



Maximum Waterfowl Species Richness: Southeast

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

Why are waterfowl species important?

Waterfowl are defined as a group of swimming birds from the family Anatidae, including ducks, geese, and swans. Waterfowl species richness estimates the number of different waterfowl species that may inhabit an area based on their range and 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 in its [ecosystem](#). Within a [food chain](#), waterfowl serve as a food source for other wildlife and function as [primary](#) and [secondary consumers](#), with various species feeding on plant material, invertebrates, fish, and aquatic and terrestrial insects. Waterfowl disperse aquatic and terrestrial plant seeds, which can influence the distribution of (both native and non-native) plant species locally or over longer distances.²

Waterfowl also influence ecosystems by moving nutrients between wetland and terrestrial habitats. Studies have shown that waterfowl can deposit 40% of the nitrogen and 75% of the phosphorus entering a wetland.² In the Southeast, nutrients deposited in waterbodies by waterfowl accumulate mostly during wintering, when bird densities increase over smaller areas. According to [Ducks Unlimited](#), two-thirds of North America's waterfowl winter in the southern states, meaning that maintaining quality waterfowl habitat in the Southeast is critical to the health of the North American population. Private landowners play an important role in providing winter waterfowl habitat by flooding their fields.



Photo: Hooded Merganser, Tim McCabe, USFWS

In addition to the important roles that waterfowl play in our ecosystems, they are also a popular food source. Waterfowl hunting has a long tradition in the U.S. A recent national survey found that ducks were the most sought after group of migratory birds hunted in the U.S. In 2011, hunters spent 23 million days hunting birds such as waterfowl and other game birds, which generated \$1.8 billion for the U.S. economy.³ Waterfowl are also appreciated by wildlife-watchers for their aesthetic beauty and the recreational opportunities they provide. There are an estimated 46.7 million birdwatchers in the U.S. and waterfowl are the most highly-viewed group of birds. In total, wildlife viewing contributed almost \$55 billion to the U.S. economy in 2011.³

How can I use this information?

The map, Maximum Waterfowl Species Richness: Southeast, is one of three EnviroAtlas maps that illustrate indicators of waterfowl species richness for the Southeast. Other EnviroAtlas maps show the mean waterfowl 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 low or high potential waterfowl species richness to help inform decisions about resource restoration, use, and conservation.

These maps can also 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.

After learning the waterfowl 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 28 waterfowl species that reside, breed, or use the habitat within the 9 southeastern states for a significant portion of their life history. Waterfowl species richness was calculated by combining predicted habitat for all GAP individual waterfowl species by pixel across the 9 states. The number of waterfowl 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. These data, based on models and large national geospatial databases of predicted habitat, are estimations of reality that may overestimate actual waterfowl 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](#)

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. Sekercioglu, C.H. 2006. [Increasing awareness of avian ecological function](#). *Trends in Ecology and Evolution* 21(8):464–471.
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.

[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 biodiversity and waterfowl 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

The data for Waterfowl Species Richness were created through a collaborative effort between the USGS GAP and EPA. Kenneth Boykin and graduate students from New Mexico State University generated the data. The data used to derive southeastern waterfowl species richness came from SEGAP and the Biodiversity and Spatial Information Center ([BaSIC](#)) at North Carolina State University. The fact sheet was written by Kenneth Boykin, New Mexico State University, Anne Neale and William Kepner, EPA, Patrick Johnson, EPA Student Services Contractor, and Sandra Bryce, Innovate!, Inc.