



Green Lands  
Blue Waters

# Minnesota Projects to Protect Drinking Water with Kernza® Perennial Grain

September 2021 Update

## What is the problem?

**Nitrogen fertilizers** and other agrochemicals used to grow annual crops like corn, soybeans, potatoes, beets, and wheat **can pollute aquatic ecosystems and rural drinking water sources**. Nitrate is one of the most mobile forms of nitrogen and can easily leach from the soil into groundwater. **It is one of the most prevalent contaminants of public and private water systems in agricultural areas of the U.S. Upper Midwest.**

In Minnesota, **75% of residents get their drinking water from groundwater**, about two-thirds from municipal water sources and the rest from private wells.

According to the Minnesota Pollution Control Agency, **49% of wells in agricultural areas statewide have nitrate concentrations higher than EPA standards for drinking water. This water is not safe to drink.**

High nitrate levels can cause blue baby syndrome and are associated with increased risk for certain cancers - even at concentrations below EPA limits - so nitrate must be removed from drinking water before consumption.

**Nitrate contamination of drinking water costs taxpayers millions**, requiring expensive construction or updates to treatment plants. There are some strategies in place to prevent contamination, but success is limited.

Throughout the state, **1.2 million acres are designated Wellhead Protection Areas**, lands managed to prevent contamination of public water systems. 360,000 acres are considered highly vulnerable, **yet nearly half of them are planted to row crops, leading to nitrate pollution.**

Despite the costs and health risks of nitrate contamination, **farmers have had few practical, economically-viable alternatives to row crops – until now.**

## What is Kernza ® Perennial Grain?

**Kernza is the trademarked name of the edible grain harvested from intermediate wheatgrass**, a perennial grass related to wheat. The trademark is held by The Land Institute. While intermediate wheatgrass is commonly planted in the U.S. as a forage grass, breeding programs at [The Land Institute](#) and the University of Minnesota's [Forever Green Initiative](#) are **developing a promising new perennial grain crop** that can be used in similar ways to wheat and barley. Selection for grain size, disease resistance, and other traits culminated in the release of the first commercial variety, MN-Clearwater, in 2019.

Kernza grain is already making its way into beer, bread, crackers, whiskey, and many other consumer packaged products.

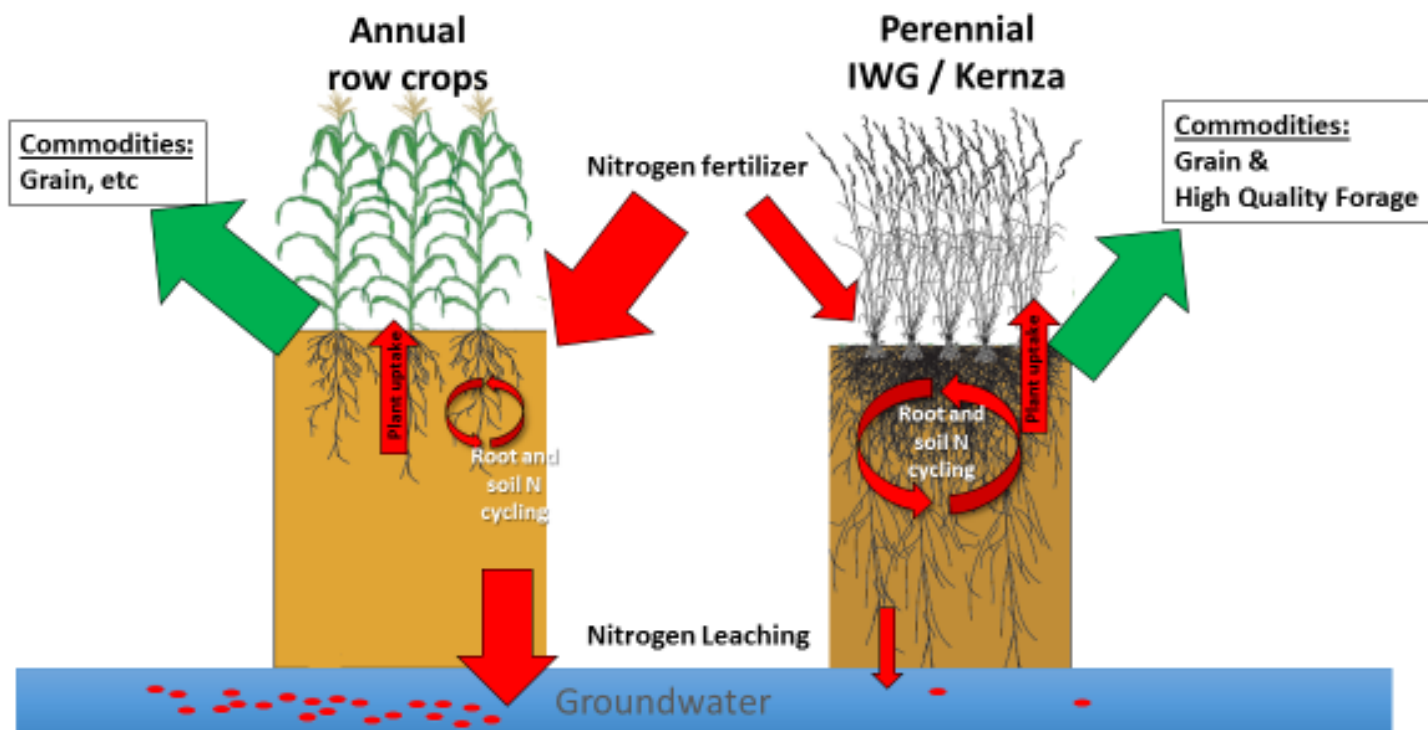
More information can be found at [kernza.org](http://kernza.org).

## How Can Kernza Protect Our Drinking Water?

Compared to annual crops, research is showing that **perennial crops like Kernza leach less nitrogen to groundwater, sequester more carbon, and prevent more erosion**. Kernza has long roots that can access nitrate deeper in the soil, and its longer growing season helps keep soil and nutrients in place. Experiments have shown very low nitrate leaching below its rooting zone, meaning that **Kernza takes up fertilizer before it reaches groundwater**.

**Grown on enough acres, Kernza and other perennials could reduce nitrate contamination of groundwater drinking sources**. As yields continue to improve and demand grows for Kernza food products, as well as livestock grazing and forage production, more farmers will be willing to replace annual crops with perennial grain.

As of Summer 2021, over 1,300 acres of Kernza were in production in Minnesota with plans to expand another 50%. Nationwide Kernza acreage stands at 4,000, with expansion planned in all corners of the country.



Credit: Dr. Jacob Jungers, University of Minnesota

# Five Minnesota Projects to Protect Water Using Kernza

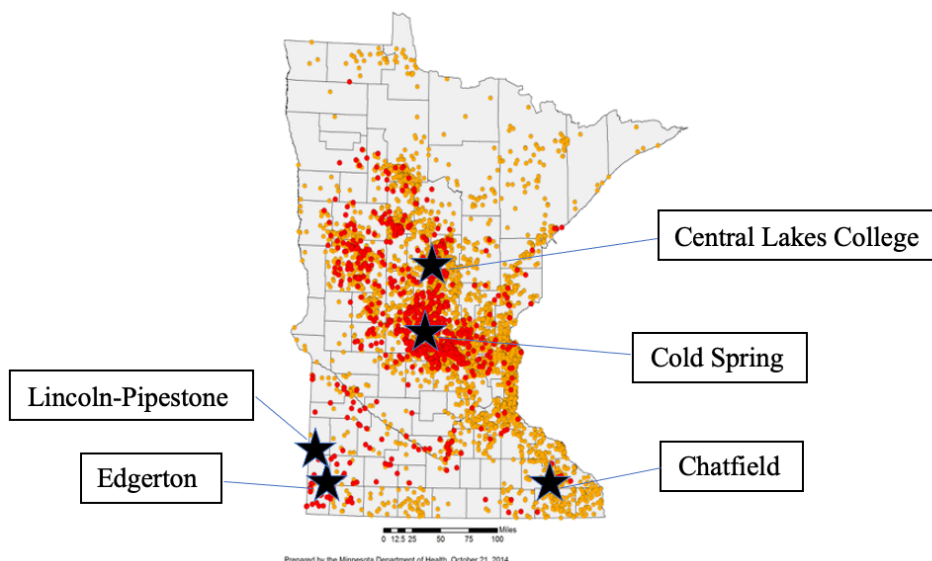
1. The sandy soil of the Central region often needs irrigation to be productive but is vulnerable to leaching. In 2017, a three-year, plot-based experiment was established at Central Lakes Community College in Staples, comparing irrigated, fertilized Kernza and a corn-soy rotation. Soil water nitrate concentrations under Kernza were 77 to 96% lower than under corn and soy. Kernza yields were comparable to other sites, demonstrating that it can be a viable crop even while reducing leaching on highly vulnerable land.
2. In 2017, 54 acres were planted on land managed by Lincoln-Pipestone Rural Water in a highly vulnerable wellhead protection area that pumps 1.8 billion gallons of water a year to rural residents in a 10-county region. Nitrate levels in soil water samples were nearly zero. Grain was sold to Perennial Pantry, who cleaned, processed, and milled it before selling it to consumers across the country through their 2020 Kickstarter campaign and to businesses including Bang Brewing.
3. Chatfield sits on karst topography that is vulnerable to leaching. In 2017, 13 acres of Kernza were planted on land owned by the city and a private party, and Kernza grain and straw were harvested for three years. Nitrate levels in soil

water samples were nearly zero throughout the second season, when water data was collected.

4. Twenty acres of Kernza, alfalfa, and a native prairie mix were planted in Melrose and Cold Spring, communities with elevated nitrate levels, as part of efforts to develop water-efficient production methods, supply chains, and end-use markets for profitable perennial systems. Grain was sent to seed cleaners, processors, millers, bakers, and brewers across the state to experiment with and develop new Kernza products.
5. In 2018, Edgerton planted 40 acres of Kernza with the goal of protecting the city's water supply. They harvested the first crop in 2019, which was sold to the U of MN for Kernza seed increase. This planting is now helping protect drinking water, increase seed availability, and generate farmer interest.

These projects have the potential to reduce drinking water contamination on vulnerable land. They also demonstrate the environmental benefits and economic viability of Kernza to Minnesota's farmers and landowners, paving the way for broader adoption and landscape-scale change. Kernza offers a way to protect drinking water *and* keep farm fields in production.

*Funding for these projects came from the Minnesota Environment and Natural Resources Trust Fund-Clean Water Fund, Institute for Renewable Energy and the Environment, The Land Institute, the Malone Family Foundation, and the MN Department of Agriculture.*



Private wells at risk of nitrate contamination in Minnesota.  
Credit: Minnesota Department of Health.



## Partnership...

**Kernza research and commercialization efforts include farmers as partners**, sharing insights into grower needs and challenges and contributing essential production knowledge. The University of Minnesota and The Land Institute coordinate with growers to support access to technical resources and markets, including launching the [Forever Green EECO Implementation Program](#). **In July 2021, the Perennial Promise Growers Cooperative was established**, the first co-op for Kernza growers, helping coordinate market efforts and share production insights.



Kernza harvest in Edgerton, Minnesota  
Credit: Carmen Fernholz, a Minnesota Kernza grower

**Additional support for Kernza commercialization will come from the Kernza Stewards Alliance**, focused on advancing shared interests of Kernza market partners to the broader marketplace, the policy arena, consumers, and researchers. The Kernza Stewards Alliance is part of the USDA NIFA-funded [KernzaCAP](#) Project.

## ...from Farm to Plate & Pint

Innovative businesses have helped launch early Kernza products. In Minnesota, consumers are already enjoying Kernza in beer from St. Paul's [Bang Brewing](#) and baked goods from Birchwood Café and others. Kernza grain, flour, and pancake mix can be ordered nationally online through Burnsville-based [Perennial Pantry](#) and can be found on a growing number of retail grocery shelves across Minnesota and the U.S. Food scientists at the University of Minnesota and elsewhere continue to experiment with Kernza, especially its bread making and malting qualities, helping to make it an attractive ingredient for bakers and brewers.



Kernza flour, whole grains, and pancake and waffle mix  
Credit: Perennial Pantry

Visit our website for the full paper, *Policies and Programs Supporting Perennial Farming Systems to Protect Drinking Water Sources in Minnesota*.

Green Lands Blue Waters is a vision for productive, profitable agriculture in the Upper Midwest based on the straightforward concept of getting as much value as possible from farmlands by growing crops that keep the soil covered year-round—what we call farming with Continuous Living Cover. The values from the crops we promote can be measured in yields and farm profits; but also as reduced risk, improved outlook for long-term productivity from the soil, more jobs, more wildlife, cleaner water and resiliency in the face of a changing climate.

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