Maximum Bird Species Richness - Southwest

This EnviroAtlas national map displays the maximum number of bird species with potential habitat within each subwatershed (12-digit HUC) in the southwestern United States (Arizona, Colorado, Nevada, New Mexico, and Utah). These data are based on habitat models, and not wildlife counts. The potential habitat may be specific to wintering, breeding, or year-round activities depending on the species.

Why are bird species important?

Bird species richness estimates how many different bird species may inhabit an area, based on potential habitat. Species richness, or diversity, 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, as 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 a means to achieve an acceptable balance among competing demands for various ecosystem services. Bird species richness is one indicator of biodiversity within an area.

Each species, regardless of type or size, plays an important role within its ecosystem. Ecosystems are highly interconnected, with numerous food chains that form a food web, where all species have a vital function. Each species depends on other species for some aspect of their survival, whether it is to provide habitat, to serve as food source, to decompose matter, for the pollination of plant species, or for the control of pest species. Thus, the removal of even one species from an ecosystem could potentially have cascading effects throughout the system.

Bird species are important to humans for many reasons and are the focal point of many non-profit organizations and citizen science data collection efforts. Ecologically, birds are part of the food chain and help control insect populations. Additionally, several studies have shown that areas with low bird diversity may have higher risks of diseases such as lyme disease and West Nile virus.[1]

Bird-watching is a popular pastime that can contribute to the economy, as well as human physical and cultural well-being. A 2009 U.S. Fish and Wildlife Service report estimated that there are 48 million birdwatchers in the U.S. who contributed $36 billion to the economy as a result of bird-watching activities.[2] A rich diversity of birds in an area can bring tourist dollars to a community and enjoyment to local residents.

Photo: Dave Menke/USFWS

How can I use this information?

The map, Maximum Bird Species Richness – Southwest, is one of three EnviroAtlas maps that illustrate indicators of bird species richness for the southwest. Additional EnviroAtlas maps show the mean, or average, species richness for each 12-digit HUC and an index of bird species richness for each HUC. Used together or independently, these maps can help identify areas of potentially low or high bird species richness to help inform decisions about resource restoration, use, and conservation. Knowing the bird 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, protection from further development, or highlighted for recreational or aesthetic reasons. This information can help identify areas that may be vulnerable to development.

After finding out the bird 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 435 bird species that reside, breed, or use the habitat within the 5-state Southwest study area for a significant portion of their life history. Bird species richness was calculated by combining predicted habitat for all GAP individual bird species by pixel across the Southwestern United States.

The number of bird species in each pixel was then summarized by subwatershed (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 these 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 are 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.

Accuracy information for the SWReGAP and GAP projects can be found on their respective web sites. For more technical details about the limitations of these data, refer to the layer's metadata.

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 can be accessed through their respective websites.

Where can I get more information?

There are numerous resources about the importance of birds 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. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

Acknowledgements

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Selected Publications

[1] Keesing, F., L.K. Belden, P. Daszak et al. 2010. Impacts of Biodiversity on the emergence and transmission of infectious diseases. Nature 468, 647-52.

[2] U.S. Fish and Wildlife Service. 2009. Birding in the United Sates: A Demographic and Economic Analysis. Addendum to the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation. Accessed March 2013.

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Boykin, K.G., B.C. Thompson and S. Propeck-Gray. 2010. Accuracy of southwest regional gap analysis project habitat models in predicting physical features for habitat associations. Ecological Modelling 221:2769-2775.

Kepner, W. G., K. G. Boykin, D. F. Bradford, A. C. Neale, A. K. Leimer, and K. J. Gergely. 2011. Biodiversity Metrics Fact Sheet. U.S. Environmental Protection Agency, Washington, DC, EPA/600/F-11/006.

Prior-Magee, J.S., K.G. Boykin, D.F. Bradford, W.G. Kepner, J.H. Lowry, D.L. Schrupp, K.A. Thomas, and Bruce C. Thompson, Editors. 2007. Southwest Regional Gap Analysis Project Final Report. U.S. Geological Survey, Gap Analysis Program, Moscow, ID.