Partners in Amphibian and Reptile Conservation Species Richness

These EnviroAtlas national maps display the number of Partners in Amphibian and Reptile Conservation (PARC) Species with potential habitat within each 12-digit hydrologic unit (HUC) in the conterminous United States. These data are based on habitat models, not wildlife counts.

Why are vulnerable reptile and amphibian species important?

The metric, Partners in Amphibian and Reptile Conservation (PARC) Species Richness, estimates the numbers of vulnerable (threatened or endangered) amphibian and reptile species that may inhabit an area based on potential habitat.[1] The Priority Amphibian and Reptile Conservation Areas (PARCAs) project focuses on portions of the landscape that serve a disproportionate role in the conservation of vulnerable reptile and amphibian species in each state. PARCAs must meet rigorous, transparent, and science-based criteria for eligibility. Specifically, in addition to landscape integrity, PARCAs include one or more of the following four criteria: 1) presence of globally or nationally vulnerable species, 2) presence of state imperiled species, 3) presence of state rare species or species of high regional responsibility, and 4) presence of an exceptional diversity of amphibian and/or reptile species. This ensures that PARCAs represent important targets for reptile and amphibian conservation.

Species richness is one measure of biodiversity that represents a metric 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 to sustain human society, economy, health, and well-being. Managing for biodiversity is one way to balance competing demands for ecosystem services.[2]

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. Amphibians and reptiles are secondary consumers in many food chains, acting as both predators and prey species. Amphibian and reptile species help control pest populations; both groups consume large quantities of insects and reptiles also prey on rodents. The removal of even one species from an ecosystem can create a trophic cascade that can affect the entire food chain.


Photo: Shenandoah salamander, B. Bratwicke, USFWS

Characteristics of biodiversity are valued in a variety of ways and they are important to include in any assessment that seeks to identify and quantify the value of ecosystems to humans. Some biodiversity metrics directly represent 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 amenities).

How can I use this information?

Three EnviroAtlas maps, Mean, Maximum, and Normalized Index of Biodiversity (NIB), illustrate PARC species richness for the conterminous United States. Used together or independently, these maps can help identify areas of low or high potential amphibian and reptile species richness to help inform decisions about resource restoration, use, and conservation. Mean richness is a commonly used and understood value for comparison. NIB provides an index to compare a metric with other metrics across multiple project scales simultaneously. Maximum richness identifies areas that are species rich but may not occupy large areas (e.g. linear riparian areas).

These maps can be used in conjunction with other maps in EnviroAtlas such as ecoregions, the U.S. Geological Survey (USGS) protected areas database (PAD-US), or the USGS Gap Analysis Project (GAP) ecological systems to identify areas with high ecological or recreational value for conservation, recreation, or restoration planning. After

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learning the Partners in Amphibian and Reptile Conservation Richness values for a particular 12-digit HUC, users can investigate an area more intensively by using individual species models available from the GAP Project.

How were the data for this map created?

The USGS GAP project maps the distribution of natural vegetation communities and potential habitat for individual terrestrial vertebrate species. These models use environmental variables (e.g., land cover, elevation, and distance to water) to predict habitat for each species. GAP modeled habitat for 1,590 terrestrial vertebrate species that reside, breed, or use the habitat within the conterminous U.S. for a significant portion of their life history; the total number of species included 322 reptiles and 282 amphibians. This map uses Partners in Amphibian and Reptile Conservation (PARC) Species predicted habitat within the conterminous United States. Areas mapped contained one or more species listed as either: a) endangered or threatened under the U.S. Endangered Species Act; b) critically endangered or endangered in the IUCN Red List; or c) globally critically imperiled (G1), imperiled (G2) or vulnerable (G3) in the NatureServe classification.

Predicted habitat for the selected 166 PARC species was combined to calculate PARC Species Richness by pixel. Of the 166 species, 102 were amphibians, and 64 were reptiles. The mean and maximum numbers of terrestrial vertebrate species in each 30-meter pixel were calculated for each 12-digit HUC. The mean species richness value by HUC was divided by the maximum mean value within all HUCs to calculate the NIB.

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 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.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. Individual 30-meter pixel data may be downloaded from the New Mexico State University Center for Applied Spatial Ecology.

Where can I get more information?

A selection of resources related to reptiles, amphibians, and biodiversity is listed below. Information on the models and data used in the USGS Core Science Analytics, Synthesis & Library's GAP project is available on their website. For additional information on how the data were created, access the metadata for the data layer from the layer list drop down menu. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

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Selected Publications

1. Sutherland, R., and P. deMaynadier. 2012. Model criteria and implementation guidance for a Priority Amphibian and Reptile Conservation Area (PARCA) system in the USA. Partners in Amphibian and Reptile Conservation, Technical Publication PARCA-1. 28 pp.

2. 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.

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. (Fact sheet for the original regional habitat models for southeastern and southwestern U.S.)

Graeter, G.J., K.A. Buhlmann, L.R. Wilkinson, and J.W. Gibbons. 2020. Inventory and monitoring: Recommended techniques for reptiles and amphibians. PARC Technical Publication IM-1.