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Scientific Review of December 14, 2010, U.S. Fish and Wildlife Service Proposal to List the Dunes Sagebrush Lizard as Endangered Under the Endangered Species Act

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EXECUTIVE SUMMARY

- 1) Statements of a 40% loss of *Sceloporus arenicolus* habitat as presented in the proposed listing are not scientifically defensible. The logic used to make this argument was flawed due to a misuse and misrepresentation of data from McDaniel et al. (1985). It is not possible to determine if a loss of habitat has occurred using the methodology and data as cited in the proposed listing.
- 2) Specific habitat requirements for *S. arenicolus* have not been quantified in the published literature or agency reports. Active dunes in shinnery oak (*Quercus havardii*) vegetation types with associated blowouts may represent only a portion of *S. arenicolus* habitat.
- 3) Literature cited within the proposed listing provides questionable estimates of *S. arenicolus* abundance. Studies referencing abundance report population indices based on survey count or capture data without providing estimates of detection probability. To provide robust estimates of species occurrence, occupancy, or abundance, estimates of detection probability are needed.
- 4) Recently published and ongoing research appears to provide a substantive

improvement over the shortcomings of previous efforts and may provide more robust estimates regarding habitat occupancy and measures of abundance.

- 5) Statements of inadequate regulatory protections are not supported by monitoring or survey data. Incomplete implementation of programs combined with a lack of quantitative evidence of success or failure do not support a conclusion of inadequate conservation of *S. arenicolus* by federal, state, and local governments.

INTRODUCTION

The dunes sagebrush lizard (*Sceloporus arenicolus*) was first considered as a possible threatened or endangered species in the 1982 Federal Register Review of Vertebrate Wildlife for Listing as Threatened or Endangered (47 F.R., No. 251, p. 58454) by the United States Fish and Wildlife Service (USFWS). At that time, the species was recognized as a subspecies and listed as Category 2. Category 2 species lack sufficient data to warrant listing, and it was explicitly recognized that many species might not warrant listing when adequate data became available. In the 1985 review, *S. arenicolus* was categorized as 3C, which comprises taxa that are now considered to be more abundant

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and widespread or substantially less subject to identifiable threats than previously thought (50 F.R., No. 181, p. 37959). In 1994, the USFWS again categorized *S. arenicolus* as Category 2, which then was defined as “Taxa for which information now in the possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which persuasive data on biological vulnerability and threat are not currently available to support proposed rules” (59 F.R., No. 219, p. 58983).

In 2001, the USFWS designated *S. arenicolus* as a new candidate and assigned a Category 2C status, the C indicating that sufficient information existed to merit a proposed listing but was precluded by higher-priority species, and the listing priority of 2 indicating an imminent threat of high magnitude to the species. Imminent threats to *S. arenicolus* were stated as shinnery oak management, activities fragmenting shinnery habitat, and overcollection of the species (66 F.R., No. 210, p. 54811). No data were provided to support the priority categorization. In 2004, a reference to a June 6, 2002, petition to list as endangered is noted (69 F.R., No. 86, p. 24876), and litigation concerning USFWS findings was discussed (Center for Biological Diversity v. Norton, Civ. No. 03–1111–AA; 69 F.R., No. 247, p. 77167). In 2006 (71 F.R., No. 176, p. 53756), the review of candidate species noted that a stakeholder group met in 2003 to develop a conservation strategy to conserve shinnery oak habitat and detailed specific actions that would support the recovery of *S. arenicolus*. The group comprised oil and gas representatives, livestock producers, environmental interests, local governments, sportsmen groups, and state and federal agencies. In 2008, no update was provided since a proposed rule to list was said to be in development (73 F.R., No. 238, p. 75176).

On December 14, 2010, a proposed rule was published to list the dunes sagebrush lizard as endangered under the Endangered Species Act of 1973. The following May

(2011), the Range Improvement Task Force was asked to conduct a scientific review of a USFWS proposal to list *S. arenicolus* as endangered. We reviewed the USFWS’s proposed listing (hereafter, “proposed listing”; USFWS, 2010) for its scientific merit, including a detailed review of the data presented and its sources (i.e., cited literature). We examined whether conclusions and inferences in the proposed listing were supported and within the bounds of presented data. Quotes excerpted from the proposed listing were cited using the following format: 75 F.R. page; column, paragraph, sentence. The review is offered here in its entirety.

HABITAT LOSS

Implied in the proposed listing of *S. arenicolus*, considered a habitat specialist, is an imminent threat of extinction within its limited geographic range from loss of shinnery oak dunes habitat. The primary argument is a claimed 40% loss of shinnery oak dunes habitat. Two statements provided to demonstrate a reduction in shinnery oak (*Quercus harvardii*) “habitat” are attributed to McDaniel et al. (1982) and appear in the proposed listing as follows. (Incidentally, the proper citation should have been Garrison and McDaniel [1982]; McDaniel et al. [1982] does not exist. Additionally, estimates of shinnery oak acres used in McDaniel et al. [1985] came from Garrison and McDaniel [1982] [McDaniel, personal communication 2011].)

In 1982, it was estimated that there was one million acres (404,686 ha) of shinnery oak dunes in New Mexico (McDaniel et al. 1982, p.12). Currently, the amount of shinnery oak dune habitat is estimated to be 600,000 acres (248,811 ha), a 40 percent loss since 1982.

Continued loss of shinnery oak dunes within the geographic range of the dunes sagebrush lizard since then has likely

further decreased the amount of habitat available. (75 F.R. 77803, 2, 2, 1-3)

and

In 1982, there was an estimated 400,000 ha (1,000,000 ac) of habitat suitable for the dunes sagebrush lizard in New Mexico. Today, there is an estimated 240,000 ha (600,000 ac) of suitable habitat, a decrease of 40 percent. Within the remaining suitable habitat, the current occupied range is estimated to cover 405,599 ac (165,759 ha) (McDaniel et al. 1982, p. 12). (75 F.R. 77805, 1, 1, 1-3)

The conclusion of a 40% loss in *S. arenicolus* habitat based on data from Garrison and McDaniel (1982) is a misrepresentation and misuse of the original data. In order to accept this argument (i.e., 40% loss in suitable habitat), the following two assumptions would first need to be validated: First, the 1982 estimate of dense shinnery oak represents shinnery oak dunes habitat and therefore is, in total, suitable *S. arenicolus* habitat. Second, the 1982 and contemporary estimates of shinnery oak acreage (600,000 ac) represent the same shinnery oak communities (i.e., they are comparing the same *S. arenicolus* habitat).

In regards to the first assumption, Garrison and McDaniel (1982) addressed the ecology, distribution, and management of selected brush species, not wildlife habitat. They estimate 1.6 million ac in light density stand classification and approximately 1.0 million ac categorized as dense stands of shinnery oak. The question concerning the distribution and habitat of *S. arenicolus* is an entirely different question that was never considered or addressed in Garrison and McDaniel (1982) (McDaniel, personal communication 2011). Regarding assumption two, the 1982 estimates were developed using aerial photographs and visits to agency professionals familiar with

southeastern New Mexico vegetation (McDaniel, personal communication 2011).

The proposed listing provides no documentation of the origins or methods associated with the contemporary estimate of 600,000 ac of shinnery oak dunes habitat. The proposed listing provides no evidence that the estimates of dense shinnery oak are synonymous with *S. arenicolus* habitat. Furthermore, the published literature provides no quantitative description of suitable *S. arenicolus* habitat, making an acre-by-acre linkage with Garrison and McDaniel (1982) dense shinnery oak estimates untenable.

HABITAT SPECIALIZATION AND SITE OCCUPANCY

In the proposed listing, *S. arenicolus* is identified as an endemic habitat specialist.

The dunes sagebrush lizard is a habitat specialist that is native to a small area of shinnery oak dunes in southeastern New Mexico and adjacent western Texas. (75 F.R. 77802; 3, 3, 4)

and

The dunes sagebrush lizard is considered to be a habitat specialist because it has adapted to thrive only in a narrow range of environmental conditions that exist within shinnery oak dunes. (75 F.R. 77803: 1, 2, 1)

Published literature identifying *S. arenicolus* as a habitat specialist that relies exclusively on shinnery oak dune blowouts is inconclusive and only provides weak inferences regarding habitat requirements. Probabilistic sampling designs, which permit unbiased inferences about locations not sampled (Thompson, 1991; MacKenzie et al., 2006), were not described in literature cited in the proposed listing (Fitzgerald et al., 1997; Sias and Snell, 1998; Laurencio et al., 2007; Chan et al., 2008) to discuss

site occupancy and habitat specialization of *S. arenicolus*. Also, no estimates of detection probability (the probability an individual may be detected during a survey) were reported regarding site occupancy and habitat specialization of *S. arenicolus* (Degenhardt and Jones, 1972; Sena, 1985; Fitzgerald et al., 1997; Sias and Snell, 1998; Laurencio et al., 2007). These deficiencies limit the ability to make robust inferences about *S. arenicolus* habitat parameters.

Conclusive statements regarding occupancy and associated dynamics (e.g., distribution, habitat preference, abundance, etc.) are more dependable when estimates of detection probabilities have been made (MacKenzie et al., 2006). In the absence of such information, research conclusions require an assumption that all animals were available to be detected and the detection probability is one (or at least constant), which is unlikely to occur in nature. If detection probability is less than one, population parameters will be underestimated (MacKenzie et al., 2003). When data are collected at different locations or different times, estimates of variation in detection probability of individuals in spatial and temporal contexts are needed. If a species is rare, elusive, or clustered (or all three simultaneously), standard sampling protocols may not be adequate to provide unbiased estimates of habitat requirements or estimates of species abundance (Thompson, 2004; also, see Smolensky and Fitzgerald, 2010). Since *S. arenicolus* was a candidate for listing (ostensibly, rare), “extremely wary” (Degenhardt and Jones, 1972; Degenhardt et al., 1996), and apparently geographically clustered (Fitzgerald et al., 1997; Snell et al., 1997; Chan et al., 2008), it is probable that detection of individuals at any one site is not guaranteed. Assumptions of complete or constant detection probability for *S. arenicolus* are not supported; therefore, reliable conclusions regarding habitat parameters (and population parameters) for *S. arenicolus* necessitate estimation of detection probabilities.

Fitzgerald et al. (1997) represents the most pointed attempt to describe the distribution and habitat of *S. arenicolus* in New Mexico. Laurencio et al. (2007) made a similar attempt in Texas using the Fitzgerald et al. (1997) methods. However, sample sites in these studies were limited to areas considered to represent potential habitat, and the studies used presence/absence data without detection probabilities to estimate distribution. MacKenzie et al. (2003) state that failing to acknowledge that a species may be present but undetected biases estimates of site occupancy, colonization, and local extinction probabilities. Apparent haphazard sampling designs in these studies do not allow for statistically based inferences beyond the sample site (MacKenzie et al., 2006). Further, only subjective descriptions of habitat categories were provided by Fitzgerald et al. (1997) and Laurencio et al. (2007). This does not meet criteria of repeatability for scientific investigation and only allows for weak inference regarding habitat parameters. Conclusions based on these studies regarding habitat specialization in *S. arenicolus* are indefensible.

Recent and ongoing studies of *S. arenicolus* represent substantially improved study designs that may provide more scientifically defensible results by estimating detection probability of *S. arenicolus* (Laurencio et al., 2007; Leavitt and Fitzgerald, 2010; Ryberg and Fitzgerald, 2010; Smolensky and Fitzgerald, 2010). Laurencio et al. (2007) discussed ongoing development of patch-occupancy models to estimate the probability that a habitat unit is occupied by *S. arenicolus*. This approach has great potential for rare (i.e., low detection probability of individuals) populations (Thompson, 2004). However, only preliminary results were offered, and methods to estimate detection probabilities and other model parameters were missing or incomplete. Leavitt and Fitzgerald (2010) are studying effects of management

practices on patterns of habitat fragmentation at a landscape scale and on populations of *S. arenicolus*. While explicit reference to estimation of detection probability is missing in their report, sampling protocols appear to allow for the parameter to be estimated. Ryberg and Fitzgerald (2010) are estimating capture probabilities using pitfall trap sampling techniques to estimate population parameters of *S. arenicolus* at Caprock Wildlife Area, Carlsbad, NM. These studies appear capable of providing more robust estimates of occupancy, abundance, and habitat relationships. Smolensky and Fitzgerald (2010) concluded that distance sampling (e.g., line transects) was not reliable and underestimated densities of lizards, including *S. arenicolus*.

ABUNDANCE

Within the proposed listing and supporting literature, references to *S. arenicolus* abundance (the number of individuals; Krausman, 2002), density (the number of organisms relative to some critical resource; Williams et al., 2002), and population indices (field measures containing information about relative size or density of the population; Williams et al., 2002) were primarily made in relation to oil and gas wells and well-pad development. They include the following:

In New Mexico, Sias and Snell (1998, p. 3) reported a negative relationship between oil well density and dunes sagebrush lizard abundance and noted an environmental sensitivity not found in other reptile species. Dunes sagebrush lizard abundance declined by 25 percent when there were 13 oil or gas well pads per section (each section has an area of approximately 260 ha (640 ac)), and the number of dunes sagebrush lizards declined by 50 percent when there were 29 pads per section (Sias and Snell 1998,

p. 3). Any shinnery oak dune habitat within 600 m (1968 ft) of any well supported 31 to 52 percent fewer dunes sagebrush lizards than areas farther than 600 m (1968 ft) from a well (Sias and Snell 1998, p. 1). (75 F.R. 77806; 1, 4, 1-3)

and

Shinnery oak removal results in dramatic reductions and extirpations of dunes sagebrush lizards (Snell et al. 1997, p. 8). (75 F.R. 77809; 1, 1, 1)

We have concerns about the accuracy of statements attributed to abundance or change in relative abundance. The use of count data as a surrogate for abundance estimates is not uncommon in the herpetological literature (Mazerolle et al., 2007). However, without accounting for probability of detection, inferences about abundance or changes in abundance are tenuous (Anderson, 2001; Yoccoz et al., 2001; Williams et al., 2002; Thompson, 2004). Examples of studies within the proposed listing that fail to account for or report estimates of detection include Sias and Snell (1998) and Snell et al. (1997). Sias and Snell (1998) used count data to estimate abundance in order to examine the influence of oil and gas development on *S. arenicolus*. Snell et al. (1997) used pitfall trapping to evaluate the removal of shinnery oak on *S. arenicolus* abundance.

By not reporting detection probabilities, the authors implicitly assumed that probability of capture did not differ among sampling sites or across time for individuals. Therefore, only weak conclusions about population changes can be drawn using these studies (Williams et al., 2002; Thompson, 2004; MacKenzie et al., 2006).

REGULATORY PROTECTION

Inadequacy of existing regulatory mechanisms is one of the criteria for listing a species as endangered. The proposed listing concludes that:

The current efforts have not provided the protection needed to remove or lessen the significant threats posed to the dunes sagebrush lizard. (75 F.R. 77811; 3, 1, 4)

Additionally, there are multiple statements in the proposed listing specifically referencing concerns about the Bureau of Land Management's (BLM) Special Status Species Resource Management Plan Amendment (RMPA; BLM, 2008a, 2008b) and USFWS Candidate Conservation Agreements (CCA) and Candidate Conservation Agreements with Assurances (CCAA) (e.g., 75 F.R. 77811; 2, 4, 1-2 and 3, 1, 1; 75 F.R. 77813; 2, 2, 5). The following is an example from the proposed listing:

Current regulations under State and local laws are not adequate to protect the dunes sagebrush lizard from known threats, because provisions that protect habitat are not included in these laws. In New Mexico, BLM's RMPA covers Federal surface and mineral activities within the species' range. Additionally, the CCA/CCAA includes the entire range of the dunes sagebrush lizard in New Mexico, but does not extend into Texas. Because participation in the CCA/CCAA by both oil and gas and ranching operators is not occurring throughout the range of the dunes sagebrush lizard, the efficacy of these conservation agreements has not yet been fully implemented and determined to be effective. (75 F.R. 77811; 2, 3, 1-4)

The proposed listing acknowledges that considerable efforts were made contributing to the conservation of the species (75 F.R. 77810;

3, 3, 3). The USFWS also stated the RMPA would provide protections to *S. arenicolus* in occupied and suitable habitats (BLM, 2008b, p. 303; USFWS consultation #22420-2007-TA-0033). By listing *S. arenicolus* as endangered in New Mexico, the state has afforded the lizard protection within its jurisdiction. In addition, the BLM's RMPA provides protection on federally managed lands and other lands with federal mineral ownership; these protections have been in place since 2008. In order to adequately assess their conservation merit, a quantitative analysis comparing baseline and waypoint parameters would be necessary. However, no monitoring data or cited literature was referenced in the proposed listing supporting the position of inadequate conservation efforts. Without data to support or refute the claim of inadequate regulatory mechanisms, it is not possible to determine the level of effectiveness these conservation efforts provide.

EPILOGUE

The USFWS reopened the comment period for the proposed listing of *S. arenicolus* in April of 2011 (USFWS, 2011) to consider any additional information and comments. In June 2012, the USFWS published a final determination (USFWS, 2012) in the Federal Register withdrawing the proposed listing and removing *S. arenicolus* from the candidate species list. Few peer-reviewed articles have been published on *S. arenicolus* since close of comments in 2011, and they include diverse topics such as ultraviolet irradiance exposure (Ferguson, 2014) and observed nesting ecology of three individual *S. arenicolus* (Ryberg et al., 2012). Peer-reviewed publications providing robust estimates of occupancy, abundance, and habitat relationships are not currently available for *S. arenicolus*.

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