Maximum Threatened and Endangered Vertebrate Species: Southeast

This EnviroAtlas national map displays the maximum number of threatened and endangered vertebrate species with potential habitat within each 12-digit hydrologic unit (HUC) in 9 southeastern states. These data are based on habitat models rather than wildlife counts. Potential habitat may be specific to wintering, breeding, or year-round activities depending on the species.

Why are threatened and endangered vertebrate species important?

Threatened species are vulnerable to multiple impacts from human development and they risk becoming endangered. Endangered species face extinction throughout all or much of their range. The Endangered Species Act (ESA) creates a mechanism to review petitions for classifying and federally listing species in these two categories. The act provides federal protections such as restrictions on taking or selling listed species, individual species recovery plans, and acquisition of habitat. Despite these protections, threatened and endangered vertebrate species continue to risk extinction from habitat loss, pollution, climate change, disease, and competition from invasive species. Some of the most endangered species in the Southeast include the red wolf, red-cockaded woodpecker, wood stork, and gopher tortoise.

The loss of these species may negatively affect the function of ecosystems and the benefits they provide. The removal of even one species from an ecosystem can create a trophic cascade that can affect the entire food chain. For example, grazers and browsers directly modify the species composition, diversity, and condition of grassland and forest habitats. Top predators, by regulating herbivore numbers, indirectly influence habitat condition and diversity by reducing grazing pressure on plant production.[1] The loss of a top predator like the red wolf removed population controls on white-tailed deer. Without predators, unchecked populations of deer degraded forest understories, affecting other species' habitat. Absence of the red wolf also allowed an increase in mid-sized predators like raccoon, fox, and coyote. Released from predation by red wolves, increased numbers of raccoons seasonally and opportunistically feed on eggs and nestlings, reducing the populations of songbirds, turkeys, quail, and the threatened gopher tortoise. Coyote is not native to the Southeast, but it has invaded in the last few decades to fill the void left by the extirpated red wolf. Today, one of the biggest obstacles to the reintroduction of the red wolf is the possible dilution of red wolf genes through hybridization with coyote.[2]


Photo: Red wolf, C. Carley

The red-cockaded woodpecker and the gopher tortoise are 2 of 29 federally-listed wildlife species of the longleaf pine ecosystem. The gopher tortoise has declined 80% in the last century as longleaf pine forests have been converted to pine plantations, agriculture, and housing. The tortoise is considered a keystone species in the longleaf pine ecosystem because its sand burrows provide shelter for over 300 other species (e.g., burrowing owl, indigo snake).[3]

In addition to their roles within ecosystems, threatened and endangered vertebrate species attract local tourism through their recreational, cultural, and aesthetic values.

How can I use this information?

The map, Maximum Modeled Threatened and Endangered Vertebrate Species: Southeast, is one of three EnviroAtlas maps that illustrate threatened and endangered vertebrate species richness for the Southeast. Additional EnviroAtlas maps show the mean threatened and endangered vertebrate species richness and a Normalized Index of Biodiversity (NIB) for each 12-digit HUC.[4] These maps can help identify areas of potentially low or high species richness to help inform decisions about resource restoration, use, and conservation. The maps can also be used in conjunction with other maps in EnviroAtlas such as protected areas (PADUS), connectivity, or GAP ecological systems to help identify areas with high ecological or recreational value for inclusion in conservation, recreation, or restoration planning.

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After learning the threatened and endangered species richness values for a particular 12-digit HUC, users can investigate an area more intensively by using higher resolution individual species models available through the Southeast Regional Gap Analysis Project (SEGAP).

How were the data for this map created?

This data layer is based on data generated by the U.S. Geological Survey (USGS) National Gap Analysis Program (GAP). The GAP program maps the distribution of natural vegetation communities and potential habitat for individual terrestrial vertebrate species. These models utilize predictive environmental variables (e.g., GAP land cover, elevation, distance to water) to derive deductive habitat models for each species.

Southeast GAP modeled habitat for 24 threatened and endangered vertebrate species that reside, breed, or use the habitat within 9 southeastern states for a significant portion of their life history. Species richness was calculated by combining predicted habitat for all GAP individual threatened and endangered vertebrate species by pixel across the 9 states. The number of threatened and endangered vertebrate species in each pixel was summarized by 12-digit HUC and the maximum value noted for each HUC.

What are the limitations of these data?

EnviroAtlas uses the best data available, but there are still limitations associated with these data. These data, based on models and large national geospatial databases, are estimations of reality that may overestimate actual threatened and endangered species presence. Modeled data are intended to complement rather than replace monitoring data. Habitat models do not predict the actual occurrence of species, but rather their potential occurrence based on their known associations with certain habitat types. Habitat is only one factor that determines the actual presence of a species. Other factors include habitat quality, predators, prey, competing species, and fine scale habitat features.

Other essential species information in addition to species richness includes the types of species and their functional groups, whether they are rare or common, native or non-native, tolerant or intolerant of disturbance. It is also important to consider that species numbers (at a landscape scale) tend to increase with moderate disturbance, meaning that moderately human-altered or disturbed habitats have higher numbers of species than either minimally disturbed or highly disturbed sites. [5]

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. Metric values for individual pixels may be obtained from the New Mexico State University Center for Applied Spatial Ecology. Individual species data may be obtained from the SEGAP geo-data server.

Where can I get more information?

A selection of resources related to threatened and endangered species and biodiversity is listed below. Information on the models and data used in the USGS GAP and SEGAP projects is available on their respective websites. For additional information on how the data were created, access the metadata for the data layer from the drop down menu on the interactive map table of contents and click again on metadata at the bottom of the metadata summary page for more details. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

Acknowledgments

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Selected Publications

1. Ripple, W.J., and R.L. Beschta. 2005. Linking wolves and plants: Aldo Leopold on trophic cascades. *Bioscience* 55(7):613–621.

2. Phillips, M.K., V.G. Henry, and B.T. Kelly. 2003. Restoration of the red wolf. Paper 234, USDA National Wildlife Research Center, Lincoln, Nebraska.

3. Van Lear, D.H., W.D. Carroll, P.R. Kapeluck, and R. Johnson. History and restoration of the longleaf pine-grassland ecosystem: Implications for species at risk. *Forest Ecology and Management* 211:150–165.

4. Kepner, W.G., K.G. Boykin, D.F. Bradford, A.C. Neale, A.K. Leimer, and K.J. Gergely. 2011. Biodiversity metrics fact sheet, EPA/600/F-11/006, U.S. Environmental Protection Agency, Washington, D.C.

5. Marzluff, J.M. 2008. Island biogeography for an urbanizing world: How extinction and colonization may determine biological diversity in human-dominated landscapes. *Urban Ecosystems* 8:155–177.