



Distribution and Habitat Use of the Gopher Tortoise in a Declining Southeast Florida Conservation Area

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Introduction

The gopher tortoise, *Gopherus polyphemus*, is threatened in Florida and endangered or threatened throughout the remainder of its range in the southeastern United States⁴. It digs deep burrows which provide shelter to more than 300 invertebrate and 60 vertebrate species and thus is considered a keystone species^{2,6}. Gopher tortoises continue to decline throughout their range primarily due to urbanization². In southeast Florida gopher tortoise research has been underrepresented and the status of the tortoise in this region is not well known^{1,3}. This study assessed the population distribution, habitat use, and status, of the gopher tortoise in a southeast Florida habitat and compared it to a similar study of this population completed in 2005.

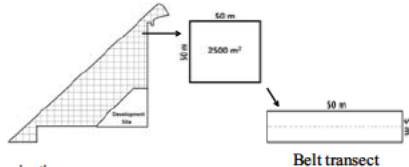
Objectives

- Completely survey the FAU conservation area for gopher tortoise burrows to assess distribution and habitat use
- Capture, mark and release as many tortoises as possible to create a demographic profile for the population
- Compare findings to data collected in 2005 for the same population

Materials and Methods

Study Site: The FAU conservation area, diagramed below, consists of 368,000 m² (36.8 ha) of upland habitat, with well-drained soils suitable for gopher tortoises¹.

Methods:



Burrow Categorization

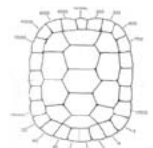


Abandoned



Active

Marking tortoises



Coding system



Long term marking

Population Status Assessment

- Tortoises were categorized into life stages based on carapace (dorsal shell) length: juveniles (<13 cm), sub adults (13-22 cm), adults (>22 cm)
- Population was assessed based on percentage of individuals in life stages

Habitat Analysis

- Natural Resources Conservation Service soil data
- Vegetation categorized by height based on aerial images and ground surveys: low (<1.5m), medium (1.5m-3.0m), high (>3m)

Results

Habitat Use and Distribution

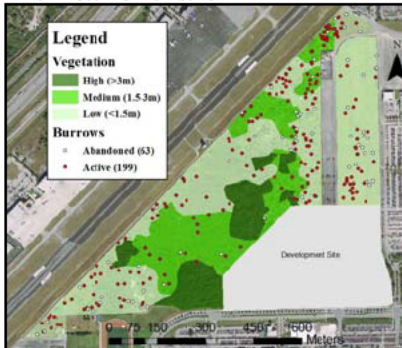


Figure 1. The spatial distribution of gopher tortoise burrows in different vegetation heights in the FAU conservation area. A total of 199 active and 63 abandoned burrows were found. Thus, the active-to-abandoned burrow ratio on this site was 3.2 to 1. Using a burrow correction factor of active burrows/2, we estimated that 100 tortoises inhabit this area. We found no significant difference between the spatial distribution of burrows in medium and low vegetation ($\chi^2 = 3.0$; $df = 1$; $p < 0.05$). Active burrow densities were 6.7/ha in low vegetation and 5.7/ha in medium vegetation. No burrows were located in high vegetation. The 2005 study of this population reported 219 burrows of which 38 were categorized as abandoned¹. In this study a significant difference was found between the spatial distribution of burrows in medium and low vegetation types¹.

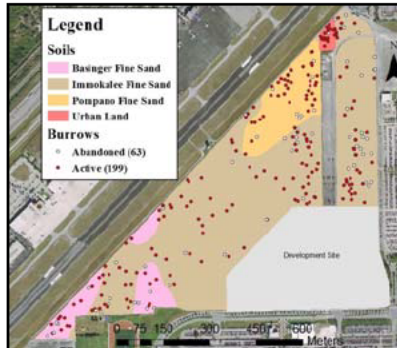


Figure 2. The distribution of gopher tortoise burrows in different soil types in the FAU conservation area. There was a significant difference between the spatial distribution of burrows and soil types ($\chi^2 = 43.8$; $df = 3$; $p < 0.05$). Active burrows were very dense in Urban land at 21.0/ha. Active burrow densities were also high in Pompano fine sand at 9.0/ha. In Immokalee and Basinger fine sand the density of active burrows was 5.3/ha and 4.3/ha, respectively. No significant differences were found between the spatial distribution of burrows and soil types in the 2005 study¹.

Demographic Profile

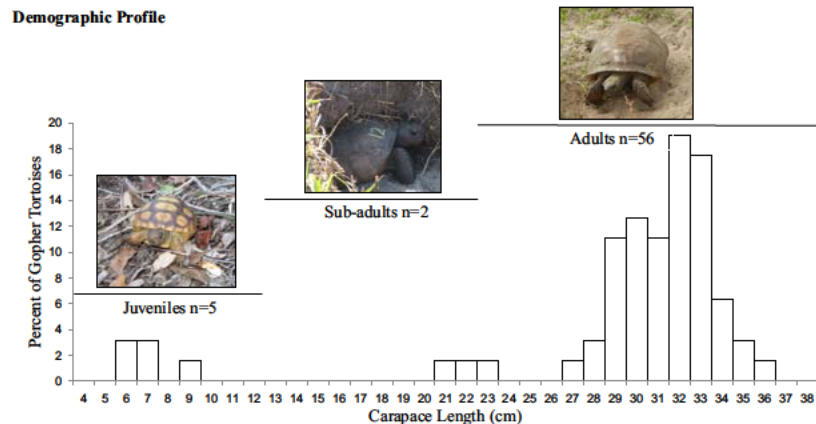


Figure 3. Carapace length distribution of gopher tortoises captured in the FAU conservation area. We caught 63 tortoises from June 2010 to February 2011. An additional 5 juveniles and 12 adults were observed but not captured. The relatively high number of juveniles and low number of sub-adults suggests that the population is reproducing successfully but the offspring are not surviving very long. Healthy tortoise populations tend to have continuous representation throughout the life stages⁵. In comparison, the 2005 study on this population caught 37 tortoises, of which only one was a sub-adult; 36 were adults¹. No hatchlings were observed in the 2005 study¹.

Results Summary

- The active-to-abandoned tortoise burrow ratio was unusually high at 3:1 indicating a stressed population².
- There was no significant difference between the spatial distribution of burrows between low and medium vegetation. No burrows were found in high vegetation. A significant difference was found between the spatial distribution of burrows in the four soil types. Differences in habitat use findings between this study and the 2005 study may be due to habitat loss (development site) and further habitat degradation that has occurred since 2005.
- The increase in active burrow numbers, from 181 in 2005 to 199 in this study, suggests that the population has increased. This may be due to relocations into the habitat, and the error associated with populations size estimates based on the burrow correction factor but probably is not due to natural population growth.
- The low number of sub-adults but presence of juveniles suggests successful reproduction but very low juvenile survival rates.

Discussion

Habitat Use

The lack of significance between the spatial distribution of burrows and vegetation types was unexpected. Contrary to typical gopher tortoise ecology, tortoises in certain parts of the conservation area preferred to dig their burrows in medium vegetation (1.5-3.0m) although open patches with low herbaceous vegetation and suitable soils were available. The tortoises may avoid such open areas if they accumulate too much water or are close to the water table. Additionally, higher density of roots in medium vegetation may help to sustain tortoise burrow structure. The relatively high density of burrows located in medium vegetation suggest novel habitat use among tortoises in confined, degraded southeast Florida habitats and warrants further research.



Roots stabilizing burrow

Population Status

The low number of sub-adults but presence of hatchling tortoises suggests successful reproduction but abnormally low hatching survival rates. Reasons for this may include increased predation by raccoons which benefit from higher vegetation common in degraded habitats. Lack of sufficient, low herbaceous vegetation, which tortoises rely on for food, and overcrowding may also play a role. The high active-to-abandoned burrow ratio that we found, in conjunction with the lack of sub-adult tortoises, indicates that the FAU population has reached its carrying capacity and may not be sustainable without significant habitat management. If properly managed small habitats such as this one can sustain healthy tortoise populations⁵. In turn, the presence of the tortoise, a keystone species, promotes the biodiversity of the ecosystem. Small habitats may also prevent disease epidemics⁵.

References

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