NIB Total Vertebrate Species Richness: Southwest

This EnviroAtlas national map displays the Normalized Index of Biodiversity (NIB), an index value for vertebrate species richness based on potential habitat within each 12-digit hydrologic unit (HUC) in the southwestern United States (Arizona, Colorado, Nevada, New Mexico, and Utah). These data are based on habitat models, not wildlife counts. Potential habitat may be specific to wintering, breeding, or year-round activities depending on the species.

Why are vertebrate species important?

Total vertebrate species richness estimates how many different vertebrate 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 that biodiversity, because it represents all forms of life on earth, provides or supports the core benefits that humans derive from their environment. Thus, biodiversity 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. Total vertebrate species richness is one indicator of biodiversity within an area.

Each species 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 for habitat, food, decomposition, pollination, or pest control. The removal of even one species from an ecosystem could potentially have cascading effects throughout the system.

Vertebrate species richness can be indicative of recreational opportunities or aesthetic qualities. Vertebrate species such as big game and birds are often mentioned in tourist brochures to highlight the recreational opportunities available within an area. Vertebrate species richness has been used as an indicator of the biodiversity conservation potential of an area and is considered an important indicator of biodiversity hot spots.

There are some people who believe that humans have a self-sustaining reason to preserve biodiversity, while others believe we have a moral obligation. There are some characteristics of biodiversity that are valued by an even


Photo: Ryan Hagerty/USFWS

larger segment of the population, and thus they are important to include in any assessment that seeks to identify and quantify the value of ecosystems to humans. Some biodiversity metrics clearly reflect ecosystem services and their contribution to our quality of life and economy (e.g., abundance and diversity of game species), whereas others reflect indirect and difficult to quantify relationships to services (e.g., relevance of species diversity to ecosystem resilience, cultural value and aesthetic values).

How can I use this information?

The map, NIB Total Vertebrate Species: Southwest, is one of three EnviroAtlas maps that illustrate indicators of vertebrate species richness for the Southwest. Additional EnviroAtlas maps show the maximum and mean species richness for each 12-digit HUC. Used together or independently, these maps can help identify areas of potentially low or high vertebrate species richness to help inform decisions about resource restoration, use, and conservation. Knowing vertebrate 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 protection from further development for recreational or aesthetic reasons. This information can help identify areas that may be vulnerable to development. Connectivity planning and estimation of species' minimum area requirements are important considerations for mobile species with large territories.

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After finding out the total vertebrate 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).

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 vertebrate species that reside, breed, or use the habitat within the 5-state Southwest study area for a significant portion of their life history. Vertebrate species richness was calculated by combining predicted habitat for all GAP individual vertebrate species by pixel across the southwestern United States. The number of vertebrate species in each pixel was then summarized by 12-digit HUC and the mean value calculated for each HUC. The NIB was calculated by dividing the mean value by the maximum value for each HUC.

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 the 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 vertebrate species and on biodiversity in general; a selection of these resources is listed below. 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

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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.