United States
Environmental Protection
Agency

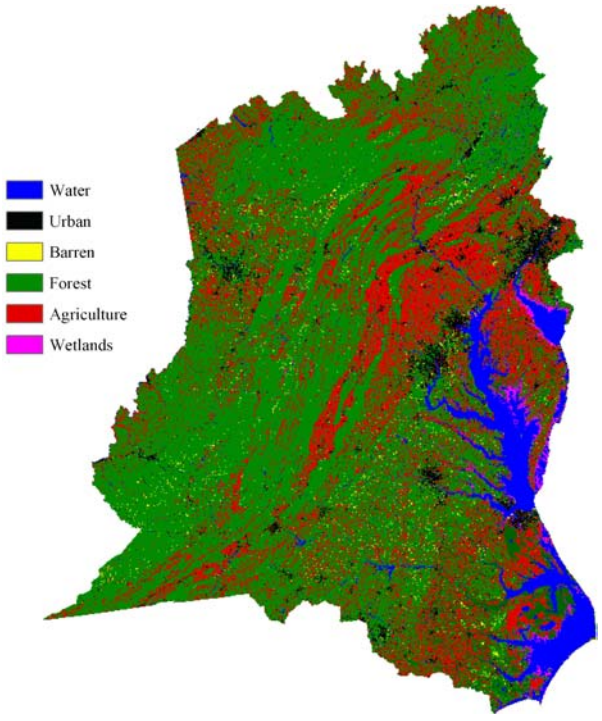
Protecting Biodiversity

Why Protect Biodiversity?

At present, over 40% of the earth's land surface has been converted from its natural state to one dominated by human activities such as agriculture and development. The destruction and degradation of natural habitats has been clearly linked to the loss of biodiversity. Biodiversity, short for biological diversity, is a broad concept that encompasses the richness of biological organisms, functions, and systems. Protecting biodiversity is important for a number of different reasons. For example, protecting biodiversity safeguards important ecosystem services such as clean air and water. Other reasons include: preventing the loss of organisms that may have as yet undiscovered medicinal uses, aesthetic reasons, and the intrinsic value of biodiversity. Therefore, preserving biodiversity is often the primary goal of conservation planning.

Measuring Biodiversity

Because there are so many different aspects of biodiversity, measuring them all is virtually impossible at large spatial scales. Consequently, conservation planners often rely on one or more measurable aspects of biodiversity such as the number of different species or habitat types as surrogates for biodiversity in general. Using species diversity as a surrogate for biodiversity requires detailed information about species' locations.



Prioritizing Areas for Protecting Species Diversity in the Middle-Atlantic Region

As part of the EPA's Regional Vulnerability Assessment Program (ReVA), EPA scientists have prioritized areas in the Middle-Atlantic region of the U.S. for the protection of species diversity. Information on the distribution of 770 species was compiled for the EPA by The Nature Conservancy (TNC) in conjunction with state Natural Heritage Programs. TNC provided the EPA with the predicted occurrences of all amphibians, reptiles, mammals, freshwater fish, freshwater mussels, and birds for each of 154 watersheds across the states of Pennsylvania, Maryland, Delaware, Virginia, West Virginia, as well as Washington, D.C. Using these data, EPA scientists ranked the watersheds based on their importance for protecting species diversity.

Species Richness and Site Irreplaceability

Areas with high numbers of species (high species richness) are often targeted for conservation. Protecting these areas will generally contribute to the goal of protecting species diversity. However, selecting only species-rich sites will not likely protect all species. Ecologists have found that many rare species are often absent from hotspots of species richness. More useful measures of the conservation value of a site assess the relative importance of the site for protecting *all* species. One such measure, irreplaceability, provides an estimate of the conservation opportunities that would be lost if a given site were no longer to exist. Thus sites that are more irreplaceable are more unique in terms of the species or the combinations of species they contain. The exact calculation of irreplaceability can be computationally demanding because it involves finding all sets of sites of a given size (e.g., 10 sites) that together protect all species.

The Irreplaceability of Middle-Atlantic Region Watersheds

Using a statistical estimate of irreplaceability, EPA scientists prioritized watersheds in the Middle-Atlantic region for the protection of freshwater aquatic species and separately for the protection of terrestrial species. Watersheds with higher irreplaceability values are those in which various conservation activities such as restoration, protection, and land-use regulation could be used to efficiently protect species diversity in the region.

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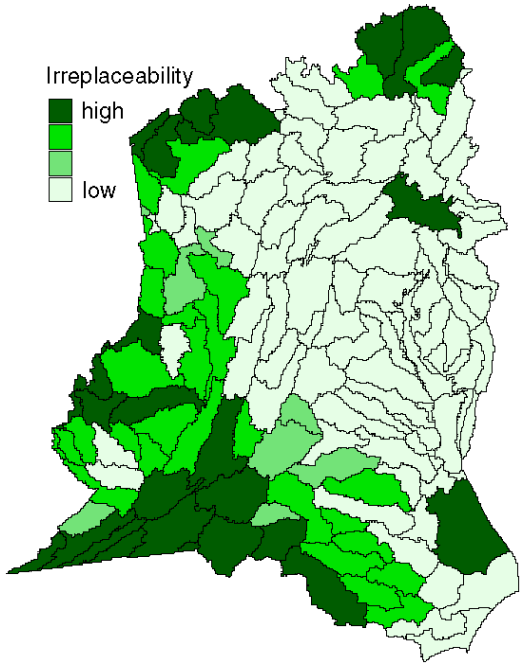
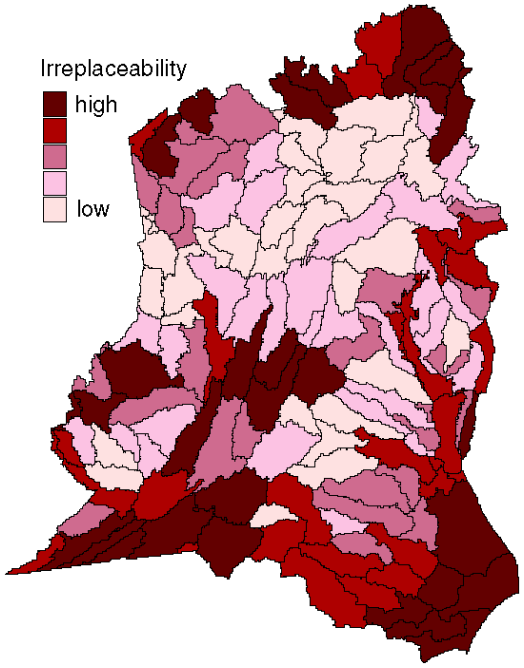
Integrating Prioritizations and Stressors

EPA's ReVA program scientists are currently conducting research to integrate site irreplaceability values with other information about natural features and resources as well as information about anthropogenic stressors in each of the watersheds. This integration will provide estimates of the vulnerability of sites, allowing conservation planners and policy makers to strategically use limited resources to protect sensitive areas.

Aquatic Species



Terrestrial Species



Additional Reading

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ReVA
Regional Vulnerability Assessment

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