Environment and Natural Resources Trust Fund

M.L. 2022 Approved Work Plan

General Information

ID Number: 2022-046

Staff Lead: Corrie Layfield

Date this document submitted to LCCMR: June 20, 2022

Project Title: Scaling a Market-Driven Water-Quality Solution for Row-Crop Farming

Project Budget: $476,000

Project Manager Information

Name: Nicholas Jordan

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

Office Telephone: (612) 625-3754

Email: jorda020@umn.edu

Web Address: https://cfans.umn.edu/

Project Reporting

Date Work Plan Approved by LCCMR: June 27, 2022

Reporting Schedule: March 1 / September 1 of each year.

Project Completion: June 30, 2025

Final Report Due Date: August 14, 2025

Legal Information

Legal Citation: M.L. 2022, Chp. 94, Art. , Sec. 2, Subd. 04n

Appropriation Language: $476,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to work with farmers to accelerate adoption of grain-camelina rotations in targeted watersheds as a scalable and market-driven way to enhance stewardship of soil, water, and wildlife.

Appropriation End Date: June 30, 2025

Narrative

Project Summary: Adding a year of grain/winter camelina production to Minnesota crop rotations provides a highly scalable market-driven clean-water solution; our pilot supply chains will accelerate wide adoption of this solution.

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

A new option is emerging for improving water conservation in Minnesota row-crop agriculture: production of cool-season and winter grains (such as hybrid winter rye, oat, or pea), followed by the winter-hardy crop camelina. These pairs of crops (a grain, and camelina) can be grown between corn and soybean years of the common corn/soybean crop rotation, enabling farmers to grow three crops in two years while significantly enhancing stewardship of soil, water, and wildlife. The grain-camelina system safeguards water by providing continuous living cover of soil for most of the year, thereby substantially reducing soil erosion, runoff of rainfall, and losses of nutrients. In addition to safeguarding water, grain-camelina systems produce abundant yields of high-value commodities, for which large markets are beginning to emerge. Therefore, enabling Minnesota farmers to add a grain-camelina rotation year to row-crop crop production systems will create a highly scalable market-driven pathway to clean water. The grain-camelina system also provides habitat for pollinators and wildlife, and produces additional value for farmers by improving soil health and management of crop pests (including herbicide-resistant weeds). There is high potential to realize many environmental benefits from Minnesota agriculture by wide adoption of the grain-camelina system.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

To realize the potential of grain-camelina production as a market-driven water-conservation strategy for row-crop farms, we must eliminate remaining barriers to wide deployment across Minnesota. The crucial next step is extensive watershed-scale pilot-testing of grain-camelina systems in three Minnesota watersheds with highly-valued water resources, including source water protection areas and trout streams. This work will build on promising results from a current LCCMR project that is testing camelina in much smaller plots, and on other successful proof-of-concept efforts. This extensive pilot-scale implementation is critically needed to activate market forces that can drive wide adoption of grain-camelina systems. Specifically, our piloting work will engage many farmers in building experience in growing the grain-camelina system across Minnesota. Our piloting work will also produce large quantities of camelina seed that are critically needed to develop storage, processing, and manufacturing methods that are key to creating strong markets for camelina. In addition, emerging markets for environmental benefits produced on farms can pay farmers for benefits produced by the grain/camelina system. Pilot implementation will help advance these payment systems. Together, environmental-benefit payments and end-use markets will support wide adoption of the grain/camelina system, providing major conservation benefits of value to all Minnesotans.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

Our key outcome is scaling up a market-driven water-quality solution for row-crop farming by piloting supply chains for the grain-camelina production system, through pilot implementation in three watersheds. Supply chains link farmers to markets for new crops, such as camelina, that can deliver major environmental benefits from row-crop farms. To achieve these benefits for the public, farmers must have markets, and markets cannot develop without supply chains. Specifically, our project will engage many farmers in piloting grain/camelina production, and produce large quantities of camelina grain that are critically needed to pilot storage, transport, and processing links in supply chains.

Project Location

What is the best scale for describing where your work will take place?

Region(s): SE, Central,

What is the best scale to describe the area impacted by your work?

Region(s): SW, SE, NW, Central,

When will the work impact occur?

During the Project and In the Future

Activities and Milestones

Activity 1: Pilot Extended Rotation on Watershed Scale: Planning and Implementation.

Activity Budget: $341,231

Activity Description:

Support groups of farmers in three watersheds or environs to test an extended crop rotation that adds a grain/camelina year to corn/soybean crop rotations. Watersheds include the Middle Minnesota, Cannon River, and Sauk River. We will engage with farmers in planning and implementing pilot testing of the rotation on their farms, evaluating results of pilot grain/camelina plantings, and implementing additional pilot plantings as warranted. Project coordinators in each watershed will organize these activities; technical assistance will be provided by UMN personnel. Coordinator staff will hold group and individual meetings with farmers to explore options for implementing the rotation. Interested farmers will collaborate to plan and execute strategically-placed implementation of the rotation in each watershed, to efficiently protect water while also enhancing crop production. We aim to plant and harvest 500 acres of grain/camelina during the project, working with 3-5 farmers per watershed (approximately 160-170 acres per watershed, staged over the three years of the project. Production and post-harvest handling will be supported by partial cost-share and derisking payments. Evaluation of crop performance will be done by observing soil protection, yield, and profit; farmers and project coordinators will make these observations; results will be widely shared.

Activity Milestones:

Description	Approximate Completion Date
Recruit participating farm operations	June 30, 2023
Develop on-farm implementation plans for grain/camelina in 9-15 total farm operations across three watersheds	August 31, 2023
Implement production plans in 9-15 total farm operations across three watersheds	June 30, 2024
Evaluation of performance of piloted grain/camelina cropping systems	May 31, 2025

Activity 2: Supply-chain Development & Support

Activity Budget: $29,095

Activity Description:

Much progress has now been made in formation and facilitation of a network focused on piloting grain/camelina cropping systems and associated supply-chains. This network includes end-use and intermediary firms, watershed groups, water-management agencies, the Forever Green Partnership and Commercialization Team, and others. Therefore, supply-chain development will focus on supporting farmers in piloting grain/camelina cropping systems, and accessing markets for grain from these cropping systems. Specifically, effort in this activity will focus on assisting farmers in accessing risk/cost-share payments, from project funds as noted above, and in accessing markets for grain from these pilot acres, thereby

building a solid foundation for further supply-chain development and scaling. Specifically, effort in this activity will focus on assisting farmers in accessing risk/cost-share payments for production and for post-harvest handling required to access markets for grain from these pilot acres, supported by project funds. Experience has shown that assistance requires significant dedicated "hands-on" support. Contracts with farmers for production and post-harvest handling will be developed and managed by University of Minnesota personnel.

Activity Milestones:

Description	Approximate Completion Date
Establish contracts for production cost-share with 3-5 farm operations	June 30, 2023

Establish contracts for production cost-share with 9-15 farm operations	June 30, 2024
Establish contracts for post-harvest handling cost share with 9-15 farm operations	December 31, 2024

Activity 3: Develop Crop Protocols for Ecosystem Service Market Development

Activity Budget: $30,000

Activity Description:
The project will collaborate with the Ecosystem Service Market Consortium (ESMC) to its current pilot project in the Sauk River Watershed. The ESMC (represented by Minnesota by project partner The Nature Conservancy in Minnesota) is a major national project prototyping scalable methods for paying farmers for producing environmental benefits (i.e., ecosystem services). The ESMC protocols for establishing marketable water-quality and flow credits for farmers will be adapted for cool-season grains and camelina in the cropping system, and then administered on a pilot scale on acreage in the grain/camelina system in the Sauk River watershed. If the ESMC protocols are accurate, the ESMC marketplace will provide a scalable pathway for farmers to capitalize on the increase in ecosystem services provided by their cropping systems.

Activity Milestones:

Description	Approximate Completion Date
Adapt ESMC protocols for establishing marketable water-quality and flow credits for the grain-camelina system	December 31, 2023
Complete verification test of ESMC protocols for grain/camelina system in row-crop rotations	January 31, 2025

Activity 4: Support End-Use Entrepreneurs

Activity Budget: $75,674

Activity Description:
Work on this activity will support the development of sustainable supply chains for winter camelina through technical assistance, commercialization support, outreach, and development of ecosystem services models that enhance market-viability for Minnesota camelina producers. Technical work will focus on assessment of winter camelina uses and provide support for businesses in development of camelina-based food, feed, and/or biobased products. Results from this work will guide the development of pilot scale projects with private businesses to commercialize winter camelina-based products.

Activity Milestones:

Description	Approximate Completion Date
Identify and assess potential uses of camelina-based food, feed, and/or biobased products.	December 31, 2024
Build network connections to advance markets and support continued development of supply chains for camelina	March 31, 2025
Provide technical assistance to Minnesota businesses in the development of camelina-based products	June 30, 2025
Collaborate in development of ecosystem services models that enhance market-viability for Minnesota camelina producers	June 30, 2025
Disseminate information developed during project through forums, publications, and other targeted outreach activities	June 30, 2025

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Brad Gordon, Program Manager – Southern MN	Great River Greening	Watershed planning and coordination in Rogers Creek, via individual and group meetings with interested farmers, and support for watershed planning in Rogers Creek and Rice Creek, by modeling agricultural practice impacts in the target watersheds with PTMApp and ACPF.	Yes
Kristi Pursell, Executive Director	Clean River Partners (formerly Cannon River Watershed Partnership)	Watershed planning and coordination in Rice Creek, via individual and group meetings with interested farmers, and water-quality and flow monitoring in Rice Creek.	Yes
Tom Raymond, Director of Environmental Sustainability	Hormel Foods Corporation	Participate in supply chain development for grain/camelina systems.	No
Tai Ullmann, Sustainability Manager, Global Edible Oilseeds	Cargill, Inc.	Participate in supply chain development for grain/camelina systems.	No
Leif Fixen, Agriculture Strategy Manager	The Nature Conservancy	Watershed planning and coordination in Sauk River Ecosystem Service Market Consortium Minnesota pilot project, via individual and group meetings with interested farmers; other integrate grain/camelina into the Sauk River Ecosystem Service Market Consortium pilot project.	Yes
Michael Stutelberg, Scientist, Chemistry	Agricultural Research and Utilization Institute	Support end-use entrepreneurs developing products from grain/camelina system, through a range of activities as detailed in Activity 4	Yes
Stefani Millie Grant, Senior Manager, External Affairs & Sustainability	Unilever North America	Participate in supply chain development for grain/camelina systems.	No
Samantha Wells, Associate Professor, Agronomy & Plant Genetics, University of Minnesota	University of Minnesota	Technical advice and support for on-farm pilot production pilot of grain-camelina systems	Yes
Jack Grushcow, President and CEO	Smart Earth Camelina Corp.	Participate in supply/value chain co-design for grain/camelina systems.	No
Dennis J. Fuchs, Administrator	Stearns County Soil and Water Conservation District	Watershed planning and coordination in Sauk River Ecosystem Service Market Consortium Minnesota pilot project, via individual and group meetings with interested farmers.	Yes
JoAnne Berkenkamp,	MBOLD	Participate in supply chain development for grain/camelina systems	No

Managing Director			
Constance Carlson	University of Minnesota	Supply-chain development	Yes
Colin Cureton	University of Minnesota	Supply-chain development	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
Project activities and outcomes will be disseminated by a wide range of activities by project partners, including public presentations, earned media content, websites of project partners, and field days and other events. Support from the Environment and Natural Resources Trust Fund will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENTRF Acknowledgment Guidelines

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?
If we are successful, our key outcome—a grain-camelina option for Minnesota row-crop farms—will be rapidly adopted in row-crop farming across Minnesota. There is very strong market interest in sustainably-sourced grains, oils, and protein produced from the grain-camelina system, as reflected by our many private-sector partners. By building prototype supply/value chains, project partners—from farmers to corporations such as Cargill, Unilever, and Hormel—will "work out the kinks' in their systems, setting the stage for wide adoption of this market-driven water-quality solution, resulting in major benefits for water, soil, and wildlife, and for all Minnesotans.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Farmer-Led Expansion of Alfalfa Production to Increase Water Protection	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 04i	$500,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Technical assistance support for farmers		Develop, coordinate, and deliver custom learning opportunities for individual farmers, groups, and others engaged in integrated grain/camelina in pilot-project region.			32%	0.36		$37,249
Supply-chain Organizer		Organize and facilitate planning and implementation of supply-chain development for grain-camelina production system			32%	0.21		$25,000
							Sub Total	**$62,249**
Contracts and Services								
Great River Greening	Sub award	Support farmers in Roger's Creek watershed (Nicollet Co.) to design and test an extended crop rotation using the grain/camelina system in watershed farms, engaging at least 5 watershed farms; collaborate locally on outreach.				0.42		$57,100
Clean River Partners (formerly Cannon River Watershed Partnership)	Sub award	Support farmers in Rice Creek watershed (Rice Co.) to design and test an extended crop rotation using the grain/camelina system in watershed farms, engaging at least 5 watershed farms; collaborate locally on outreach.				0.39		$64,600
Agricultural Resources Utilization Institute	Sub award	Establish opportunities and investigate new camelina markets with private businesses; pilot R&D projects for food and non-food uses; organize annual educational field days; organize events for dissemination of market and supply-chain opportunities for grain/camelina system; travel (technical, business development, outreach) @ AURI mileage & M&IE, $3,750 total.				0.51		$70,485
The Nature Conservancy	Sub award	Support farmers in Stearns Co. to test an extended crop rotation using the grain/camelina system, engaging at least 5 watershed farms; work with the Ecosystem Service Market Consortium (ESMC) to adjust ESMC protocols and algorithms for				0.78		$102,100

		grain/camelina, obtain available validation data; evaluate results; collaborate locally on outreach.						
							Sub Total	**$294,285**
Equipment, Tools, and Supplies								
	Tools and Supplies	Supplies required for Activity 4	Activity 4: Product R&D: Reagent and consumable supplies/chemicals for all years ($3,000).					$3,000
	Tools and Supplies	Supplies required for Activity 4	Activity 4: Refreshments for field days and other events ($1,189)	X				$1,189
							Sub Total	**$4,189**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel by UMN staff for related to work in project watersheds.	Travel to project watersheds in Nicollet, Rice, and Stearns Counties, involving individual and group meetings with participants in and near those watersheds. Projected travel: 646.65 miles per year, x 3 years, at 0.56/mile					$1,087
	Miles/ Meals/ Lodging	Travel by UMN staff to provide technical assistance to participating farmers.	Technical support (5 Minneapolis-St. Peter round trips/yr, all years x $95 trip for mileage, per diem). (5 Minneapolis-Dundas round trips/yr, all years x $69 trip for mileage, per diem). (5 Minneapolis-Freeport round trips/yr, all years x $109 trip for mileage, per diem). $4095 total					$4,095
	Miles/ Meals/ Lodging	Travel by UMN staff related to supply-chain development and support	Supply-chain organizing (5 Minneapolis-St. Peter round trips/yr, all years x $95 trip for mileage, per diem). (5					$4,095

			Minneapolis-Dundas round trips/yr, all years x $69 trip for mileage, per diem). (5 Minneapolis-Freeport round trips/yr, all years x $109 trip for mileage, per diem). $4095 total					
							Sub Total	**$9,277**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Flyers, signage, and other printed materials for field days and other events	Provide information on grain/camelina cropping systems for attendees at field days and other events					$1,000
							Sub Total	**$1,000**
Other Expenses								
		Risk-share payments to growers for grain/camelina production and post-harvest handling.	Cost- and risk-share payments ($60,000 total) to growers of grain/camelina ($120/acre expected payout, projected scope 500 acres total, distributed approximately equally across all three target watersheds), in partial compensation for costs of camelina production, a reasonable mark-up for grain produced, and risk of lost income in participating in pilot project. $45,000 will cost-share (at 25% of total projected costs) post-harvest aggregation, storage, transportation, and processing of product harvested from winter camelina acres supported by the project. These funds are needed to de-risk both production and early post-farmgate activity of these crops.					$105,000
							Sub Total	**$105,000**

							Grand Total	**$476,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Equipment, Tools, and Supplies		Supplies required for Activity 4	Budget ($1,189) is requested to provide refreshments at educational events associated with Activity 4. This assumes a budget of $5 per person for light refreshments such as coffee and rolls, and a total of 237 attendees at a total of 5 field days and other events.

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount
State				
			State Sub Total	**-**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**-**

Attachments

Required Attachments

Visual Component

File: 3baf7254-111.pdf

Alternate Text for Visual Component

Photograph of winter camelina crop and map illustrating the project region for watershed-scale pilot implementation of the grain/camelina system for safeguarding water in Minnesota row-crop farming, indicating that the project area contains many highly-valued water resources such as high-value trout fisheries, and vulnerable groundwater and drinking water source protection areas....

Optional Attachments

Support Letter or Other

Title	File
Letter of support from Headwaters Agriculture Sustainability Partnership	8f59d17c-0b0.pdf
Letter of support from Cannon River Agricultural Collaborative	bd4fd2d5-009.pdf
Background check document	26e5e068-f60.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

To adapt the project workplan and budgeting to the funding allocated, the following modifications have been made:
Activity 1: The number of farms has been reduced by 50%and most associated budget items have been reduced proportionately. Target acreage has been reduced by 33%. Funding for cost-share for production and post-production handling reflecting lessons learned in piloting of other crops, and other experience; specifically the production cost-share rate has been reduced, but post-production handling cost-sharing has been added.
Activity 2: Since proposal submission in April 2021, much progress has been made in formation and facilitation of a network of end-use and intermediary firms, water-management agencies, watershed groups, the Forever Green Partnership, and others. Therefore, we shifted the nature of supply-chain development activities to focus on coordination of support for farmers piloting the grain/camelina system and post-production costs. Experience shows coordination is time-consuming and critically important.
Activity 3: No changes.
Activity 4: The scope of each sub-activity has been reduced by 50%, as has associated budgeting.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I agree to the UMN Policy.

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

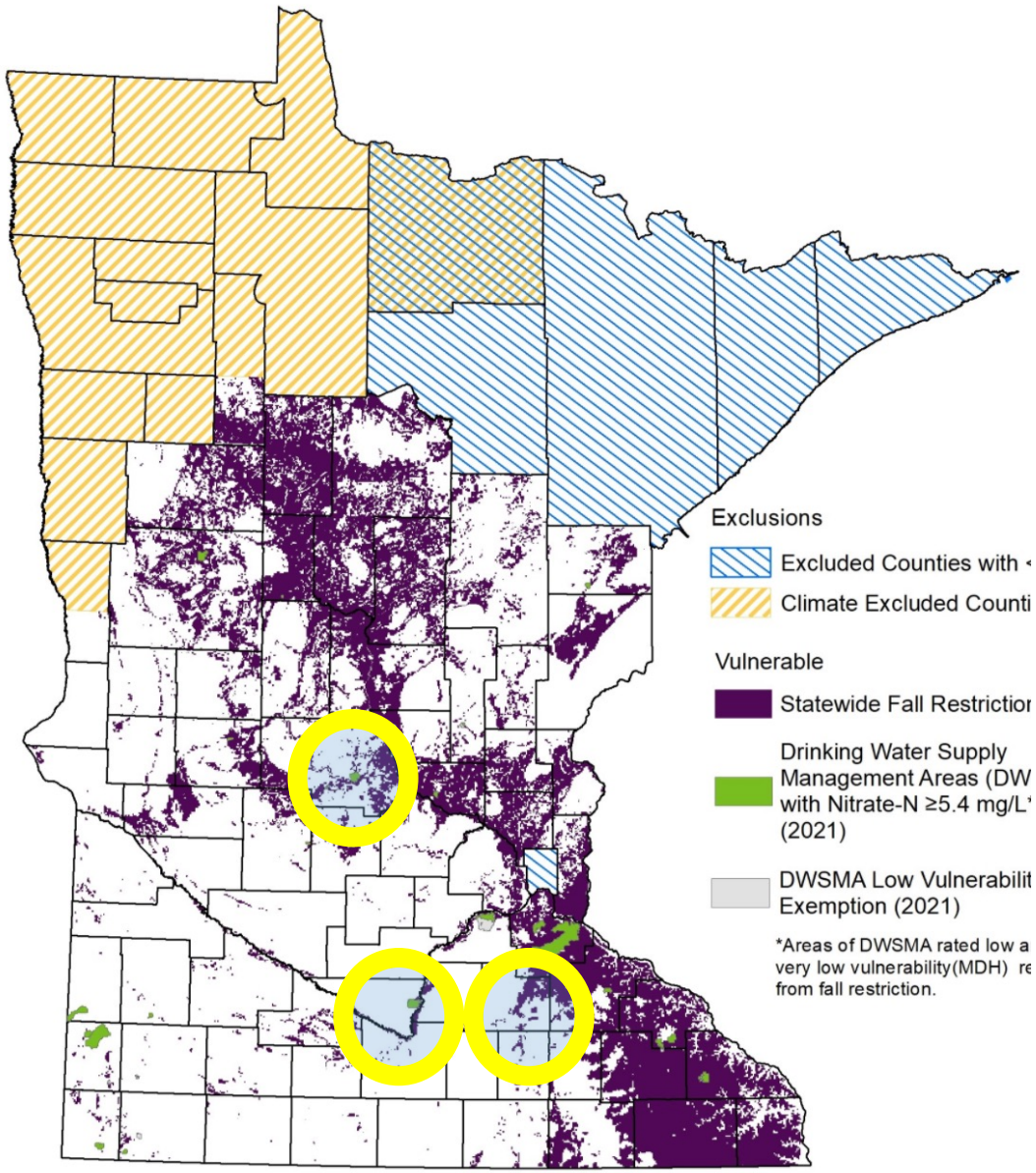
No

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

Project Pilot Regions & Winter Camelina Crop

Grain/Camelina pilot production area (yellow circles) are situated to protect water in areas with high-value trout fisheries and vulnerable groundwater and drinking water source protection areas. Purple areas are vulnerable groundwater areas as mapped by Minnesota Department of Agriculture.



Winter camelina in flower, and double cropped into silage corn.