Maximum Reptiles Species Richness: Southeast

This EnviroAtlas national map displays the maximum number of reptile species with potential habitat within each subwatershed (12-digit 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 reptile species important?

Reptile species richness estimates the number of reptile species that may inhabit an area based on potential habitat. Species richness is frequently used as a surrogate for measuring biodiversity and as a measure of the relative conservation value of a particular area. Many scientists believe that biodiversity, because it represents all forms of life on earth, provides or supports the core benefits that humans derive from their environment and helps sustain human culture worldwide. Many organizations consider managing for biodiversity as one way to achieve an acceptable balance among competing demands for various ecosystem services.[1]

Each species plays an important role within its ecosystem, and ecosystems are highly interconnected. Each species depends on others for some aspect of its survival to provide food, habitat, decomposition, pollination, or control of pest species. The removal of even one species from an ecosystem can create a trophic cascade that can affect the entire food chain.

Reptile species include turtles, snakes, lizards, and alligators, a diverse group of vertebrate species that play a vital role in ecosystems. They are an integral part of the food web, acting as both predators and prey species. Many reptiles feed on pests, such as insects and rodents, which helps to limit damage to plants and cultivated crops. Herbivorous reptiles can be important seed dispersers and pollinators. Some reptiles, such as the gopher tortoise and alligator, may be keystone species in their respective habitats.

Reptile species can also be important to human health and the development of pharmaceuticals. For example, substances taken from snakes have been used to develop antimicrobials, anticoagulants, and painkillers, as well as drugs to treat hypertension and high cholesterol.[2] Maintaining the diversity and richness of reptiles allows for the possible future discovery of more valuable treatments.

Reptiles are also economically and culturally important. Many people enjoy simply viewing reptiles and they seek them out in their natural habitats. Three groups of North American reptiles—snakes, turtles, and crocodilians—have their highest species richness in the southeastern United States.[3] However, reptile numbers there have been reduced by development, road kill, habitat loss, predation, and pesticides. One of the more prominent threatened reptile species in the Southeast is the gopher tortoise, which has declined with the disappearance of the southern longleaf pine ecosystem.[3]

How can I use this information?

The map, Maximum Reptile Species Richness: Southeast, is one of three EnviroAtlas maps that illustrate indicators of reptile species richness for the Southeast. Other EnviroAtlas maps show the mean reptile species richness and a Normalized Index of Biodiversity (NIB) for each 12-digit HUC.[4] Used together or independently, these maps can help identify areas of potentially low or high reptile species richness to help inform decisions about resource restoration, use, and conservation.

These maps can be used in conjunction with other maps in EnviroAtlas such as protected areas (PADUS) or GAP ecological systems to help identify areas with high ecological or recreational value for inclusion in conservation, recreation, or restoration planning. Connectivity planning is also important for reptiles because their life cycles often require traveling between upland and wetland habitats.

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After learning the reptile 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, and distance to water) to derive deductive habitat models for each species.

Southeast GAP modeled habitat for 124 reptile species that reside, breed, or use the habitat within 9 southeastern states for a significant portion of their life history. Reptile species richness was calculated by combining predicted habitat for all GAP individual reptile species by pixel across the 9 states. The number of reptile species in each pixel was summarized by 12-digit HUC and the maximum species richness 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. The data, based on models and large national geospatial databases, are estimations of reality that may overestimate actual reptile 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 reptiles 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 more information on the data creation process for EnviroAtlas, access the metadata found in the drop-down menu for each map layer. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

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Selected Publications

1. Boykin, K.G., W.G. Kepner, D.F. Bradford, R.K. Guy, D.A. Kopp, A. Leimer, E. Samson, F. East, A. Neale, and K. Gergely. 2013. A national approach for mapping and quantifying habitat-based biodiversity metrics across multiple spatial scales. *Ecological Indicators* 33:139–147.

2. USDA, APHIS. 2011. The Reptile and Amphibian Communities in the United States. Accessed February 2014.

3. Bailey, M.A., J.N. Holmes, K.A. Buhlmann, and J.C. Mitchell. 2006. Habitat management guidelines for amphibians and reptiles of the southeastern United States. Partners in Amphibian and Reptile Conservation Technical Publication HMG-2, Montgomery, Alabama. 88 p.

4. Kepner, W.G., K.G. Boykin, D.F. Bradford, A.C. Neale, A.K. Leimer, and K.J. Gergely. 2013. Biodiversity Metrics Fact Sheet, EPA/600/F-11/006, U.S. Environmental Protection Agency, Washington, D.C.

5. Marzluff, J.M. 2005. Island biogeography for an urbanizing world: How extinction and colonization may determine biological diversity in human-dominated landscapes. *Urban Ecosystems* 8:155–177.