Percent Wetlands on Wet Areas

This EnviroAtlas national map uses a wetness index to estimate the percent of land within each subwatershed (12-digit HUC) that is frequently or periodically wet and is covered by wetlands.

Why are wetlands important?

A wetness index or Composite Topographic Index (CTI), based on watershed contributing area, slope, and overland flow, was used to generate a series of EnviroAtlas data layers for land cover on wet areas. Wet areas are typically created by runoff from natural land cover when rain falls on saturated soil. Surface and rill (or small channel) runoff carries excess water to lowland depressions or wet areas.

The wet areas data layers cover areas that may or may not be defined as wetlands. The three main components used to define wetlands are the presence of wetland hydrology, hydric soils, and hydrophytic (water-adapted) vegetation.[1] A depression that carries water during wet periods may be temporary and may not possess one or more of the required wetland components. This data layer depicts wet areas with high wetness index values that have been defined as wetlands.

Over 200 million acres of wetlands covered the U.S. in colonial times. Major regional wetland losses have occurred across the conterminous U.S. over the last 200+ years with expanding coastal development, agricultural land conversion, and urbanization. Wetland losses vary by state and region. For example, California and the five top agricultural Midwestern states have lost over 80% of their historical wetland area.[2] Today, over 100 million acres of wetlands remain. The pace of wetland conversions has slowed with recognition of the values they provide and the passage of some disincentives to conversion.

EnviroAtlas provides information about the benefits provided by wetland ecosystems, particularly for clean and plentiful water, natural hazard mitigation, and recreational and cultural values. Wetlands provide aesthetic values and also more tangible ecosystem services such as wildlife habitat, biological diversity, soil loss reduction, groundwater recharge, nutrient and toxics filtration, carbon sequestration, and flood water storage.[3] Wetlands support biodiversity by providing habitat for fish, amphibians, reptiles, birds, and semi-aquatic mammals. Coastal marshes and estuaries and the wetland backwaters of

streams and rivers serve as nurseries for young fish. Migratory waterfowl use coastal and inland wetlands for resting, feeding, breeding, and nesting.

By slowing the passage of water, wetlands can prevent sediment, nutrients, harmful bacteria, pesticides, and metals from entering waterbodies and degrading water quality. Nutrients in the form of excess nitrogen and phosphorus enter waterbodies from fertilizer use and in runoff from industry and wastewater treatment plants. Wetlands can remove both phosphorus and nitrogen from runoff and groundwater, reducing eutrophication and algal blooms in receiving waters. Wetlands are able to remove more nitrogen than phosphorus from water and sediments because wetland sediments are major sites for denitrification, a process where bacteria in saturated soil transform dissolved nitrates into gaseous nitrogen compounds that escape to the atmosphere.[3]

Current wetland research efforts focus on quantifying the benefits of wetlands and wetland restoration. Recent studies have estimated the amount of carbon sequestered by functioning wetlands[4] and the increased water storage provided by wetlands to alleviate flooding.[5] Knowing the relative value of wetland benefits is important for locating and prioritizing candidate areas for wetland conservation and restoration. Multiple functions may be ranked by local needs for water quality, wildlife habitat, flood protection, nutrient filtration, or groundwater recharge.

How can I use this information?

This national map uses a wetness index to estimate the percent land area of 12-digit HUCs covered by wetlands. It

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is one of a series of national-scale maps displaying land cover (including agriculture and developed land) on wet areas using a CTI wetness index. For conservation efforts, this map may be overlaid with Supplemental data such as National Wetland Inventory (NWI) and Protected Areas (PADUS) or other national EnviroAtlas data layers such as Potentially Restorable Wetlands.

Knowing potential runoff contributing areas can help target implementation of best management practices (BMPs) to improve water quality.[5] Wet areas maps may be overlaid with data on cropland or impervious cover to show possible contributing sources. Wet areas maps may be compared with EPA impaired waters data to maximize wetland filtration capabilities when implementing Total Maximum Daily Loads in streams. Wetlands restored alongside or upstream of impaired stream segments may help reduce sediment and nutrient loads to streams.

How were the data for this map created?

This dataset of wetlands on wet areas for each 12-digit Hydrological Unit (HUC-12) is based on the 2006 National Land Cover Database (NLCD) and the USDA's 2010 Crop Data Layer (CDL). These combined sources provide NLCD land coverages and agricultural land uses. A wetness index or Composite Topographic Index (CTI) was developed to identify areas wet enough to collect water. The wetness index grid, calculated from National Elevation Data (NED), relates upstream contributing area and slope to overland flow. Results from previous studies suggested that CTI values > 550 captured the majority of wet areas. Percentages of wetland land coverage on wet areas (CDL class 87 Wetlands, NLCD classes 190 Woody Wetlands, and 195 Herbaceous Wetlands) within 12-digit HUCs were calculated by raster cell counts with a cell size of 30m x 30m and an area of 900 m^2 per raster cell. A list of metric creation steps is included in the metadata processing steps. 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.

What are the limitations of these data?

EnviroAtlas uses the best data available, but there are still limitations associated with these data. The landcover classes found in NLCD and CDL are created through the classification of satellite imagery. Human classification of different landcover types that have a similar spectral signature can result in classification errors. The wetness index, CTI, tends to overestimate wet areas, in part because it does not consider precipitation and evaporation water balances. It will also overestimate wetness in areas with highly permeable soils that do not retain water. Finally, CTI indicates wet areas based entirely on topography and surface water flow and will miss wet areas created by other factors such as heavy precipitation or irrigation outflow.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. Land cover, crop, and elevation data are available on their respective websites.

Where can I get more information?

A selection of references relating to wetlands and the ecosystem services they provide is listed below. Information about the base data layers can be found at the websites linked throughout the text. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

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Selected Publications

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4. Gleason, R.A., B.A. Tangen, M.K. Laubhan, K.E. Kermes, and N.H. Euliss, Jr. 2007. Estimating water storage capacity of existing and potentially restorable wetland depressions in a subbasin of the Red River of the North. USGS Open File Report 2007-1159, U.S. Geological Survey, Reston, Virginia. 36 p.

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