Gopher Tortoise Minimum Viable Population and Minimum Reserve Size Working Group Report

Prepared by:
The Gopher Tortoise Council
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A workshop was held on 13-14 March 2013, to define the minimum viable population (MVP) for the gopher tortoise (*Gopherus polyphemus*) using the best available scientific information. In this case, the purpose of establishing MVP parameters is to provide acceptable benchmarks for conservation and recovery efforts and is not to determine absolute minimum thresholds that if not met will result in certain population demise.

Invited attendees included gopher tortoise biologists, land managers, and experts in demographic modeling (Table 1).

Background:

The U.S. Fish and Wildlife Service's 12-month finding for listing the gopher tortoise as Threatened under the Endangered Species Act (ESA) has stimulated additional interest in conservation of the species. A Candidate Conservation Agreement and a comprehensive conservation strategy have been developed for the gopher tortoise (http://www.fws.gov/southeast/candidateconservation/examples.html). It will be necessary to define a minimum viable population size, the number of viable populations needed, and the ideal geographic distribution of these populations in order to successfully conserve this species.

The scientific literature provides mixed guidance about what constitutes a minimum viable gopher tortoise population. Results from existing population viability models vary from 25 to 250 ***individuals*** under ideal habitat conditions (Table 2). In addition, there is no consistency in the scientific literature regarding how large a parcel of habitat must be to support a viable population. Therefore, there was a clear need to convene experts in gopher tortoise biology, ecology, management, and demographic modeling to reach consensus regarding the following objectives:

(1) Define a minimum viable gopher tortoise population size based on the best scientific information available.

(2) Identify the minimum reserve size needed to support a viable gopher tortoise population.

(3) Identify the number and distribution of viable gopher tortoise populations necessary to ensure the long-term viability of the species.

Workshop Format:

The workshop was held at the Charlie Elliott Wildlife Center in Mansfield, Georgia. John Jensen with the Georgia Department of Natural Resources gave the welcome address and the workshop facilitators (Brett Boston and Vern Herr of Group Solutions, Inc.) delivered the statement of purpose for the meeting. This was followed by a series of brief presentations. Rachael Sulkers presented a review of the definition of an MVP, population viability analysis (PVA), and demographic parameters used to develop a PVA. Joan Berish presented a comprehensive overview of previous gopher tortoise PVA's (Table 2).

Following the formal presentations, there was considerable discussion regarding what constitutes an appropriate MVP for gopher tortoises and how many known populations (by state) met this threshold. Because there is a lack of information about an ideal population structure for the species due to difficulty in locating immature tortoises, the group agreed that in application the focus should be on counts of ***adults*** rather than ***individuals*** of all age classes. Based on these discussions and findings by Miller et al. (2001) and Tuberville et al. (2009), the group agreed that using a count of 250 ***adults*** as an approximation of a MVP was appropriate for the gopher tortoise.

Populations as small as 50 ***individuals*** that are intensively managed were deemed important, in that, they play a support role in conservation of the species. In addition, small non-viable populations may be important on a local scale (i.e., for educational purposes).

Finally, the influence of habitat size, quality, and management on the viability of gopher tortoise populations was discussed. The group concluded that the minimum reserve size to support a viable tortoise population was 100 hectares (247 acres), if that site is of superior quality and will be maintained at that quality. Future discussions will focus on determining the number and distribution of viable gopher tortoise populations necessary to ensure the long-term survival of the species.

Summarized Workshop Findings:

Objective (1)

a. The consensus MVP for the gopher tortoise is 250 ***adults*** with a density of no less than 0.4 tortoises per hectare (approximately 0.16 tortoise per acre) with:
    - A male-female ratio of 1:1
    - Evidence of recruitment into the population

- Variability in size and age class; the smallest size and age classes should be monitored over the long-term (i.e., every 5-10 years) because recruitment and detectability within any given year can vary considerably.
- The landscape should not have major constraints to gopher tortoise movement (i.e., major rivers or highways).

b. Populations less than 250 ***adults*** and as small as 50 ***individuals***, of any age class (i.e., "support" populations), may persist for long periods of time and, although vulnerable to stochastic events, they play an important role in supporting the overall recovery of the species. Support populations should be candidates for intensive management to attain MVP levels, where feasible.

c. Small non-viable populations (<50 ***individuals***) can be used for education, community interest, translocation, or augmentation purposes.

Objective (2)

a) Minimum reserve size:

- An MVP of gopher tortoises (>250 ***adults***) can persist on a reserve that is at least 100 ha in size, provided the site receives intensive management.
- High quality soils are necessary to support a viable tortoise population on a reserve of this size.
- Some assessment of land management effectiveness must take place every 1-2 years with appropriate management action taken as needed.

Objective (3)

a) Number and distribution of viable populations:

- The number of MVPs should be high enough that stochastic events do not result in long term decline of the species and the number and distribution of the populations represent the historic range of the species.
- Each state must first summarize current population sizes and age class structure within their state to meet this objective.
- Additional data are needed to determine the genetic viability within and among gopher tortoise populations.

Table 1. Participants at the Gopher Tortoise Minimum Viable Population and Minimum Reserve Size Workshop at the Charlie Elliott Wildlife Center in Mansfield, Georgia, 13-14 March 2013.

PARTICIPANTS	AFFILIATION
Joan Berish	Florida Fish and Wildlife Conservation Commission
Becky Bolt	InoMedic Health Applications, Kennedy Space Center
Doug Bruggeman	Ecological Services and Markets, Inc.
Deborah Burr	Florida Fish and Wildlife Conservation Commission
Kyla Cheynet	Plum Creek
Matt Elliott	Georgia Department of Natural Resources
Jeff Gainey	United States Forest Service
Steve Godley	Cardno Entrix
Jim Godwin	Auburn University
Jeff Goessling	Auburn University
Craig Guyer	Auburn University
Mike Harris	Georgia Department of Natural Resources
Sharon Hermann	Auburn University
Matt Hinderliter	United States Fish and Wildlife Service
Jen Howze	Joseph W. Jones Ecological Research Center
John Jensen	Georgia Department of Natural Resources
Keri Landry	Louisiana Department of Wildlife and Fisheries
Jess McGuire	University of Georgia
Janet Mizzi	United States Fish and Wildlife Service
Clint Moore	University of Georgia
Erin Rivenbark	United States Fish and Wildlife Service
Lora Smith	Joseph W. Jones Ecological Research Center
Jodie Smithem	United States Fish and Wildlife Service
Rachael Sulkers	Environmental Services, Inc
Mark Thornton	Ft. Benning – Conservation Branch

5 Table 2. Summary of the findings of gopher tortoise population viability models.

Reference	Description	Findings
Abercrombie, C.L. 1981. A simulation model for the management of the gopher tortoise (*Gopherus polyphemus*) and gopher tortoise habitat. Unpublished report.	The model population consisted of a spatially defined group of gopher tortoise colonies. Ran simulations under 3 scenarios: burn probability= 0.25, 0.50, and 0.75, with a starting population size of 600 individuals.	Under the burn probability of 75%, >90% of tortoises were alive after 100 years.
Cox, J., D. Inkley, and R. Kautz. 1987. Ecology and habitat protection needs of gopher tortoise (*Gopherus polyphemus*) populations found on lands slated for large-scale development in Florida. Nongame Wildlife Program Technical Report No. 4. Florida Game and Fresh Water Fish Commission, Tallahassee, FL. 69 pp.	Estimated viability of gopher tortoise populations in Florida impacted by development. Simulations were run under harsh (little-to-no management activity), moderate, and favourable conditions (greater attention to management) for 200 years. They defined a viable population as the population size needed to provide a >90% probability of surviving for at least 200 years. Defined demographic characteristics of the initial population (10% juveniles, 30% subadults, 60% adults).	(1) Under harsh conditions even relatively large populations had little chance of surviving for extended time periods, (2) Under moderate conditions populations >130-150 individuals were needed to survive to 200 years, (3) under favourable conditions populations of approximately 40-50 individuals met criteria for a viable population.
Miller, P.S. 2001. Preliminary population viability assessment for the gopher tortoise (*Gopherus polyphemus*) in Florida. IUCN/SSC Conservation Breeding Specialist Group and Participants in PVA Workshop, Tallahassee, FL. 45 pp.	Used initial population numbers ranging from 50-20,000 for three regions in Florida (Panhandle, North Central, and South). Northern populations (N= 50 and 250) showed as much as 60% reduction after 100 years if URTD was included in the model.	Models were most sensitive to uncertainty in juvenile mortality (age class 0-1) and adult female mortality. Initial baseline analysis showed lower growth rates in northern populations, but no risk of extinction at 100 years. Same was true when they restricted carrying capacity.
Root, K.V., and J. Barnes. 2006. Risk assessment of a focal set of rare and imperiled wildlife in Florida—Final report FWC Contract No. 03111. Florida Fish and Wildlife Conservation Commission, Tallahassee, FL. 17pp.	Ran baseline models for gopher tortoise populations in Florida on (1) all potential habitat and (2) managed habitat only.	For baseline models, the probability of extinction was zero over the next 100 years. Adult survival (>15 years old) was the most influential parameter on population growth. Only the largest populations (those with >27 adult females) were likely to be occupied after 100 years; smaller populations were not likely to persist 100 years without occasional dispersal.
Tuberville, T.D., J. W. Gibbons, H. E. Balbach. 2009. Estimating the viability of gopher tortoise populations. U.S. Army Corps of Engineers ERDC/CERL-TR-09.	Model was range-wide, but varied demographic parameters for the south, central, and periphery of the range. For each scenario, 100 simulations were run for both 100 and 200 years.	Under all scenarios, gopher tortoise populations exhibited gradual declines. Only initial populations of at least 250 individuals were able to persist for 200

		years. Demographic sensitivity analysis revealed that hatchling survivorship was the most critical life history stage.

References

Abercrombie, C.L. 1981. A simulation model for the management of the gopher tortoise (*Gopherus polyphemus*) and gopher tortoise habitat. Unpublished report.Department of Interior, Fish and Wildlife Service. 2011. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Gopher Tortoise as Threatened in the Eastern Portion of Its Range. Federal Register 76(144): 45130-45162.

Cox, J., D. Inkley, and R. Kautz. 1987. Ecology and habitat protection needs of gopher tortoise (*Gopherus polyphemus*) populations found on lands slated for large-scale development in Florida. Nongame Wildlife Program Technical Report No. 4. Florida Game and Fresh Water Fish Commission, Tallahassee, FL. 69 pp.

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