



Percent Wetlands

This EnviroAtlas national map depicts the percent land cover comprised of woody and emergent herbaceous wetlands in each 12-digit hydrologic unit ([HUC](#)). For the conterminous U.S., the map layer uses the EnviroAtlas hybrid 2016 Cropland Data Layer ([CDL](#)) - 2016 National Land Cover Dataset ([NLCD](#)) to define percent wetlands. Alaska is derived from the 2016 [NLCD](#); Hawaii from the 2005–2011 National Oceanic and Atmospheric Administration’s Coastal Change Analysis Program ([C-CAP](#)) data, Puerto Rico from [2010 C-CAP](#), and the U.S. Virgin Islands from [2012 C-CAP](#) data.

Why are wetlands important?

Wetlands, generally defined, are lands often or periodically saturated with water. The saturation level in these areas influences the soils, plants, and animals that thrive under these conditions, creating unique ecological communities. Wetlands can be found adjacent to rivers, lakes, streams, in tidal areas, or as isolated systems. Often located at the interface of upland terrestrial systems and aquatic systems, wetlands provide critical services, including nutrient retention, flood control, storm-surge mitigation, carbon sequestration, nurseries for fisheries, habitat, and opportunities for recreation. In 2011, the U.S. Fish and Wildlife Service estimated that wetlands comprised 5.5 percent of land within the contiguous U.S.¹ While over 100 million acres of wetlands remain, significant losses have occurred over time. Wetlands are protected under federal regulations, and activities that impact wetlands areas often require a permit. In addition to loss of wetland area, changes in the water regime, water quality, and [invasive species](#) may also impact wetland services.

Wetland plants, microbes, and soils promote water quality by removing excess nutrients (e.g., nitrogen and phosphorus), sediment, and toxic chemicals. Wetlands may intercept surface-water runoff from higher dry land before the runoff reaches open water, often reducing [eutrophication](#) in downstream waters and preventing contaminants from reaching groundwater and other sources of drinking water. By buffering the effects of coastal storms and mitigating floods, wetlands help prevent loss during storm events. Wetlands reduce flooding by storing rainwater, slowly releasing it after storms to surface- and groundwater resources. Trees, root mats, and other wetland vegetation slow the speed of flood waters and distribute them more slowly over a floodplain. The presence of vegetation in wetlands decreases the area of open



Photo: Great Blue Heron, NOAA

water and increases drag on water motion, thereby dispersing energy and decreasing the size of waves or storm surges. Unfortunately, the value of wetlands to reduce the impacts of floods has often been retrospective, based on the estimated costs of damage or loss after a flood or storm has occurred.

In addition to their natural hazard mitigation benefits, wetlands can be significant carbon reservoirs. Carbon is contained in the standing crops of vegetation, litter, and in organic soil/sediments. The magnitude of storage depends upon wetland size, vegetation, depth of wetland soils, ground water, nutrient levels, pH, biogeochemical conditions, and the potential offsets from methane and nitrous oxide production, necessitating analyses of such factors.

Wetlands support [biodiversity](#) by providing habitat. Many of the nation’s fishing and shell fishing industries harvest wetland-dependent species. Fish, such as flounder, sea trout, croaker, and others, breed and raise their young in coastal marshes and estuaries. Wetlands provide shelter, breeding areas, and food for shrimp, crabs, oysters, and clams. Various birds, amphibians, and mammals also depend on wetlands to survive. Ducks, geese, woodpeckers, hawks, wading birds, and many songbirds depend on wetlands to feed, nest, reproduce, and raise their young. Migratory waterfowl use coastal and inland wetlands as resting, feeding, breeding, or nesting grounds for at least part of the year. The prominence of wildlife in wetland areas makes them ideal locations for birdwatching, hunting, and kayaking. As vibrant natural communities, wetlands can also provide aesthetic value for surrounding towns and communities.

How can I use this information?

The national map, Percent Wetlands, summarized by 12-digit HUCs, can be used in conjunction with other data to study the importance of wetlands for nutrient retention, flood control, storm-surge mitigation, [carbon sequestration](#), fish and waterfowl production, and recreation. For example, the map can help inform investigations into water quality issues such as sedimentation, nutrients, pesticides, or biological impairment. After noting the total wetland percentage of a particular 12-digit HUC, one can investigate potential restoration areas by adding streams and rivers from NHDPlus (under Boundary Layers), and increasing the transparency to view the aerial imagery base map beneath.

How were the data for this map created?

These data were generated from the EnviroAtlas hybrid 2016 [CDL-NLCD](#) for the conterminous U.S. and the 2016 [NLCD](#) for Alaska. C-CAP data were used for Hawaii (2005–2011), Puerto Rico (2010), and the U.S. Virgin Islands (2012). These land cover data were used in the landscape assessment tool, Analytical Tools Interface for Landscape Assessments (ATtILA). [ATtILA](#) is an Esri ArcGIS extension created by EPA that calculates many commonly used landscape metrics. The landcover data were summarized by 12-digit HUC boundaries from the [NHDPlusV2](#) Watershed Boundary Dataset (WBD Snapshot) for the conterminous U.S., Hawaii, Puerto Rico, and the U.S. Virgin Islands, and the November 24, 2016 WBD for Alaska. The calculation includes Woody Wetland and Emergent Herbaceous Wetland categories from the NLCD and Palustrine and Estuarine Forested, Shrub/Scrub, and Emergent Wetlands from C-CAP.

Selected Publications

1. Dahl, T.E. 2011. [Status and trends of wetlands in the conterminous United States 2004 to 2009](#). U.S. Department of the Interior; Fish and Wildlife Service, Washington, D.C. 108 pp.
- Bentrup, G. 2008. [Conservation buffers: Design guidelines for buffers, corridors, and greenways](#). General Technical Report SRS-109. U.S. Forest Service, Southern Research Station, Asheville, North Carolina. 110 p.
- Costanza, R., O. Perez-Maqueo, M.L. Martinez, P. Sutton, S.J. Anderson, and K. Mulder. 2008. [The value of coastal wetlands for hurricane protection](#). *Ambio* 37(4):241–248.
- Cowardin, L.M., Carter, V., Golet, F.C. and La Roe, E.T. 1979. [Classification of wetlands and deepwater habitats in the United States](#). U.S. Dept. Interior, Fish & Wildlife Service, FWS/OBS-79/31.
- 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.
- Mayer, P.M., S.K. Reynolds, Jr., M.D. McCutchen, and T.J. Canfield. 2007. [Meta-analysis of nitrogen removal in riparian buffers](#). *Journal of Environmental Quality* 36:1172–1180.
- U.S. Environmental Protection Agency. [Wetlands protection and restoration](#). Office of Wetlands, Oceans and Watersheds. Accessed May 2020.
- Zedler, J.B., and S. Kercher. 2005. [Wetland resources: Status, trends, ecosystem services, and restorability](#). *Annual Review of Environment and Resources* 30: 39–74.

What are the limitations of these data?

The landcover classes found in NLCD and C-CAP are created through the classification of satellite imagery. Classification of land cover types that have a similar spectral signature can result in classification errors. As a result, NLCD and C-CAP are a best estimate of actual land cover. Each version of NLCD is released several years after the date of the satellite imagery used in its creation, meaning that the land cover patterns are several years out of date when released.

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 on wetlands is listed below. For more information on the metric calculation, please see the [ATtILA User's Manual](#). For additional information on how the data were created, access the [metadata](#) for the data layer from the layer list drop down menu on the interactive map. To ask specific questions about this data layer, please contact the [EnviroAtlas Team](#).

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