EnviroAtlas

people • health • nature • economy

Fact Sheet

www.epa.gov/enviroatlas

Percent Agriculture on Hydric Soil

This EnviroAtlas national map depicts the percentage of agricultural land within each 12-digit hydrologic unit (HUC) with soil units having greater than 80% hydric soils. Agriculture includes all land dedicated to the production of crops, but excludes land managed for pasture.

Photo: Farmed wetlands, J. Rodriguez, USGS

Why is agriculture on hydric soils important?

Hydric soils may be located in depressions, flood plains, and near seeps and springs. The Food Security Act (or Farm Bill) defines hydric soil as a soil that in its un-drained condition is saturated, flooded, or ponded long enough during the growing season to develop an oxygen deficiency (anaerobic condition) that supports the sustained growth of hydrophytic (water-adapted) vegetation. Soil saturation under still or slowly moving water combined with the presence of bacteria decomposing soil organic matter creates the oxygen deficiency. Hydric soils that are subject to periodic saturation and anaerobic conditions may be identified by a range of characteristic colors and by evidence of iron reduction or accumulation.[1] The identification of hydric soils is important to define their capabilities (for agriculture) and their limitations (for some types of development). The Natural Resources Conservation Service maintains national and state lists of hydric soils. Hydric soils also help define wetlands that may be protected under the Clean Water Act. The presence of hydric soils alone is not sufficient to define a wetland; hydric soil type must be accompanied by the presence of wetland hydrology and hydrophytic vegetation.

Over 200 million acres of wetlands covered the U.S. in colonial times. During the 19th and 20th centuries, U.S. government policies encouraged the conversion of wetlands to other uses. The government-subsidized construction of levees and drains opened floodplains and depressional wetlands to agricultural use. Agricultural crop subsidies also provided an incentive to increase profitable acreage. Between settlement and 1954, the rate of wetland conversion averaged over 800,000 acres per year.[2]

While the expansion of agriculture on hydric soils has increased crop yields, it has reduced the residence time of water on the landscape, sending precipitation and overland flow directly through drains and tiles to streams and rivers and bypassing wetland filtering services. By slowing the passage of water, wetlands provide soil loss reduction, groundwater recharge, nutrient and toxics filtration, carbon sequestration, and flood water storage.[3] Recent studies have quantified the amount of carbon sequestered by functioning wetlands[4] and the increased water storage provided by wetlands to alleviate flooding.[5]

In the second half of the 20th century, the ecological benefits of wetlands became more widely known and accepted. The Farm Bill of 1985 reduced wetland conversion by denying farm program benefits to farmers who drained wetlands without a permit. Since 1992, the Wetlands Reserve Program (WRP) has helped private landowners voluntarily restore wetlands and wildlife habitat on their lands.[3] Because of programs like the WRP, in recent years overall gains have been recorded for wetlands in agricultural areas. In addition, wetland losses have been greater for urban and rural development than for agricultural uses.

A national overview of the distribution of hydric soils is one important aspect of locating and prioritizing candidate areas for the restoration of particular wetland functions. Local needs for water quality improvement, wildlife habitat, flood protection, nutrient filtration, or groundwater recharge may be ranked and compared with wetland losses. Once areas of hydric soils are identified, detailed site analysis may be planned for identifying and restoring individual wetlands.

How can I use this information?

This national map estimates the percent land area of 12-digit HUCs covered by hydric soils, using a threshold of soil units that are ≥ 80% hydric. It is a companion map to Percent Agriculture in Areas of High Water Accumulation that uses a wetness index to identify potential cultivated wet areas.

CONTINUED ON BACK ▶

This map gives a national overview of hydric soils within HUCs and allows comparison among them. For conservation efforts, this map may be used with other metrics such as protected lands, National Wetland Inventory (NWI) wetlands, or other national EnviroAtlas data layers such as Potentially Restorable Wetlands on Agricultural Land.

Information on areas of high wetland conversions is useful to compare with overall wetland distribution and protection in planning for restoration. Areas of potential restoration may be compared with EPA impaired waters data to assist in planning 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 map of percent agricultural land cover on hydric soil for each 12-digit HUC is based on a combination of the 2006 National Land Cover Database (NLCD) and the USDA's 2010 Crop Data Layer (CDL). These combined sources provide NLCD land cover and agricultural land uses. The hydric soil determinations are based on the December 30, 2009 Natural Resources Conservation Service Soil Survey Geographic Database (NRCS SSURGO). Soil units with ≥80% hydric soils were selected for this dataset. Percentages of agricultural land cover on hydric soil 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. HUC boundaries were taken from the NHDPlusV2 Watershed Boundary Dataset (WBD Snapshot).

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 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. Hydric soils data are interpreted from a combination of remotely-sensed data and field information. The final map is not meant to be a recreation of reality but an interpretation of hydric soils in the U.S. that can serve as a useful planning and screening tool.

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 soil data are available on their respective websites.

Where can I get more information?

A selection of references relating to hydric soils, agriculture, and wetlands is listed below. Information about the base data layers can be found at the websites linked throughout the text. For more details on metric creation and the WBD Snapshot update, 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.

Acknowledgments

Peter Cada, Hillary Nicholas, and Michael Paul, Tetra Tech, Inc., produced the hydric soil data analyses for this map. The fact sheet was created by Sandra Bryce, Innovate!, Inc.

Selected Publications

1. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). 2010. Field indicators of hydric soils in the United States. Version 7.0. USDA Natural Resources Conservation Service in cooperation with the National Technical Committee for Hydric Soils, Washington, D.C.

2. Heimlich, R.E., K.D. Wiebe, R. Claassen, D. Gadsby, and R.M. House. 1998. Wetlands and agriculture: Private interests and public benefits. Agricultural Economic Report No. 765, Resource Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

3. Natural Resources Conservation Service. 2012. Restoring America’s wetlands: A private lands conservation success story. Natural Resources Conservation Service, Washington, DC. 16 p.

4. 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.

5. 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.