



MANAGING CROPLAND IN A CHANGING CLIMATE: MIDWEST



Farmers and land managers are accustomed to adjusting management in response to changing conditions; fluctuations in markets, costs, pests, and weather are familiar variables. Climate change presents new challenges^{1,2}; finding strategies to adapt to these changes can help farmers remain productive and profitable. USDA's Climate Hubs and the Northern Institute of Applied Climate Science have identified tools and approaches³ to help farmers adapt their management and operations in response to current and future changes in climate. The conservation programs offered by the Natural Resources Conservation Service (NRCS) can provide technical and financial assistance to help farmers and landowners achieve their goals. Below are some examples of how adaptation strategies and NRCS programs can help you manage your resources and prepare your agricultural land for climate change.

HOW IS CLIMATE CHANGE IMPACTING MY FARM?

For a full description of climate change impacts on farms in the Midwest, view the Midwest National Climate Assessments: <https://nca2018.globalchange.gov/chapter/21/> and <https://nca2014.globalchange.gov/report/regions/midwest>.



TEMPERATURE INCREASES

Temperatures in the Midwest have warmed by more than 1.5° F between 1900 and 2010. Over the past few decades, the rate of temperature increase has been accelerating. Temperatures are projected to increase by another 5.6 to 8.5° F by the end of the century. The growing season has lengthened by an average of 9 days between 1950 and 2015, due largely to spring frosts ending earlier.



PRECIPITATION CHANGES

Mean annual precipitation in the Midwest has increased over the past century, with a tendency toward heavier and more intense rainfall events. Heavy rainfall has significant impacts on soil moisture, flooding, surface runoff and erosion, and infrastructure.

By late century, average winter and spring precipitation is expected to increase by 10-20%, relative to recent decades (1971-2000). Current projections indicate that summer and fall precipitation may experience less change, although summers may become somewhat drier. The number of days without precipitation is projected to increase, which may increase the likelihood of agricultural drought.



SOIL MOISTURE AND DROUGHT STRESS

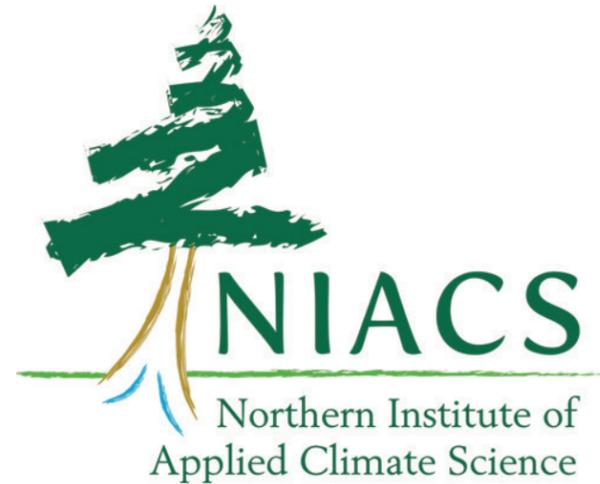
Drought stress may increase due to warmer conditions, longer growing seasons, and longer periods between rainstorms. During more frequent intense rain events, water may be lost due to increased runoff rather than being stored in the soil, which could also increase drought stress and could lead to decreased crop yields. Even though total mean annual precipitation has and is likely to continue to increase¹, these factors may lead to net drier conditions for the Midwest overall, especially as warmer conditions lead to increased evaporation. There is some evidence that elevated carbon dioxide in the atmosphere and longer growing seasons may help increase some crop yields in the short term, but these gains are expected to decline over the long term, particularly due to the heightened frequency of extreme weather events.


 United States Department of Agriculture
Natural Resources Conservation Service

Helping People Help the Land

NRCS provides America's farmers and ranchers with financial and technical assistance to voluntarily put conservation on the ground, not only helping the environment but agricultural operations, too.

www.nrcs.usda.gov



The Northern Institute of Applied Climate Science (NIACS) has been designed as a collaborative effort among the Forest Service, universities, conservation organizations, and forest industry to provide information on managing forests for climate change adaptation and enhanced carbon sequestration.

www.niacs.org


Climate Hubs
 U.S. DEPARTMENT OF AGRICULTURE

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WHAT CAN I DO?

Whether you are concerned about climate change impacts or are just interested in what you can do to keep your cropland productive and profitable, NRCS has programs that can provide the technical and financial assistance to help you achieve your goals and objectives.

ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP)

Provides technical and financial help to landowners for conservation practices that protect natural resources.

CONSERVATION STEWARDSHIP PROGRAM (CSP)

Helps landowners, land trusts, tribes and other entities protect, restore, and enhance wetlands, grasslands and working farms and ranches through conservation enhancements.

CONSERVATION TECHNICAL ASSISTANCE (CTA)

The CTA program provides technical assistance to help landowners and users address opportunities, concerns, and problems related to natural resources.

WHERE DO I START?

After applying for a program, you'll meet with an NRCS conservationist, who will help you:

- Identify your **GOALS, OBJECTIVES** and **RESOURCE CONCERNS**;
- Consider how climate change will affect your land; and
- Develop a conservation plan including strategies and conservation practices that support climate adaptation.



OBJECTIVE: PROMOTE ADAPTABILITY BY INCREASING DIVERSITY

ADAPTATION APPROACHES: *Promote biological diversity across the landscape; Maintain or restore natural ecosystems; Diversify existing systems with new combinations of varieties.*

CONSERVATION PRACTICES: *Conservation Cover, Field Borders*

Increasing diversity across the landscape can help systems adapt and cope with changing conditions. Often, there are unused or degraded areas on the farm that can be restored or enhanced to improve ecosystem functions and benefits, such as pollinator and wildlife habitat, and carbon storage. Incorporating natural ecosystems into the farm landscape can also improve soil and water quality without substantially impacting agricultural production. Field borders, for example, can provide food and cover for wildlife while reducing compaction and eliminating less-productive end rows. Diversity can also come in the form of different agricultural management practices, such as selecting crops that will be better adapted to future temperature and precipitation conditions.



OBJECTIVE: REDUCE THE IMPACT OF EXTREME PRECIPITATION

ADAPTATION APPROACHES: *Protect water quality; Reduce peak flow, runoff velocity, and soil erosion*

CONSERVATION PRACTICES: *Grassed Waterway, Contour Buffer Strips, Riparian Herbaceous Cover, Cover Crops, Residue/Tillage Management: Reduced Till or No Till*

Intense, heavy rainfall events and flooding are becoming more common, posing risks to soils, crops and infrastructure. More intense precipitation can increase runoff and erosion, as well as fertilizer and nutrient loss, contributing to contamination downstream. Slowing and infiltrating the flow of water across your land can help minimize these impacts. Contour buffer strips are bands of permanent, herbaceous vegetation established around hill slopes in crop fields; they can help reduce erosion and protect water quality by capturing sediment in runoff and preventing its transport to surface waters. Grassed waterways are shaped vegetated channels designed to convey water at non-erosive velocities. Installing these types of water management structures may help prevent erosion and gully formation in vulnerable areas. Bare soil is the most at risk during extreme rains. Keeping soils covered can help prevent damage; consider using cover crops and minimizing tillage. Converting high-risk areas into conservation buffers, pasture, or other types of permanent vegetation can also help minimize the impacts of increasingly intense precipitation.



OBJECTIVE: BUILD CLIMATE ADAPTED SOILS

ADAPTATION APPROACHES: *Maintain and improve soil health; Reduce peak flow, runoff velocity, and soil erosion*

CONSERVATION PRACTICES: *Cover Crops, Residue/Tillage Management: Reduced Till or No Till, Forage and Biomass Planting*

Healthy soils are necessary for productive agriculture; they also provide many functions such as regulating water quality, storing carbon, and providing nutrients. Improving or maintaining soil health may help buffer the effects of extreme weather, such as excessive precipitation and drought. For example, soil organic matter acts like a sponge and can help increase water holding capacity, meaning more water can be infiltrated and stored within the soil. Increased cover reduces the velocity of water, thereby increasing the opportunity for infiltration. Reducing or eliminating tillage; maintaining soil cover through mulches, residue, or cover crops; or converting annual cropland into pasture or hay are all ways to protect and restore the soil. Choosing the right cover crop varieties and management can help achieve different goals, such as building organic matter, reducing erosion, or minimizing compaction. Cover crops can also scavenge and store nitrogen in plant tissues, preventing its loss from fields as runoff during winter and spring and help protect water quality. Much of this nitrogen will then be available to the subsequent crop.

OTHER RESOURCES AVAILABLE

Conservation programs, practices, and easements are available through the NRCS. Visit your local USDA Service Center or www.nrcs.usda.gov. More adaptation strategies and approaches are available for forestry and other topics. Visit the Climate Change Response Framework website at: forestadaptation.org/adapt.

CITATIONS

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