Percent Range 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 range land. In EnviroAtlas, range is defined as land dominated by shrubs or herbaceous vegetation.

Why is range on wet areas important?

A wetness index or Composite Topographic Index (CTI), based on watershed contributing area, slope, and overland flow, was used to generate this EnviroAtlas data layer. 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. A depression that carries water during wet periods may be temporary and may not possess one or more of the required wetland components.

Range is a category of land use and land cover based on its prime use, grazing, and the dominance of herbaceous or shrubby vegetation, which can be composed of native grasses, shrubs, and forbs or introduced non-native vegetation, such as crested wheatgrass and Russian wildrye. Range on wet areas includes native spring seep and wet meadow species and non-natives such as various clover species, Kentucky bluegrass, and quack grass.

The term range is often associated with the western U.S. where much of the grazing activity occurs outside of intensively managed agricultural pastures. However, the Society for Range Management, in its field guide, lists range vegetation for the southeastern U.S. in addition to that found in the western regions from the Great Plains to the west coast. Ecosystem services provided by range on wet areas are particularly important in the western U.S. where much of the grazing land occurs in subhumid, semiarid, or arid landscapes. Because of moisture-retentive soils and high plant density, range on wet areas represents some of the most productive grazing land in the west.

By filtering surface runoff, rangeland vegetative cover on wet areas can prevent sediment, nutrients, and harmful

Photo: Range on wet areas, South Dakota, NRCS

bacteria from entering waterbodies.[1] Wet area herbaceous and shrubby land cover can also help regulate the flow of surface water into a waterbody by slowing and storing runoff and recharging ground water.

The ecosystem services supplied by rangeland wet areas may be reduced when grazing pressure begins to change the structure and functionality of the wet areas. Grazers can remove preferred species entirely and trample vegetation. Grazing pressure opens areas of bare soil that can increase species diversity but also promote the establishment of invasive species.[2] Pathways in compacted wet soil can create mounded microtopography that can change local hydrology and alter available wildlife habitat. Amphibians and waterfowl are sensitive to such changes in habitat.[2] Strategies for use of range on wet areas while maintaining good condition vary from keeping livestock out of wet areas entirely to light use in winter or early spring, which allows time for plant recovery after use.[3, 4]

Knowing the distribution of rangeland on wet areas is important for locating and prioritizing candidate areas for sediment capture, nutrient filtration, and groundwater recharge. Multiple functions may be ranked by local needs for water quality improvement, wildlife habitat, or flood protection.

How can I use this information?

This national map estimates the percent land area of 12-digit HUCs covered by grazing land on wet areas. It is one of a series of national-scale maps displaying land cover

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(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. Wet areas 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 range 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 range land coverage on wet areas (NLCD classes 152 Shrubland and 171 Grassland Herbaceous) 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 range and wet areas 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.

Acknowledgments

Peter Cada, Hillary Nicholas, and Michael Paul, Tetra Tech, Inc., produced the wetness index for the wet areas data layers. The fact sheet was created by Sandra Bryce, Innovate!, Inc.

Selected Publications

1. Mankin, K.R., D.M. Ngandu, C.J. Barden, S.L. Hutchinson, and W.A. Geyer. 2007. Grass-shrub riparian buffer removal of sediment, phosphorus, and nitrogen from simulated runoff. *Journal of the American Water Resources Association* 43(5):1108–1116.

2. Jones**,** W.M., L.H. Fraser, and P.J. Curtis. 2011. Plant community functional shifts in response to livestock grazing in intermountain depressional wetlands in British Columbia, Canada. *Biological Conservation* 144: 511–517.

3. Montana Watercourse. 2008. Landowner's guide to Montana wetlands. Montana State University, Bozeman, Montana.

4. Wyman, S., D. Bailey, M. Borman, S. Cote, J. Eisner, W. Elmore, B. Leinard, S. Leonard, F. Reed, S. Swanson, L. Van Riper, T. Westfall, R. Wiley, and A. Winward. 2006. Riparian area management: Grazing management processes and strategies for riparian-wetland areas. Technical Reference 1737-20. BLM/ST/ST-06/002+1737. U.S. Bureau of Land Management, Denver, CO. 105 p.

5. Jurasek, K. 1999. Estimation of potential runoff-contributing areas in Kansas using topographic and soil information. U.S. Geological Survey Water Resources Investigation Report 99-4242, U.S. Geological Survey, Washington, D.C.