



**U.S. Fish and Wildlife Service**  
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**Desert Tortoise Science Advisory Committee Meeting**  
**December 9-10, 2005**  
**Tucson, AZ**

**Meeting Goals and Objectives**

- Review progress
- Identify recovery criteria

**Attendees**

Roy Averill-Murray, DTRO  
Kristin Berry, SAC  
Kim Field, DTRO  
Sandy Marquez, DTRO  
Earl McCoy, SAC

Katherine Ralls, SAC  
Michael Reed, SAC  
Amy Salveter, DTRO  
Bob Steidl, SAC  
Richard Tracy, SAC

**Meeting Summary**

**1. Ft. Irwin translocation**

The SAC recommendations (Attachment 1) have been completed and forwarded to the Ft. Irwin Conservation and Mitigation Work Group. The recommendations have been integrated into a draft RFP for research associated with the translocation project.

**2. Threats interaction survey**

The SAC reviewed and confirmed its prior determination that there was too little information to conduct a meaningful categorization or prioritization of individual threats during the recovery planning process. Regional recovery planning working groups should develop recovery action plans that address any threats within their respective regions. Management should be implemented in a hypothesis-based approach. The regional working groups could contribute valuable information on the potential relative strengths of relationships between interacting threats, however. The DTRO is developing a survey in which respondents will qualitatively rank the degree to which individual threats contribute to another. For example, on a scale of 1-4, what is the relative contribution, in a particular region, of roads and highways to fires? What is the relative contribution of invasive plants to fires? Etc. This exploratory analysis will provide the basis for developing hypotheses and models to better predict the effects of management actions on recovery of the tortoise.

**Action Items:** The DTRO will complete the “threats interaction” survey for review at the next meeting. A category needs to be included to explicitly distinguish ‘unknown’ from ‘no effect.’ An example diagram may also be helpful to illustrate the concept behind ranking relative strengths of different threat relationships. The DTRO will complete a draft threat outline that documents the basis in the literature for each threat. The DTRO will also define terms used in the

survey and outline, with a glossary, to ensure that readers and survey respondents consistently interpret each term.

### **3. U.S. Institute for Environmental Conflict Resolution** (with Mike Eng, Pat Lewis, and Joan Calcagno)

USIECR (the Institute) staff met with the SAC to discuss the agreement and scope of work (Attachment 2) developed with FWS for facilitating stakeholder involvement in the recovery planning process. Discussion centered around the roles of the Institute, stakeholder groups, and the SAC in this process.

The Institute is embarking on a stakeholder (broadly speaking to include both government and non-government interests) assessment to determine the receptivity of stakeholders in collaborative recovery planning, as well as their concerns about and input into such a process. The Institute will make recommendations to the FWS, based on this assessment, for proceeding with the actual planning process. Assuming that the stakeholder assessment does conclude that collaborative recovery planning is appropriate and feasible, stakeholder groups will focus on developing recovery actions based on SAC recommendations, including revised recovery criteria. Stakeholder participation will be guided by specific principles recently approved by the Council on Environmental Quality. The SAC will review and provide input on the stakeholder groups' proposed recovery actions.

Important to the entire process is maintaining credibility. Areas of uncertainty must be clearly explained, and the DTRO and SAC must be responsive to questions about the science behind decisions or recommendations, especially in the face of uncertainty. The SAC can foster credibility by maintaining a transparency in its meeting summaries (which will continue to be posted on the DTRO website) by documenting uncertainty, using plain English, identifying any differences among SAC members, and documenting the decision-making process, including any paths identified but not taken. As a decision is made or conclusion is reached during SAC meetings, the group needs to take the time to summarize how the committee reached that point so that effective notes can be taken and captured in the meeting summary.

### **4. Recovery criteria**

While reviewing the 1994 recovery criteria, it is important to distinguish between the recovery objective and criteria listed in the 1994 recovery plan and current guidance. Current guidance<sup>1</sup> modified the term "objective" to be more consistent with general planning terminology. Therefore, the 1994 Recovery *Objective* ("Delisting through recovery") now corresponds to the overall Recovery *Goal*. Recovery objectives are meant to provide parameters for the recovery goal of delisting the tortoise, and each recovery objective should include "objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list (of threatened and endangered species)."<sup>2</sup> Several of the 1994 recovery criteria better fit the current concept of recovery objectives.

Recovery criteria:

- can be viewed as the targets, or values, by which progress toward achievement of recovery objectives can be measured;

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<sup>1</sup> National Marine Fisheries Service. 2004. Interim Endangered and Threatened Species Recovery Planning Guidance (developed in conjunction with the Fish and Wildlife Service).

<sup>2</sup> ESA, Section 4(f)(1)(B)(ii)

- should address representation (conserving the breadth of the genetic makeup of the species to conserve its adaptive capabilities), resiliency (ensuring that each population is sufficiently large to withstand stochastic events), and redundancy (ensuring a sufficient number of populations to provide a margin of safety for the species to withstand catastrophic events);
- must include the management or elimination of threats, addressing the five statutory (de-) listing factors; and
- must be measurable and objective (but they need not all be quantitative).

The SAC reviewed a “straw dog” list of recovery objectives and criteria (Attachment 3) developed by the DTRO, largely from discussions in previous SAC meetings. Objectives from the straw dog address 1) tortoise distribution/occupancy across the landscape, 2) healthy populations, and 3) threat mitigation and uncertainty/information needs. Additional possible objectives initially identified by the SAC would address 4) habitat and 5) genetic diversity. The following summary uses the numbering in the list above, but final recovery objectives and criteria will be renumbered in a logical sequence.

Draft Recovery Objective 1: Maintain a broad and stable-to-increasing distribution of desert tortoises within each recovery unit (*note that recovery units remain to be evaluated*)

This recovery objective and associated criteria would essentially replace the 1994 Delisting Criterion 1: “As determined by a scientifically credible monitoring plan, the population within a recovery unit must exhibit a statistically significant upward trend or remain stationary for at least 25 years (one desert tortoise generation).” There are various difficulties in applying the original criterion.

- As currently worded, the criterion relies on statistical significance in recognizing a trend, but it does not explicitly acknowledge sampling or temporal variation within the data, which could result in a population shown to be statistically stable or increasing but actually decreasing on the landscape (i.e., incorrectly concluding that the trend is  $\geq 0$  when it is actually  $< 0$ , a Type II error). Revision of the current criterion would clarify the statistical and biological confidence in measured trends.
- The current criterion ignores potential metapopulation processes acting across the vast spatial scale of each recovery unit by lumping all populations within each unit. The loss of complete populations could temporarily be balanced by increased density within other populations, potentially placing the entire stakes of recovery on fewer, more isolated populations.

The revised recovery objective would help provide for representative, resilient, and redundant populations within each recovery unit. Implicit in this objective is the maintenance of sufficient habitat to sustain tortoises on the landscape. That is, stable or increasing tortoise distributions can only be achieved by managing habitat appropriately. However, habitat should also be addressed in other objectives/criteria.

Draft Recovery Criterion 1a: The lower limit of the 95% confidence band around the slope of desert tortoise occupancy (across all public lands and private conservation lands below 4200-foot elevation in each recovery unit) measured over time equals or exceeds 0.

Draft Recovery Criterion 1b: Criterion 1a is specifically met within i) one “biological core area” of at least 100 square miles per critical habitat unit, AND ii) any additional “biological core

areas” of at least 100 square miles necessary to establish a minimum of 3 such areas within each recovery unit. The only exception is that the Upper Virgin River Recovery Unit will have a single “biological core area” of 86 square miles coinciding with its sole critical habitat unit (*this assumes there is no other habitat within the recovery unit suitable for an additional “biological core area”*).

The new criteria lower the original bar of estimating range-wide density of tortoises to determining the presence (occupancy) of tortoises across the species’ range. Estimating occupancy is quicker and easier than estimating density and will provide a much more efficient evaluation of where tortoises are on the landscape. However, these criteria do not sacrifice the need for viable populations. Criterion 1b and subsequent objectives/criteria help assure population viability.

These criteria require a stable-to-increasing trend of tortoise occupancy across each recovery unit, rather than a specified point estimate (e.g., 90% mentioned in Draft Recovery Criterion 1 in Attachment 3). A specific point estimate would essentially be arbitrary, because historical benchmarks for tortoise occupancy in the Mojave Desert do not exist. However, we may want to establish minimum “trigger points” below which more intensive management actions may be required.

These criteria would require the establishment of a precise baseline of the area over which tortoise occupancy is measured, so occupancy over time will be measured and compared against the same standard established at the time of the recovery plan revision. The baseline will prevent habitat loss resulting in a comparison of similar relative measures of tortoise occupancy across smaller absolute areas in the future. Questions to resolve include: Should the baseline apply across the entire range (as implied by 1a, above) or only to designated critical habitat? What about occupied lands outside of critical habitat? The size of the “biological core areas” also needs to be evaluated further.

Finally, we may need a better understanding of the spatial scale of tortoise population “clumps” or patches to design an effective sampling strategy to obtain precise estimates of occupancy. However, there was also discussion that random sampling within even crude stratification may minimize or eliminate sampling problems arising from patchy distribution of tortoises on the landscape. The resolution of the sampling frame needs to be determined, as well as the minimum number of sample points for precise estimates of occupancy. The large scale at issue may still present some problems.

Draft Recovery Objective 4: Protect or intensively manage enough habitat within each recovery unit to ensure long-term viability of desert tortoise populations

This recovery objective directly parallels the second delisting criterion in the 1994 recovery plan, but specific criteria are added here to ensure that we have an accurate understanding of what constitutes desert tortoise habitat. Meeting Recovery Objective 1 necessitates meeting Objective 4, so criteria under this objective require the ability to relate habitat conditions to tortoise populations.

Draft Recovery Criterion 4a: A GIS habitat model has been developed to identify minimum requirements for desert tortoise population persistence.

Draft Recovery Criterion 4b: A habitat-tracking system, based on the habitat model in Criterion 4a, is in place to monitor the status of desert tortoise habitat within the areas identified in Criteria 1a and 1b.

In order to manage desert tortoise habitat well enough to meet Objective 1, we must be able to link habitat data to tortoise demographic data. Information from this type of model will allow us to identify minimum conditions for potential tortoise occupancy and, therefore, to analyze occupancy as a function of habitat characteristics. Consequently, Criteria 1a and 1b are tied directly to Criterion 4a. The subsequent link to the habitat-tracking system in Criterion 4b provides a mechanism to measure an implicit requirement of “no net unmitigated loss” of desert tortoise habitat (i.e., stable-to-increasing distribution of desert tortoises).

Maintaining stable-to-increasing tortoise occupancy through no net unmitigated loss of habitat provides opportunities to balance habitat degradation or loss with restoration of currently degraded habitat. The habitat model must identify thresholds below which habitat degradation fails to provide the minimum conditions for potential occupancy. The tracking system will require a baseline delineation of habitat that includes the historic distribution of the tortoise (i.e., areas potentially containing tortoises at present, as well as in the future), less those areas already lost completely or degraded below suitability for tortoise occupancy. This system will provide an accountable “ledger” of habitat status so that restored areas are added to the positive side and degraded or lost areas are added to the negative side. We will then be able to quantitatively measure the amount of occupied habitat, the amount of newly available (restored) habitat for tortoises to expand into, and the rate that restored habitat is occupied/effectiveness of the restoration. An approach taken by the Sonoran Desert Conservation Plan modeled covered-species’ habitat at 3 levels: i) critically important - biological core, ii) moderate, and iii) non-habitat/excluded. There may also be examples from the gopher tortoise arena.

This approach recognizes the need for large natural areas to accommodate large stochastic events, but focuses the most intensive management within “biological core areas” within these larger areas. The “biological core areas” should be as undisturbed as possible and include intensive restoration or management (e.g., weed management). The size of “biological core areas” should be evaluated through the habitat model and adapted up or down as necessary. Modeling should help better quantify what proportion of the habitat needs to be occupied or available to be occupied. Of paramount importance is establishing specific recovery actions with clear timelines to develop the habitat model and tracking system.

#### Additional Recovery Objectives/Criteria

The group briefly discussed the current problem of tortoises disappearing from the landscape and the risk of losing entire genetic lineages of the species. An objective directed toward maintaining genetic diversity may be necessary, with criteria requiring the establishment of captive refugia for each distinct genetic unit, as was included in the Barton Springs Salamander Recovery Plan. Concern was expressed that bringing animals into captive-refugium settings should be a last-ditch effort, and we should approach this recommendation cautiously. The IUCN has published guidelines (<http://www.iucn.org/themes/ssc/pubs/policy/exsituen.htm>) that address this topic, which requires more discussion.

Group consensus is that the remaining third and fourth delisting criteria from the 1994 recovery plan, listed below, are generally good, and these concepts should be retained in the revised recovery plan. The fifth criterion is inherent to any delisting decision and is essentially unnecessary as a separate recovery objective or criterion.

- (3) provisions must be made for population management within each recovery unit so that discrete population growth rates ( $\lambda$ s) are maintained at or above 1.0.
- (4) regulatory mechanisms or land management commitments must be implemented that provide for long-term protection of desert tortoises and their habitat; and
- (5) the population in the recovery unit is unlikely to need protection under the Endangered Species Act in the foreseeable future.

The draft Recovery Objectives/Criteria 2-3 in Attachment 3 address the 1994 Delisting Criteria 3-4, and the group agreed that the concepts in the draft are suitable and should be developed further. Additional information needs related to ecology and natural history of desert tortoises might need to be incorporated directly into draft Recovery Objective 3, but each recovery objective and criterion should probably highlight relevant information needs directly.

Generally, good concepts being incorporated into the recovery objectives and criteria include i) they apply to each recovery unit so as to maintain representation, resiliency, and redundancy (recognizing that recovery units still need to be evaluated); ii) adaptive management is incorporated; and iii) they recognize the concept of conservation-reliant species, as described by Scott et al. (2005. Recovery of imperiled species under the Endangered Species Act: the need for a new approach. *Frontiers in Ecology and the Environment* 3:387-389.), which recognizes that “recovery” or delisting can occur, and in many cases may only occur, with assurances of ongoing management actions, as opposed to totally “hands-off,” self-sustaining populations.

**Action Item:** The DTRO will produce revised draft recovery objectives and criteria.

**Action Item:** Roy will investigate possibilities of having Darryl MacKenzie or one of his co-authors of the book, *Occupancy Estimation and Modeling*, meet with the SAC to discuss this topic and/or the possibilities of attending the Occupancy Estimation and Modeling Workshop in San Marcos, TX, May 31 – June 2.

**Action Item:** Roy will contact Todd Esque to find out the status of the USGS desert tortoise habitat modeling study.

**Action Item:** Earl will provide habitat modeling examples for the gopher tortoise.

#### Next Meetings

- January 20-21 in Las Vegas (moved to Tucson due to scheduling conflicts in Las Vegas)
- March 16-17 (field trip on the 18<sup>th</sup>) in Tucson

**Ft. Irwin Translocation Research Recommendations  
Desert Tortoise Science Advisory Committee**

**September 30, 2005**

On July 21, 2005, the DTRO Science Advisory Committee (SAC) reviewed the draft Ft. Irwin Translocation Plan. In general, the SAC thought the plan was well thought out – as far as it went (i.e., describing the translocation process itself and potential measures of success). The SAC spent more time on July 22 discussing research questions that would be important to address relative to the success of the translocation, as well as to advancing recovery of the tortoise. The entire group agreed that while it hopes for, and expects, high individual survival, the scale of this project provides too great an opportunity to waste by not addressing questions related to population-level recovery.

On September 16, the SAC discussed relative priorities and emphases for research questions associated with the translocation project. Of utmost importance, proposals for research must clearly state specific hypotheses being tested. Hypotheses related to the dispersion/distribution of tortoises across the landscape or in areas of different habitat characteristics would be particularly valuable (baseline data collected prior to translocation would be equally important for this purpose, in addition to post-translocation data). Analyzing dispersion relative to other individuals also is important. The use of radio telemetry would allow questions that address factors influencing survival/mortality of tortoises to be incorporated into broader research.

Finally, on September 30, the SAC more clearly described critical aspects that must be addressed in order to unambiguously evaluate the success, impacts, or effects of the translocation while contributing valuable information relevant to desert tortoise recovery. The SAC's recommendations are organized into 4 categories: important research questions directly related to the translocation, variables, study design, and additional research questions.

Primary Research Questions

It is important to ask questions at multiple temporal scales. *Critical* topics to compare between translocated, resident, and control individuals, generally listed from short-term to long-term (although several may span variable timeframes), include:

- Movement patterns
- Dispersion/redistribution of individuals
- Condition/health of individuals
- Survival
- Recruitment

Research should focus on hypotheses relevant to these topics, and proposals should include specific hypotheses that address questions such as:

- What habitat characteristics contribute to spatial patterns, movement, settlement, and survival of tortoises (each experimental group)?
- How do potential impacts (e.g., stress, behavior, disease) differ between experimental groups of tortoises?
- Does translocation change the demography of augmented populations?

Additional metrics of success listed in the translocation plan can easily be incorporated into this approach and the design described below.

Variables

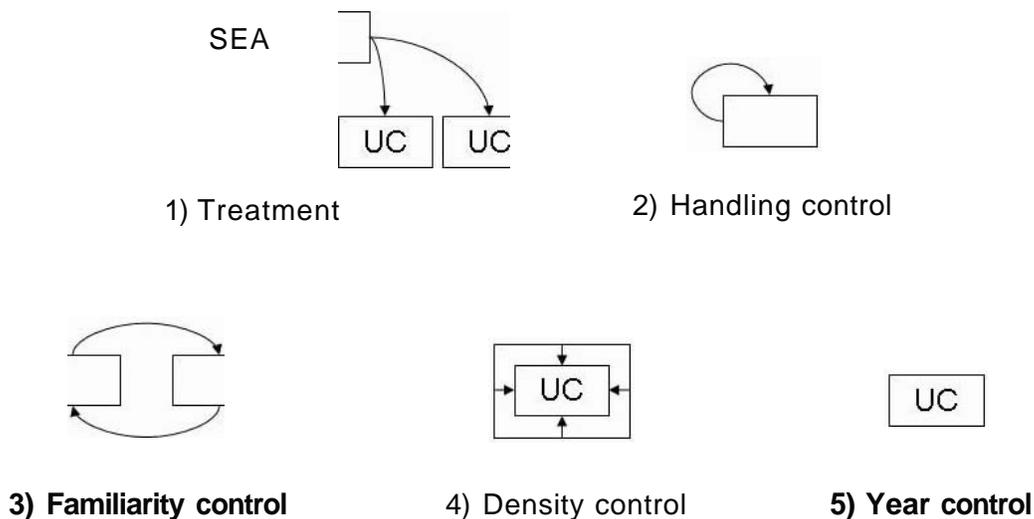
Four different scales are important to the topics/questions listed above: individual, population, ecological, and landscape. Several essential variables or derived statistics that must be measured or recorded occur at each scale.

- Individual: size (including carapace length, mass, volume), condition index, location, health status (serology, PCR, culture, Berry and Christopher assessment), genotype, blood work (hormones, chemistry, etc.)
- Population: dispersion of individuals, size/age distribution, sex ratio
- Ecological: habitat characteristics (including those gathered from aerial imagery), threats
- Landscape: spatial depiction/summary (GIS) of all of the above, physiognomy, barriers, corridors, land use, measures of disturbance, all at multiple spatial scales that are potentially ecologically relevant to desert tortoise

Study Design

Data must be collected on *both* the Southern Expansion Area (SEA) as tortoises are removed and at recipient sites, including measuring the variables at all 4 scales listed above. Data from the SEA, and from residents at translocation sites before translocated tortoises are introduced, establish baseline conditions for the translocation. The fact that the SEA (and some recipient sites - see below) will be completely cleared of tortoises also provides an important opportunity to characterize natural tortoise populations at an unprecedented spatial scale.

Those involved with the translocation project must recognize that the translocation “treatment” includes 4 effects: handling, introducing the translocated animals to unfamiliar areas, increasing density, and time. The study design must control for each of these effects, as described below (see figure).



- 1) The treatment involves moving animals from the SEA into new sites (uncleared [UC] of resident tortoises).
- 2) Picking up, handling, and returning tortoises from sites within the recipient area will provide a control for “handling.”

- 3) Reciprocally translocating tortoises (~100% clearance) between relatively distant sites within the recipient area (holding density constant) will provide a control for “familiarity.”
- 4) Translocating individuals from adjoining areas into a plot within the recipient area (doubling density) will provide a control for “density” (the translocated tortoises are assumed to have a level of familiarity with the central, recipient plot).
- 5) Monitoring tortoises within the recipient area that are not translocated nor subject to translocated tortoises will provide a control for “time/year.”

Ideally, controls 2-4 should occur with *6 replicates* each to ensure adequate power to statistically distinguish between alternate hypotheses. Monitoring tortoises distributed throughout the recipient area will be adequate for control 5. This study design assumes that plots are spatially independent. A minimum distance based on expected tortoise movements between plots (e.g., 6 miles, if tortoises are expected to move 3 miles from a given plot) would help meet this assumption.

The treatment (#1) would occur on as many sites as necessary to accommodate the tortoises within the SEA. Groups of tortoises from within the SEA would ideally be translocated together to the different treatment sites. For example, tortoises from within each square mile section of the SEA would be moved to a separate section within the recipient area in different density combinations, such as 9 matched high-density sites (SEA to recipient), 9 matched low density, 9 matched low density to high density, and 9 matched high density to low density. The number and arrangement of treatment and control plots will necessarily be affected by the number of tortoises to be moved and spatial constraints of the larger recipient area, but it is important to consider these treatments/effects in the final study design.

The SAC also recognized that the amount of effort to track the expected number of tortoises being translocated, as well as monitored as controls and residents, will be significant. A meeting to discuss how this monitoring should take place (e.g., remote towers, field technicians, etc.) would be warranted before grants are awarded to ensure that effort is expended wisely and not duplicated.

#### Additional Research Questions

Diseased tortoises (ELISA positive and symptomatic) should not be overlooked after they are moved from the SEA into quarantine pens. ELISA-positive, asymptomatic tortoises should be segregated from symptomatic individuals. Important disease-related topics for research include:

- Tracking the immune response over the course of the disease
- Investigate/document genetics of diseased tortoises relative to healthy tortoises (e.g., homozygosity)
- Test susceptibility of ELISA-positive, asymptomatic tortoises (naturally recovered vs. treated with antibiotics) to reinfection

The Conservation and Mitigation Working Group should also consider using tortoises, including diseased tortoises, cleared from the SEA in a headstarting program to produce additional tortoises for research/recovery purposes in the western Mojave Desert.

Finally, researchers should record potentially confounding variables during the translocation experiment, including ecological and landscape effects. These data may allow analyses or inductive inferences of additional translocation-related questions, including those related to:

- effects of particular threats,
- effectiveness of management actions,
- possible Allee effects in low-density sites,
- relationship between high-density sites and habitat quality, and
- relationship of species/habitat models to putative barriers or corridors.

U.S. INSTITUTE FOR ENVIRONMENTAL CONFLICT RESOLUTION AND USFWS  
DESERT TORTOISE (MOJAVE POPULATION) COLLABORATIVE RECOVERY PLANNING

Summary of Initial Phases for Proposed Scope of Work

**Initial Steps— PROJECTED COMPLETION: DECEMBER 2005**

- Internal Consultations and Assessment with FWS
  - Desired outcomes of collaborative process clarified
  - Internal alignment of FWS staff and leadership to goals of collaborative process sought
- Determine Facilitation Needs and Define Appropriate Selection Criteria
  - Determine key requirements for neutral assistance associated with process design, convening, facilitation, and mediation elements
  - Incorporate selection criteria into a Request for Statements of Interest, Availability, and Qualifications to be issued by the U.S. Institute
- Initiate Identification and Engagement of Stakeholders
  - Identify full range of potentially affected and interested stakeholders
  - Invite stakeholder participation in the selection of third party neutral contractors
- Develop and Issue “Request for Statements of Interest, Availability, Qualifications, and Cost”
  - Recruit a pool of qualified teams of professional third party neutral practitioners to partner with the U.S. Institute on the project
  - It is anticipated that one team will be selected to focus specifically on recovery areas with California, while the U.S. Institute would conduct the conflict assessment for recovery areas in NV, AZ, and UT
- Review Proposals and Identify final Candidates
  - Selection of third party neutral practitioner candidates to be interviewed pending concurrence of FWS
- Interview Final Candidates and Select Third Party Neutrals
  - Final selection of third party neutral practitioner pending concurrence among the stakeholder participants on the interview panel
- Establish Contract with Selected Team of Third Party Neutrals
  - The U.S. Institute will negotiate contract for CA with oversight from FWS
- Advice on Collaborative Problem Solving
  - Provide independent and impartial advice on collaborative problem solving to FWS and the Regional Working Group participants
- Project Management
  - The U.S. Institute Project Manager and Senior Mediator will provide ongoing oversight, coordination, consultation, and project management

## **Organizational Meeting and Stakeholder Assessment— PROJECTED COMPLETION: APRIL 2006**

- Organizational Meeting
  - The U.S. Institute's assigned Project Manager and Senior Mediator and the selected third party neutral contractor will participate in an initial one-day organizational meeting with the FWS and any other appropriate partners to establish clear and mutual understanding of all aspects of the project
- Review Background Information
  - The facilitation team & U.S. Institute will review relevant information provided to them by the FWS and from other relevant sources as appropriate and available
- Stakeholder Assessment
  - The U.S. Institute and the facilitation team will conduct a coordinated Stakeholder conflict Assessments to determine receptivity and potential support in the different regions for a collaborative process to develop regional recovery action plans that would be integrated into a comprehensive revised Recovery Plan for the desert tortoise
  - Identify and interview willing, available, and appropriate individuals to invite to participate on the different Regional Working Groups (approximately 100 interviews will be conducted)
  - Different conclusions may be reached regarding how to approach working with stakeholders on recovery action planning in the different regions, or possibly not to proceed as originally envisioned

**→DECISION POINT: Whether or not to proceed with subsequent phases of the project, or how best to proceed, with the possibility of pursuing different approaches in different areas**

### **Process Design and Convening of the Regional Working Groups**

- Extend invitations to Regional Working Group participants – May 2006
- Convene Regional Working Groups –May/June 2006

### **Plan, Facilitate, Document, Follow-up Meetings of Regional Working Groups**

- Conduct initial Regional Working Group meetings – June/July 2006
- Conduct second round of Regional Working Group meetings – July/August 2006
- Conduct third round of Regional Working Group meetings – August/September 2006
- Conduct fourth round of Regional Working Group meetings – September/October 2006

### **Report on Regional Working Group Process**

- Submit summary report, including recovery action plans, of Regional Working Group meetings – November 2006
- Provide process evaluation memo to FWS – November 2006

DRAFT RECOVERY OBJECTIVES AND CRITERIA  
December 9, 2005

**Draft Recovery Objective 1**

Maintain desert tortoise distribution within each recovery unit at levels sufficient to maintain representative, resilient, and redundant populations.

**Draft Recovery Criterion 1**

1a) The lower bound of the 95% confidence limit for desert tortoise occupancy equals or exceeds 90% across all public/private conservation lands below 4200-foot elevation in each recovery unit.

1b) The lower bound of the 95% confidence limit for desert tortoise occupancy equals or exceeds 95% across i) each of 3 “management areas” of at least 100 square miles within each recovery unit, OR ii) across 1 “management area” of at least 100 square miles per critical habitat unit within the recovery unit, whichever is greater. Each critical habitat unit must contain at least 1 management area of at least 100 square miles (86 square miles for Upper Virgin River).

**Draft Rationale**

This recovery criterion addresses representation, resiliency, and redundancy. Representation is achieved by applying the criterion to each recovery unit. Specific recovery actions should identify different degrees of management within each tier. For example, the first tier (1a) requires relatively light management and includes the minimum occupancy criterion.

Managing for high resiliency (i.e., protecting against stochasticity) is particularly important. The second tier (1b) should include moderate management, such as aggressive fire suppression, exotic plant removal, focused habitat restoration, etc., and includes a higher occupancy criterion. The scale of the second tier should be sufficient to withstand the largest possible catastrophe that could reasonably be expected to impact a tortoise population. The identified scale of 100 square miles for each management area is based on the largest total burned area within a critical habitat unit in 2005 (see table; the largest single burn was 55 square miles [Duzak fire on Beaver Dam Slope]). This tier also addresses redundancy by requiring multiple management areas within each recovery unit in order to insure against losses due to catastrophic events.

**Questions**

- 1a-b) Can confidence limits be derived for occupancy, or would we just measure the 90 or 95% kernel from transect data, for example?
- 1a) Is 90% occupancy appropriate? More/less?
- 1a) Do we need a better/more specific habitat definition? The precise baseline should probably be established, up front, for each recovery unit.
- 1b) Is 95% occupancy appropriate? More/less?
- 1b) Is there a better terms than “management area?”
- 1a-c) Should a time horizon be incorporated into this criterion, or will additional criteria provide assurance that unwarranted delisting will not occur (or be advocated) even if minimum occupancy levels are achieved in a single year?
- 1a-c) What are the monitoring implications of this criterion?

<b>Critical Habitat Unit</b>	<b>Area 2005 Burns</b>		
	<b>(sq mi)</b>	<b>(sq mi)</b>	<b>% Burned</b>
BEAVER DAM SLOPE	320	73.1	22.8
CHEMEHUEVI	1,463	0	0
CHUCKWALLA	1,595	0	0
FREMONT-KRAMER	811	0	0
GOLD BUTTE-PAKOON	763	97.6	12.8
IVANPAH	988	1.7	0.0
MORMON MESA	668	24.3	3.6
ORD-RODMAN	398	0	0
PINTO MOUNTAINS	268	0	0
PIUTE-ELDORADO	1,517	0.2	0.0
SUPERIOR-CRONESE	1,197	0	0
UPPER VIRGIN RIVER	86	16.3	19.0
<b>TOTAL</b>	<b>10,074</b>	<b>213.2</b>	<b>2.1</b>

### **Draft Recovery Objective 2**

Maintain healthy desert tortoise population levels ( $\lambda \geq 1$ ) within each of the management areas specified in Recovery Criterion 1b.

#### Draft Recovery Criterion 2

2a) The lower bound of the 95% confidence limit for adult desert tortoise density equals or exceeds 65/square mile (25/square km) within at least 1 “intensively managed area” of at least 10 square miles within each “management area.”

2b) The lower bound of the 95% confidence limit for adult desert tortoise survival equals or exceeds 90% within each “intensively managed area.”

2c) Desert tortoises <180 mm carapace length should comprise at least 40% of the total number of tortoises observed during surveys of each “intensively managed area.”

#### Draft Rationale

This recovery criterion also addresses representation and resiliency. Representation is achieved by applying the criterion to each recovery unit. Each of the sub-criteria establish minimum demographic parameters to ensure resiliency of the populations. The specified “intensively managed areas” should include elevated management above that in the “management areas” identified in Recovery Criterion 1b, such as headstarting (at least until threat mitigation is better understood), provision of supplemental water during drought, plus those actions in the larger “management areas.” Ideally, “intensively managed areas” would be managed at a level sufficient to produce excess tortoises to populate adjacent areas.

Density levels (2a) are based on estimates from range-wide distance sampling. Minimum survival (2b) is based on upper values estimated from study plots in California and Arizona. Minimum recruitment (2c) is based on pre-decline surveys of study plots throughout the Mojave Desert. (*We need to alter or specify these values more precisely. See the questions, below.*)

Questions

- 2a) Is 65 adult tortoises/sq mi appropriate? This value was taken from Upper Virgin River (most 95% CI lower limits between 1998 and 2003 are just below 65 tortoises/sq mi). Should the number differ between recovery units?
- 2a) Is an area of 10 square miles appropriate for each intensively managed area? More/less?
- 2a) Is there a better terms than “intensively managed area?”
- 2b) Is 90% minimum survival appropriate? More/less? This level of precision was not met in any of 5 years of surveys at 3 sites with apparently healthy populations in Arizona.
- 2c) Is 40% representation of tortoises <180 mm adequate to ensure good recruitment? More/less/some different measure altogether? Numbers from 3 sites in Arizona (1 year each) that I was able to quickly pull up range from 22-45%.
- 2a-c) Should a time horizon be incorporated into this criterion, or will additional criteria provide assurance that unwarranted delisting will not occur (or be advocated) even if minimum density levels are achieved in a single year?
- 2a-c) What are the monitoring implications of this criterion?
- 2a-c) Should an updated PVA be incorporated more directly into this criterion?

**Draft Recovery Objective 3**

Threats (including potential interactions between threats) to desert tortoise population persistence are sufficiently understood and mitigated to ensure the recovery of the species.

Draft Recovery Criterion 3

Management plans or cooperative agreements have been implemented within each recovery unit to ensure the maintenance of Recovery Criteria 1 and 2. Each plan or agreement must contain: a) explicit management actions that reflect the risks facing desert tortoise population persistence within that recovery unit, b) demonstrated effectiveness of those management actions mitigating the relevant risks, c) adaptive management strategies that ensure that the plan is evaluated and revised regularly, and d) assurances that the plan will be implemented.

Draft Rationale

Virtually nothing is known about the demographic impacts on tortoise populations of any of the various identified threats or the relative contributions each threat makes to tortoise mortality (Tracy et al., 2004). Therefore, specific and meaningful threats-based recovery criteria cannot be identified at this time. Specific recovery actions, including research, must be implemented to identify sets of threats that contribute to a greater number of mortality mechanisms or that affect size structure or fecundity. The relative strengths of hypothesized connections between threats and mortality must also be assessed (some individual linkages may be more important than multiple linkages from other individual threats). This assessment should be based on data from research designed specifically to elucidate relationships between threats and mortality. As quantitative information on threats and tortoise mortality is obtained, effective management actions can be identified, prioritized, and implemented through the management plans or cooperative agreements required by this recovery criterion. In addition, new information may contribute to the development of more specific threats-based recovery criteria during future recovery plan review and revision.