

How agriculture can address climate change



Clockwise from top left: A demonstration at Twin Oaks Farm in Northfield during an Oct. 17 event highlighting BWSR and MPCA's climate reports compared the erosion potential of conventionally tilled soil (left) with no-till soil (right). Rice SWCD provided a seeder to plant cover crops. Landowner Mike Peterson grows a mix of annual rye grass, purple top turnips and kale as cover crops. Strip-tilling and planting cover crops are two practices that promote soil health and reduce greenhouse gas emissions. **Photo Credits:** Mary Juhl, BWSR



BWSR and MPCA reports highlight how agricultural practices can play a key role in mitigating climate change



Some Minnesota farmers are already experiencing the negative effects of climate change as extreme weather events become the norm. Record rainfall and flooding can prevent planting and create uncertain prospects for the fall harvest season. According to the Minnesota State Climatology Office, much of Minnesota is experiencing the wettest decade on record. In 2019 alone, heavy rainfall and flooding prevented 1.7 million acres from being planted in Minnesota, with similar totals in other Midwestern states.

All commercial sectors contribute to greenhouse gas emissions, the primary cause of a warming climate. This includes industries that generate

power and provide transportation, plus urban development. According to Minnesota Pollution Control Agency (MPCA) data, certain agricultural practices related to soil nutrient management, tillage and energy use, plus livestock methane emissions also contribute to increasing greenhouse gas emissions.

The good news: Most agricultural best management practices that improve water quality and soil health also help mitigate the effects of climate change. The Minnesota Board of Water and Soil Resources' (BWSR) Climate Change Trends and Action Plan details the benefits of these practices, drawing on new data compiled by the MPCA.

In October, the MPCA released a new study, Greenhouse Gas Reduction Potential of Agricultural Best Management Practices, which assesses the potential for conservation practices to reduce emissions. The most beneficial practices are those that get more perennial vegetation on the land, including hedgerows, shelterbelts, buffers, grass waterways and filter strips. Practices such as reduced tillage, nutrient management, and cover crops can be effective strategies for existing cropland. To produce the Climate Trends and Action plan, BWSR staff used data from the MPCA report to assess the climate benefits of conservation easements, conservation practices funded through soil and water conservation grants and wetland restoration efforts.

Accomplishments in mitigating climate change include:

- Between 2004 and 2018, soil and water conservation grants have supported implementation of conservation practices such as filter strips across more than 500,000 acres statewide. The per-acre estimates in the MPCA report indicate this will help reduce greenhouse gas emissions by about 300,000 metric tons per year (measured as CO2 equivalents). According to the US Environmental Protection Agency (EPA), the average passenger car emits about 5 tons of CO2 per year.
- Conservation easements established through the Reinvest in Minnesota (RIM)



Landowner Mike Peterson discussed his cover crop mix at an Oct. 17 event at his Northfield farm highlighting two recently released reports about how agriculture and conservation practices can help mitigate the effects of greenhouse gas emissions. In addition to planting cover crops, Peterson uses strip-tilling to improve soil health.

Reserve program have restored nearly 290,000 acres— much of it marginal farmland — to grasslands, wetlands or forest lands since the program began in 1987. Conservation practices tracked on about 180,000 acres are estimated to have reduced greenhouse gas emissions by roughly 232,400 metric tons per year.

- Minnesota’s wetland banking program has created over 380 wetland banks, covering 42,000 acres of both existing and restored wetlands. Wetland restoration can enhance carbon sequestration — which is beneficial to reducing emissions — but also result in methane emissions that can trap radiation in the atmosphere. By weighing these effects, BWSR estimates that the 11,800 acres in restored wetland banks result in

greenhouse gas emission reductions of about 13,500 metric tons per year. In addition, preserving high-quality wetlands can avert the increased emissions that would result from conversion to agriculture or urban development.

Both reports were highlighted at an Oct. 17 event at Twin Oaks Farm in Northfield. Landowner Mike Peterson hosted staff from BWSR, MPCA, the Minnesota Department of Agriculture and Rice Soil and Water Conservation District (SWCD), showing how he’s implemented strip-till and cover crops to improve soil health. These practices can also reduce greenhouse gas emissions.

The event included a soil health demonstration and a field site visit to view cover crops and machinery used for strip-tilling.

How do conservation practices reduce greenhouse gas emissions?

Soils contain vast quantities of carbon — more than double the amount in the atmosphere. Healthy soil holds the carbon that plants absorb from the air and incorporate into their root systems. Carbon is stored in the soil as roots, root exudates, and decomposed plant matter. Repeated plowing and chemical fertilizer use can reduce soil carbon, soil fertility and water-holding capacity. Wetland drainage also leads to reduced soil carbon.

The same practices that are known to improve soil health and water quality can increase carbon sequestration (the amount of carbon retained in the soil.) Beneficial practices such as cover crops, reduced tillage and perennial vegetation keep

soil covered year-round, reinvigorating soil biology and increasing carbon sequestration. Conservation practices also can reduce the amount of fertilizers, fuel and other inputs needed for agriculture, thus reducing greenhouse gas emissions and costs simultaneously.

Effective practices

According to the MPCA report, the most effective practices for greenhouse gas reduction include:

- Planting trees and shrubs in hedgerows, windbreaks or buffers
- Converting marginal farmland to grassland or

other native vegetation

- Installing grassed waterways
- Adding a perennial grass to a crop rotation

Practices that keep cropland in production, such as no-till, strip till, cover crops and reduced fertilizer use, have a lower per-acre effect but can potentially cover many more acres. Minnesota contains more than 20 million acres of cropland.

- Planting cover crops on 5 million acres — just a quarter of Minnesota's cropland — would reduce emissions by 1 million tons, the equivalent of taking 200,000 cars off the road.

Currently, cover crops are planted on about 3% of the state's cropland.

- Reducing fertilizer use by 15% on 10 million acres would reduce greenhouse gas emissions by 5.9 million tons, the equivalent of taking 1.2 million cars off the road.

Combined, BWSR programs have helped reduce greenhouse gas emissions by 600,000 tons of CO₂-equivalent emissions, or 2.2% of estimated emissions from cropland in Minnesota. However, this assessment does not include the effects of related state and federal programs and of voluntary practices. For example, the USDA's Natural

Resources Conservation Service (NRCS) programs such as the Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP) are not included in these estimates. Farms enrolled in the Minnesota Agricultural Water Quality Certification Program (MAWQCP) are estimated to reduce an additional 30,000 tons per year of greenhouse gases. BWSR is continuing to work with MPCA and other agencies to refine these estimates and share information about the ag industry's potential to be a major contributor in reducing the effects of climate change.



Landowner Mike Peterson demonstrates the strip-tilling process during an Oct. 17 event on his Northfield farm highlighting BWSR and MPCA's climate reports.