

forever green

healthy local food



When we think “healthy food,” we often think about our own health or the health of our families. But a truly healthy food system also considers how our food is grown – including the impacts on the environment.



This exhibit focuses on the farm side of farm-to-fork – and explores exciting new crops that can provide farmers with new income opportunities while providing a series of environmental benefits, such as:

- Cleaner groundwater, lakes and rivers
- Improved habitat for pollinators
- Healthier soils



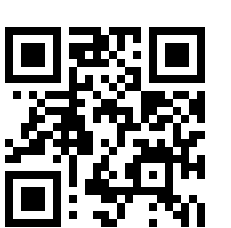
The vision showcased here is part of the **Forever Green Initiative**, led by the University of Minnesota, in partnership with farmers and advocates across the state. It is an initiative that is developing a better agriculture for Minnesota that benefits farmers, the environment, and our communities.

Healthy Local Food and the Forever Green exhibit was made possible through a partnership of the following organizations.
Thank You!



Many Photos for the Forever Green exhibit are courtesy of the University of Minnesota

Photo to left: Courtesy of The Land Institute. Comparison of the roots of annual wheat (left) to intermediate wheatgrass (right). Intermediate wheat grass roots can grow 12 feet long compared to the annual wheat (left). Read more about the Forever Green Initiative at: www.forevergreen.umn.edu, contact Don Wyse at wysex001@umn.edu, or scan this QR code.

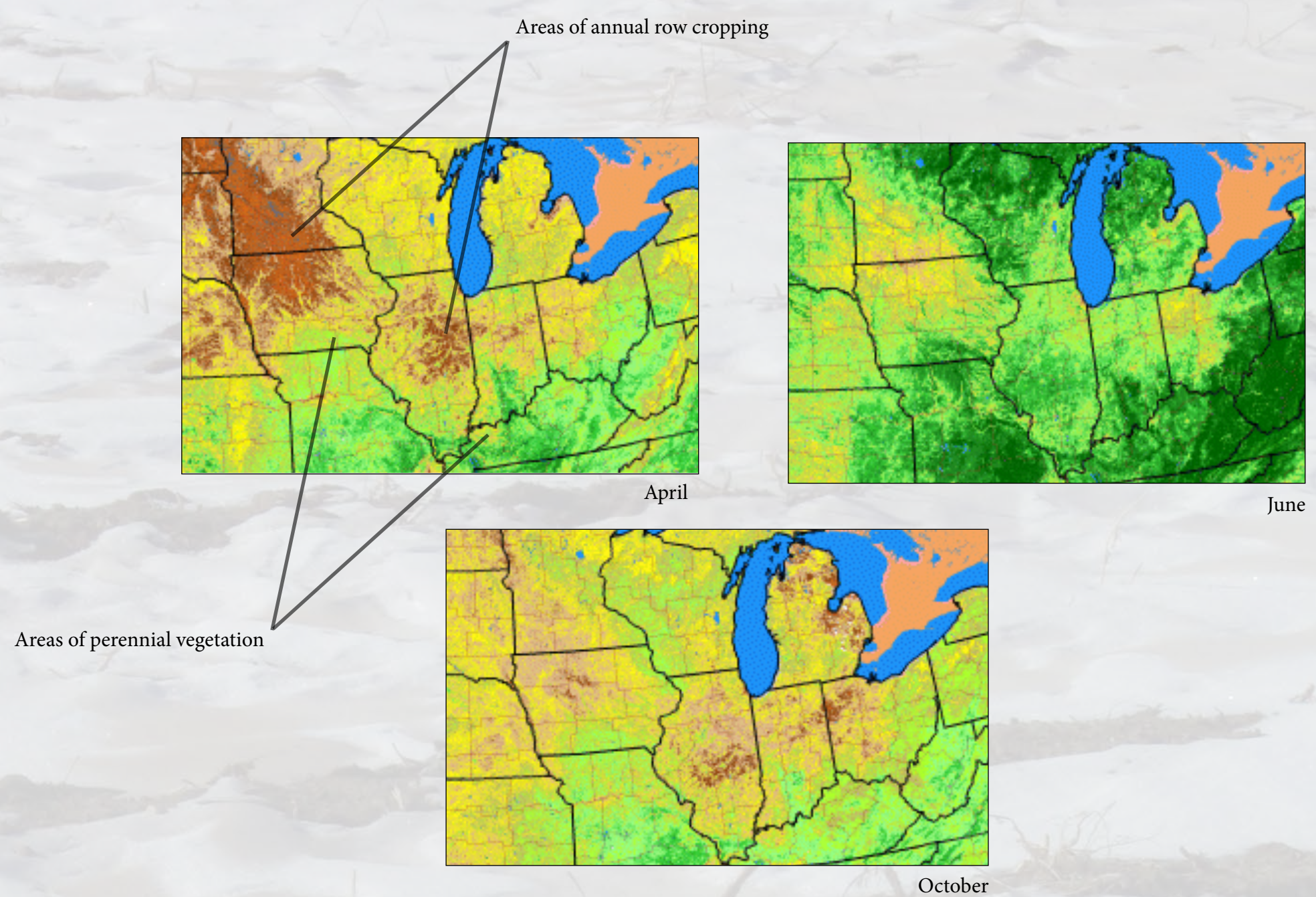


The Land Institute

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The Situation

Corn and soybean dominate Minnesota's fields in the summer months. These super productive row crops are critical to our current agricultural system, but their strength is also their weakness. While it only takes them a few months to grow from a seed to a mature plant, the downside is that for the rest of the year, that land often lays bare.



Bare soil is problematic for several reasons:



Topsoil can be blown away by wind



Rain can wash topsoil off of fields

These same rains can transport nutrients from fields into our lakes, rivers, and groundwater



These issues arise because corn and soybean are summer annuals and they lack the roots to overwinter, stabilize the soil, and use fertilizers efficiently during the spring, fall, and winter.

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The Opportunity

Through the **Forever Green Initiative** farmers, scientists, and advocates have been working together to develop new cropping systems that include things like winter annual crops, that grow in the off season, and perennial crops that grow all year round. These crops help keep the soil in place, enhance soil health, and capture sunlight, water, and nutrients at times of the year when summer annuals are no longer on the fields.

In this exhibit, you will learn about four kinds of cropping systems that provide a promising future for agriculture in the Midwest. Cropping systems that:

- boost farm profitability
- provide pollinator and wildlife habitat
- improve soil health
- and protect our lakes, rivers and groundwater

These systems are “works in progress.” Research at the University of Minnesota and other institutions is focused on breeding new winter annual and perennial crops, working with farmers to test these crops in the field, and evaluating the economic and environmental benefits of these systems.





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Winter Annual Crops

Annuals are plants that complete their life cycle in one growing season. Winter annuals are planted in the fall after the harvest of summer annual crops or can be interseeded between row crops. Plants get established in the fall, lie dormant over the winter, resume growth as the soil warms up, and are ready for harvest in late spring or early summer.

Examples: pennycress; camelina; winter barley

Perennial Crops

Perennial plants live for multiple years. Their leaves may die off in the winter, but their root systems stay intact, and in the spring, new growth develops from those roots. Perennial systems provide continuous cover to the soil year round.

Examples: intermediate wheatgrass, perennial sunflowers, perennial flax, silphium

Woody Crops

Woody crops are perennials, but with woody stems that do not die back to the ground each year. A number of woody perennials bear fruit or nuts; others are good sources of biomass. These systems provide a multitude of environmental benefits.

Examples include: hazelnuts; elderberries; raspberries; apples

Managed Pasture

Livestock have been grazing on pastures for thousands of years, but in the late 20th century farming systems in the US trended towards keeping animals in more confined spaces and bringing feed to them. There is a renewed interest in well managed, grass-based systems that not only provide nutritious feed for livestock, but also provide a range of ecosystem services associated with having the ground covered year round.

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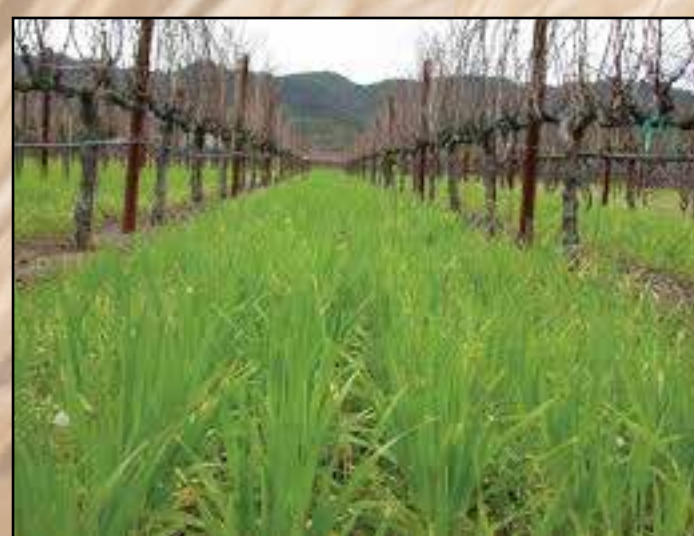
Winter Annual Crops

Winter Barley

Hordeum vulgare L.



Barley is one of our most ancient crops, domesticated from wild barley over 10,000 years ago. While widely used as animal feed, barley is best known as the grain of choice for beer makers. It also is a heart healthy grain that is a great addition to soups, salads, breads and cereals.



Most of the barley grown in Minnesota are spring varieties. In fact, the University of Minnesota has had a spring barley breeding program for over 100 years! But with the growing interest in continuous cover, some researchers have turned their attention to winter barley.

Like other cover crops, winter barley provides an array of ecosystem services: holding the soil in place, capturing residual nutrients, and soaking up water from fall and spring rains.

Add this to the growing demand among craft



breweries and food companies for more locally, sustainably-sourced ingredients, and the future looks promising!



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Winter Annual Crops

Camelina

Camelina sativa L.



Once considered a weed, winter camelina is showing promise as a soil-protecting cover crop that has economic value to farmers. Winter camelina can be interseeded into fields of corn and soybean in late summer and harvested the next spring.

Winter camelina provides living cover on fields that would otherwise be bare,

holding soil in place and capturing excess nitrogen (keeping it out of ground and surface waters.) A member of the mustard family, it blooms with bright yellow flowers in early spring providing an early food source for pollinators.



Camelina oil can be extracted from the seeds of the plant. The edible oil is heart-healthy, has a long shelf life, and is versatile – great in a vinaigrette or for frying

up green tomatoes. The seed meal, left over from extruding the oil, is a high quality animal feed.

Field pennycress

Thlaspi arvense L.

Field pennycress is a winter annual with the potential to be an outstanding cover crop and profitable alternative oilseed crop within Minnesota's traditional corn/soybean rotation. Cover crops, in general, provide crucial environmental services including nutrient scavenging, weed suppression, soil erosion protection and runoff reduction. Field pennycress may offer Minnesota farmers all of those benefits as well as being a profitable oilseed crop that can be harvested right before planting a soybean crop.



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Perennial Crops

Kernza™

Intermediate Wheatgrass
Thinopyrum intermedium L.



While distantly related to wheat, intermediate wheatgrass differs substantially in that it is a perennial plant rather than an annual. That means

a farmer can plant it once and harvest it for multiple years, eliminating the need for annual tilling, planting, and fertilizing.



Intermediate wheatgrass roots grow up to 12 feet deep, several times the depth of annual wheat. Roots like this not only hold soil in place, they build

soil health and soak up water from heavy rainfalls. They also reach deep to find water during droughts, making the plant adaptable to a wide range of climates.



Kernza™ is the grain that comes from intermediate wheatgrass. While not an exact wheat replacement, it has captured

the interest of chefs, bakers, and food companies looking to source more environmentally-friendly ingredients. Elite bakeries like Brooklyn's Bien Cuit and San Francisco's Tartine are

experimenting with this new and unique grain, and in Minneapolis, the Birchwood Café regularly showcases Kernza™ on its menu.



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Perennial Crops

Perennial Flax

Linum perenne and *Linum lewisii*



Historically, annual flax has been an important source of fiber for cloth and specialty papers, and of linseed

oil for the production of paints and linoleum. The importance of flax diminished with the invention of synthetic fibers and oils. However, interest in flax is being renewed as demand increases for natural fibers and foods high in heart-healthy omega-3 fatty acids.

While beautiful in landscape settings, and providing an array of ecosystem services including soil stabilization, water retention, and a food source for pollinators, perennial flax is not currently a profitable cash crop for farmers.



This is where scientists comes in. Researchers at the University of Minnesota are working to develop more profitable varieties of perennial flax

by selecting the best performers in plant trials and cross breeding perennial flax with annual flax. Their goal is to develop lines of perennial flax that are hardy and produce good seed yields.



Hazelnuts

Corylus americana



Minnesota is not known for its nut crops. Only a few of species have any productivity in our far northern climate. But a handful of researchers have been crossing northern-hardy, native hazelnuts with domesticated varieties for the past 30 years. The result is that we are on the verge of hazelnut bushes that provide both ecosystem services and a profitable crop.



Hazelnut bushes have deep root systems that prevent soil erosion and protect water quality. They are also wildlife magnets, providing

shelter and food to an array of pollinators, birds, and mammals. Hazelnuts keep their leaves well into the fall which increases carbon sequestration and oxygen production.



From whole nuts to extra virgin hazelnut oil, consumers and food companies are ready to snap up this new Minnesota crop when it becomes commercially available. And did we mention Nutella? Try making that out of soybeans!



Elderberry

Sambucus canadensis



The elderberry is a perennial, fruit-bearing shrub that grows well in northern climates like Minnesota. It's nutrient dense flowers and

berries make it a sought after ingredient in both dietary supplement and medicinal markets. Its berries also make for great pies and jams — and even wine!

As with all woody perennials, elderberries provide a spectrum of ecosystem services. Their root systems hold soil in place and soak up excess water, thereby preventing soil erosion and protecting water quality. They are a food source and haven for pollinators, birds, and other wildlife.

Elderberries are suited to both small and large scale production. They can fit into many small niches in the agricultural landscape, and add economic value when planted in integrated systems such as windbreaks, living snow fences, riparian buffers, contour strips, and other marginal lands.



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Managed Pasture

Cows



Cows grazing on lush green pastures. It is the image we like to picture when we think about the origins of our milk or cheese. While only a small percentage of dairy cows currently spend much time on pasture, these grass-based systems are gaining support

because they deliver ecosystem services and provide profits to farmers.

Cows raised on pasture require less “inputs.” They harvest much of their own food, rather than having food raised, processed and brought to them. They also are less prone to disease. And consumers will pay a premium for pasture-raised products, especially if they are certified organic.



A well managed pasture keeps the ground covered year round. It soaks up heavy rains, builds healthy soils, and is a boon to all sorts of wildlife, from pollinators, to song birds, to a range of critters. And the cows are happy too!



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Grazing & Managed Pasture

Goats

Goats are cute, have personality, and can be an important part of a forever green landscape. Ecologically sensitive lands are less likely to be plowed up and planted to row crops if they can have an alternative means of being profitable. Enter the goats.

Goats love to eat almost anything, and can thrive on plants that other animals don't find palatable. They're great vegetative managers, gladly consuming any number of invasive species - from buckthorn to wild parsnip. Their superpower is their digestive system, which kills many weed seeds, stopping the cycle of weed propagation.

Goats can provide a variety of income sources to farmers. Some farmers rent them out as "weed managers." Others milk their goats and sell the milk or use it to make products like yogurt or cheese. Other farmers are finding growing market for goat meat, a lean and popular protein source for a number of ethnic traditions - from Greeks to Somalis.

