by Boarman & Kristan (2008) and the Petitioners (Appendix 1) to Categorize the Importance of Livestock Grazing as a Threat To Sonoran Desert Torotoises on Each of 17 Study Plots

Acording to Boarman and Kristan (2009, at p. 11, Table 2), four "evaluation criteria" – recency, frequency of cattle observed, AUMs, and signs of grazing – were used to "categorize" the "importance of livestock grazing" as a "threat" to Sonoran Desert Tortoises on each of 17 permanent study plots using a "threat range" score for each plot of "0-4." To qualify for consideration in the making of a 12-Month finding on the petition to list the Sonoran Desert Tortoise, the ESA requires that each of these four "evaluation criteria" used to "categorize" the "importance" of livestock grazing as a "threat" to Sonoran Desert Tortoises, and each analysis thereof, must be supported by relevant and reliable scientific data quantifying the actual nature and effects of livestock grazing on each study plot. As clearly illustrated below, however, because neither Boarman's and Kristan's "evaluation criteria" nor the petitioners' respective Appendix 1 "analyses" are actually supported by <u>*any*</u> scientific data, neither those evaluation criteria nor analyses can be considered in the making of a 12-Month finding on this petition:

Study Plot / Threat Score	**Charcterization of Grazing Level / Scientific Data Support**	**Evaluation Criteria / Scientific Data Support**	**Comment**
Arastra (4)	"Heavy" / None	Recency / None Frequency/ None AUMs / None Signs / None	Area, ranch & grazing allotment(s) to which alleged AUM and acreage numbers might apply are not identified and no citation to source for those numbers is provided; all information relative to recency, frequency and sign of livestock presence consists of subjective, anecdotal observations unsupported by any scientific data or any attempt at scientific quantification; see Analysis at p. 1
Bonanza (4)	"Active, Heavy" / None	Recency / None Frequency / None AUMs / None Signs / None	No AUMs cited; see Arastra comments, above; see also Analysis at p. 1, 2
Buck (0)	"No grazing" / None	Recency / None Frequency / None AUMs / None Signs / None	No information on this area's history of grazing is provided; see Analysis at p. 2
Eagletail (3)	"Active " / None	Recency / None	No information on the identity of

	Frequency / None AUMs / None Signs / None	the ranch and grazing allotment(s) to which alleged AUMs, numbers, and acreage might apply and no citation to source for those numbers provided; see Arastra comments; see also Analysis at p. 2, 3
East Bajada (3) "Heavy" / None	Recency / none Frequency / none AUMs / none Signs / none	No information as to identity of ranch or grazing allotment(s) to which alleged AUMs and acreage might apply and no citation to source provided; see Arastra comments, above; see also Analysis at p. 3, 4
Four Peaks (1) "History of" / None	Recency / None Frequency / None AUMs / None Signs / None	No AUMs or acreage stated; see comments for Arastra, above; see also Analysis at p. 4
Granite Hills (2) "Evidence of In Past" / None	Recency / None Frequency / None AUMs / None Signs / None	No AUMs stated; see comments for Arastra, above; see also Analysis at p. 4, 5
Harcuvar (2) "Grazing" / None	Recency / None Frequency / None AUMs / None Signs / None	No information on identity of ranch or grazing allotment(s) to which numbers and AUMs allegedly apply, no citation to source provided; see Arastra comments, above; see also Analysis at p. 5
Harquahala (2) "Grazing" / None	Recency / None Frequency / None AUMs / None Signs / None	No information on identity of ranch or grazing allotment(s) to which average and AUMs allegedly apply, no citation to source provided; see Arastra comments, above; see also Analysis at p. 5, 6
Hulapai (2) "Grazing" / None	Recency / None Frequency / None AUMs / None Signs / None	No AUMs stated; see Arastra comments, above; see also Analysis at p. 6, 7
Little Shipp (4) "High" / None	Recency / None Frequency / None	No AUMs stated; see Arastra comments, above; see also

		AUMs / None Signs / None	Analysis at p. 7
Maricopa (1)	"Light" / None	Recency / None Frequency/ None AUMs / None Signs / None	No AUMs stated; see Arastra comments, above; see also Analysis at p. 7, 8
New Water (1)	"Low" / None	Recency / None Frequency / None AUMs / None Signs / None	No AUMs stated; see Arastra comments, above; see also Analysis at p. 8, 9
San Pedro (1)	"Grazing" / None	Recency / None Frequency / None AUMs / None Signs / None	No information on identity of ranch or grazing allotment(s) to which AUM per Secton numbers allegedly apply, no citation to source provided; see Arastra comments, above; see also, Analysis at p. 9
Tortilla (3)	"Ongoing" / None	Recency / None Frequency / None AUMs / None Signs / None	No information on identity of ranch or grazing allotment (s) to which AUM & acreage numbers allegedly apply, no citation to source provided; see Arastra comments, above; see also Analysis at p. 9, 10
West Silverbells (2)	"Occasional, Light" / None	Recency / None Frequency / None AUMs / None Signs / None	No AUMs stated; see Arastra comments, above; see also Analysis at p. 10, 11
Wickenburg (4)	"Considerable" / None	Recency / None Frequency / None AUMs / None Signs / None	No AUMs stated; see Arastra comments, above; see also Analysis at p. 11

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