

Background, Scope, Methods, and References

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Most of the spatial information on species used in this analysis is provided by NatureServe (www.natureserve.org) and its network of natural heritage member programs, a leading source of information about rare and endangered species, and threatened ecosystems.

The National Atlas of the United States also provided some data layers used in this analysis.

This document is the result of an internal scoping and exploratory analysis based on publically available data and has not been peer-reviewed. We hope it will initiate discussion on effective and efficient pre-compliance management for at-risk species in the southeast.

BACKGROUND

In 2010, The Center for Biological Diversity filed a scientific petition with the U.S. Fish and Wildlife Service (FWS) to list 404 Southeastern aquatic, riparian and wetland species as threatened or endangered (CBD 2010). With continued legal pressure from the Center, the FWS agreed to a settlement to move forward in the protection process for several hundred species across the country, 364 of which occur in the Southeast (defined here as AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, and VA).¹ These 364 species join the 70 species already classified as candidates for listing in the region and the 330 already listed as threatened or endangered (FWS accessed May 2013). Altogether, that totals 764 species (hereafter referred to as “at-risk species”) in 11 southeastern states.²

Over 500 of these species have some aspect of their life history associated with aquatic, riparian, or wetland habitats and many of these species are interconnected members of the aquatic food web. Reptiles may consume mollusks, including mussels, as a primary food source. Mussels rely on fish as larval hosts and those fish rely on abundant fly larvae populations. Multi-species management plans aimed at protecting collective groups, rather than individual species, may prove to be both a more effective and a more efficient use of limited conservation resources.

Multi-species management remains a somewhat uncommon undertaking, at least in the context of programs authorized and implemented under Section 10 of the Act. As of February 2014, there were 421 plans or agreements recorded in Region 4. A vast majority (373) consisted of Habitat Conservation Plans (HCPs) with the balance falling under Candidate Conservation Agreements (CCAs - 29), Safe Harbor Agreements (SHAs - 12), and Candidate Conservation Agreements with Assurances (CCAAs - 6) (USFWS, 2014). Only 45 of these plans and agreements covered multiple species, however. Here again, HCPs dominated the count (33), followed by CCAs (8), SHAs (3), and CCAAs (1). Within multi-species plans and agreements, most covered only two species, and no plan or agreement covered more than five.

¹ THE CBD petition includes Texas and Oklahoma as part of the southeast and therefore has a different petitioned species count. Also, the Magnificent Rams-horn snail (*Planorbella magnifica*) has been moved from petitioned (2010) to candidate status (2012).

² This analysis is based on the 2010 CBD petition, the 2012 Federal Register listing of candidate species, and May 2013 download of already listed based on USFWS Environmental Conservation Online System: Threatened and Endangered Species. The numbers have since changed.

³ Source: USFWS Glossary (USFWS 2013)

FWS definitions³

Endangered – “The classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.”

Threatened – “The term “threatened species” means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range - - as defined in the Endangered Species Act.”

Candidate species – “Plants and animals that have been studied and the Service has concluded that they should be proposed for addition to the Federal endangered and threatened species list. These species have formerly been referred to as category 1 candidate species. From the February 28, 1996 Federal Register, page 7597: ‘those species for which the Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list but issuance of the proposed rule is precluded.’ “

Petition (Listing) – “A formal request, with the support of adequate biological data, suggesting that a species, with the support of adequate biological data, be listed, reclassified, or delisted, or that critical habitat be revised for a listed species.”

SCOPE, DATA SOURCES, AND GENERAL METHODS

Included Species. This analysis includes three categories of at-risk species: those that are already listed as threatened or endangered, those that are candidates for listing, and those that have been petitioned to be listed. Listed species are defined as those identified as endangered or threatened by the USFWS in Region 4, plus the state of Virginia. Candidate species were identified from the Federal Register, Docket No. FWS-R9-ES-2012-0050; MO-4500030113 (Vol. 77, No. 225, November 21 2012). Petitioned species were identified from a revised version of the Center for Biological Diversity's "Petition to List 404 Aquatic, Riparian, and Wetland Species from the Southeastern United States as Threatened or Endangered Under the Endangered Species Act" submitted on April 20, 2010 (Federal Register, Docket No. FWS-R4-ES-2011-0049).

Geographic Scope. This analysis includes 11 states in the southeastern U.S.: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. This extent includes all states within the USFWS defined Southeast Region, plus Virginia (Figure 1). Virginia was included as many of its ecosystems are similar to those in the Southeast Region. All of watershed regions 03 and 06 are included, as well as portions of 02, 05, 08, and 11. HUC8 watersheds that fall partially within the borders of the included states were included in their entirety.

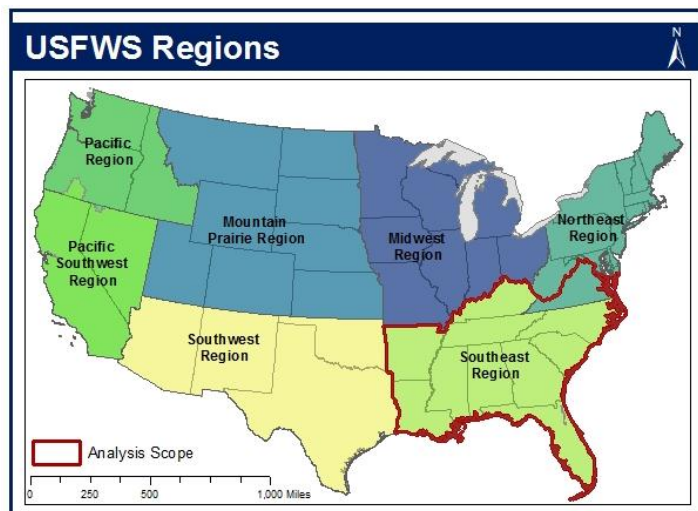


Figure 1: Overlay of analysis scope on USFWS defined regions.

General Methods and Data Sources. This analysis includes information on both species distributions and species characteristics. Spatial analysis was completed using ArcGIS 10.2 (ESRI) at both the county and watershed (HUC8) levels. Spatial information (county FIPS codes and watershed HUC8) was identified primarily using NatureServe's Explorer platform (www.natureserve.org/explorer/) and supplemented with the USFWS Species Profile platform (ecos.fws.gov/speciesProfile). Spatial information is incomplete as occurrence information is not thoroughly known for all species. Further, this analysis is based on presence/absence for an entire county or watershed, and is not based on element occurrence data.

Species characteristics include habitat, special habitat characteristics, mobility (dispersal capacity for plants), interspecific relationships, variation in habitat by life stage, and migratory behavior (Overview, Table 1; Details, Appendix 1). Most of this information was obtained via NatureServe's Explorer platform. However, this information was often supplemented with information from other sources as needed (Table 2). Very little is known about some species and therefore this information is not complete.

A Note on Habitat. NatureServe has several different levels of habitat designation, but not all species have information for all levels. This analysis incorporated two levels of habitat: one broad (riverine, estuarine, palustrine, lacustrine, forest, and woodland) and one more specific (28 sub-habitats of the broad categories, plus an additional 12 habitats) (Appendix 1). The broad habitats were chosen for two reasons: first, they had subcategories within NatureServe and second, using them enabled habitat information to be incorporated from other sources. For example, habitat information is not listed in NatureServe for several insect species. However, other sources would indicate that "riverine,"

“palustrine,” or “lacustrine” habitats were appropriate for those species. These broad categories have further distinctions within NatureServe for other species, but because the habitat information was identified through other sources, only the broad categories could be used for those insect species.

CHARACTERISTIC	CATEGORIES
Habitat: Broad	Riverine, Estuarine, Palustrine, Lacustrine, Forest, Woodland
Habitat: Specific	See Appendix 1
Special Habitat Factors	Benthic, Borrowing In/Using Soil, Subterranean Obligate, Fallen Log/Debris, Snags/Hollow Trees
Life Stage Habitat Variation	Yes, No
Interspecific Relationships	Yes, No
Mobility	Very Low, Low, Moderate, High, Very High
Migratory Behavior	Non-migratory, Locally Migrant, Long Distance Migrant

Table 1: Overview of species characteristics. See Appendix 1 for details on each category.

DATA SOURCES	
Amphibians	Amphibiaweb.org http://amphibiaweb.org/index.html
Birds	The Cornell Lab of Ornithology's Bird Guide http://www.allaboutbirds.org Buhlmann et al. (2008)
Insects	Butterflies and Moths of North America http://www.butterfliesandmoths.org/ Plecoptera Species File http://plecoptera.speciesfile.org
Fish	North Carolina Department of Environment and Natural Resources Fish Finder http://portal.ncdenr.org/web/mf/fish-finder
Mussels	North Carolina Wildlife Resources Commission http://216.27.39.101/Wildlife_Species_Con/WSC_FWMussels_EndFish_Mussels.htm
Vascular Plants	Weakley's Flora of the Southeastern and Mid-Atlantic States (Working Draft 30 Nov 2012) http://www.herbarium.unc.edu/flora.htm Flora of North America http://www.efloras.org/flora_page.aspx?flora_id=1 US Department of Agriculture Resource Conservation's Plants Database http://plants.usda.gov/java/ Center for Plant Conservation http://www.centerforplantconservation.org/
General Supplementation	IUCN Redlist iucnredlist.org
Location	NatureServe Explorer Platform https://www.natureserve.org/explorer/ USFWS Species Profile Platform http://ecos.fws.gov/speciesProfile

Table 2: Data Sources.

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APPENDIX 1:

DESCRIPTIONS OF SPECIES CHARACTERISTICS

TRAIT	CATEGORIES	DESCRIPTION
Special Habitat Factors	Benthic	
	Burrowing in or using soil	
	Fallen log/debris	
	Subterranean obligate	
	Standing snag/hollow tree	
Life Stage Habitat Var.	Yes	Having life stage habitat variation
	No	Not having life stage habitat variation
Interspecific Relationships	Yes	Having interspecific relationships with other species (not necessarily obligate)
	No	Not having interspecific relationships with other species
Mobility / Dispersal	Very Low	Very low mobility/dispersal capacity (generally cave species and amphipods)
	Low	Capacity of less than 100 meters
	Moderate	Capacity between 100 meters and 1 kilometer
	High	Capacity greater than 1 kilometer
	Very High	Capacity greater than several kilometers (generally migratory vertebrate species)
Migratory Behavior	None	Non-migratory
	Locally migrant	Locally migrant (up to several hundred meters)
	Long distance migrant	Long distance migrant

Table 1. Descriptions of non-habitat species characteristics.

HABITAT NAME		DESCRIPTION
Broad Habitat	Riverine	river habitats
	Estuarine	mixed freshwater and marine habitats
	Lacustrine	lake habitats
	Palustrine	temporary pools, wetlands, riparian habitats
	Forest	conifer, hardwood, and mixed forest habitats, plus forest edge
	Woodland	conifer, hardwood, and mixed woodland habitats
Specific Habitat	(Riverine) Big River	the largest streams, with large perennial flows, large quantities of nutrients and organic matter, high turbidity, and fine sediments
	(Riverine) Medium River	perennial tributaries of big rivers (or flowing directly into other water bodies), with coarse-to-fine sediments; riparian vegetation does not heavily dominate the community through shading and organic inputs
	(Riverine) Creek	smaller streams, sometimes characterized by heavy influence (shading, organic detritus) from adjacent terrestrial habitats; variable flow, sometimes intermittent
	(Riverine) Spring/Spring Brook	points of concentrated groundwater discharge, either concentrated (at a distinct orifice) or diffuse (at a seep); the outflow channel is classified as a spring brook as far downstream as the spring waters' characteristics (relatively constant temperature, nutrient-poor) are maintained
	(Riverine) High Gradient	streams with a fall of more than 2 meters per kilometer, characterized by riffles, pools, rock outcrops, and coarse sediments
	(Riverine) Moderate Gradient	streams with a fall between 0.2 and 2 meters per kilometers; bottom sediments are a mosaic of sand, gravel, and silt
	(Riverine) Low Gradient	streams with a fall less than 0.2 meters per kilometer; there may be sand bars, but the sediments are mostly silt
	(Riverine) Riffle	shallow area where water passing over the bottom causes visible disturbances (ripples) at the water surface
	(Riverine) Pool	discrete areas where the water is relatively still and usually deeper than adjacent waters
	(Estuarine) Bay/Sound	subtidal (continuously submerged), open water, estuarine habitats, excluding river mouths
	(Estuarine) River Mouth / Tidal River	lower reaches of rivers with both brackish water and tidal influence
	(Estuarine) Tidal Flat/Shore	non-vegetated zone of wave or tidal action, intermittently exposed or inundated
	(Estuarine) Herbaceous Wetland	N/A
	(Lacustrine) Shallow Water	the littoral zone, characterized by the frequent presence of rooted aquatic plants, disturbance by wave action, and periodic exposure during drawdown (i.e. during drought)
	(Palustrine) Temporary Pool	small depressions in which surface water is present for extended periods (especially early in the growing season) but is absent by the end of the season in most years; "seasonally flooded"
	(Palustrine) Herbaceous Wetland	N/A
	(Palustrine) Scrub-Shrub Wetland	N/A
	(Palustrine) Forested Wetland	N/A
	(Palustrine) Bog/Fen	wetlands with peat or muck substrate resulting from unusual water chemistry; includes areas of highly mineralized groundwater discharge (e.g., many fens) as well as sterile rainwater catch-basins (e.g., many bogs) and other peatlands
	(Palustrine) Riparian	a narrow zone of habitats, which may or may not be vegetated, directly associated with streambanks or lake shores, or similar immediately adjacent habitat

Table 2. Descriptions of habitat types used in the cluster analysis (continued on next page).

Source: NatureServe Explorer (http://www.natureserve.org/explorer/glossary/gloss_a.htm) – Note: not all categories are described by NatureServe.

HABITAT NAME		DESCRIPTION
Specific Habitat	(Forest) Hardwood Forest	N/A
	(Forest) Mixed Forest	N/A
	(Forest) Conifer Forest	N/A
	(Forest) Forest Edge	N/A
	(Woodland) Hardwood Woodland	N/A
	(Woodland) Mixed Woodland	N/A
	(Woodland) Conifer Woodland	N/A
	Forest/Woodland	N/A
	Savanna	N/A
	Old Field	successional habitat composed of a mosaic of shrubs, scattered trees, and herbaceous vegetation
	Grassland / Herbaceous	N/A
	Bare Rock/Talus/Scree	unvegetated bedrock or broken rock
	Subaquatic	underground water habitats (above and below water table)
	Subterrestrial	subterranean air-filled habitats (caves and soil)
	Sand/Dune	beach or sand dune habitats
	Cropland/Hedgerow	cultivated fields and field borders
	Scrub	primarily referring to Florida scrub habitat
	Marine Near Shore	coastal subtidal marine habitats, extending outward as far as wave action and light penetration to the bottom
	Cliff	vertical or nearly vertical cliff outcrops
	Barrens	N/A