

## Maximum Threatened and Endangered Vertebrate Species - Southwest

This EnviroAtlas national map displays the maximum number of threatened and endangered 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 threatened and endangered vertebrate species important?

Endangered species are those species that are in danger of extinction through all or much of their range; threatened species are likely to become endangered. The [Endangered Species Act \(ESA\)](#) provides protections for listed species, which include protection from Federal activities, restrictions on taking or selling these species, plans to help them recover, and authority to acquire important habitat. Despite these protections, threatened and endangered vertebrate species remain at risk of extinction due to many factors such as habitat loss, competition from invasive species, pollution, climate change, and disease. The loss of these species may affect the function of some ecosystems and the many benefits they provide, including their added recreation, aesthetic and cultural value.

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.

For instance, the endangered Gray Wolf is a [keystone](#) predator and an integral part of the ecosystems to which it belongs. Its re-introduction into Yellowstone National Park helped bring balance to both animal and plant communities, aiding in the recovery of this degraded ecosystem.<sup>1</sup>

In addition to their ecosystem roles, threatened and endangered vertebrate species are important to many people simply for their presence within environments. Many of these species provide recreational, cultural, or aesthetic value



Photo: Gary Kramer/ USFWS

and may contribute to an area's ability to attract tourism and tourism-related jobs. People who are interested in viewing wildlife, such as avid birdwatchers, may visit areas for the purpose of viewing species such as the endangered Southwestern Willow Flycatcher or the recovered Bald Eagle.

### How can I use this information?

The map, Maximum Modeled Threatened and Endangered Vertebrate Species - Southwest, is one of three EnviroAtlas maps that illustrate indicators of threatened and endangered vertebrate species richness for the southwest. Additional EnviroAtlas maps show the mean, or average, species richness for each 12-digit HUC and an index of threatened and endangered vertebrate species richness for each HUC. Used together or independently, these maps can help identify areas of potentially low or high threatened and endangered vertebrate species richness to help inform decisions about resource restoration, use, and conservation. Knowing 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 threatened and endangered 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 21 threatened and endangered vertebrate species that reside, breed, or use the habitat within the 5-state Southwest study area for a significant portion of their life history. Species richness was calculated by combining predicted habitat for all GAP individual threatened and endangered vertebrate species by pixel across the Southwestern United States.

The number of threatened and endangered vertebrate 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 on the importance of threatened and endangered species; a selection of these 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

EnviroAtlas is a collaborative effort led by EPA. The data for Threatened and Endangered Vertebrate Species 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 Threatened and Endangered Vertebrate Richness came from [SWReGAP](#). The fact sheet was written by Kenneth Boykin, New Mexico State University, Anne Neale and William Kepner, EPA, and Jessica Daniel, EPA Student Services Contractor.

### Selected Publications

<sup>1</sup> Beschta, Robert L., and William J. Ripple. 2009. Large predators and trophic cascades in terrestrial ecosystems of the western United States. *Biological Conservation* 142.11: 2401-2414.

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.

U.S. Fish & Wildlife Service. 2005. [Why Save Endangered Species?](#) U.S. Fish & Wildlife Service, Endangered Species Program, Arlington, Virginia, USA.