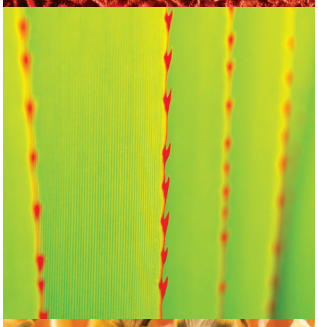
ECOREGION: PRAIRIE GRASSLANDS



The rolling acres of grassland stretching across the center of the United States are a classic American image. Early European settlers of this ecoregion were so impressed by these endless grasslands that they compared them to the ocean, and named their wagons "prairie schooners" after large ships of the time.[1] The prairie grasslands begin with the Great Plains at the eastern edge of the Rocky Mountains and extend all the way to the Appalachian Mountains in the eastern part of the country. The Rocky Mountains prevent moist air from moving over the Great Plains, and this "rain shadow" helps to keep the prairie grasslands extremely dry.[2] However, it is not just the lack of rain that makes the prairie a harsh place to live. Twelve thousand years ago, retreating glaciers left behind a flat landscape open to extreme heat in the summer and extreme cold in the winter. The lack of geographic barriers or cover means that the wind runs rampant across the plains, leading to the "black blizzards' of the 1930s Dust Bowl and continuously endangering agriculture.

Despite these extremes, many plants and animals such as wildflowers, pronghorn antelope, mule deer, prairie dogs, and coyotes make their homes in the prairie grasslands. In addition, small, isolated wetlands dot the dry prairies, providing much-needed water and aquatic habitat for birds. In the Northern Great Plains, these wetlands formed as the glaciers receded and left round, sunken areas behind them. Rain and groundwater fill these depressions during certain times of year, creating scattered wetland habitat known as "prairie potholes." The Prairie Pothole Region in the Northern Great Plains contains 5-8 million small wetlands and some of the most important freshwater resources in North America.[3] Bullrushes, sedges, and cattails grow on the edges of these potholes because they prefer standing water, and these plants in turn provide food and shelter for other species, such as birds. More than half of the migratory waterfowl in North America depend on prairie potholes for their survival.[4]

IMPACTS OF CLIMATE CHANGE

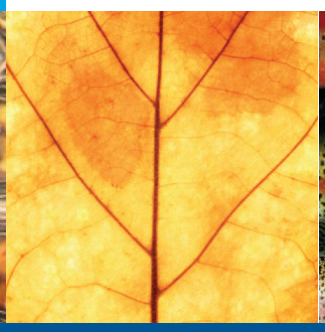
Climate change will affect the prairie grasslands ecoregion by pushing temperatures higher and decreasing rainfall in certain areas.[5] Human activity has already damaged many Great Plains habitats, primarily through agricultural and livestock activity in the region. For example, only 40-50% of the original prairie pothole wetlands remain intact and undrained today.[6] It is likely that climate change will further exacerbate this trend. Climate records reveal that while the average annual temperatures in the United States have increased about 1°F (0.6°C) over the past hundred years, average temperatures on the central and northern Great Plains have risen by at least 2°F (1.1°C).[7]

In some areas, such as North and South Dakota and portions of Montana, average temperatures have increased as much as 5.5°F (3.1 °C).[8] In addition to rapidly rising temperatures, patterns of rainfall have changed over the same time period so that the eastern areas of Montana, Wyoming, and Colorado have suffered a decrease in precipitation of 10%.[9] Climate models predict that this increased drought in some areas will cause wetlands to relocate or disappear. Climate change will challenge wetlands in particular, because most wetlands in the plains occur where the effects of climate change are predicted to be most severe.[10] These findings imply that climatically drier portions of the Prairie Pothole Region, including areas that migratory birds rely on, are especially vulnerable. However, higher temperatures and decreased precipitation will make life harder for the entire region.

SPOTLIGHT ON A SPECIES

The prairie grasslands ecoregion is often referred to as a "duck factory" because it produces roughly 50% of America's ducks even though it occupies only about 10% of total duck breeding territory.[11] Duck species such as northern pintails and mallards form mating pairs and breed in the scattered wetlands of this region. Ducks seem to prefer the smaller wetlands because the isolated ponds allow each pair to have its own space. In fact, ducks already inhabiting a small pond may chase away other ducks in order to protect their territory.[12] Mallards, pintails, and blue-winged teals are all dabbling ducks, which means they feed in the shallow wetland waters by dipping their heads just below the water surface to eat plants, insects, and small fish. Diving ducks, like the redhead, dive into the deep water to feed on the bottom of the pond.[13] Ducks often prefer to nest near the wetlands and ponds of the prairie grasslands region in order to feed on the plentiful resources available there. They also prefer this area because the tall grass habitat provides protection from predators.[14] Agriculture and other activities have decreased the total amount of grassland in the prairie grasslands region, and scientists have found that as the grassland diminishes and the habitat becomes fragmented, predators destroy more duck nests. Part of the reason for this increase in predation is that predators such as foxes and crows are better able to see nests in less grassy and more fragmented areas.[15]

The number of ducks that breed successfully in the prairie grasslands region depends on the wetland conditions that year. In the past, lower duck populations have resulted from unusually dry years with fewer wetland areas.[16] Wetlands in the prairie grassland



region are likely to be affected by forecasted changes in climate, but the magnitude of the impact is uncertain.

Scientists from the U.S. Geological Survey, South Dakota State University, and the University of Montana initiated a study to examine how prairie grassland wetlands might respond to climate change. Model simulations determined that a warmer climate of only a few degrees Celsius increased the frequency and duration of droughts, and produced less favorable vegetation conditions in semi-permanent wetlands for most of the region. Climate scenarios using smaller temperature and rainfall changes resulted in geographic shifts in the locations of prairie grassland wetlands. During the model simulations, the scientists found that if rainfall increased with temperature, the location of the most productive wetlands would remain approximately the same. However, if precipitation remained stable or decreased, models predicted that most of the prairie grassland region would become too dry to maintain the wetland conditions.[17] These findings indicate that the duck factory is vulnerable to climate change, particularly under conditions of water stress.

PROFILING A CLIMATE STEWARD

Many groups are involved in wetland restoration to protect the habitats of waterfowl from the dangers of climate change, human development, and invasion by exotic species. One of the largest ongoing wetland restoration projects is the Glacial Ridge Project in northwestern Minnesota. Glacial Ridge is an important stop for many species of birds as they migrate on the mid-continental flyway. Climate change is likely to threaten some of these species, so preserving habitat for them is very important. The Glacial Ridge Project lies in the heart of ancient beaches that formed along the shores of glacial Lake Agassiz, which developed at the end of the last North American glacial period. The Nature Conservancy purchased the land and began restoring the site in 2000. When the restoration is complete in 2012, the Nature Conservancy will turn the land over to the U.S. Fish and Wildlife Service for management as a wildlife refuge. More than 30 other organizations have helped in various ways with the restoration project.

When the project began, only one of the six square miles of Glacial Ridge was in its natural condition; the rest had been transformed by human use for gravel extraction, farmland, and animal grazing. When the project is complete, one and

a half square miles of wetland and three square miles of tallgrass prairie will have been restored. So far, about two square miles of prairie have been planted and over 150 wetlands have been restored.

Since 2003, every year on Earth Day students from local schools journey to Glacial Ridge. Here, they can stop and participate at six different stations that help them learn about the natural prairie environment. Among other activities, students search for and identify amphibians, recognize how wetlands can improve water quality, and map how vegetation adapts to different natural conditions across the landscape. In addition, for the past several years, 4th, 5th and 6th grade students from Red Lake Falls have been conducting science projects at Glacial Ridge.

Glacial Ridge is an important home for species such as the western prairie fringed orchid, prairie chicken, sandhill crane, upland sandpiper, clay-colored sparrow, and marsh wren. Conversion of Glacial Ridge back to the native habitat for these plants and animals will help them to flourish once again. Wetlands and natural prairie also serve as natural filters, removing many of the pollutants added to water by human activities. Therefore, in addition to helping protect the habitat of many species of birds and plants, wetland restoration also helps give local residents cleaner water to drink!

If you don't live in Minnesota, you can still get involved in protecting wetlands. There are many organizations engaging in this type of activity all over the country. Search the internet with your teacher and classmates to see what kind of projects you can get involved with in your local community!

FOR MORE INFORMATION

- Ducks Unlimited is a nonprofit organization that works on conserving duck species in the prairie grassland region. For more information on ducks and the prairie wetlands, visit the Ducks Unlimited website at: http://www.ducks.org/conservation/initiative45.aspx
- Donald Trimble's Geological Survey Bulletin entitled, "The Geologic Story of The Great Plains" provides information on the geology of the Great Plains and the early history of settlers in the region, check out: http://www.lib.ndsu.nodak.edu/govdocs/text/greatplains/text.html
- For detailed information on the cultural and ecological history of the region, see David Wishart's *Encyclopedia of the Great Plains*. University of Nebraska Press, 2004. Partially available online at: http://books.google.com/books?id=rtRFyFO4hpEC&printsec=frontcover.
- To find more scientific information on how climate change may affect the Prairie Pothole Region, see Johnson, C., Millett, B., Gilmanov, T., Voldseth, R., Guntenspergen, G. and D. Naugle. 2005. Vulnerability of Northern Prairie Wetlands to Climate Change. *BioScience* 5(10):863-872.
- The Intergovernmental Panel on Climate Change (IPCC) is the definitive source of unbiased climate change science. www.ipcc-wg2.org/index.html

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