Mean Reptile Species Richness: U.S.

This EnviroAtlas national map displays the mean number of reptile species with potential habitat within each 12-digit hydrologic unit (HUC) in the conterminous United States. 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.


Photo: Alligator, R. Rauch, USFWS

Why are reptile species important?

Reptile species richness estimates the number of reptile species that may inhabit an area based on potential habitat. Across the U.S., the numbers of reptile species decline from a high of over 70 species in subtropical and desert ecosystems to 11 or fewer species in the northern tier of states (e.g., Minnesota, North Dakota, and Montana). Reptiles are cold-blooded animals with no internal temperature regulation. In cold climates with short summers, reptiles have difficulty not only surviving the winter season but completing essential life functions like mating and reproduction.

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]

Reptile species include turtles, snakes, lizards, and alligators, a diverse group of vertebrate species that plays a vital role in ecosystems. They are an integral part of the food web, acting as both predators and prey species. The removal of even one species from an ecosystem can create a trophic cascade that can affect the entire food chain. Many reptiles feed on pests, such as insects and rodents, which helps to limit damage to plants and cultivated crops. Herbivorous reptiles can be important seed dispersers and pollinators. Some reptiles, such as the gopher tortoise and alligator, may be keystone species in their respective habitats.

Reptile species can be important to human health and the development of pharmaceuticals. For example, substances taken from snakes have been used to develop antimicrobials, anticoagulants, and painkillers, as well as drugs to treat hypertension and high cholesterol.[2] Maintaining the diversity and richness of reptiles allows for the possible future discovery of more valuable treatments.

Reptiles are also economically and culturally important. Many people enjoy simply viewing reptiles in their natural habitats. However, reptile numbers have been reduced by development, road kill, habitat loss, predation, and pesticides. The U.S. Fish and Wildlife Service lists 32 terrestrial reptile species (plus 8 sea turtle species) as threatened or endangered in the lower 48 states. Two of the more prominent threatened reptile species are tortoises—the gopher tortoise in the Southeast and the desert tortoise in the Southwest.[3]

How can I use this information?

The map, Mean Reptile Species Richness: U.S., is one of three EnviroAtlas maps that illustrate indicators of reptile species richness. Other EnviroAtlas maps show maximum reptile 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 potentially low or high reptile species richness to help inform decisions about resource restoration, use, and conservation.

These maps can 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.

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Connectivity planning is also important for reptiles because their life cycles often require traveling between upland and wetland habitats.

After learning the reptile species richness values for a particular 12-digit HUC (click on a HUC area to see the popup), users can investigate an area more intensively by increasing the transparency to view the aerial imagery beneath. Higher resolution individual species models are also available for various regional GAP project areas such as the Southeast (SEGAP) or Southwest Regional Gap Analysis Projects (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, and distance to water) to derive deductive habitat models for each species.

GAP modeled habitat for reptile species that reside, breed, or use the habitat within the U.S. for a significant portion of their life history. Reptile species richness was calculated by combining predicted habitat for all GAP individual reptile species by pixel across the U.S. The number of reptile species in each pixel was summarized by 12-digit HUC and the mean species richness value calculated 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, are estimations of reality that may overestimate actual reptile 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. 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.

Where can I get more information?

A selection of resources related to reptiles and biodiversity is listed below. Information on the models and data used in the USGS GAP projects is available on their website. 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

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. USDA, APHIS. 2011. The reptile and amphibian communities in the United States. Accessed December 2014.

3. U.S. Fish and Wildlife Service. 2013. U.S. endangered species: Reptiles. Accessed December 2014.

4. Kepner, W.G., K.G. Boykin, D.F. Bradford, A.C. Neale, A.K. Leimer, and K.J. Gergely. 2013. 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.