As native ecosystems are degraded throughout the world, the importance of managing, conserving, and restoring wildlife habitat escalates. We must carefully consider which approach to habitat conservation is optimal, given that resources for habitat conservation are limited. One enticing option involves channeling limited resources to manage for a single umbrella species, assuming that a number of other species within the same ecosystem would also benefit. The danger inherent to this approach is that care must be taken when selecting an umbrella species that maximizes ecosystem-wide benefits. This paper presents a combination of methods to quantitatively evaluate if keystone species, given their integral role in affecting the ecosystem where they reside, can also function as effective umbrellas for habitat management.

In a case study, we evaluate two imperiled keystone species, the gopher tortoise (Gopherus polyphemus) and the red-cockaded woodpecker (Leucomopicus borealis), within a global biodiversity hotspot, the longleaf pine (Pinus palustris) ecosystem of North American coastal plain. We 1) develop spatial habitat models in MaxEnt for 10 terrestrial vertebrate wildlife species of conservation interest across an 11 million hectare region, 2) identify the preferred umbrella candidate with spatially-explicit correlation and range overlap analyses using ENMTools, and 3) evaluate the effectiveness of the chosen umbrella species with a test of niche similarity and quantitative habitat suitability comparisons in ArcGIS.

Our results suggest the potential for an endemic keystone species to effectively function as an umbrella species. Specifically, we identified the gopher tortoise as the preferred umbrella, given the overlap in suitable habitat for 9 of 10 species evaluated in this ecosystem. These results are significant for habitat management within this region, but most importantly, this application of spatially-explicit modeling to quantitatively measure habitat suitability is an advance in approaches to habitat conservation planning.

This investigation successfully demonstrates our application of spatial habitat modeling for efficiently identifying umbrellas and provides additional evidence that keystone species can function as habitat conservation umbrellas and promote biodiversity. These results are of value for habitat management within this region, but more importantly, this efficient use of spatial habitat modeling to quantitatively measure habitat suitability is an effective advance in approaches to habitat conservation planning. While no model is completely accurate, we believe these methods yield substantial benefits for habitat conservation planning, which may be applied under limited availability of funding and resources as an approach to optimize the selection of a single umbrella species. We encourage others to use this accessible method to optimize their approach for managing, conserving, and restoring ecosystems.

Prescribed fire influences habitat selection of female eastern wild turkeys

ABSTRACT: Prescribed fire is widely used in southeastern pine (*Pinus* spp.) forests to maintain desirable forest conditions and provide early successional vegetation. However, it is unclear how fires applied just prior to and during the reproductive cycle of ground nesting Galliformes influence resource selection. We examined the short-term influence of prescribed fire on habitat selection of female eastern wild turkeys (*Meleagris gallopavo silvestris*) throughout their reproductive cycle (Feb–Aug) at Kisatchie National Forest in west-central Louisiana, USA during 2014 and 2015. Kisatchie was dominated (>60%) by pine stands managed with prescribed fire at a frequent (i.e., 1–3 yr) return interval. We captured 46 females and equipped them with backpack-style global positioning system (GPS) transmitters programmed to collect relocation data hourly from 0600 to 2000 each day. We used distance-based analysis to estimate selection or avoidance of vegetation communities relative to reproductive phenology of individual females. Hardwood and mixed-pine hardwood vegetation communities were selected for before and after reproductive efforts; hardwood stands were avoided during brooding. While laying their first clutch of the reproductive period, females selected mature pines burned 0–5 months prior. Females avoided mature pine stands 2 growing seasons post-burn prior to initiating their first nests. Females avoided mature pine stands 3 growing seasons post-burn when brooding. Turkeys did not select for pine stands that had experienced ≥3 growing seasons post-burn during any reproductive period, and may avoid these stands during pre-nesting and brooding. Frequent fire return intervals maintain vegetation communities that females select at some point during the reproductive season in pine-dominated landscapes.

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Functional relationships reveal keystone effects of the gopher tortoise on vertebrate diversity in a longleaf pine savanna

ABSTRACT: Keystone species are important drivers of diversity patterns in many ecosystems. Their effects on ecological processes are fundamental to understanding community dynamics, making them attractive conservation targets for ecosystem management. However, many studies assume keystone effects are constant. By developing functional relationships of species’ effects and assessing how they vary with context, we can design more efficient conservation strategies to maintain keystone impacts. The threatened gopher tortoise (*Gopherus polyphemus*) is presumed to be a keystone species promoting biodiversity in endangered longleaf pine ecosystems of the Southeastern Coastal Plain, USA. Although many commensals use tortoise burrows, their putative keystone influence on emergent diversity patterns lacks critical evaluation. We quantified the functional relationship between tortoise burrow density and non-volant vertebrate diversity in a longleaf pine savanna, located in central Florida. Tortoise burrow density had a positive effect on vertebrate diversity and evenness but did not affect species richness. This relationship was robust across fire disturbance regimes and was the primary factor explaining diversity at the local scale. Our results demonstrate keystone effects of the gopher tortoise through an ecosystem engineering mechanism. Continued gopher tortoise population declines will have large, negative impacts on vertebrate diversity in this biodiversity hotspot. Therefore, maintaining gopher tortoise populations is critical to effectively conserve dependent species and the function of endangered longleaf pine ecosystems. We show that developing a functional understanding of keystone relationships (not a binomial categorization) can lead to important insights into community processes.

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Upcoming Events

- **Turpentining in Florida: Past, Present, Future?**
  October 13, 2017. 9:30 am to 3:30 pm, Austin Cary Forest, Gainesville, FL. The Association of Consulting Foresters, University of Florida, and Society of American Foresters are pleased to host a program on this important part of Florida’s past, present, and future. Includes tour of the new A. Chester Skinner Jr. Turpentine Education Site at the Forest. Mark your calendar. SAF CFEs are pending. $15 fee covers program and lunch. Register at: https://tinyurl.com/y9u2d9ze


- **11th Southern Forestry and natural Resource Management GIS Conference. December 11-12, 2017.** The University of Georgia and the Warnell School of Forestry and Natural Resources invite researchers and professionals in forestry and natural resource management to a conference devoted to practical issues and advances in the use of geographic information systems (GIS) and related mapping and spatial technologies. [Click here for more information.](#)

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**CFEOR Mission:**
To develop and disseminate knowledge needed to conserve and manage Florida’s forest as a healthy, working ecosystem that provides social, ecological and economic benefits on a sustainable basis.

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