

Working Lands Watershed Restoration Program: Project Summary and Update

November 2018

In 2016, the Minnesota Legislature appropriated funds and directed the Board of Water and Soil Resources (Board) to prepare a plan and feasibility study for a Working Lands Watershed Restoration Program to incentivize the establishment and maintenance of perennial and cover crops. BWSR completed the feasibility study and plan and submitted it to the Legislature on February 1, 2018.

The Problem

Minnesota has made a significant commitment to clean water and habitat through the Clean Water, Land and Legacy Amendment and decades of investment in conservation programs. While the quality of Minnesota's lakes, rivers, streams, and groundwater is improving, the pace of progress is not as fast as hoped. The Minnesota Nutrient Reduction Strategy and numerous other studies show that excess phosphorous, nitrogen, and sediment are impairing water quality.

Annual row crops leave farmland essentially bare for much of the year, making it vulnerable to wind and water erosion and loss of nutrients. The timing and intensity of precipitation are changing, increasing the risks of destructive flooding and soil loss. In spite of improvements in agricultural practices, such as conservation tillage, improved manure and nutrient management, and land set-aside programs, water quality is increasingly threatened by these forces.

There is increasing recognition among conservation professionals, researchers, farmers and other engaged citizens that in order to increase the pace of progress on water quality we need more vegetation on the land for longer periods of time. But is it possible to increase this 'conservation footprint' on the landscape without taking additional land out of production?

In 2015 and 2016, a coalition of renewable energy, environmental and agricultural organizations promoted a bill that would incentivize planting of perennial crops and build markets for their productive use while also improving water quality. In 2016 the Minnesota Legislature directed BWSR to prepare a plan and feasibility study for a Working Lands Watershed Restoration Program (see sidebar).

What did the Legislature direct BWSR to do?

Develop a detailed plan to implement a working lands watershed restoration program **to incentivize the establishment and maintenance of perennial crops**, including:

- a process for selecting **pilot watersheds** that are expected to result in the greatest water quality improvements and exhibit readiness to participate in the program;
- an assessment of the **quantity of agricultural land** that is expected to be eligible for the program in each watershed
- an assessment of **landowner interest** in participating in the program;
- an assessment of the **contract terms** and any recommendations for changes to the terms, including consideration of variable payment rates for lands of different priority or type;
- an assessment of the opportunity to **leverage federal funds** through the program and recommendations on how to maximize the use of federal funds for assistance to establish perennial crops;
- an assessment of how **other state programs** could complement the program; (cont.)

Multiple Solutions

While the original legislation was focused on the potential for biofuel development, to be deployed in conjunction with existing ethanol plants, there are many technical and policy barriers to widespread production of ethanol from perennials, termed “cellulosic ethanol” or “advanced biofuel.” Obstacles range from the relatively low prices of conventional fuels to difficulties in processing the tougher plant fibers of perennial grasses.

The Working Lands study therefore looks beyond ethanol production to other potential uses for perennials, as well as for cover crops that hold the soil in place. New interseeding technologies now make it more feasible to maintain living cover outside of the relatively short growing season. Innovations in crop breeding and production methods by the University of Minnesota’s Forever Green Initiative are improving the yield and hardiness of many perennial crops.

Alternative Crops and Potential Uses

There are many perennial and cover crops currently in use or under development. Among those considered in the Working Lands study:

- Perennial grasses: Switchgrass and Miscanthus – biofuel, livestock bedding, soil conditioning (biochar)
- Kernza wheat (Intermediate wheatgrass) – forage, food products, biofuel
- Alfalfa – for hay or as part of mixed forages, other livestock feed, new value-added products
- Mixed forage crops for managed grazing by beef and dairy cattle (grass-fed beef, organic dairy, dairy heifer, cow-calf operations)
- Oilseed “cash cover crops” Winter Camelina and Pennycress – oils (camelina oil is edible), bio-jet fuel, bio-products, livestock feed
- Mixed cover crops (legumes, brassicas, annual grasses) for soil health

Watershed Surveys and Modeling

Six watersheds were selected for surveys and modeling based on their geographic and physical diversity, diversity of cropping systems, previous planning efforts and level of community engagement. Within each major watershed, one or more minor watersheds were selected for water quality modeling:

- Buffalo-Red River Watershed – Whiskey Creek
- Chippewa River Watershed – Shakopee Creek Headwaters
- Le Sueur River Watershed – Upper Cobb River and Cobb Creek
- Minnesota River – Mankato Watershed– Rogers Creek / St. Peter
- Root River Watershed – Watson Creek
- Sauk River Watershed – Getchell Creek / County Ditch 9

- an estimate of **water quality improvements** expected to result from implementation in pilot watersheds;
- an assessment of how to best integrate program implementation with **existing conservation requirements** and develop recommendations on harvest practices and timing to benefit **wildlife production**;
- an assessment of the potential viability and water quality benefit of **cover crops** used in biomass processing facilities;
- a **timeline for implementation**, coordinated to the extent possible with proposed biomass processing facilities; and
- a projection of **funding sources** needed to complete implementation.

[Laws 2016, c. 189, s. 4](#)

A survey of landowners in each of the major watersheds was conducted, assessing landowner familiarity with the alternative crops, their interest in planting those crops, and the factors that would encourage them to participate in a contract program.

Effects of land conversion on water quality were assessed using the HSPF computer simulation program to calculate the amount of pollutants – nitrogen, phosphorus and sediment – entering waterways via overland runoff or tile drainage.

Survey Results

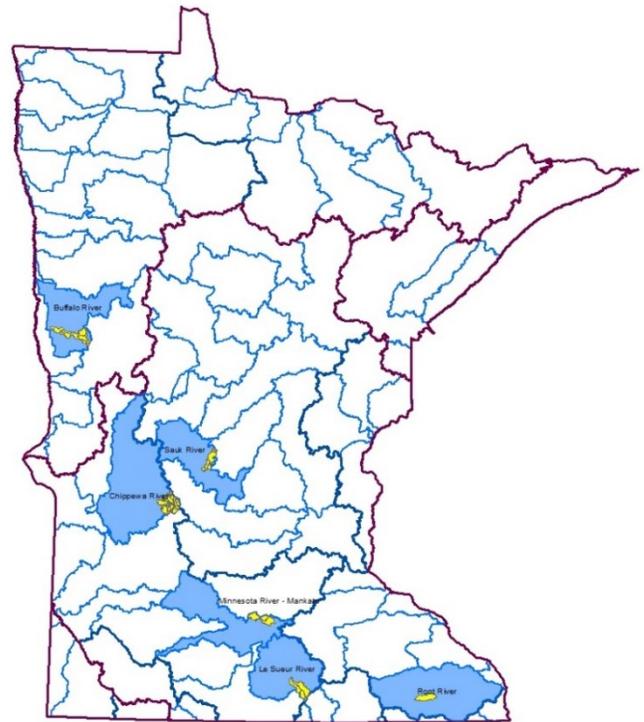
Overall, 430 respondents completed and returned the questionnaire, for a response rate of 14.3%.

- Respondents are most familiar with alfalfa, followed by annual cover crops and small grains, and were generally unfamiliar with kernza, winter camelina, and pennycress.
- Over one-third (39%) of respondents are somewhat to very likely to plant alfalfa on their farm in the next five years, with the greatest likelihood in those watersheds where alfalfa is an established crop (Root and Sauk River watersheds).
- The average respondent was willing to plant about a quarter of their land in cover crops, if contract payments were offered (choices of \$20, \$35 and \$50 per acre were offered; with similar responses between all three).
- A range of potential contract lengths (5, 10, and 15 years) and per-acre payments were offered as choices for planting alfalfa and other perennials. The payments respondents were willing to accept for growing alfalfa (including any income from the crop) ranged from \$163 to \$232 per acre, with higher amounts for longer contracts. For perennials, respondents were willing to accept payments of around \$125 per acre, regardless of contract length.

Modeling Results

MPCA modeled two distinct restoration scenarios: 1) a “Mid-term scenario” assumed that 30% of all marginal row crop acres would be converted to perennial grass, and that cover crops would be planted on 40% of all remaining row crop acres, and 2) a “Long-term scenario” assumed that 100% of marginal cropland would be converted to perennial grass, and that cover crops would be planted on 50% of all remaining row crop acres. Modeling the mid-term scenario, which offers a feasible goal for a working lands program, resulted in reductions of total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN) in each watershed. The percentage of reduction varied based on several factors:

- Position in the watershed, with greatest reductions seen in the upstream catchments; for example, reductions of 25 – 30% in all three pollutants were seen in the uppermost Whiskey Creek (Buffalo River) catchment;
- Existing land uses, the amount of marginal land, terrain, and hydrology – for example, lake reaches (which are modeled differently) can trap sediment and nutrients, affecting downstream results;
- Targeting those areas with higher pollution loading rates for land conversion produced greater reductions in



Study watersheds

sediment and nutrients. For example, in the Le Sueur subwatersheds (Freeborn Lake/Cobb Creek), reductions of over 25% in TSS and TP were achievable when targeting these areas.

Potential Elements of a Working Lands Program

How would a working lands program lead to more widespread adoption of alternative crops that improve water quality and soil health, but currently lack dependable markets? The program would need to subsidize the alternative crops while working to create or improve market opportunities, so that subsidies will eventually become unnecessary. According to landowner survey results and stakeholder input, landowners seek a reasonable return from alternative crops, the opportunity to experiment with different crops, and a simple enrollment process.

Program elements could include:

- **Different contract terms:** for 1) cover crops (where the primary crop remains), 2) cash cover crops (where the primary crop remains but yields may be reduced) and 3) perennials (where the primary crop is replaced).
- **Flexibility:** landowners could choose which alternative crops to plant in any growing season, as long as perennial cover is maintained.
- **Risk management:** A contract should provide assurance of a base level of payment for a defined period (e.g., 5 or 10 years). Future crop insurance eligibility would be maintained if possible.
- **Watershed, “supplyshed” or source water protection focus:** Focusing on a specific watershed enables better targeting and measuring of water quality improvements, but a “supplyshed” spanning multiple watersheds connected to a processing facility could also be considered. *Drinking water protection, especially in vulnerable wellhead areas, appears to offer the greatest potential for a pilot program, since conversion of a relatively small land area can yield measurable results for public water supplies.*
- **Prioritize environmentally-sensitive lands, multiple benefits:** The program could be structured with variable payment rates, with the highest rates going to those lands that contribute the highest loads of pollutants to waterways. Lands that offer multiple benefits in addition to water quality, such as carbon storage and wildlife and pollinator habitat, could also be prioritized

Project Partners and Stakeholders

- **Interagency Advisors:** Departments of Agriculture, Health, Natural Resources, and the Minnesota Pollution Control Agency
- **Economic and Social Capacity Analysis:** University of Minnesota Water Resources Center (contractor for analysis and survey) and Center for Changing Landscapes
- **Water Quality Modeling:** MPCA
- **Federal Farm Programs and Policies:** Environmental Initiative
- **Stakeholder Committee:** Ag Utilization Research Institute, Cattlemen’s Association, MN Corn Growers Assn., Friends of the Mississippi River, Great Plains Institute, Great River Greening, MN Ag Water Resources Center, MN Environmental Partnership, MN Farm Bureau, MN Farmers Union, MN Rural Water Association, MN Soybean Growers, Pheasants Forever, U of MN Forever Green Initiative.



Winter camelina harvest. Photo: Forever Green