

Strategy for *in situ* conservation of at-risk and declining sandhills species

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Abstract

Plants and animals associated with the interior uplands of the south eastern United States are seriously declining in numbers. The red-cockaded woodpecker is endangered. The gopher tortoise has been proposed to be listed. Better management plans for these animals have been extensive, and often well-funded, but the distinctive plant communities also once present are being lost with very little expressed concern. While building region-wide support for a new tortoise recovery effort, it has become clear that we are also supporting the maintenance of habitat for the numerous unique sandhills plants which require the same conditions of cover and use of controlled fire.

Background

The south eastern United States sandhills fall line region is a unique environment. Developed from Miocene marine sands, it lies between the Piedmont and the Coastal Plain, and is considered a part of the plain (Fig. 1). The distinct landscape is different from adjoining regions, occasionally taking the form of a dune, but more often vegetated. As with many unique environments, it supports a variety of plant and animal species not elsewhere sympatrically distributed. And, as is common with unique systems, these sandhills have suffered severe and continuing pressures from reshaping of the landscape for human needs. Many tracts have been converted to commercial forest plantation development. When cleared for agriculture, the soils rapidly lose fertility and erode severely.

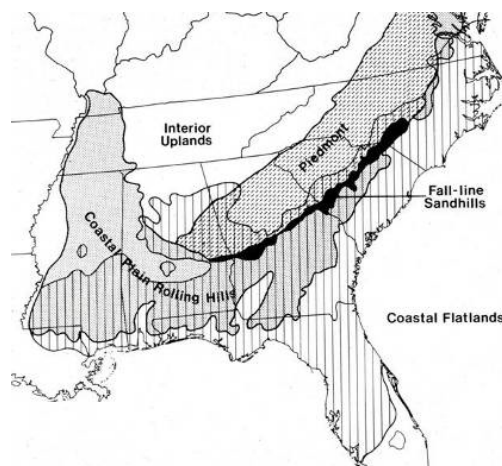


Figure 1. The Fall Line Sandhills of the SE United States

Within the sandhills, sandy xeric ridgetop sites support a unique flora and fauna, including a suite of threatened, endangered or special concern (TES) plant and animal species. The red-cockaded woodpecker (*Picoides borealis*) is a characteristic bird, although it may be found well beyond the sandhills. Characteristic herpetofauna include the gopher tortoise (*Gopherus polyphemus*), gopher frog (*Rana capito*), pine snake (*Pituophis melanoleucus*), southern hognose snake (*Heterodon simus*), and the coral snake (*Micrurus fulvius*). Again, these species are also found in the surrounding pine woodlands. Characteristic plant species of conservation concern include sandhills milk-vetch (*Astragalus michauxii*), sandy-woods chaffhead (*Carphephorus bellidifolius*), woody goldenrod (*Chrysoma pauciflosculosa*), sandhill lily (*Nolina georgiana*), sandhill gay-feather (*Liatrix secunda*), and Pickering's morning glory (*Stylisma pickeringii* var. *pickeringii*). All of these species are federally or state protected, or have been documented to be at risk throughout their range (Gibbons et al. 2000, Tuberville et al. 2000, Harper et al. 1997).

By far the greatest conservation focus in the sandhills is on the endangered red-cockaded woodpecker. Management guidelines for the species call for prescribed burns at least every three years with intervals not to exceed five years, to promote longleaf pine woodlands (USFWS, 2003). These burns are usually performed during the dormant season due to cooler temperatures and more predictable winds (Wade and Lunsford 1989), and because silviculturalists fear that growing season fires will damage pine trees or pine regeneration (Streng 1993). Historically, xeric sandhill sites probably burned more frequently, and often during the growing season (Frost 1993). Specifics on the beneficial frequency and timing of burning for most of these sandhills species are unknown, although a natural burn regime that promotes the overall sandhills community may be most desirable.

The gopher tortoise is a keystone species of these pine-dominated stands, at least in those areas where appropriate well-drained, sandy soils dominate. Common associates in many parts of the gopher tortoise's range include most of the endangered or at-risk species noted above. Tortoise habitat, like that of the red-cockaded woodpecker with which it is, or once was, often associated, must be actively managed (e.g., forest thinning, regular prescribed burning) to maintain the open canopy and diverse herbaceous forage that support gopher tortoises.

Gopher tortoises are herbivorous, and it is generally agreed that their preferred management includes frequent burns during the growing season, promoting herbaceous plants that form their diet. Gopher tortoises escape from growing season fires in their burrows, and other TES animals may use their burrows as refugia. The majority of sandhill plant species show adaptations to survival in fire-dependent systems (Walker 1993) and growing season burns have been shown to have a positive effect on flowering and seed production of sandhill herbs and grasses (Streng 1993).

Comparison of TES species habitats

On several federally-owned lands in the fall line region of the southeastern US, we examined the habitat characteristics of a suite of nine TES plant species and compared them to sites being managed for red-cockaded woodpecker and gopher tortoise habitat. We collected data on forest species composition, canopy openness, and soils. Most TES plant populations occurred in areas of moderately open pine-dominated forest, similar to those occupied by gopher tortoise populations (Table 1). In particular, gopher tortoise sites managed by burning (during either growing or dormant seasons) were comparable to TES plant habitats.

In addition to sampling known TES plant populations, we developed GIS maps of potential habitat locations for each species based upon Landsat-7 enhanced thematic mapper plus (ETM+) satellite imagery acquired during periods of leaf-on and leaf-off and maps of soils associated with known population locations. We then combined these maps to illustrate locations where one or more TES plant species may occur.

Species (and treatment)	% Canopy Openness	Relative Abundance		
		Pines	Oaks	Others
Gopher tortoise (NM)	42	25	68	7
Gopher tortoise (GSB)	65	53	47	0
Gopher tortoise (DSB)	45	84	13	3
<i>Astragalus michauxii</i>	17	53	30	17
<i>Baptisia lanceolata</i>	39	57	34	9
<i>Carphephorus bellidifolius</i>	26	60	38	2
<i>Chrysoma pauciflosculosa</i>	52	83	9	8
<i>Liatis secundata</i>	33	61	32	7
<i>Nolina georgiana</i>	23	64	30	6
<i>Phaseolus polystachios</i>	42	59	28	13
<i>Stylisma pickeringii</i>	45	39	46	15
<i>Warea cuneifolia</i>	31	31	61	8

Table 1. Percent canopy openness and relative abundance of pines, oaks and other deciduous canopy species in gopher tortoise sites compared with TES plant habitats (NM = no management, GSB = growing season burns, DSB = dormant season burns)

In surveys to validate these maps, populations of TES species were found at more than 50% of the predicted sites, and more than 78% of the sites had soils and vegetation characteristics similar to known TES plant habitats. We then combined the potential TES plant species maps with information on known locations of gopher tortoise burrows and red-cockaded woodpecker colonies. As expected, there was substantial overlap among habitats of these sandhills animals and plants (Figure 2). Of 8395 mapped gopher tortoise burrows on one property, 4854 (or 58%) are within areas mapped as probable habitat for one to five TES plant species. Furthermore, the areas of highest occurrence of both plant and animal TES species are in the most xeric sandhills areas with open pine canopy.

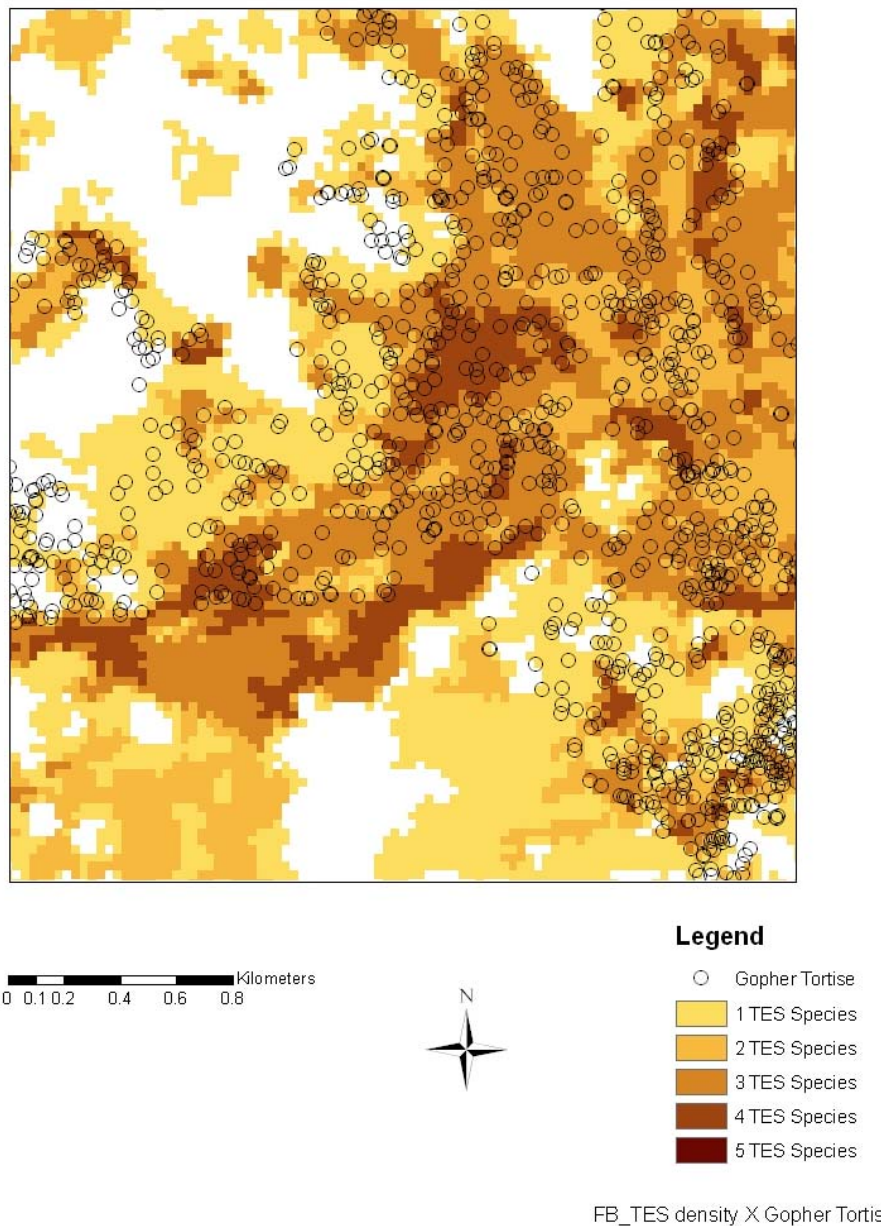


Figure 2 Map of study site showing agreement among rare plant species sites and gopher tortoise burrows

Gopher tortoise memorandum of agreement

In 2006, the gopher tortoise was proposed for federal protection as a threatened species, due largely to decreased numbers following loss and fragmentation of its traditional habitat. A large group of federal and state agencies, combined with private conservation groups and private landowners, developed a memorandum of understanding, or intent among themselves. The ultimate goal for the parties is to create a range-wide environment in which the gopher tortoise will not only survive, but thrive, and that this success will preclude the necessity to list the

gopher tortoise as a federally protected species. This effort gained a wide set of responsible partners within a few months, and reflected their desire to manage the tortoise, and its habitat, more responsibly and more effectively. Some of the specific objectives were to encourage public/private partnerships among governmental agencies, community and non-governmental organizations, academic institutions, corporations, and private landowners to coordinate resources and achieve habitat conservation results on a large landscape scale; to promote the establishment of landscape corridors and buffers between and adjacent to public and private conservation lands; to increase simultaneously the recovery potential for other federal and state threatened and endangered species associated with the gopher tortoise and reduce the need to list additional species; and to work to achieve landscape-level conservation of fish, wildlife, plants, and their habitats through partnerships with interested organizations and individuals. It is clear to the authors that achievement of these sweeping goals, and implied and actual commitment of resources, would almost certainly not have been seen if rare plant conservation had been the primary goal.

Conclusion

We acknowledge that the interest of the public, and of legislative and regulatory bodies as well, may be captured much more effectively when one proposes to set aside habitat for endangered, or at-risk animal species. The red-cockaded woodpecker and the gopher tortoise are sandhills examples which are relevant here. Literally tens of millions of dollars have been expended on research and land management to support the woodpecker over the past 10 years. The rapidity with which the gopher tortoise MOA achieved support is an example of the speed and intensity which may be found when the goal involves an animal species considered important to the ecosystem in which it occurs, and whose value is widely recognized. Where, though, may we find similar concern expressed for any of the plant species noted above? Yes, there is beginning to be some small interest in propagation of certain species for restoration purposes. Some plant collections, arboreta, and botanical gardens feature examples of the unique sandhills flora. These *ex situ* actions are vital and must be encouraged. Some gardens, including those of Georgia and North Carolina, are cooperating to conserve rare species and habitats *in situ*. This is done through partnering with local volunteer groups, highway departments, and electric power companies, whose rights-of-way provide good habitat for many species.

The reality, however, is that nobody is going to spend tens of millions on *in situ* conservation of these plants so that woodpecker-level management may be achieved. Nor will the thousands of acres proposed to be acquired for tortoise management be focused on any of the plant species. Legislatures simply do not think that it is worthwhile to devote large sums of money or intensive management efforts to preserve the natural habitat of these...or any other...species of herbaceous plants. There is some good news, however. Every time land managers apply prescribed fire as a part of their woodpecker management programs, the understory is also thinned for the benefit of the herbaceous plants on the forest floor. Every acre acquired by the state department of natural resources to manage the woodpecker or the tortoise is also added to the acreage where these lesser-known and less-appreciated species, including these declining plant species, may be preserved and managed! While *ex situ* conservation collections play an important role in species survival, we have here a strong example where joining with initiatives aimed at higher-profile animal species will also allow for greatly improved *in situ* habitat conservation for the plants which share that habitat.

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