Waterbody Area

This EnviroAtlas national map estimates the total square kilometers of lakes, ponds, reservoirs, estuaries, playas, swamps, and marshes within each 12-digit hydrologic unit (HUC).

Why is waterbody area important?

Waterbody area is a basic attribute reflecting the climate and associated ecosystem types of an area of interest. Waterbody area is an indicator of water availability, relative annual precipitation amount, surface water runoff, and the density of lakes and reservoirs. Communities nationwide enjoy the benefits of natural waterbodies and human-created reservoirs that provide drinking water, electric power, irrigation, flood control, and recreation. Reservoirs created in arid regions of the U.S. have been instrumental in allowing major population increases in the Southwest. Waterbodies of all types provide important wildlife habitat as well as opportunities for tourism and recreation.

Waterbody type, distribution, density, and area tend to vary by ecoregion (see the data fact sheet for USEPA Ecoregions). This EnviroAtlas map shows regions of greater waterbody area in the lakes and wetlands of the formerly-glaciated Northeast and Upper Midwest, reservoirs and swampland in the southeastern coastal and Mississippi alluvial plains, mountain lakes in the West, and isolated HUCs capturing the large reservoirs in the Southwest (e.g. Lake Powell and Lake Mead). A recent study of the regional distribution of lakes and reservoirs in the U.S., with data summarized by USEPA level II ecoregions, found that the estimated percent land area covered by lakes and reservoirs was 2.5% in the Northeast and Upper Midwest, 4.2% in the southeastern coastal and Mississippi alluvial plains, and 0.6% in the Southwest.[1] Higher densities of natural ponds, wetlands, and lakes occur in northern glaciated areas, while numerous private impoundments create the high densities of lakes and ponds found in the Southeast and Great Plains.

This EnviroAtlas map shows high waterbody area in the Prairie Pothole region of North and South Dakota. This concentration of millions of small ponds and wetlands is an extremely productive ecosystem for waterfowl, shorebirds, and grassland birds. The ponds and wetlands also contribute to climate change mitigation by storing significant amounts of carbon.[2] A U.S. Geological Survey study in the region estimated that 12.2 million acres of potentially restorable wetlands (i.e., wetlands that have been farmed) in that area


Photo: Two alpine lakes, Mt. Shuksan, Washington State

have the potential to sequester 122.6 million tons of soil organic carbon over a 10-year period.[2] The high numbers of artificial impoundments found in other parts of the Great Plains do not provide the same productive wildlife habitat value that natural lakes and wetlands do, but the artificial ponds and lakes do trap sediment, affect local groundwater recharge, and provide resting habitat for migrant birds.[3]

Microorganisms within waterbodies play an important role in the breakdown of organic and inorganic materials to create chemical components that are buried in bottom sediments or released to the atmosphere. These processes are particularly active in groups of smaller waterbodies where light and oxygen are available in the water column and sediments. Large reservoirs can store large amounts of carbon, but they tend to lack oxygen in deeper water and bottom sediments. Depending on their size, lakes and ponds may be sources or sinks for greenhouse gases (GHG) such as carbon dioxide, methane, and gaseous nitrogen compounds.[4]

How can I use this information?

This EnviroAtlas national map, Waterbody Area, depicts total square kilometers of lakes, ponds, reservoirs, estuaries, playas, swamps, and marshes summarized by 12-digit HUC. One may click on individual HUCs to see the estimated waterbody area within the HUC. The waterbody area map may be overlaid and compared with other EnviroAtlas maps depicting land cover and habitat, ecoregions, agriculture, or water supply and demand to reveal how waterbody area relates to landscape character, ecosystem services, and productivity. For conservation efforts, this map may be used

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with other metrics such protected lands, National Wetland Inventory (NWI) wetlands, recreation demand, or species biodiversity maps.

An area can be more thoroughly investigated by adding data for streams and water bodies (NHDPlus, found under the boundaries icon) to the base map. Increasing the transparency of the map layer and examining the base map gives a view of the drainage network and the locations and connectivity of waterbodies. Waterbody area maps may be compared with EnviroAtlas impaired waters data to assist in planning and implementing Total Maximum Daily Loads in streams. Users may compare the total waterbody area map with an underlying map of 12-digit hydrologic units boundary lines (found under the boundaries icon) and impaired waterbodies (impaired waters area) to explore the relative aquatic health of assessed waterbodies in selected areas of interest.

How were these data created?

National Hydrography Dataset (NHD) waterbody shapefiles for all states in the conterminous U.S. were merged and intersected with the NHDPlusV2 Watershed Boundary Dataset (WBD Snapshot). NHDPlus is a dataset produced by EPA's Office of Water with the U.S. Geological Survey and Horizon Systems for surface waters of the United States. The dataset integrates the vector NHD stream network and WBD hydrologic unit boundaries with national elevation data gridded land surface. The area of each waterbody was noted and the sum of all waterbody areas in square kilometers was calculated for each 12-digit HUC.

What are the limitations of these data?

All national data layers, such as the NHDPlus, are an estimation of reality based on the best available science. Calculations based on these data are therefore also estimations. Smaller waterbodies may not be included. The user can study the mapped data to inform further investigation. Periodic updates to EnviroAtlas will reflect improvements to nationally available data.

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 the importance and application of waterbody area data is listed below. For additional information on data creation, 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.

Acknowledgments

EnviroAtlas is a collaborative effort led by EPA. This EnviroAtlas map was developed by Megan Culler, EPA Student Services Contractor. The fact sheet was created by Sandra Bryce, Innovate!, Inc.

Selected Publications

1. McDonald, C.P., J.A. Rover, E.G. Stets, and R.G. Striegl. 2012. The regional abundance and size distribution of lakes and reservoirs in the United States and implications for estimates of global lake extent. Limnology and Oceanography 57(2): 597–606.

2. Gleason, R.A., N.H. Euliss, Jr., R.L. McDougal, K.E. Kermes, E.N. Steadman, and J.A. Harju. 2005. Potential of restored prairie wetlands in the glaciated North American prairie to sequester atmospheric carbon. Paper 92, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, North Dakota.

3. Smith, S.V., W.H. Renwick, J.D. Bartley, and R.W. Buddemeier. 2002. Distribution and significance of small, artificial waterbodies across the United States. *The Science of the Total Environment* 299: 21–36.

4. Tranvik, L.J., J.A. Downing, and 25 other authors. 2009. Lakes and reservoirs as regulators of carbon cycling and climate. *Limnology and Oceanography* 54(6, part 2):2298–2314.