



GREAT PLAINS

KEY MESSAGES

Rising temperatures are leading to increased demand for water and energy. In parts of the region, this will constrain development, stress natural resources, and increase competition for water among communities, agriculture, energy production, and ecological needs.

Changes to crop growth cycles due to warming winters and alterations in the timing and magnitude of rainfall events have already been observed; as these trends continue, they will require new agriculture and livestock management practices.

Landscape fragmentation is increasing, for example, in the context of energy development activities in the northern Great Plains. A highly fragmented landscape will hinder adaptation of species when climate change alters habitat composition and timing of plant development cycles.

Communities that are already the most vulnerable to weather and climate extremes will be stressed even further by more frequent extreme events occurring within an already highly variable climate system.

The magnitude of expected changes will exceed those experienced in the last century. Existing adaptation and planning efforts are inadequate to respond to these projected impacts.

The Great Plains is a diverse region where climate is woven into the fabric of life. Daily, monthly, and yearly variations in the weather can be dramatic and challenging. The region experiences multiple climate and weather hazards, including floods, droughts, severe storms, tornadoes, hurricanes, and winter storms. In much of the Great Plains, too little precipitation falls to replace that needed by humans, plants, and animals. These variable conditions already stress communities and cause billions of dollars in damage. Climate change will add to both stress and costs.

The people of the Great Plains historically have adapted to this challenging climate. Although projections suggest more frequent and more intense droughts, heavy downpours, and heat waves, people can reduce vulnerabilities through the use of new technologies, community-driven policies, and the judicious use of resources. Efforts to reduce greenhouse gas emissions and adapt to climate change can be locally driven, cost effective, and beneficial for local economies and ecosystem services.

Even small shifts in timing of plant growth cycles caused by climate change can disrupt ecosystem functions like predator-prey relationships or food availability. While historic bison herds migrated to adapt to changing conditions, habitats are now fragmented by roads, agriculture, and structures, inhibiting similar large-scale migration.¹



Increases in heavy downpours contribute to flooding.

The trend toward more dry days and higher temperatures across the Southern Plains will increase evaporation, decrease water supplies, reduce electricity transmission capacity, and increase cooling demands. These changes will add stress to limited water resources and affect management choices related to irrigation, municipal use, and energy generation.² Increased drought frequency and intensity can turn marginal lands into deserts.

Changing extremes in precipitation are projected across all seasons, including higher likelihoods of both increasing heavy rain and snow events³ and more intense droughts.⁴ Winter and spring precipitation and heavy downpours are both projected



A Texas State Park police officer walks across a cracked lakebed in August 2011. This lake once spanned more than 5,400 acres.

to increase in the north, leading to increased runoff and flooding that will reduce water quality and erode soils. Increased snowfall, rapid spring warming, and intense rainfall can combine to produce devastating floods, as is already common along the Red River of the North. More intense rains will also contribute to urban flooding.

Expectations of more precipitation in the northern Great Plains and less in the southern Great Plains were strongly manifest in 2011, with exceptional drought and recording-setting temperatures in Texas and Oklahoma – and flooding in the northern Great Plains. Many locations in Texas and Oklahoma experienced more than 100 days over 100°F, with both states setting new high temperature records. Rates of water loss were double the long-term average, depleting water resources and contributing to more than \$10 billion in direct losses to agriculture alone. In the future, average temperatures in this region are expected to increase and will continue to contribute to the intensity of heat waves.

By contrast, the Northern Plains were exceptionally wet, with Montana and Wyoming recording all-time wettest springs and the Dakotas and Nebraska not far behind. Record rainfall and snowmelt combined to push the Missouri River and its tributaries beyond their banks and leave much of the Crow Reservation in Montana underwater. The Souris River near Minot, North Dakota, crested at four feet above its previous record, causing losses estimated at \$2 billion.

Projected climate change will have both positive and negative consequences for agricultural productivity in the Northern Plains, where increases in winter and spring precipitation will benefit productivity by increasing water availability through soil moisture reserves during the early growing season, but this can be offset by fields too wet to plant. Rising temperatures will lengthen the growing season, possibly allowing a second annual crop in some places and some years. However, warmer winters pose challenges.⁵ Some pests and invasive weeds will be able to survive the warmer winters,⁶ and winter crops that emerge from dormancy earlier are susceptible to spring freezes.⁷

In the Southern Plains, projected declines in precipitation in the south and greater evaporation everywhere due to higher temperatures will increase irrigation demand and exacerbate current stresses on agricultural productivity. Increased water withdrawals from the Ogallala and High Plains Aquifers would accelerate depletion of the aquifers and limit the ability to irrigate.⁸ Holding other aspects of production constant, the climate impacts of shifting from irrigated to dryland agriculture would reduce crop yields by about a factor of two.⁹



SELECTED RESPONSES

The Oglala Lakota tribe in South Dakota is incorporating climate change adaptation and mitigation planning as they consider long-term sustainable development. Their Oyate Omnicnye plan is a partnership built around six livability principles related to transportation, housing, economic competitiveness, existing communities, federal investments, and local values. Their vision incorporates plans to reduce and adapt to future climate change while protecting cultural resources.¹⁰

