Maximum Mammal Species Richness: Southeast

This EnviroAtlas national map displays the maximum number of mammal 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 mammal species important?

Mammal species richness estimates the number of mammal 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 areas 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.

Mammals are a diverse group of vertebrates that play important roles in ecosystems as herbivores, carnivores, insect and carrion feeders, plant pollinators, and seed dispersers. Mammals in these various roles affect their habitats by modifying vegetation composition, diversity, and condition. For example, grazers and browsers directly modify the species composition and condition of grassland and forest habitats. Top predators, by regulating herbivore numbers, indirectly influence habitat condition by reducing grazing pressure on plant production. A predator-prey balance, now lost in many ecosystems in the Southeast, helps to maintain vegetation and wildlife species diversity.[2]

Mammals are economically and culturally important. Many people enjoy simply viewing mammals and they seek them out in their natural habitats. For example, elk, recently re-introduced to Great Smoky Mountains National Park, attract visitors to the Cataloochee Valley, where they may also see


Photo: Steve Hillebrand, USFWS

white-tailed deer. Mammals are an important food source. Big game hunting has a long tradition in the U.S.; in 2011, about 85% of hunters pursued large mammals.[3] The presence of large mammals creates revenue from federal excise taxes and hunting licenses, which is used to support conservation efforts, land acquisition, and wildlife restoration projects.

How can I use this information?

The map, Maximum Mammal Species Richness: Southeast, is one of three EnviroAtlas maps that illustrate indicators of mammal species richness for the Southeast. Other EnviroAtlas maps show the mean mammal 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 mammal species richness to help inform decisions about resource restoration, use, and conservation. Knowing mammal species richness is one element of biodiversity conservation.

The maps can 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. Connectivity planning is also important for mobile mammal species with large territories.

After learning the mammal species richness values for a particular 12-digit HUC, users can investigate an area more intensively by using higher resolution individual species

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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 97 terrestrial mammal species that reside, breed, or use the habitat within 9 southeastern states for a significant portion of their life history. Mammal species richness was calculated by combining predicted habitat for all GAP individual mammal species by pixel across the 9 states. The number of mammal 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. The data, based on models and large national geospatial databases, are estimations of reality that may overestimate actual mammal 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 mammals 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.

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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. Miller, B., B. Dugelby, D. Foreman, C. Martinez del Rio, R. Noss, M. Phillips, R. Reading, M. E. Soulé, J. Terborgh, and L. Wilcox. 2001. The importance of large carnivores to healthy ecosystems. *Endangered Species Update* 18(5):202–210.

3. U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2013. 2011 National survey of fishing, hunting, and wildlife-associated recreation, FHW/11-NAT (RV), Washington, D.C.

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.