



**U.S. Fish and Wildlife Service**  
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**Desert Tortoise Science Advisory Committee Meeting**  
**Meeting Summary**  
**March 31**  
**Tucson, AZ**

**Meeting Goals and Objectives**

- Resolve draft recovery criteria
  - Provide recommendations for geographic baseline over which trends in lambda, occupancy, and habitat will be measured (using USGS habitat model)
  - Provide recommendations for the number, size, and placement of demographic study areas within each recovery unit (using the USGS habitat model and UNR/USGS spatial analysis of monitoring data)
- Review genetic and ecological data to provide recommendations for revising recovery units

**Attendees**

Linda Allison, DTRO

Roy Averill-Murray, DTRO

Kim Field, DTRO

Jody Fraser, DTRO

Kristin Berry, SAC

Peter Hudson, SAC

Earl McCoy, SAC

Katherine Ralls, SAC

Michael Reed, SAC

Bob Steidl, SAC

Richard Tracy, SAC

Diane Elam, FWS

Todd Esque, USGS

Ken Nussear, USGS

Bridgette Hagerty, UNR

Robert Murphy, Royal Ontario Museum

**Meeting Summary**

**1. Disease management recommendations**

The committee continued its discussion from the last meeting on developing recommendations for disease research and management. The emphasis is to document/summarize the background on desert tortoise disease and then identify important questions to answer that will lead to appropriate management recommendations. One key question affecting management is whether mycoplasmosis typically acts as factor that regulates desert tortoise populations through sublethal effects, or whether it acts as an epidemic that causes large die-offs, but clears to the point that populations may recover if freed from other pressures.

The committee drafted a working document at the last meeting that needs to be updated/revised. Kristin will conduct the next revision, integrating conclusions from the 2002 disease workshop, more recent literature, and key references. An important task is to identify conflicts in the data, questions for follow-up with specific data, and areas of consensus. Toward that end, the committee decided to invite Dr. Mary Brown, University of Florida, and Dr. Ken Hunter, University of Nevada, Reno, to the next meeting to discuss their past and current research. The disease document will be revised accordingly. The committee hopes to make general management recommendations based on available information, identify high-priority research goals, and clarify how this research will lead to more specific or better management recommendations.

**Action Item:** Kristin will revise and circulate the draft disease document by the end of April.

**Action Item:** Roy will invite Mary Brown and Ken Hunter to the next SAC meeting.

**Action Item:** Kristin, Dick, and Earl (in addition to Mary and Ken) will identify key papers to review prior to the next meeting.

## **2. Recovery unit overview**

To set the stage for the following agenda items, Diane Elam, Recovery Coordinator for the California-Nevada Operations Office, provided a brief overview of the role and purpose of recovery units. The overview reiterated and clarified past discussions on the topic, particularly noting that recovery units are specifically identified as essential for the recovery of the listed species. Justification for recovery units should rely on cumulative information on genetics, demographics, ecology, threats, or other features necessary for the long-term sustainability of the species. Given the long-term prospects for desert tortoise recovery and concern surrounding global climate change, the committee pointed out that the revised recovery plan should emphasize the need to revisit recovery units if climate change is determined in the future to affect tortoise distribution.

## **3. Habitat model and tortoise spatial analysis**

Todd Esque and Ken Nussear presented the results of the habitat modeling exercise following the discussion at the last SAC meeting. They used four different algorithms to model potential tortoise distribution across most of the Mojave Desert north and west of the Colorado River using 16 environmental variables. They compiled desert tortoise occurrence data from sources spanning more than 80 years, especially including data from the 2001-2005 range-wide monitoring surveys. After standardizing the data, the dataset included 4,691 tortoise presence points. They divided these points into a set of 3,753 points used in the model and a set of 938 points used to test the model. They constrained each algorithm to produce output that included 80, 85, 90, and 95% of the test points, and the SAC reviewed the resulting maps. The Generalized Regression Analysis and Spatial Prediction (GRASP) model including 95% of the test points appeared to be slightly more conservative (including fewer areas of questionable habitat based on professional knowledge) than other models and was preferred by the committee.

Ken Nussear gave a presentation on progress in spatially analyzing tortoise observations from the range-wide sampling effort with potential threat variables collected during the 2005 surveys. While some threats were either so rarely encountered, or so ubiquitous that they likely have little explanatory value, several of the perceived threats appear to have sufficient pattern to warrant further analysis. Ken and Jill Heaton (UNR) have been analyzing these threats range-wide using spatial general linear models to estimate whether significant correlations exist between perceived threats to tortoises and the numbers encountered during transect sampling. These analyses and results will be finalized to inform the SAC and land/wildlife managers, and a manuscript detailing these analyses will be prepared for publication.

Following these presentations, the committee determined that the recovery criteria should generally apply to, and be monitored across, the full extent of modeled habitat, at least across public lands and private conservation lands. Some exceptions to this general rule can be made, such as cutting out DOD lands and existing OHV open areas, noting that some desert tortoise

protections still occur within these areas and they may contribute to overall recovery, but reliance on these lands specifically for recovery is unfeasible. The committee also determined that if the recovery criteria are monitored and evaluated across the larger extent of modeled habitat, then land/wildlife managers would be in a better position to identify any specific focal areas for greater or lesser recovery management attention.

#### **4. Tortoise genetics and recovery unit review**

Bob Murphy and Bridgette Hagerty presented results of their respective studies on desert tortoise genetics. Murphy, Berry, et al., sampled >1000 tortoises across the entire range, including Arizona and Mexico, although the northeast Mojave was less represented, and analyzed 15+ microsatellites. Results indicate that Sonoran/Sinaloan tortoises are much differentiated from Mojave tortoises, with the two groups comprising at least two species. Within the Mojave Desert, genetic differentiation is relatively low between populations, but several distinct groups can be identified with 55-96% accuracy. Results of this study have been accepted for publication in *Chelonian Conservation and Biology*.

Bridgette sampled 748 tortoises across the extent of the Mojave and Colorado deserts (i.e., the Mojave population) and analyzed 20 microsatellites. This study also found relatively low differentiation between populations overall, but several distinct clusters were apparent. The two studies appeared to be largely concordant, and several “barriers” between genetic groupings are visible as gaps in the GRASP habitat model. Bridgette is currently working on completing her dissertation and preparing manuscripts for publication.

**Action Item:** Bob and Bridgette will send shape files and brief summaries of their results for use in recovery planning.

**Action Item:** Roy will develop revised draft recovery units by starting with the genetic groupings from the two studies above and incorporating the habitat model, biotic community descriptions, information on threats, and other ecological information. The draft recovery units will then be evaluated to determine whether they meet the criterion for being essential to the recovery of the listed entity and will be modified accordingly.

#### **5. SAC post-doc**

The committee remains interested in hiring a post-doctoral student to assist with specific recovery related projects. Consensus was that, once funding is available, hiring someone to refine the heuristic threat model in the DTRPAC report was the highest priority among suggested topics. A candidate with advanced modeling skills is highly desirable to develop more refined models of threats and tortoise demography that can better inform recovery efforts. This project will be pursued upon availability of funds in the DTRO.

#### **6. Next meeting**

The next meeting will be in Las Vegas on June 11-12. The agenda will include developing recommendations for disease research and management, other research priorities, status report of range-wide monitoring, and recovery unit review.

**Open Forum**

An open forum with the SAC was held from 5-7pm. Four stakeholders/interested parties attended, representing the Arizona Game and Fish Department, University of Arizona, and QuadState County Government Coalition, in addition to invited participants of the day's meeting. The group discussed a variety of topics, and the SAC committed to hosting another forum at the next meeting in Las Vegas.