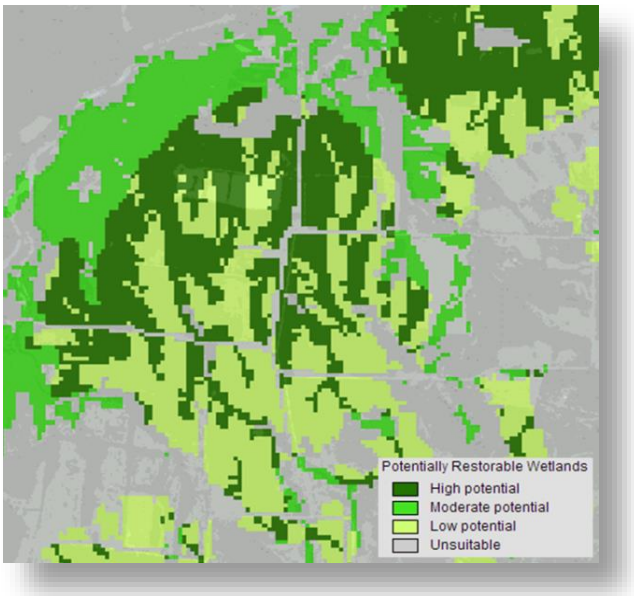
Potentially Restorable Wetlands on Agricultural Land

This EnviroAtlas map depicts potentially restorable wetlands, defined as agricultural areas that naturally accumulate water and contain some proportion of poorly-drained soils. The EnviroAtlas Team produced this dataset by combining three data layers—land cover, digital elevation, and soil drainage information.



Why are potentially restorable wetlands important?

EnviroAtlas provides information about the benefits provided by wetland ecosystems for clean and plentiful water. Although wetlands contain intrinsic and aesthetic values, they also offer 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.[1]

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. For example, California and the five top agricultural Midwestern states have lost over 80% of their historical wetland area.[2] Wetland mitigation programs have not been able to significantly offset or reverse continued wetland losses.[2, 3] Recently, working groups have formed to regain lost wetland area through a more comprehensive effort; they promote and coordinate research to quantify the benefits of wetlands and wetland restoration. For example, a model developed to simulate wetland water storage in a sub-basin of the Red River of the North (a system that floods frequently) showed that restoring 25% of drained wetlands would increase water storage by 27–32% basin-wide to help alleviate flooding.[4]

Wetlands also have the ability to store atmospheric carbon (carbon sequestration). Potentially restorable wetlands, by banking additional stored carbon, can make a significant contribution to climate change mitigation. Cultivated wetlands lose their stored soil organic carbon to the atmosphere, but soil organic carbon is rapidly restored when wetland function is restored.[5] A study in the Prairie Pothole region estimated that the 12.2 million acres of potentially restorable wetlands in that area have the potential to sequester 122.6 million tons of soil organic carbon over a 10-year period.[5] Studies such as these reveal the range of what is possible; it is the job of local land managers to prioritize needs and locate areas with the greatest potential to restore wetland benefits in a cost-effective manner.

How can I use this information?

This map identifies agricultural lands in the U.S. with wetland restoration potential. This dataset may be overlaid with other data such as National Wetland Inventory (NWI) wetlands, ecoregions, or protected areas (PADUS) data. Information on wetland distribution and protection is useful to compare with areas of high wetland conversions in planning for optimal areas for restoration.

The potentially restorable wetlands layer overlaid with EPA assessed and impaired waters data may assist in planning to maximize wetland filtration and flood mitigation 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 as well as runoff flow volume. Multiple wetland functions may be ranked in importance depending on local needs for water quality improvement, wildlife habitat, flood protection, nutrient filtration, or groundwater recharge. Another metric developed from this data, Percent Potentially Restorable Wetlands on Agricultural Land, is summarized by 12-digit hydrologic unit (HUC). Once high-ranking areas of potentially restorable wetlands are identified, detailed site analysis may be planned for restoring individual wetlands.

How was the data for this map created?

To map these potentially restorable wetlands, 2011 National Land Cover Data (NLCD) classes *pasture/hay (81)*and *cultivated crops (82)* were reclassified as potentially suitable and all other landcover classes as unsuitable. Poorly- and very poorly-drained soils were identified using Natural Resources Conservation Service (NRCS, 2014) Soil Survey information mainly from the higher resolution Soil Survey Geographic (SSURGO) Database. The two poorly drained soil classes, expressed as percentage of each polygon in the soil survey, were combined to create a raster layer. The greater the presence of poorly draining soils, the greater the restoration potential. A wetness index—or modified Compound Topographic Index (CTI)—was developed by the EnviroAtlas Team in 2012 to identify areas wet enough to create wetlands. The wetness index grid, calculated from National Elevation Data (NED), relates upstream contributing area and slope to overland flow and potential accumulation. Results from our analysis suggested that CTI values ≥900 captured the majority of wetlands.

The three layers, when combined, resulted in four classes: unsuitable, low, moderate, and high wetland restoration potential. Areas with high potential for restorable wetlands have suitable landcover (crop/pasture), CTI values ≥900, and 80–101% poorly- or very poorly-drained soils (PVP). Areas with moderate potential have suitable landcover, CTI values ≥900, and 1–79% PVP. Areas with low potential meet the landcover and 80–101% PVP criteria, but do not have CTI values ≥900 to corroborate wetness. All other areas were classed as unsuitable.

What are the limitations of these data?

EnviroAtlas uses the best data available, but there are limitations associated with these data: 1) 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; 2) the poorly-drained soils data were transformed from a proportion of a polygon to a raster data structure, which affected their location; and 3) CTI tended to overestimate wet areas, in part because it does not consider precipitation and evaporation water balances. However, the final map, derived through data transformation and spatial analysis, is not meant to be a recreation of reality but a model of potentially restorable wetlands 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.

Where can I get more information?

A selection of references relating to potentially restorable wetlands is listed below. For additional information on the data creation process, 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 these data, please contact the EnviroAtlas Team.

Acknowledgments

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Selected Publications

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

2. Zedler, J. B. 2004. Compensating for wetland losses in the United States. *Ibis* 146: 92–100.

3. Turner, R.E., A.M. Redmond, and J.B. Zedler. 2001. Count it by acre or function—mitigation adds up to net loss of wetlands. *National Wetlands Newsletter* 23(6):1–16.

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.

5. 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.

Zedler, J.B., and S. Kercher. 2005. Wetland resources: Status, trends, ecosystem services, and restorability. *Annual Review of Environment and Resources* 30: 39–74.