Maximum Waterfowl Species Richness: Southwest

This EnviroAtlas national map displays the maximum number of waterfowl species with potential habitat within each 12-digit hydrologic unit (HUC) in the southwestern United States (Arizona, Colorado, Nevada, New Mexico, and Utah). Waterfowl refers to any type of goose, duck, or swan. 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 waterfowl species important?

Waterfowl species richness estimates how many different waterfowl species may inhabit an area based on potential habitat. Species richness is frequently used as a measure of the relative conservation value of a particular area. It has been used as a surrogate for measuring biodiversity. Many scientists believe 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 throughout the world. Therefore, many organizations consider managing areas for biodiversity as a means to achieve an acceptable balance among competing demands for various ecosystem services. Waterfowl species richness is one indicator of biodiversity within an area.

Each species plays an important role within its ecosystem and the food web. Within the food chain, waterfowl function as primary and secondary consumers and as a food source for other wildlife. They can play a role in dispersing aquatic and terrestrial plant seeds, which can influence the distribution of plant species in the environment. Moreover, waterfowl can influence ecosystems by moving nutrients across habitats and the landscape.[1]

In addition to the important roles that waterfowl play in our ecosystems, they are also a popular harvestable species and an important food source. Waterfowl hunting has a long tradition in the U.S. and continues to be a popular activity today. According to the U.S. Fish and Wildlife Service, 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 doves, which generated $1.8 billion for the U.S. economy.

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.[2] Waterfowl provide recreation, cultural, and aesthetic value to wetlands and water features.


Photo: George Gentry/USFWS

How can I use this information?

The map, Maximum Waterfowl Species Richness: Southwest, is one of three EnviroAtlas maps that illustrate indicators of waterfowl species richness for the Southwest. Additional EnviroAtlas maps show the mean waterfowl species richness and a Normalized Index of Biodiversity (NIB) for each 12-digit HUC. Used together or independently, these maps can help identify areas of potentially low or high waterfowl species richness to help inform decisions about resource restoration, use, and conservation. Knowing the waterfowl species richness provides one aspect necessary to conserve biodiversity.

These maps can also be used in conjunction with other maps in EnviroAtlas to help identify areas with high ecological or recreational value for inclusion in conservation or restoration planning or protected from development for recreational or aesthetic reasons. This information can help identify areas that may be vulnerable to development.

After learning the waterfowl species richness values for a particular 12-digit HUC, an area can be more intensively investigated by using individual species models at a higher resolution. Individual species models are available through the Southwest Regional Gap Analysis Project (SWReGAP).

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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.

A component of GAP, SWReGAP modeled habitat for 25 waterfowl species that reside, breed, or use the habitat within the 5-state Southwest study area 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 Southwestern United States. The number of waterfowl species in each pixel was then summarized by 12-digit HUC and the maximum value for each HUC was calculated. For more information on these methods, see the layer's metadata or the publications below.

What are the limitations of these data?

EnviroAtlas uses the best data available, but there are still limitations associated with the data. These data are based on models and large national geospatial databases. Calculations based on these data are estimations of the truth founded on the best available science. Modeled data can be complementary but the information is not meant to replace monitoring data. Habitat models do not predict the actual occurrence of species, but rather their predicted 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 such as woody debris.

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. SWReGAP and GAP data and accuracy information can be accessed through their respective websites.

Where can I get more information?

There are numerous resources about the importance of waterfowl and on biodiversity in general; a selection of these resources is below. Additional information on the models and data used in the USGS GAP and SWReGAP projects are 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

EnviroAtlas is a collaborative effort led by EPA. The data for Waterfowl Species Richness were created through a collaborative effort between the USGS GAP and EPA. The data were generated by Kenneth Boykin and graduate students from New Mexico State University. The data used to derive Waterfowl Species Richness came from SWReGAP. The fact sheet was written by Kenneth Boykin, New Mexico State University, Anne Neale and William Kepner, EPA, and Patrick Johnson, EPA Student Services Contractor.

Selected Publications

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2. 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.

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