M.L. 2010 Project Abstract
For the Period Ending June 30, 2014

Project Title:	**Ecosystem Services in Agricultural Watersheds**	
Project Manager:	Kylene Olson	Terry VanDerPol
Affiliation:	Chippewa River Watershed Project	Land Stewardship Project
Mailing Address:	629 North 11th Street, Suite 17	301 State Rd, Suite 200
City / State / Zip:	Montevideo, MN 56265	Montevideo, MN 56265
Telephone Number:	320 269-2139 X116	320 269-2105 X 13
E-mail Address:	kylene@chippewariver.org	tvdp@landstewardshipproject.org
FAX Number:	320 269-6593	320 269-2190
Web Site Address:	http://www.chippewariver.com	www.landstewardshipproject.org

FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2013, Chapter 52, Section 2, Subdivision 17 and M.L. 2010, Chp. 362, Sec. 2, Subd. 3i
APPROPRIATION AMOUNT: $247,000

Overall Project Outcome and Results

The Chippewa River Watershed (CRW) subbasin of the Minnesota River has extensive corn and soybeans, grazing livestock, diminishing longer crop rotations and natural systems. Stream and lake impairments in the CRW include turbidity, bacteria, and excessive nutrients. The LCCMR project is part of the ongoing Chippewa 10% Project (C10) that includes: stream monitoring, mapping sensitive areas, modeling cropping systems with historical and future climate to predict changes and extensive farmer engagement through individual contacts, organizing four farmer learning networks and connecting farmers to markets, conservation incentives and technical assistance. We held a total of twelve educational events attracting 494 people with Environment and Natural Resources Trust Fund (ENRTF) and other funding. Partners developed four networks working with 63 farmers and landowners on 8500 acres with ENRTF and other funding. These will continue and grow past the completion of this project. Networks and events developed during this time with assistance from other funding, as detailed in the report, include:

- Women Caring for the Land network with 15 women landowners engaged in conservation efforts on their land
- Nitrogen management network with 8 farmers utilizing soil tests, corn stalk nitrate tests and nitrogen management strategies
- Soil Health workshop with 270 attendees

The goals for the ENRTF project were to identify sensitive fields on 10% of corn and soybean fields, engage landowners with information about benefits of diversification, including available conservation incentives and markets, and monitor for changes on fields.
ENRTF funds and other funding accomplished these deliverables to achieve the goals:

- Mapped three focal areas based on water quality monitoring, multi-year crop rotations and scenarios for diversifying 110,000 acres to rotational grazing, forage strips at the toe of steep fields, longer rotations on poorer soils or cover crops;
- Calculated Ecosystem Service Coefficients (ESC) using the Agricultural Production Systems Simulator model for localized future climate and included warm season grass and grazing operations;
- Modeling predicted decreases of 16% sediment load and 7% NO2-NO3 nitrogen load when converting sensitive fields to perennial crops
- Integrated ESC into the Hydrologic Simulation Program – Fortran for the CRW;

- Conducted one-on-one interviews and follow-up with 74 landowners;
- Networks developed included:
    - The 25-landowner Simon Lake Challenge, a landscape-scale grazing network on 6,000 acres;
    - Cover crop network of 15 farmers on 943 acres; soil biological activity was monitored with soil tests on 150 acres, showing higher soil moisture from cover crops resulted in higher biological activity in the fall;
- Five educational events attracting 165 people;
- Published multiple articles and a website (http://landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/chippewa10).

Project Results Use and Dissemination

1. Information has been used in several ways.

Within the team and beyond, interaction with research scientists, agency personnel, farmers and nonprofit staff create opportunities for longer-term engagement. These opportunities may help bring about land management and landscape changes that result in increased ecosystem goods and services along with better community support.

We have learned together that:

- There are many benefits associated with grazing systems and longer-term rotations.
- Riverine or stream systems can be very flashy in terms of flow, and by extension, ecosystem services the more corn and soybeans dominate the landscape.
- Market signals can sometimes be amplified, distorted or misinterpreted so that the price of one commodity can drive behavior in a direction that may not necessarily be benefiting farmers in the long run.
- It may be possible to tie monitoring, modeling and on-farm changes in practices by linking scenarios, modeling diverse production systems, stream monitoring linked to land-cover, and on-farm practices being monitored with and by farmers and demonstrated through farmer networks.
- Better modeling output can be developed if research scientists work with applied scientists, extension personnel, producers and nonprofit staff to generate information from models on different grazing systems, conventional and organic production systems and different weather patterns.

Based on the strength of the Chippewa 10% Project and its partners and modeling, the Chippewa River Watershed was chosen the by United States Department of Agriculture's Agricultural Research Service to be part of the Long-term Agroecological Research Sites (LTAR). This was officially announced in 2012 and funding allocated to North Central Soil Conservation Research Lab in Morris for this purpose in 2013.

The Chippewa 10% Project regularly provides opportunities for farmers and landowners to learn about new approaches they may not be familiar with. For example, most of the farmers we have engaged who graze ruminant livestock use continuous grazing or a very non-intense, low-level management, e.g., moving the animals every 8 days. Early winter of 2013 we brought a group of farmers to a presentation on soil health building strategies. A number of them were quite taken with a presentation by North Dakota rancher Gene Goven who has increased the

productivity of his grasslands to boost his cattle stocking rate by 400%. He did so using sound planning strategies, fundamental soil-building techniques, and building diversity of flora and fauna above and below his soil, not by acquiring more land or throwing money at his challenges.

Since then we have selected a few farmers from the group who are open to the message of planning for a grazing system that is multi-functional, improving profit, water quality, wildlife habitat and soil health, and gave them an intense two day course on the Holistic Planning techniques they could use to move their farms toward those goals. Seven farmers participated, some enthusiastically embracing the approach and expressing willingness to show others what they're doing and provide some coaching for friends and neighbors

LSP staff working in the Root River Watershed were engaged to learn about GIS and outreach techniques and begin to plan for and apply them in Minnesota's Root River Watershed.

2. Communications and dissemination activities

The Chippewa 10% Project has shared information through conference presentations at National Institute of Food and Agriculture Project Directors meeting, two Green Lands Blue Waters conferences about watersheds in IA and MN, the 4th Interagency Conference on Research on the Watershed in Anchorage, AK, the MOSES conference in La Crosse and several other in-state venues with staff from multiple agencies.

In addition we are sharing information for the general public through extensive coverage in the *Land Stewardship Letter* published by the Land Stewardship Project and front page coverage through AgriNews in November, 2013.

We have held 9 field days with 166 attendees over the course of this project and several workshops on cover crops, grazing, markets and conservation programs. There have been eight team meetings over the period.

A list of other reports and posters appended to the project is as follows:

- Rohweder, J.R, G. Boody, S. Vacek. 2012. Modeling Important Bird Habitat Using Multiple Alternative Land Cover Scenarios within the Chippewa River Watershed, Minnesota. US Geological Survey.
- A study by USGS paid for with funds by National Institute of Food and Agriculture.
- DeVore, B. 2012. Feeding the subterranean herd: How putting soil at the center could help revitalize farmland...& farming. September to December 2012. Land Stewardship Project Soil_health_lsl_package_final.pdf
- Olson, K, et al. 2013. The Chippewa 10% Project: Achieving Needed Ecosystem Services in an Agricultural Watershed. Poster and presentation at the Green Lands Blue Waters annual conference section on watersheds. November 20-21, 2013. Minneapolis, MN. Published by Land Stewardship Project.
- LSP et al. 2013. Farmer/Landowner Outreach and Organizing in the Chippewa and Root River Watersheds: Achieving a healthy ecosystem in agricultural watersheds. Poster presented at Green Lands Blue Waters annual conference section on watersheds. November 20-21, 2013. Minneapolis, MN. Published by Land Stewardship Project.
- Jaradat, A.A, J. Starr, G. Boody. 2014. Comparative Assessment of *Organic* and *Conventional* Production of Row Crops under Climate Change: Empirical and Simulated Yield Variation in the Chippewa River Watershed, MN. Poster at MOSES conference on Organic Farming. La Crosse, WI. February 2014

Materials are being added to the Chippewa 10% Project website at http://landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/chippewa10. A related website is http://landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/soilquality . LCCMR and other funders are acknowledged on these websites.

In addition, research papers were published with other funding. More research will be published that references ENTRF funding.

Environment and Natural Resources Trust Fund (ENRTF)
2010 Work Program FINAL REPORT

Date of Report: August 5, 2014
Date of Next Progress Report: Final Report
Date of Work Program Approval: May 28, 2014
Project Completion Date: June 30, 2014

I. PROJECT TITLE: Ecosystem Services in Agricultural Watersheds

Project Manager:	Kylene Olson	Terry VanDerPol
Affiliation:	Chippewa River Watershed Project	Land Stewardship Project
Mailing Address:	629 North 11th Street, Suite 17	301 State Rd, Suite 200
City / State / Zip:	Montevideo, MN 56265	Montevideo, MN 56265
Telephone Number:	320 269-2139 X116	320 269-2105 X 13
E-mail Address:	kylene@chippewariver.org	tvdp@landstewardshipproject.org
FAX Number:	320 269-6395	320 269-2190
Web Site Address:	http://www.chippewariver.org	www.landstewardshipproject.org

Location: *The Project will take place in the Chippewa River Watershed in western Minnesota. Various consultants will do part of their work in offices outside the watershed. Please see attached map.*

Total ENRTF Project Budget:	**ENRTF Appropriation**	**$ 247,000.00**
	Minus Amount Spent:	**$ 224,355.94**
	Balance Remaining:	**$ 22,644.06**

Legal Citation: M.L. 2013, Chapter 52, Section 2, Subdivision 17 and M.L. 2010, Chp. 362, Sec. 2, Subd. 3i

Appropriation Language:
$247,000 is from the trust fund to the commissioner of natural resources for an agreement with the Chippewa River Watershed Project to develop local food and perennial biofuels markets coupled with conservation incentives to encourage farmers to diversify land cover in the Chippewa River Watershed supporting improvement to water quality and habitat. The availability of the appropriations for the following projects are extended to June 30, 2014: (9) Laws 2010, chapter 362, section 2, subdivision 3, paragraph (i), Ecosystem Services in Agricultural Watersheds;" by which time the project must be completed and final products delivered.

II. FINAL PROJECT SUMMARY AND RESULTS:

ABSTRACT

Overall Project Outcome and Results

The Chippewa River Watershed (CRW) subbasin of the Minnesota River has extensive corn and soybeans, grazing livestock, diminishing longer crop rotations and natural systems. Stream and lake impairments in the CRW include turbidity, bacteria, and excessive nutrients. The LCCMR project is part of the ongoing Chippewa 10% Project (C10) that includes: stream monitoring, mapping sensitive areas, modeling cropping systems with historical and future climate to predict changes and extensive farmer engagement through individual contacts, organizing four farmer learning networks and connecting farmers to markets, conservation incentives and technical assistance. We held a total of twelve educational events attracting 494 people with Environment and Natural Resources Trust Fund (ENRTF) and other funding. Partners developed four networks working with 63 farmers and landowners on 8500 acres with ENRTF and other funding. These will continue and grow past the completion of this project. Networks and events developed during this time with assistance from other funding, as detailed in the report, include:

- Women Caring for the Land network with 15 women landowners engaged in conservation efforts on their land
- Nitrogen management network with 8 farmers utilizing soil tests, corn stalk nitrate tests and nitrogen management strategies
- Soil Health workshop with 270 attendees

The goals for the ENRTF project were to identify sensitive fields on 10% of corn and soybean fields, engage landowners with information about benefits of diversification, including available conservation incentives and markets, and monitor for changes on fields.
ENRTF funds and other funding accomplished these deliverables to achieve the goals:

- Mapped three focal areas based on water quality monitoring, multi-year crop rotations and scenarios for diversifying 110,000 acres to rotational grazing, forage strips at the toe of steep fields, longer rotations on poorer soils or cover crops;
- Calculated Ecosystem Service Coefficients (ESC) using the Agricultural Production Systems Simulator model for localized future climate and included warm season grass and grazing operations;
- Modeling predicted decreases of 16% sediment load and 7% NO2-NO3 nitrogen load when converting sensitive fields to perennial crops
- Integrated ESC into the Hydrologic Simulation Program – Fortran for the CRW;
- Conducted one-on-one interviews and follow-up with 74 landowners;
- Networks developed included:
    - The 25-landowner Simon Lake Challenge, a landscape-scale grazing network on 6,000 acres;
    - Cover crop network of 15 farmers on 943 acres; soil biological activity was monitored with soil tests on 150 acres, showing higher soil moisture from cover crops resulted in higher biological activity in the fall;
- Five educational events attracting 165 people;
- Published multiple articles and a website (http://landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/chippewa10).

Project Results Use and Dissemination

1. Information has been used in several ways.

Within the team and beyond, interaction with research scientists, agency personnel, farmers and nonprofit staff create opportunities for longer-term engagement. These opportunities may help bring about land management and landscape changes that result in increased ecosystem goods and services along with better community support.

We have learned together that:

- There are many benefits associated with grazing systems and longer-term rotations.
- Riverine or stream systems can be very flashy in terms of flow, and by extension, ecosystem services the more corn and soybeans dominate the landscape.
- Market signals can sometimes be amplified, distorted or misinterpreted so that the price of one commodity can drive behavior in a direction that may not necessarily be benefiting farmers in the long run.
- It may be possible to tie monitoring, modeling and on-farm changes in practices by linking scenarios, modeling diverse production systems, stream monitoring linked to land-cover, and on-farm practices being monitored with and by farmers and demonstrated through farmer networks.
- Better modeling output can be developed if research scientists work with applied scientists, extension personnel, producers and nonprofit staff to generate information from models on different grazing systems, conventional and organic production systems and different weather patterns.

Based on the strength of the Chippewa 10% Project and its partners and modeling, the Chippewa River Watershed was chosen the by United States Department of Agriculture's Agricultural Research Service to be part of the Long-term Agroecological Research Sites (LTAR). This was officially announced in 2012 and funding allocated to North Central Soil Conservation Research Lab in Morris for this purpose in 2013.

The Chippewa 10% Project regularly provides opportunities for farmers and landowners to learn about new approaches they may not be familiar with. For example, most of the farmers we have engaged who graze ruminant livestock use continuous grazing or a very non-intense, low-level management, e.g., moving the animals every 8 days. Early winter of 2013 we brought a group of farmers to a presentation on soil health building strategies. A number of them were quite taken with a presentation by North Dakota rancher Gene Goven who has increased the productivity of his grasslands to boost his cattle stocking rate by 400%. He did so using sound planning strategies, fundamental soil-building techniques, and building diversity of flora and fauna above and below his soil, not by acquiring more land or throwing money at his challenges.

Since then we have selected a few farmers from the group who are open to the message of planning for a grazing system that is multi-functional, improving profit, water quality, wildlife habitat and soil health, and gave them an intense two day course on the Holistic Planning techniques they could use to move their farms toward those goals. Seven farmers participated, some enthusiastically embracing the approach and expressing willingness to show others what they're doing and provide some coaching for friends and neighbors

LSP staff working in the Root River Watershed were engaged to learn about GIS and outreach techniques and begin to plan for and apply them in Minnesota's Root River Watershed.

2. Communications and dissemination activities

The Chippewa 10% Project has shared information through conference presentations at National Institute of Food and Agriculture Project Directors meeting, two Green Lands Blue Waters conferences about watersheds in IA and MN, the 4th Interagency Conference on Research on the Watershed in Anchorage, AK, the MOSES conference in La Crosse and several other in-state venues with staff from multiple agencies.

In addition we are sharing information for the general public through extensive coverage in the *Land Stewardship Letter* published by the Land Stewardship Project and front page coverage through AgriNews in November, 2013.

We have held 9 field days with 166 attendees over the course of this project and several workshops on cover crops, grazing, markets and conservation programs. There have been eight team meetings over the period.

A list of other reports and posters appended to the project is as follows:

- Rohweder, J.R, G. Boody, S. Vacek. 2012. Modeling Important Bird Habitat Using Multiple Alternative Land Cover Scenarios within the Chippewa River Watershed, Minnesota. US Geological Survey.
- A study by USGS paid for with funds by National Institute of Food and Agriculture.

- DeVore, B. 2012. Feeding the subterranean herd: How putting soil at the center could help revitalize farmland...& farming. September to December 2012. Land Stewardship Project Soil_health_lsl_package_final.pdf
- Olson, K, et al. 2013. The Chippewa 10% Project: Achieving Needed Ecosystem Services in an Agricultural Watershed. Poster and presentation at the Green Lands Blue Waters annual conference section on watersheds. November 20-21, 2013. Minneapolis, MN. Published by Land Stewardship Project.
- LSP et al. 2013. Farmer/Landowner Outreach and Organizing in the Chippewa and Root River Watersheds: Achieving a healthy ecosystem in agricultural watersheds. Poster presented at Green Lands Blue Waters annual conference section on watersheds. November 20-21, 2013. Minneapolis, MN. Published by Land Stewardship Project.
- Jaradat, A.A, J. Starr, G. Boody. 2014. Comparative Assessment of *Organic* and *Conventional* Production of Row Crops under Climate Change: Empirical and Simulated Yield Variation in the Chippewa River Watershed, MN. Poster at MOSES conference on Organic Farming. La Crosse, WI. February 2014

Materials are being added to the Chippewa 10% Project website at http://landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/chippewa10. A related website is http://landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/soilquality . LCCMR and other funders are acknowledged on these websites.

In addition, research papers were published with other funding. More research will be published that references ENTRF funding.

III. PROGRESS SUMMARY AS OF :

Amendment Request 05/28/2014

As Chippewa 10% Project partners seek to complete deliverables in Result 2, we pursued some with other funds and also are taking advantage of new opportunities with more potential state-level impact. In the Land Stewardship Project subcontract, we propose the following changes:

Deliverable 2: LSP did investigate biomass options. However, we found them to be infeasible to request farmers to adopt at this time.
Deliverable 3 and 4: We are making excellent progress toward the farmer engagement and network building and have found effective ways to engage farmers and landowners. This takes more staff time on building relationships and has not required other planned LSP subcontracts. For example, LSP staff assisted farmers to write a small farmer-based proposal for cover crop demonstration funds to the USDA Sustainable Agriculture Research and Education Program, which enabled farmers to feel a strong sense of ownership. As a result we won't spend as much from ENRTF funds for the on-farm demonstration network products. Neither will we need funds for CanVis images, as the Chippewa 10% Project has found other ways to engage farmers. Funds from related grants have been used for meeting expenses and publications. We propose increasing staff costs to allow for continued work during June, 2014 along with related staff travel.
Deliverable 5. There have also been some shifts related to spending in related grants, delayed timing and a new opportunity. APSIM has been rerun and results are just becoming available. Due to this timing, the baseline integrated economic model will be completed by June 30, 2014—and scenarios by December 2014 with other project funding. Funds for a University of Minnesota student and related travel from John Westra were not needed. Instead, a new opportunity has arisen. With funds from USDA National Institute of Food and Agriculture, LSP and CRWP worked with Minnesota Pollution Control Agency's consultant, RESPEC, to see if C10 scenarios and data could be used in HSPF model for the Chippewa River Watershed (February to April). We have determined this is possible. We propose to use LCCMR funds in June to integrate those scenarios into HSPF, the hydrological model being used by MPCA for every 8-digit watershed in Minnesota. With funds from the Walton Family Foundation, the ecosystem services output coefficients from APSIM will be integrated into the model and run this summer to determine to what extent C10 scenarios for agricultural diversification and best management practices might meet water quality standards. This may have relevance beyond the Chippewa River Watershed. Also, through work with RESPEC we were able to utilize information on possibly expiring Conservation Reserve Program acres for 2014-2019, identified as part of the Environmental Benefits Index. Decision tools will be planned by June 30 and completed this fall with funding from the Walton Family Foundation.
Proposed Budget categories for which increased funding is requested for June include additional staff time $16,200, additional mileage for the month of $1500 and the RESPEC contract during June for $12,000.
The LSP staff time would be for Andy Marcum FT; Robin Moore, FT (Both working on farmer network and engagement; Terry VanDerPol 40% (Direct supervising of field staff and reporting); Steve Ewest FT (GIS work to troubleshoot scenarios, translate RESPEC scenarios to outreach tools and develop report maps); and Rebecca Terk White 60% (Working on Women Caring for the Land non- operating landowner network development and outreach and distribution networks).

We also request a retroactive approval tor added mileage reimbursement for field staff working on farmer networks in April and May of $500. Considerable progress was made in the Simon Lake grazing network during this period that required additional travel. Additional time ($1.795) for Steve Ewest who worked on preparing GIS data for RESPEC in May, 2014 is requested. Note that this data is integral to the project and will also be used in the Integrated Economic Water Quality Model and use in InVest. These expenses are an important part of meeting the deliverables for Result 2, Deliverables 3 and 5, respectively

Amendment Approved: [5/29/2014]

12/31/2013

A farmer/landowner engagement strategy uses a directed one-on-one meeting approach. We have engaged 145 farmers and landowners in face-to-face conversations and held four kitchen table conversations. Four learning networks have been started, including 70 farmers focusing on nitrogen management in corn, adding cover crops in a row crop rotation, improving and adopting rotational grazing or women non-operating landowners seeking enhanced conservation with renters.

An integrated water quality and Economic model is being developed by Dr. John Westra using ecosystem service coefficients from the Agricultural Production Systems Simulator model. It will integrate economic and biophysical aspects of the systems for baseline and four land-use or management scenarios to achieve water quality. Comparisons between cover crops and cattle grazing will be included in the models.

Preliminary results are: (1) APSIM predicted more runoff and soil erosion levels with climate change in an annual row-crop farming system compared to an organic cropping system in Land Capability Classes 2 and 3; (2) Farmers are tracking or experimenting with changed management on 4,470 acres to-date; and (3) Stream monitoring data continues to be collected. The approach of this project is a robust and transferable model.

6/30/2013

A farmer engagement strategy uses a directed one-on-one meeting approach. We have engaged 89 farmers in face-to-face conversations and held four kitchen table conversations. Four learning networks have been started, including 60 farmers focusing on nitrogen management in corn, adding cover crops in a row crop rotation, improving and adopting rotational grazing or women non-operating landowners seeking enhanced conservation with renters.

Modeling simulation has been done with the Agricultural Production Systems Simulator (APSIM) model, based on crop rotation data from USDA Agricultural Research Service, predominant soils in the watershed and historical and future climate. We mapped five basic crop rotations using 2006-2010 USDA National Agriculture Statistics Service data and estimated nitrogen and phosphorous availability from livestock operations in the watershed, including various pasture-based systems (continuous and rotational), AFOs and CAFOs for beef, dairy, swine and poultry. Ecosystem services output coefficients for yields, nitrate-nitrogen loss, runoff, drainage loss and erosion were simulated in APSIM for geospatially referenced crop rotations. Two models will integrate economic and biophysical aspects of the systems for baseline and four land-use or management scenarios to achieve water quality. Comparisons between corn and grass-fed cattle, or cover crops and cattle grazing will be included in the models.

Preliminary results are: (1) APSIM predicted more runoff and soil erosion levels with climate change in an annual row-crop farming system compared to an organic cropping system in Land Capability Classes 2 and 3; (2) Farmers are tracking or experimenting with changed management on 3,900 acres to-date; and (3) Stream monitoring data indicate that precipitation extremes can have major impacts on water quantity and quality which can be mitigated by landscapes with sufficient perennial cover. The approach of this project is a robust and transferable model.

1/31/2013 Amendment Request

The following request language was taken from the cover letter about the request. We have taken the time to build a solid foundation with farmers and other partners in the watershed to make progress despite significant external challenges such as the high price of corn that does not encourage this type of alternative. We have also engaged in complicated modeling in several areas. As the map appended to the workplan request shows, CRWP and LSP have engaged on-the-ground collaborators willing to explore options that make sense to them to improve profitability while resulting in potential environmental improvements. We have been primarily utilizing other funding to conduct the work through the first two and one-half years.

The Chippewa River Watershed Project has just become a local government unit with 33 collaborators. It has an executive board. That has taken significant time and focus to bring to fruition. Health issues of two LSP staff also caused delays.
We therefore jointly request the following:
1. A no-cost extension of time to complete the project and expend the funds to June 30, 2014.
2. Approval of a workplan amendment for deliverables and related costs as shown in the workplan amendment request report and budget.

Amendment Approved: [5/9/2013]

12/31/2012

Farmer Outreach is in high gear. Fifty-six individual farmers have responded to surveys on CRP planning, engaged in Nitrogen testing, are experimenting with multispecies cover crops or came together to discuss conservation options on land they rent or lease to farmers. These efforts are supported by an Environmental Benefits Index updated with LiDAR data for the Chippewa River Watershed. Meetings on soil health and other topics involved more than 500 producers and agency staff from the watershed and beyond. Market development is focusing on transportation and cooperative development using the Twin Cities experience of markets pulling farmers. Modeling is bearing fruit and has been expanded to include 132 soil types representing most of the watershed. Initial conclusions suggest that perennials added into crop rotations may be needed to lower N runoff with climate change. We found that current Land Capability Class information may need to be updated to better predict ecosystem services resulting from various crop rotations on various soil series. Articles and presentations describe the work. New staff has been hired or are working with the project and new web pages have been developed.

06/30/2012

Geographic Information Systems (GIS) have become more important to the project to map baseline information, scenarios, plat books and much more. We accomplished a lot with student interns over last summer and fall and Land Stewardship Project (LSP) has since hired a staff person for next stages of work. GIS with newly available LiDAR data will be used to identify potentially sensitive fields for discussions in the one-to-one farmer outreach.

Market development is proceeding through new partnerships with Wallace Center and with distributors in the region. LSP and partners have prepared specific plans in the three focal areas for landowner outreach to help them adopt production practices and systems that protect water quality and improve wildlife habitat. These have been developed with partners and are detailed under farmer Implementation below in order of effort this year:
1. Shakopee Creek N management on individual farms (under way);
2. Cover crops trials and monitoring on individual farms in East Branch and Middle Mainstem (under way);

3. Converting Conservation Reserve Program acres expiring in 2012 which might not otherwise re-enrolled to working grasslands for grazing (underway);
4. Women absentee landowners outreach in watershed (underway); and
5. Prairie plan focus in East Branch.

Our predictive modeling work is complex, but beginning to bear fruit. The Agricultural Production Systems Simulator (APSIM) initial simulations with row crops and alfalfa show that perennial crops could reduce nitrate leaching strongly under future climate change. Modification of the Soil and Water Assessment Tool to more closely match Chippewa River Watershed conditions is underway.

12/31/2011

Project collaborators began implementing strategies to identify landowners and farmer operators in the Chippewa River Watershed. Two models, Agricultural Production Systems Simulator and Soil and Water Assessment Tool have been calibrated for the Chippewa River Watershed to help identify sensitive lands and predict the results of changes to agricultural land use on water quality. An initial round of simulations has been used to validate the models. Twenty six farmers have interviewed for an economic survey. Focal areas defined by sensitive features or water quality issues and by 12-digit watersheds have been mapped. Scenarios for crop management and agricultural land use changes have been developed and are in the process of being mapped. Value chains for products from perennial crops and pastured-based livestock systems have been highlighted through workshops and field days. A new distributor has been approved by the University of Minnesota, Morris dining facilities and will carry more regionally produced foods. Seven farmer outreach events focused on showing that perennial systems can be adopted at a field-scale or a farm scale and can be profitable were held this summer and fall. Funds in the “Other Funding” category totaling $81,859.84 from the Walton Foundation and the National Institute of Food and Agriculture were also used to support the work during this period.

6/30/2011

Project collaborators defined strategies to identify landowners and farmer operators in the Chippewa River Watershed. We have learned about and are beginning to use the Ecological Ranking Tool developed by BWSR to help identify sensitive fields in the Chippewa River Watershed. Two models, Agricultural Production Systems Simulator and Soil and Water Assessment Tool were also being calibrated for the Chippewa River Watershed to help identify sensitive lands and predict the results of changes to agricultural land use on those fields. An economic survey has been readied for field testing. Value chains for products from perennial crops and pastured-based livestock systems have been highlighted through workshops and field days. Seven institutions or businesses have been asked to participate in those value chains. Changes in personnel at the University of Minnesota, Morris vendor, Sodexho, have slowed discussions. Eight farmer outreach events focused on showing that perennial systems can be adopted at a field-scale or a farm scale and can be profitable. Funds in the “Other Funding” category totaling $107,960 from the Walton Foundation and the National Institute of Food and Agriculture were used to support the work during this period.

12/31/2010

The project was named the Chippewa 10% Project and was initiated publicly in the Chippewa River Watershed with a successful roll out event called “Profits from Perennials, Imagine the Possibilities” (65 people attended). Outreach about the Project to the general farm community within the watershed was “branded” as “Profits from Perennials” to emphasize

the Project's recognition that the incorporation of perennials into a farming operation to meet larger water quality goals must also meet the economic needs of the farmers who implement those land use changes. Research and outreach activities were initiated during this period with team meetings with project partners. Activities included calibration of the Soil and Water Assessment Tool with baseline data for water quality from the Chippewa River Watershed Project and initial calibration the Agricultural Production Systems Simulator model with test soils data from the watershed. Focal areas were identified in which to conduct individual farmer outreach and four land-use scenarios tied closely to marketing options were identified for use in outreach and modeling. Funds in the "Other Funding" category, totaling $105,826 from the Walton Foundation and the National Institute of Food and Agriculture were used to support the work during this period.

IV. OUTLINE OF PROJECT RESULTS*:*

RESULT/ACTIVITY 1: Target agricultural land-use changes to achieve watershed goals.

Description: Included in this result is the completion of the targeting of sensitive fields within the watershed to convert from row crops to perennial cover. With funding from USDA National Institute of Food and Agriculture the project will target sensitive fields, predict ecological benefits and involve watershed farmer leaders in the development of estimates of economic value of those changed practices on sensitive fields for landowners, operators and potential lessees. As part of the project, we will identify landowners or operators who have sensitive fields identified through the research phase. This project will also collaborate with an LCCMR project called "Statewide Ecological Ranking for CRP and other Critical Lands" to share GIS information and processes, directed by Board of Soil and Water Resources (BWSR). We will seek to develop compatible approaches that show how to utilize that information while adding finer geographic specificity. This result includes two deliverables.

1. *Identify land operators and/or landowners* who manage or own the sensitive fields. We will use plat books and other locally available information to determine who owns and or operates the fields. This may be an ongoing process, depending on the difficulty and changes in operator status over the project.
2 *Determine how to build linkages to the BSWR project by* linking our GIS analysis and modeling results as more geographically focused layers to those developed by the BWSR analysis.

Summary Budget Information for Result/Activity 1:	**ENRTF Budget:**	**$ 28,740.00**
	Amount Spent:	**$ 27,915.00**
	Balance:	**$ 825.00**

Deliverable/Outcome	Completion Date	Budget
1. Identify land operators and/or landowners who manage and/or own sensitive row crop fields, primarily with other funding	6/30/2014	$25,740
2. Determine how to add our GIS analysis and modeling results as additional layers to the BWSR CRP GIS project, primarily with other funding	6/30/2013	$3,000

Result Completion Date: *6/30/2014*

Result Status as of 06/30/2011:

Deliverable 1

An initial step in identification of landowners was to assemble a 12 member Farm advisory committee of farmers in the Chippewa River Watershed.

Identification of land operators and landowners is underway. We have begun by checking with counties to determine if and how we can access electronic data on landownership. Our next step will be to compare that data to plat books and if needed country records accessed in person.

We are also developing an outreach strategy to identify widowed landowners who are interested in requiring higher levels of conservation on the lands they lease and training materials to help them accomplish their conservation goals on the land they lease.

Deliverable 2

LSP participated in a webinar about the Ecological Ranking Tool developed by BWSR and its partners in March, 2011. A Chippewa River Watershed Project staff member, LSP staff and an intern, and an Agricultural Research Service staff member attended a training session on June 20th on the use of the Tool to evaluate sensitive areas. LSP has begun to adapt the Tool for use in Chippewa River Watershed by assembling data layers used by BWSR, more localized data layers and the addition of plant cover layers BWSR did not use.

Funding from the Walton Foundation and National Institute of Food and Agriculture was used to pay for these activities in Deliverables 1 and 2 through 6/30/2011.

Result Status as of 12/31/2011:

Deliverable 1

Plat books were purchased and are being mapped by focal area 12-digit watersheds and townships to coincide with farmer outreach work. Information was not available electronically so we are manually scanning and clipping the information to watershed and township boundaries. This work is not finished, but will be completed during the winter of 2012.

Deliverable 2

Since Chippewa River Watershed Project, Land Stewardship Project and the North Central Soil Conservation Research Lab participated in a webinar about the Ecological Ranking Tool developed by BWSR and its partners in June, 2011 we have been focused on other aspects of the project. The development of this tool for the Chippewa River Watershed will be continued after project scenarios have been modeled.

Funding from the Walton Foundation and National Institute of Food and Agriculture was also used to pay for these activities through 12/31/2011.

Result Status as of 6/30/2012:

Deliverable 1

LSP cooperated with Pope County Soil and Water Conservation District and Farm Services Agency to mail to landowners who have Conservation Reserve Program contracts. We invited landowners to contact us for more information about options.

Deliverable 2

LiDAR data is being processed and the Board of Water and Soil Resources' Environmental Benefits Index is being tested to identify potentially sensitive fields for discussions in the one-to-one farmer outreach.

This work is being supported with funding from National Institute of Food and Agriculture and Walton Family Foundation.

Result Status as of 12/31/2012:

Deliverable 1

- LSP has mapped Plat Book landowners in each focal area. We do not necessarily know which are absentee owned from this information. More specific follow-up is needed and we are in the process of that in various focal areas through conversations with farmers and others. This will be ongoing beyond the end of this project. For example:
    - In addition to getting press releases into area newspapers about the Women Caring for the Land (WCFL) meeting in May, we did a direct mailing to 244 women (mostly non-operating) landowners, in Pope County and SW Douglas County for a summer meeting.
    - On June 25th, 2012 LSP and Pope SWCD sent a letter to 659 CRP contract holders in Pope County asking them to call about options for renewing or converting it to working lands grasslands. Some of these may be absentee landowners and we will keep track of this as they respond.
    - CRWP and LSP have gone to the courthouse to look up ownership records in certain areas, but this is time intensive.
- We have found it helpful to classify non-operating landowners as living locally in the community and absentee. As we expand 1-to-1 outreach with farmers and landowners we will identify and map different kinds of landowners.

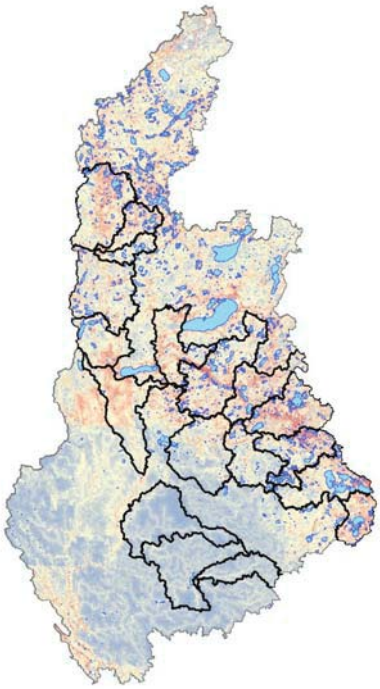


Figure 1 (12/31/12) Chippewa River Watershed with focal HUC 12 watersheds and EBI (red being areas of more environmental risk)

Deliverable 2

The University of Minnesota's Environmental Benefits Index has been localized for Chippewa River Watershed for the East Branch and Middle Mainstem 12 digit Hydrological Unit Code (HUC 12)sub-watersheds. This is based on LiDAR data processed by LSP for these focal areas. (see Figure 2 12.31.2012)

This work is also being supported with funding from National Institute of Food and Agriculture and Walton Family Foundation.

Result Status as of 06/30/2013:

We used the water quality component of the Environmental Benefits Index (EBI)to get an assessment of the locations that are of high priority for water quality.

The Water Quality Component of the EBI was used because it displays the areas that have a greater probability of contributing to overland surface runoff to waters. The water quality of the EBI is composed to two parts: proximity to water and the Stream Power Index (SPI). The proximity to water is a distance to water bodies and streams that are given a percentile rank based on their distance, whereas the SPI is a function how surface water flow would accumulate on the landscape multiplied by the slope. The higher values of SPI display surface erosion and lands closer to waters get a higher value for their proximity and these combined together make the water quality component of the EBI. The higher values of the water quality component of the EBI show lands that maybe of a higher conservation need if they are not managed under continuous living cover.

We generally apply the Water Quality framework of the EBI at a 30 meter resolution for the Chippewa River watershed. However we also do visualization and exploration with incorporation of 3 meter LiDAR data into the water quality framework at zoomed in selected locations in the Chippewa watershed.

This work is also being supported with funding from National Institute of Food and Agriculture and Walton Family Foundation.

Result Status as of 12/31/2013:

No new updates at this time. Related information is included in Result 3.

Final Report Summary:

Based on 15 years of water quality monitoring by Paul Wymar with the Chippewa River Watershed Project, the Chippewa 10% Project Team in 2011 identified three focal areas each with several HUC12s to begin targeting and outreach. These are described in Result 2.

Deliverable 1

Identification of farmers and landowners becomes more detailed as particular focal areas are addressed, so this is an iterative process. In general, LSP overlaid plat maps onto focal areas and sensitive lands (see Result 2) to estimate that there are 2300 landowner parcels that might also be sensitive to potential water quality issues or to protect or restore habitat.

In a given area for farmer/landowner engagement purposes, CRWP/LSP or other partners identify particular landowners and/or farmers to contact using plat maps, plat books, those attending field day events, and suggestions from those with whom we work in the area. An example includes the Simon Lake Challenge discussed in Result 2 where we identified landowners in all of these ways.

Deliverable 2

As discussed in previous reporting periods, LSP quite thoroughly investigated the use of the water quality component of the Environmental Benefits Index (EBI). We found there was not a way to directly link it to our modeling efforts.

However, after engaging the firm RESPEC, for HSPF modeling, we started working with Greg Larson, who now works for RESPEC. As a result, the Chippewa 10% Project is now using the index developed as part of the EBI program to focus on exiting Conservation Reserve Program parcels more likely to return to corn production. That information is now included in updated scenarios as described under Result 2 below. We now know there are about 4,000 acres that

have a crop productivity index of between 60 and 100 (more likely to exit) in the watershed as a whole.

RESULT/ACTIVITY 2: Engage farmers, institutions that have relevant markets for farmers and agencies with appropriate incentives to facilitate needed land-use changes.

Description: Included in this result are expanding the outreach to farmers, engaging institutions that have potential markets for farm products, developing value chains and engaging agencies with conservation incentives to act in the watershed. Additional community incentives may need to be created if they are identified as being needed in Result 1. This result includes several deliverables.

1. *Build value chains to meet purchasing goals for locally-raised food at University of Minnesota, Morris (UMM) and other institutions.* The goals of this deliverable are to encourage the institutions to set purchasing goals at prices that will help leverage the number of acres needed for conversion in the watershed. We also intend to develop value chains that will aggregate the product for those markets from individual farms. Activities will include engaging farmer leaders already involved in the project and those growing perennials and diversified crops in the watershed, along with other interested landowners/lessees, in conversations with institutions to talk about product needs, quality, timing of deliveries, packaging and other post-harvest issues that will have to be met. We will identify transportation and processing options that could be adapted for community-based markets for grass-fed and pastured livestock products, diversified crops, tree crops, etc., at nearby institutions such as UMM and healthcare institutions in Willmar and Benson. The project will engage economic development institutions to help entrepreneurs find funding to develop new businesses that may be needed.
2. *Build value chains to meet purchasing goals for perennial biomass at UMM.* The goals of this deliverable are to encourage the institution to set purchasing goals for biomass from perennials at prices that will help leverage the number of acres needed for conversion in the watershed and develop value chains that will aggregate the product for those markets from individual farms. Activities will include facilitating arrangements with farmers and UMM to get product from farms to the UMM plant. We will engage farmer leaders already involved in the project and those growing perennials, along with other interested landowners/lessees, in conversations with UMM to talk about product needs, quality, timing of deliveries, and other post-harvest issues that have to be met. We will identify transportation options for community-based markets for biomass from perennial crops to be used in the UMM gasifier. The project will engage economic development institutions to help entrepreneurs find funding to develop new businesses that may be needed.
3. *Recruit farmers and landowners to adopt practices.* The goal of this deliverable is to engage enough landowners with targeted fields to adopt perennials on row crop fields to meet water quality and wildlife habitat goals as well as market opportunities. Activities will include developing fact sheets and hosting three public meetings or field days to bring together landowners, beginning farmers, other farmers willing to contract for long-term leases on those fields, market managers and agencies with incentives or technical assistance. We will also conduct one-on-one outreach to farmers identified in Result 1. This deliverable includes involvement of the Agricultural Research Service's North Central Soil Conservation Research Lab, using modeling tools (Agricultural Production Systems Simulator and/or Decision Support System for Agrotechnology Transfer) adapted for the Chippewa River Watershed, to help individual farmers understand the potential contributions to water quality if they converted fields on their farms. Similarly, it will include contracting with a University of Minnesota graduate student (co-supervised

by John Westra and potentially a faculty member at the University of Minnesota) to use the economic decision tool developed with federal funding. This analysis will help individual landowners and potential lessees understand how the economics of growing perennials in previously row-cropped fields could work for their own particular operation. If landowners don't wish to manage it themselves and they are willing, we will work with landowners and potential lessees to adapt long-term leases for rotational grazing, tree crops, or other environmentally suitable diversified crops that enable contract operators to manage converted fields. In order to encourage the adoption of perennials and certain fields, the project will assist the parties to develop plans and apply for conservation programs and other market incentives needed to manage income and risk.

Summary Budget Information for Result/Activity 2: **ENRTF Budget: $ 163,579.00**
Amount Spent: $ 147,012.59
Balance: $ 16,566.41

Deliverables/Outcomes (see map pertaining to 3-5)	**Completion Date**	**Budget**
1. Utilize developing distribution routes in region with product for local and Twin Cities markets through cooperatives as well as institutions; and conduct targeted outreach to graziers about profitable grass-fed beef production opportunities utilizing expanding markets that aggregate supply.	03/2014	$37,600
2. (Deleted) ~~Assist farmers to test systems that burn perennial grasses for on-farm grain drying or other on farm energy applications as a near term opportunity.~~	None	None
3. Recruit farmers, landowners and potential lessees through at least three field days or public meetings, new materials and individual visits. We will identify and develop leaders for land use change: o in nitrogen application (Shakopee Creek), o cover crops and soil health (East Branch) and o more environmentally sound grazing systems (Lower Upper Mainstem and Middle Mainstem), and greater conservation practice participation on leased land in East Branch and Middle Mainstem.	06/2014	$ 30,000
4. Engage landowners in reviewing environmentally- and economically- sound options: • Engage 80 more farmers in conversations about (kitchen table meetings) • Establish/expand four networks of farmers demonstrating innovative profitable conservation strategies around o Nitrogen Management o Cover Crops and building Soil Health o Reducing Sediment through more environmentally friendly grazing techniques. o Non-operating landowners influencing leaser conservation practices. • Engage up to 2000 acres under different management • And systems well underway to recruit more landowners in the future after the this grant	06/2014	$53,479

5. Identify sensitive row crop fields and model predicted environmental outcomes from conversion to perennials by: o Adapting the Agricultural Production Systems Simulator Model climate change projections downscaled to the Chippewa River Watershed o Completing baseline integrated economic model • Conducting GIS analysis, mapping and adapting the Environmental Benefits Index • HSPF model for C10 scenarios for the Chippewa o Developing a plan to create decision tools for farmers to be put on the web	06/2014	$42,500

Result Completion Date: 06/31/2014

Result Status as of 12/31/2010:

Deliverable 1

The University of Minnesota, Morris set a goal of purchasing up to 50% of its food as regionally as possible by 2013. A change in Sodexho Campus Dining Service personnel at the University has necessitated our helping to bring new staff up to speed on the challenges and opportunities of sourcing food locally LSP has initiated conversations with four area hospitals to set goals and purchase from the Watershed.

LSP has engaged a local business natural poultry and natural food store business in the watershed about the potential for becoming a "regionally grown" distributor for UMM/Sodexho and other area institutions.

Deliverable 2

The roll-out event in September noted below included a biomass gasification demonstration by University of Minnesota, Morris.

Deliverable 3

As part of the outreach strategy a roll-out event was held on September 30, 2010 in the watershed. The public roll-out event for the C-10% Project was held on September 30th at the Don and Helen Berheim farm north of Benson, MN. The goals of this event were to 1) introduce the public to the Chippewa 10% Project and 2) invite a wide variety of people to participate & collaborate together to ensure the success of the Project's goals. The event was well attended by 65 people and publicized favorably in the press (two articles are appended and for me see http://www.chippewa10.org/news.html). The community-based and farmer centered nature of the project was highlighted by speakers and stops at the farm. It involved discussion with watershed residents and agency staff.

Project outreach materials (brochures and banner) were utilized at a number of county fairs within the watershed: Chippewa, Pope, Stevens and Swift counties during July and August of 2010.

Partners were engaged in modeling and economic analysis activities during this period:

- The Agricultural Research Service hired a new staff person last fall to conduct the modeling. Calibration was begun on the Agricultural Production Systems Simulator

model by using soils data from the North Central Soil Conservation Research Lab in Morris.

- The Soil and Water Assessment Tool calibration was begun by Chippewa River Watershed Project in relation to their turbidity total maximum daily load study.
- Two focal areas were identified to begin initial modeling and outreach. These include portions of the Shakopee Creek and Middle Chippewa Mainstem sub-watersheds, with primarily row crops and diversified agricultural operations, respectively. Scenarios were identified that would focus on profitable options for sensitive fields based on business opportunities available to farmers in the watershed:
    - Pasture-based livestock (cow calf and grass-fed markets)
    - Perennial Biomass--single and multiple species (including the UMM biomass burner and the MN Valley Alfalfa Co-op as markets).
    - Best Management Practices in row crops--nutrient management, 3rd and longer crop rotations for feed and other uses (for which conservation programs or markets are available).
    - Conservation Lands--those practices that take land out of agricultural production such as wetland restoration (for which easement payments or conservation program contracts are available).

Funding from the Walton Foundation and National Institute of Food and Agriculture was used to pay for these activities in Deliverables 1, 2 and 3 through 12/31/2011.

Result Status as of 06/30/2011:

Deliverable 1

Before beginning extensive one-on-one outreach with individual farmers in deliverable 3, Chippewa River Watershed Project and Land Stewardship Project have been holding workshops and field days to show that perennials can be profitable for farmers and that value chains exist that could take more product.

Since January 2011 we have held:
- Two workshops in a series called “Options for Making $45,000 (in net profit) from ___”. The first on “Hogs” was held January 29th outside the watershed, but was linked with West Central Research and Outreach Center scientists and included farmers from the watershed. A second was held on February 5th in Glenwood (inside the watershed) on “Grass-fed Livestock.” They were attended by nearly 100 people and were very well received.

- Two events covering markets for alternative hog production and grass-fed beef. These events included businesses building value chains to aggregate product from farms and process, deliver and sell products to institutions and retail outlets in the region and beyond. These two events were attended by 65 unique individuals and were reported to be very useful by the participants.

- Two workshops attended by 25 individuals were held in Western Minnesota about understanding transportation costs and options for reducing transportation costs through aggregation and careful planning. An existing transportation cost calculator is being reviewed that may be appropriate for Minnesota.

- Additional events with 48 people held this spring also included a winter livestock facilities tour at the West Central Research and Outreach Center facilities and three, two-day classes on Holistic Management®: 1) Planning for Success – Introduction to Holistic Management®, 2) Holistic Financial Planning and 3) Holistic Planned Grazing. Holistic Management® is a proven decision-making tool that can help farmers, ranchers, entrepreneurs and natural resource

managers achieve a "triple bottom line" of economic, environmental and social sustainability. The planned grazing class In June included a focus on conservation grazing with The Nature Conservancy at the Ordway prairie in the Chippewa River Watershed. This event was designed for farmers with cow-calf or grass-fed operations and land mangers to show how to plan for and conduct profitable grazing that also results in good conservation. Utilizing public lands for grazing will help expand product availability.

LSP continued conversations with four area hospitals to set goals and purchase from the Watershed and University of Minnesota, Morris, as well as two area distributors about carrying more product produced from the watershed.

Deliverable 2

The University of Minnesota, Morris has conducted testing on the Biomass burner. We have engaged with the University of Minnesota, Morris about options for markets for perennial biomass for the Chippewa River Watershed.

Deliverable 3

Partners were engaged in modeling and economic analysis activities during this period:

- Agricultural Production Systems Simulator has been calibrated by the Agricultural Research Service lab for cropping systems and 12 soil types in the watershed, including sub-watersheds selected as focal areas. Calibration results are statistically acceptable and paper on the calibration results has been accepted for presentation this summer at a national Agricultural Research Service event. We are still calibrating for livestock system impacts.
- The Soil and Water Assessment Tool calibration continues.
- The US Geological Survey worked with project partners to begin to identify appropriate land-use data and bird species to include in their model. Partners settled on using the 2006 National Land Cover Dataset enhanced with wetland information for the Chippewa River Watershed and bird listings by the Audubon Society and those included in the Prairie Plan for the area. This is a subset of the species included in the BCR matrix 23 developed by the US Fish and Wildlife Service.
- An economic survey is ready to be field tested in July in the Chippewa River Watershed. It has been prepared by economist John Westra.

Funding from the Walton Foundation and National Institute of Food and Agriculture was used to pay for these activities through 6/30/2011.

Result Status as of 12/31/2011:

Deliverable 1

- University of Minnesota, Morris's food service Sodexho approved Coop Partners, a Twin Cities based food distributor that is very interesting in cross-docking. They are familiar with aggregating products from individual family farms. This is potentially very significant infrastructure development. LSP staff members are helping make connections with local retail stores.

- We've had a lot of success in engaging four private companies in workshops during the spring and summer.

- A processor that also distributes to the Twin Cities is exploring expansion into regional food distribution. We have put them in contact with farmers, and local retailers interested in more regionally produced food.

- LSP staff members are in contact with a purchasing consortium for three area school districts and Rice Memorial Hospital in Willmar about opportunities to increase purchase of sustainably grown, regionally produced foods.

- We are investigating design and cost of mobile processing (red meat) that could help expand land use in pasture in the Chippewa River Watershed.

- In November and December we initiated a series of meetings (one in person and numerous telephone contacts) with the entrepreneur who operates a retail foods store at the Kadejan poultry processing facility in Glenwood. They are interested in developing a local foods distribution network to spread the company's chicken distribution and transportation costs. We put him in touch with farmers who regularly move products along a route his truck regularly travels empty and with area distributors.

- We are planning two working sessions for distributors and farmers along various routes between the Twin Cities markets and western Minnesota for the winter of 2011-12. The first will be held in Milan on January 19th. The other one will be held in Glenwood in late February.

Funding from the Walton Foundation and National Institute of Food and Agriculture was also used to pay for these activities through 12/31/2011.

Deliverable 2

- Julia Ahlers Ness attended the Midwest Biomass Conference Nov. 2-3 to get a sense of whether this is something that has more near term market potential in the Chippewa River Watershed or is more of a down the road possibility.

Funding from the Walton Foundation and National Institute of Food and Agriculture was also used to pay for these activities through 12/31/2011.

Deliverable 3

A. Farmer Outreach

- Project partners formed working relationships with:
    - The Nature Conservancy related to the Chippewa 10% Project through a joint event on grazing planning in the Ordway Prairie and connecting on the MN State Prairie Plan;
    - STRIPS project in Iowa for which LSP did additional publicity through an article, blog and podcast (see below);
    - Prairie Pothole Region Integrated Land Conservation Strategy which is considering the Chippewa 10% Project as a study site;
    - Green Lands Blue Waters which we supported through a meeting on perennials at Decorah and by participating on work groups and partnership planning meetings;
    - Pope County Soil and Water Conservation District, which will host the Ag Land Solutions Specialist position for Land Stewardship Project and the Chippewa 10% Project (see implementation);
    - A crop consulting firm assisting with farmer outreach in the Shakopee Creek (see implementation); and

- The Minnesota River Watershed Alliance which asked the C10% to co-sponsor a meeting.

- Public field days, tours, etc. have been targeted to the watershed. We have often got response from those outside the watershed. Since June we have had seven events with 217 people attending. We focused outreach to farmers and landowners with hands-on practical, production oriented workshops and field days:
  - Holistic planned grazing to build connections with private and public land managers about high quality profitable contract grazing that meets specific conservation objectives;
  - Opportunities inherent in contract grazing;
  - Biomass + grazing market opportunities; and
  - Practical approaches to making grazing work on farmer's fields.

- One-on-one or small group discussions have taken place with 12 farmers on advisory committee, 13 farmers on marketing options in Morris and Litchfield, 26 case interviews for the economic analysis and two farmers recruited to work with a crop consultant this fall.

Farmer Outreach Strategy:
This winter the focus will shift heavily toward targeted contact with individual farmers and landowners, with the hiring of the new "Ag Land Solution Specialist" to work out of the Pope County SWCD office in Glenwood and through contract work a crop consulting firm focused on the Shakopee Creek area as noted below.

Northern 2/3 of watershed, more diversified landscape, more livestock

- Focal areas are Middle Main Stem and East Branch and upper Shakopee Creek in the Prairie Core area identified through the Prairie Plan, where we will work with the Nature Conservancy to protect existing prairie, Conservation Reserve Program contracts, grass-based operations and transition some additional row crop fields to continued working lands in productive grass-based operations near the core areas.
- We intend to address the increase in turbidity that starts in the upper main stem area as well as nutrient runoff and fecal coliform runoff.
- The new "Ag Land Solutions Specialist" position based out of Pope County SCWD office will make connections with farmers and landowners through talking with farmers and those who know farmers about landowners and operators we should meet. The hiring for this position occurred this fall and the position will start in January 2012.

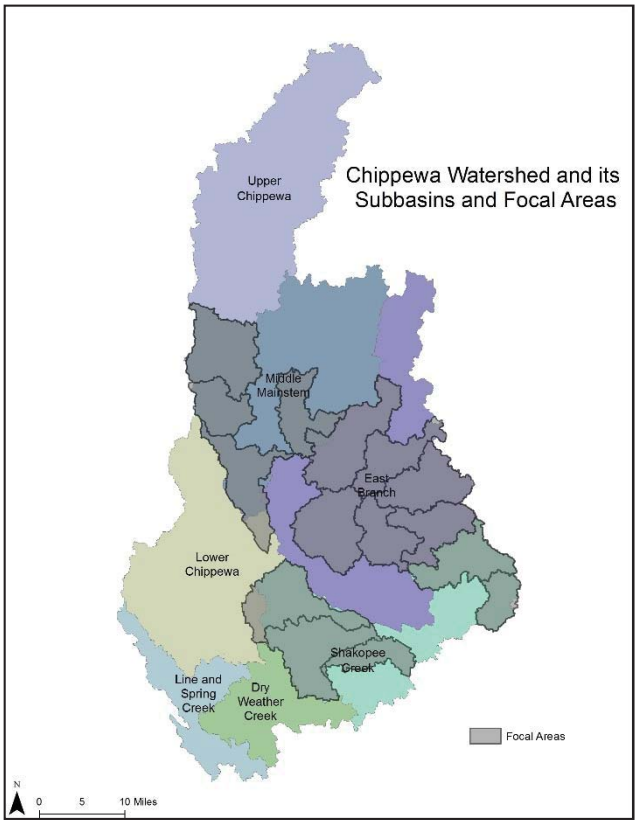
Southern 1/3 80-90 % row cropped; geographically homogeneous, flat w/ virtually no remaining wetlands

- Focal area is Shakopee Creek sub-watershed, particularly the lower 1/3 which contributes 65% of nitrogen flowing into the main stem. In addition to nitrogen management, CRWP monitoring points to issues of flow (speed & quantity) and the contributions of Shakopee Lake.
- Strategies will include:
  - Identifying landowners via one to one contacts;
  - Working with crop consulting firm to connect with farmers on nitrogen management plans & monitoring; and
  - Organizing kitchen table meetings about BMPs for nitrogen management to save farmers money and reduce losses of nitrogen to streams.

B. Modeling and other analyses

- Focal areas – The project has identified three focal areas with associated 12 digit watersheds (HUC):
    - Shakopee Creek below the lake (nutrient issues) and turbidity hot spots;
    - Middle Main Stem (erosion issues); and
    - We added a third focal area to include the state Prairie Plan core area within the Chippewa River Watershed, where it is important to:
        - protect what already exists;
        - expand grass where possible; and
        - understand the attributes that lead to clean H_2O.

- Agricultural Production Systems Simulator --
    - The model has been calibrated and validated for row crops and alfalfa and is being calibrated for perennials and animals by Abdullah Jaradat and Jon Starr at the North Central Soil Conservation Research Lab.
    - Calibration simulations have been tested with certain crop rotations and with possible future rainfall conditions. Loss of N, erosion, biomass, grain yield, soil carbon and runoff have been simulated. One academic paper has been published.
    - The long-term effects of row crops and alfalfa has been evaluated in relation to climate change & soil types



- The Soil and Water Assessment Tool—
    - It has been calibrated by the Chippewa River Watershed Project.
    - CRWP staff are now in the process of assessing the significance of using regionally measured values for pasture and hay land erosion.
    - This work has been delayed while turbidity total maximum daily load meetings were held by the Chippewa River Watershed Project this winter.
- Economic Analyses—
    - 26 interviews have been conducted by John Westra to gather production costs and returns for alternative systems being considered in the Chippewa 10% Project. During the next few months John Westra will finish and compile production survey work of alternative production systems; gathering information about production activities on a per acre basis for the cost of production, production output, profits from production and risk.
    - LSP will complete a case study on grass-based beef production (any beef systems that use grass to some degree). Information is being exchanged with other related case studies underway.

- GIS analyses ---

- LSP is using several data sets: National Land Cover Data 2006, National Agriculture Statistics Service 2010, SURGO soils database, orthogonal pictures, Ducks Unlimited wetlands layer, US Fish and Wildlife Service Bird Matrix, Prairie Pothole layers to develop baseline and scenario maps.
- LiDAR digital elevation data is being processed for the watershed to map:
  - Areas sensitive to runoff;
  - Locations of crop rotations in relation to watershed features; and eventually
  - Locations of grazing farmers, transportation routes in relation to each other or land forms

Funding from the Walton Foundation and National Institute of Food and Agriculture was also used to pay for these activities through 12/31/2011.

Result Status as of 06/30/2012:

Deliverable 1

We are getting traction on the distribution front in a way that might parallel the path of infrastructure development in the Twin Cities, while wider regional and national markets are developed through entrepreneurs.

At our last team meeting we came up with a plan to focus on local food activity in the Pope County area, around our Middle Mainstem focal area (and close to MN Prairie Plan focus area.) We've already done some work in the area and it is ripe. Kadejan is interested. They already have a truck out and about in the region and are too often returning home empty. This can raise awareness and, potentially, production activity around grass based systems in the area.

Key food cooperative players (brick and mortar as well as on-line) are seeing the value of working together. Co-op Partners Warehouse, certified as a Sodexho supplier, is ready to start a route even if it has to be subsidized by more lucrative routes at first. The food director for two of the larger public schools in the area has spoken with LSP about her interest in being a purchaser on one of these routes. In addition, we have two of the largest local food players in the region who market and want to increase their markets in this area ready to start paying someone else so they can get out of the truck and stay home. It makes sense to build this around Co-ops that could, as they did in the Twin Cities, pioneer the path toward greater regional food consumption.

We are working to identify other opportunities for branded programs to get more supply from the region.

Deliverable 2

LSP is partnering with The Wallace Center Pasture Project. Their case study shows a significant potential for grass-fed been markets if additional supply can be found. Working with John Westra and the Pasture Project we are assembling the background to clarify the economic case for row crop farmers to lease sensitive fields to cattle producers wanting more grazing capacity.

Deliverable 3

A. Farmer Outreach

The primary ways we've been working to build that credibility with row crop producers have been to:

- Meet farmers on terms with which they are familiar - starting with offering support of farmer-based efforts to increase nutrient management efficiency (Shakopee Creek work) with the hope that this will help establish a solid enough relationship with the farmers that can be built upon & expanded to include other voluntary conservation or BMP practices. LSP has contracted with a person to work about 10 hours/week visiting with farmers in the lower 12 digit watersheds in Shakopee Creek to encourage them to participate and to invite neighboring farmers along tile lines or minor tributary creeks to participate in kitchen table conversations. We anticipate conversations with up to 45 farm operators this summer and fall.
- Partner with entities that are already working with farmers in the direction of the conservation farming (SWCD offices), and work together to help farmers take things to the next level beyond conservation to that of "seeking farm profitability through good stewardship of our land & water resources."
- Begin outreach to absentee landowners. Upwards of 60% of farmland is owned by absentee landowners who increasingly want one-year rentals escalating each year based on the price of corn and the availability of dollars for higher land rents effectively undergirded by risk management insurance. The Chippewa 10% Project needs to reach out directly to absentee landowners about options for profitable, conservation farming systems. Local partners and the C10 Project have forged connections with women landowners who want to understand conservation and conservation programs and talk about what is available and how easy it really can be for farmers holding land leases to improve conservation.
- Other efforts including reaching out to owners with Conservation Reserve Program acres expiring in 2012 that might not otherwise be re-enrolled or seek conversion to working lands practices such as grazing.

B. Other outreach

- Because of the relationships developed through the 10% Project over the last year, Pope County Soil & Water office has expressly asked LSP to help put on a series of Holistic Management classes within the county, most likely to be scheduled for November of 2012.
- One of LSP's Farm Beginnings Programs for 2012-213 will be held at the West Central Research and Outreach Center in Morris; the intention with this class is to specifically reach out to existing "ag of the middle" and beginning farmers interested in grass-based livestock operations. The C10 project is in a position to help and inform this effort.
- The area's Working Lands Initiative, which includes C10 team members, is looking to develop a cropland to grassland demonstration site within or near the watershed. This will provide a key outreach base to farmers and landowners within the watershed.
- The C10 Project has been invited to be a sponsor for the 2012 Tri-State Conservation Grazing Workshop geared to support the practice of conservation grazing as a land management tool where the primary goal is to meet specific or defined ecological objectives.
- Minnesota Grazing Lands Conservation Association is co-sponsoring a Soil Quality Improvement workshop with the C10 project because of the economic, conservation and ecosystem benefits that come from farming systems that improving soil quality. These systems include use of minimum tillage, cover crops, and diverse crop rotations that includes grazing livestock to help boost biological life and carbon sequestration in the soil.

C. Modeling

Our predictive modeling work is complex, but beginning to bear fruit. It is of considerable interest to agencies in this state and beyond. The Agricultural Production Systems Simulator

(APSIM) initial simulations with row crops and alfalfa show that perennial crops could reduce nitrate leaching strongly under future climate change (~50% reduction due to continuous alfalfa) and would level-off at about 50-60% perennial in the crop rotation. Initial simulations runs also predict that the current crop production system, even on a highly productive soil, will have difficulty in consistently attaining a goal of achieving acceptable levels of ecosystem services, including <10 mg NO3-N/L in tile drainage water even though prudent nitrogen fertilization is followed).

Next steps are to complete the datasets to be used in APSIM by adding cool season mixed species pastures, mixed species perennials and the effects of adding grazing animals in the watershed into the modeling. Output coefficients for ag pollutants are being indexed for about several major crop rotations on different soil series and land capability classes for: No3-N, erosion, biomass, grain yield, soil carbon and runoff. These will be used for the integrated economic model being developed by John Westra in the economic analysis, to strengthen SWAT modeling for total suspended solids and for InVest modeling applied to the Chippewa River Watershed for ecosystem service prediction.

Information is being exchanged with the Wallace Center study. A second study on Pork is being done jointly with Minnesota Institute for Sustainable Agriculture.

Presentations last fall at which we were invited to present were:

- Prairie Pothole Region Integrated Landscape Conservation Strategy (PPRILCS) is interested in the Chippewa 10% Project as a comprehensive approach dealing with economics.
- Minnesota River Interagency Study Team is considering applying a detailed hydrologic model tying in-stream concentrations with changes in farm management practices at a small scale. It would focus on a HUC 12 or smaller unit of the eastern Shakopee Creek.

Funding from the Walton Family Foundation and National Institute of Food and Agriculture was primarily used to pay for these activities in Deliverables 1, 2 and 3 through 6/30/2012. Remaining ENRTF funding will be used from July 2012 to June 2013.

Result Status as of 12/31/2012:

Deliverable 1

Meetings of farmers, distributors and interested purchasers were held in the southern and northern parts of the region in early summer of 2012 to discuss distribution. The meetings featuring successful regional distribution strategies were held in Milan, Minnesota and in Glenwood, in the northern and southern parts of the region in which the Chippewa River Watershed is located. Farmers along the southern parts of the region were primarily interested investigating the possibility of forming their own cooperative and purchasing a truck for distribution.

In the northern part of the region, farmers, purchasers and potential distributors are interested in working with existing distributors in ways that will enable them to tap into the lucrative Twin Cities market as well as distribute product to larger market in and around the Chippewa River watershed. This area includes a number of food coops in Ortonville, Morris, a new Coop in Willmar and in Litchfield as well as the University of Minnesota Morris campus. The area also is

home to the four hospitals and three public schools we have engaged in purchasing regionally grown food.

In October we held a public meeting that featured author Attina Diffley. The focus of the discussion was on the role the growing Twin Cities food cooperative movement had in making success possible for farms like Gardens of Egan. Since then we have held meetings with managers and board members of four area food coops and Kadejan, an interested distributor in Glenwood. This effort will lead to a meeting February with food coop and University purchasers and Coop Partners Warehouse. We believe we will have sufficient product to result in a weekly route set up by Coop Partners between the Twin Cities and this region, with strong possibilities for regional distribution by Kadejan.

Through our participation in the University of Minnesota's Southwest Regional Development Partnership we have been able to help implement a mini-grant program in Southwest Minnesota providing funding to groups of farmers and other entrepreneurs who want to pursue regional food system value chain strategies.

Deliverable 2

Through our partnership with Wallace Center's Pasture Project in the Root River area, LSP acquired economic analysis of cost/benefit of grass fed beef production in the upper Midwest on a per/acre basis. This is the approach that will be most appealing to farmers accustomed to row crop economics. With this information and Economist John Westra's findings we will be able to complete fact sheets on the economics of grass fed beef production.

In partnership with Green Lands Blue Waters Grazing Task Force we have developed three fact sheets valuable to beginning farmers interested in making a success of contract grazing and grazing on leased land. They include a summary fact sheet, a fact sheet on land suitability, and one on contract details.

Deliverable 3

Due to a delay in hiring for this work, we are behind schedule on this deliverable and will not be completed by March 2013.

A. Farmer Outreach

Outreach to farmers has been through:

- In 2012 LSP partnered with the Pope SWCD to conduct technical assistance with CRP contract holders and graziers and others.

- In addition we distributed a survey to beef producers in the area who ask for one as a result of publicity through the media or partners such as Grazing Lands Conservation Association. Seventy-three people have responded so far. The results are being analyzed by the West Central Research and Outreach Center. Through this survey we were able to identify graziers who are interested in expanding as well as training topics livestock producers in the area identify. This information assists us in tailoring individual and "retail" outreach efforts and identifies farmers who want to expand their grazing operations to help us target our one to one outreach.

- As a result of mailings, public meetings, tours to neighboring states and individual visits, farmers are assessing or implementing conservation in 2012 through the Chippewa 10% Project as follows:
  - 10 famers on 1057 acres enrolled in N testing;
  - 6 farms with 225 ac engaged in multi-species cover crops work;
  - 25 CRP contract holders responded to a mailing about options besides allowing contract to expire;
  - 15 women landholders participated in meetings this summer about conservation options for their owned acres in the Chippewa River Watershed or nearby.
- A plan has been developed for individual outreach with farmers and kitchen tables meetings this winter and spring with farmers in key focal areas.

B. Other outreach

- In 2012 we conducted field days and tours to engage farmer and other stakeholders:
  - This July the C10 Project cosponsored, assisted in planning the agenda and lent promotional support to WCROC Organic Dairy Day August 7th and the North Central Soil Conservation Research Lab's annual field day August 16th, which had at least 60 people. In addition, we sponsored trips to Burleigh, ND on Soil Health and Cover Crops; EcoSun Prairie Farm in SD and STRIPs project in IA for farmers and others in the watershed. (See attached article about the work).
  - LSP and the C10 project co-sponsored the TriState Conservation -Grazing Conference to be held in eastern North Dakota Aug. 21-22 and we are helped recruit livestock producers from the watershed to attend with about 200 people attending with about half a dozen from the watershed.
  - LSP, CRWP, Grazing Lands Conservation Association, Natural Resources Conservation Service (NRCS) and others sponsored a statewide Soil Health Workshop on September 21 that featured farmers, NRCS staff and Agricultural Research Service staff from North Dakota talking about multi-species cover crops (270 people participated). See http://landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/chippewa10/soilquality for more information. Funding for this workshop was provided by the Walton Family Foundation and co-sponsorships.
  - LSP sponsored a field day on October 24 demonstrating soil health improvement through innovative cover crop strategies at two diversified crop and livestock farms in our cover crop network.

C. Modeling

- The North Central Soil Conservation Research Lab calibrated the Agricultural Production Systems Simulator (APSIM) model and conducted initial simulations on 12 representative soil types in the Chippewa River Watershed for crop rotations (corn/soy, corn/soy/wheat/alfalfa, continuous corn, corn/alfalfa and continuous alfalfa), 100 years of historical temperature/rainfall/C02 data and, using the Intergovernmental Panel on Climate Change A2-climate scenario, estimated climate up to 100 years into the future. Ecosystem service output coefficients included: biomass yield, grain yield, flow, N03-N, NH4-N, soil carbon (to 1 m) and soil erosion. Output coefficients have been expanded to include 132 soil types (about 90% of the CRW) and three groupings of land capability classes (LCC) for conventional and organic systems. Jaradat et al., found that, in testing a performance index on 24 representative soil series in a range of LCCs, current LCC groupings are not as effective as soil series for predicting the effects of climate change on ecosystem services resulting from various crop rotations (see attached poster).
- Soil and Water Assessment Tool has been calibrated against long-term stream monitoring for sediment in the CRW. This is based on 2006 National Land Cover Data crops or soils that represented 10% or more of the area.

- o US Geological Survey has completed an analysis of bird habitat in relation to Chippewa River Watershed land-use and potentially sensitive areas in row crops defined by the 2006 National Land Cover Data set on Land Capability Class (LCC) 3 and above and slopes >3% (about 106,000 acres). Converting row crops on those lands in focal areas to grasses on about 45,000 acres would increase grassland birds by 15 to 17% (see attached).
- o Louisiana State University Agricultural Center (LSU) has completed interviews with 26 producers on production costs and returns for alternative systems being considered in the Chippewa 10% Project. They are also gathering information from Farm Business Management for 5 or 6 commodities plus alfalfa/grass and livestock about a per acre basis for the cost of production, production output, profits from production and risk. The University of Minnesota's West Central Research and Outreach Center has identified a student to help draw together their economic data from comparisons of the grazing dairy herd and the confinement dairy herd.
- o A Phase I feasibility study was completed this summer looking at perennial biomass for on-farm grain drying and other on-farm energy production. Results are mixed at best.
- o Case studies with area livestock producers on costs and returns are being finalized.

D. Integration

- The expanded output coefficients for each baseline rotation, including animals, will be finalized this winter and will be used for the integrated economic model being developed by John Westra, to strengthen SWAT modeling for total suspended solids and for InVest modeling applied to the Chippewa River Watershed later this spring for ecosystem service prediction.
- It will be applied to several scenarios to test how many acres will be needed to achieve goals.
- Decision tools will be developed in 2013 for farmers based on the results of predictive modeling.

Funding from the Walton Family Foundation and National Institute of Food and Agriculture was primarily used to pay for most of these activities in Deliverables 1, 2 and 3 through 12/31/2012. Remaining ENRTF funding will be used from November 2012 to June 2013

Result Status as of 6/30/2013:

Deliverable 1

We are working closely with the Wallace Center at Winrock International on their efforts to expand farmer connections to growing grass-fed markets. LSP staff made connections between farmers and Thousand Hills Cattle Company for grass-fed markets.

Deliverable 2

This objective has been difficult to address as biomass markets for true perennials have not developed. We intend to conduct a follow-up feasibility study later this summer on field-scale options for crop drying.

Deliverable 3

We are finding it very productive to use a 1-1 meeting (relational meeting) approach. In this context, a project organizer helps the farmer or landowner discern their core values, name the fears that are keeping them from making changes, identify ways through, around or over those fears and explore options on their farm that could protect water quality. From these meetings we are identifying farmers who are interested in joining a nitrogen management, grazing network, or are willing to try some cover crops or some other practice on their farms.

LSP staff member Andy Marcum completed 74 1-1s this winter. LSP staff member Terry VanDerPol completed five and Chippewa River Watershed Project staff member, Jen Hoffman, completed 10 follow-ups w/farmers monitoring nitrogen needs in their corn. We have also aggregated last summer's results. One result of this work is that 20 farmers agreed to host so far, though most have not happened yet.

Workshops held during this period include the following.
- LSP and CRWP coordinated a two-part East Branch workshop on grazing with 22 agency partners followed by one with 5 farmers
- A workshop called "Promoting Long-term Care of Land Through Leases & Contracts" was held on April 4 in Glenwood with 14 farmers and was sponsored by LSP.
- LSP coordinated three "Introduction to Holistic Management" webinars (counted as one event in 2013 with12 farmers and 13 SWCD, NGO, University and other partners.
- The CRWP introduced, at their annual meeting attended by 70 stakeholders (watershed residents and project partners), a conservation planning tool that uses biophysical data and stakeholder values to identify priorities. Using interactive instant response technology stakeholders shared their values and preferences related to watershed restoration and protection needs to use for conservation planning.

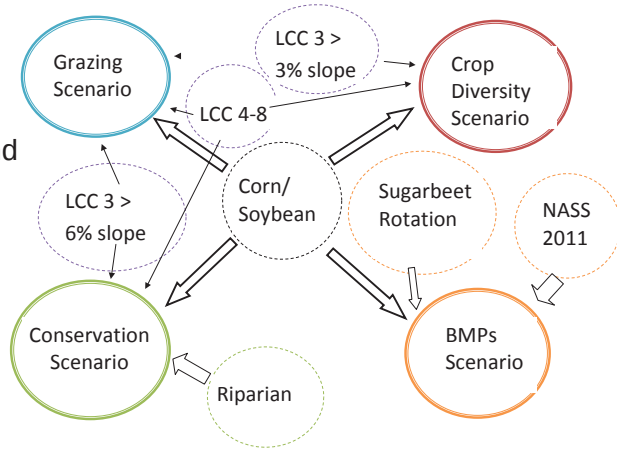
Deliverable 4

We held three Kitchen Table Meetings with 16 farmer participants.

Four learning networks with 60 farmers have been organized on: nitrogen management in corn, adding cover crops in a row crop rotation, improving and adopting rotational grazing and women non-operating landowners seeking enhanced conservation with renters. There have been two group meetings and three individual follow-ups with the women landowners. The group wants to continue meeting this summer and four have expressed interest in making changes next year.

Deliverable 5

Modeling simulation has been done by the USDA Agricultural Research Service with the Agricultural Production Systems Simulator (APSIM) model, based on crop rotation data from USDA Agricultural Research Service,132 predominant soils in the watershed and historical and future climate. We also mapped five basic crop rotations using 2006-2010 USDA National Agriculture Statistics Service data and estimated nitrogen and phosphorous availability from livestock operations in the watershed, including various pasture-based systems (continuous and rotational), AFOs and CAFOs for beef, dairy, swine and poultry. Ecosystem services output coefficients for yields, nitrate-nitrogen loss, runoff, drainage loss and erosion have been simulated in APSIM for the geospatially referenced crop rotations.



Two models will integrate economic and biophysical aspects of the systems for baseline and four land-use/management scenarios to achieve water quality. Comparisons between corn and grass-fed cattle, or cover crops and cattle grazing will be included in the models (see table above).

Items needed to run InVest and the Integrated Economic Water Quality models include the following:

- Baseline crop rotations and land-use (have been mapped for the watershed by LSP
- N and P estimated for all feedlots in the watershed has been calculated and mapped
- Scenarios have been finalized and mapped.
- APSIM export coefficients have been generated by ARS for all crop rotations and are almost finished for pasture and warm season grasses. These are being reviewed by Team members before being finalized.
- Economic baseline information has been assembled and case studies are available.

In addition, Paul Wymar at Chippewa River Watershed Project has improved Soil and Water Assessment Tool (SWAT) estimates of flow and sediment. He did this by rerunning SWAT with hydrological response units based on soils or land-uses at a resolution of 1% of their area instead of the previously used 10% resolution.

Funding from the Walton Family Foundation, National Institute of Food and Agriculture and National Fish and Wildlife Foundation was primarily used to pay for most of these deliverables through 6/30/13. Remaining ENRTF funding will be used until June 2014. Note that during the first 6 months of 2013, we utilized about $80,000 in Walton Family Foundation funds and $60,000 from National Institute of Food and Agriculture for Results 1, 2 and 3.

Result Status as of 12/31/2013:

Deliverable 1

Planning is underway for two sessions on marketing.

Deliverable 2

This objective has been difficult to address as biomass markets for true perennials have not developed. We intend to conduct a follow-up feasibility study later on field-scale options for crop drying.

Deliverable 3

A. One-to-one farmer and landowner outreach continues to succeed through one-to-one conversations about stewardship values, obstacles to greater conservation and options. Our success is then in following up with people and connecting them to conservation planning agencies and resources. Our partnerships with Pope Soil and Water Conservation District, USFWS, DNR, Chippewa River Watershed Project (CRWP) and TNC are critical to this success. A total of 145 one-to-one visits were held through November 2013. The number of new Environmental Quality Incentives Program grazing plans on 2170 acres with 15 farmers completed by the Pope SWCD is in part a result of this approach.

Workshops held during this period include the following.

-Farmer members of our cover crop group hosted two successful field day events this summer. A bus tour featured cover crop farms integrating grazing livestock and season extension into their crop strategy. The second featured cover crops inter-seeded into standing corn and their impact on soil quality and health. 37 watershed farmers attended one or both of these tours. Attendee's also included non farming landowners and interested agency staff. Brian DeVore, LSP Communications Director interviewed two of the farmers and developed a podcast on cover crops and soil health.

-Farmers at the Morical cover crop field day inspected an implement Jerry Morical and his grandson Taylor designed for inter-seeding cover crops into standing corn. Suggestions for enhancements to improve soil-to -seed contact were generated.

Deliverable 4

Farmer networks are solidifying and more people are becoming interested.

Cover Crops and Soil Health

The project is in our second year of convening a network of farmers innovating in cover crops and soil health. Mr. Jim Paulson, University of Minnesota Extension dairy and grazing expert and Dr. Sharon Weyers, Research Soil Scientist with the USDA Ag Research Service, both members of the Chippewa 10% Project Team are advising this group.

Group activities include experimenting with different mixes of seeds, methods of seeding and ways to utilize the cover crops that will add value to livestock farmers beyond soil building. Farmers in the group get financial support for biological soil testing and seed costs as well as a group consultation from the soil laboratory to assist them in interpreting their soil test reports. In return the farmers agree to sponsor a field day or participate in a multi-farm tour or workshop showing other farmers what they are learning and they agree to make their yield and financial numbers available to the project team to develop and publish educational materials.

Nitrogen Management Network and Tile Line Monitoring in the Shakopee

Seven members have been participating during the 2013 growing season, covering roughly 1000 acres. This is fewer than anticipated. Farmers were preoccupied and scrambling to deal with the wildly late spring planting. The late and wet spring also led to some soil test timing issues but the participants, through coordination with their chosen crop consultant, had pre-sidedress nitrogen soil samples collected. The crop consultants for stalk nitrate test analysis collected corn stalk samples for the season. Results of all tests will be obtained from crop consultants.

Following the crop harvest, participants will be met with individually to discuss their on-farm results and then convened as a network to share their experiences, strategize for increasing the network and identifying other needs they would like met. A summary of results similar to 2012s will be compiled. During the next six months a strong push will be made for solidifying the current participants as a functioning, identifiable network and securing additional members in the target area of Shakopee Creek.

Chippewa River Watershed Project (CRWP) with the aid of Bosch Farms (of Montevideo) identified two fields with accessible tile lines for tile flow monitoring and nitrogen testing. The first location taps into a tile system from a 40 acre field that is pattern tiled with no surface inlets and is currently used to grow corn and soybeans. The second site monitors a tile line that drains an 80 acre corn and soybean field that has many open tile intakes.

CRWP hopes to monitor tile flow and nitrogen levels from these two sites in order to characterize seasonal tile flow output and nitrogen levels from fields within the Shakopee Creek and Dry Weather Creek watersheds of the Chippewa River. In addition we hope to collect data that can be used to compare and contrast the difference between drainage with and without open tile intakes.

Work is being undertaken to establish a third site that will foster the goals of the project, provide further authentication of the results and expand the study area. CRWP expects to identify this third site in the next several weeks (October).

Women Caring for the Land in the Chippewa Watershed

Land Stewardship Project's Non-Operating Landowners Network for women landowners is called "Women Caring for the Land." Identifying stewardship values, learning about ways of implementing those values through conservation leases, new enterprises like managed grazing or government programs in a 'safe', women-only group empowers participants to act. A significant portion of the first meeting and each subsequent meeting that includes new participants is a round robin of women talking about their land, how they acquired it, what it means to them, their families and community and their vision for the landscape. The impression that our fast paced, market centered culture does not afford many opportunities for this type of reflection about stewardship values and connection is borne out by the intensity that builds through these conversations. Their connections to the land and to the community are deep and strong as is their desire to build their farmland as an asset and part of a healthy functioning landscape.

Some Chippewa Watershed women landowners tour a native prairie in Pope

Three meetings were held this period. One focused specifically on legal and relationship aspects of developing Conservation Leases with renters. The second focused on USDA-FSA conservation programs and conversations about how to talk with renters about conservation. The third meeting focused on the role of cover crops, how challenges to cover cropping in this northern climate are being met by innovative farmers, and how to tell if your soil is healthy. A farmer member of our Cover Crop Network was the primary presenter. Currently there are eight core members of the group representing about 1820 acres of farmland in the Chippewa River Watershed.

Grazing Clubs

Four grazing farmers from the Chippewa Watershed have formed a grazing club to learn from each other and improve grazing techniques. The group also includes two experienced grazing advisors, Terry VanDerPol and Richard Ness from LSP, a retired grazing mentor, and occasional experts. The club is going to meet this winter to recruit more grazing farmers with a goal of 8+ farmers actively participating and 20+ farmers in the network and occasionally participating.

A Landscape Level Initiative to address Profits from Perennials, Wildlife Corridors and Water Quality, which is also a second grazing network focused on a specific landscape is underway. Last spring, LSP staff member Andy Marcum was contacted by USFWS from the Morris Wetland Office to be briefed on a community organized conservation plan for Southeastern Pope County. A community could come together to find innovative land management practices that meet the interests of individual landowners and benefit the land, soil health, water quality and native plants and animals. It is a large enough area to function as a significant "patch" within the MN Prairie Plan Corridor through the Chippewa River Watershed. One management tool would be to implement a large-scale grazing operation across the entire landscape that would help set back/clean up invasive plant species, improve soil health, assist in restoring native grasses and protect area lakes. This is an area that is largely in perennial cover, a mix of

private and public land with 30 livestock producers, or non-operating landowners. It also includes some large corn and soybean fields

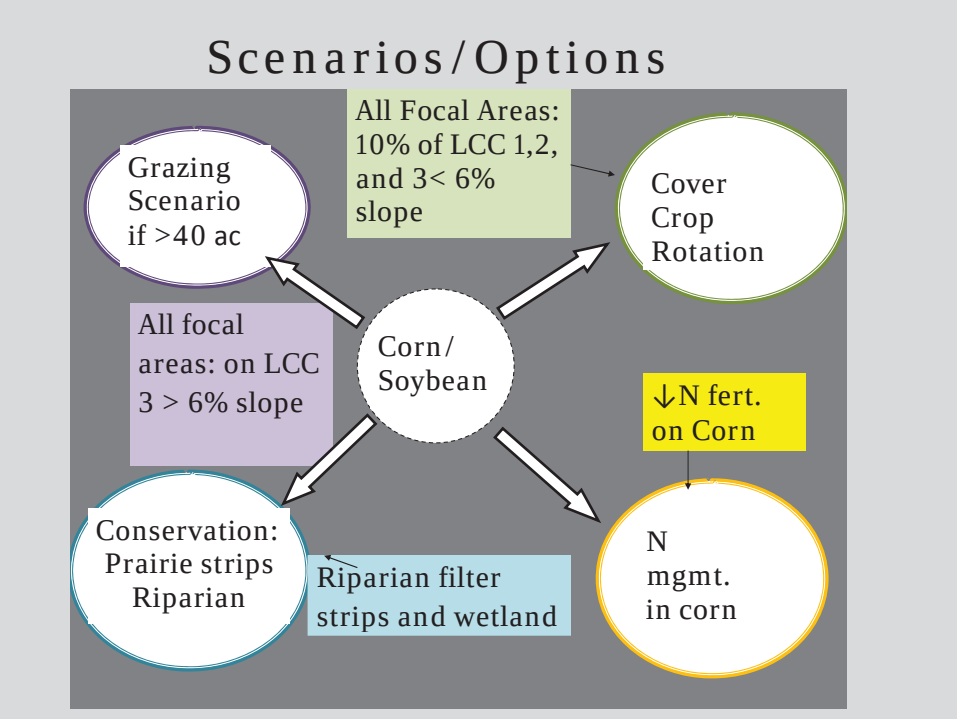
Between LSP, USFWS, DNR, CRWP, TNC and private landowners, we have started to coordinate efforts that conserve and enhance the natural resources and rural way of life that would result in creating sustainable communities. Twelve grazing farmers in the area are meeting with public land managers and recreational landowners to refine grazing strategies for farm profit and for grassland conservation. The farmers and representative recreational landowners met in December and agreed to make plans for grazing and conservation grazing on large tracts of pasture, public land, and privately owned grassland that is being degraded by brush and invasive species. Next steps are being decided and plans to implement work on the land are anticipated to begin in 2014.

Deliverable 5

Baseline modeling simulations with Agricultural Production Systems Simulator (APSIM) have been completed by ARS for crop rotations including corn soybeans, sugarbeets, wheat, alfalfa and hay. Modeling simulations for various levels of grazing are being finalized.

While ASPIM research pieces have been painstaking, we now have ecosystem service coefficients that can be used for the water quality modeling. John Westra is working on this now. Preliminary testing of these coefficients in the 10 digit Shakopee sub-basin of the CRW suggests that a combination of N management, cover crops on 10% of high quality farm land and diversifying rotations on more sensitive lands is encouraging. Economic returns per acre favor continuation of corn and soybeans, and suggest the need to factor in an economic values for soil health improvements, grazing of diversified croplands and an ecosystem services payment.

The slide shows scenarios we are testing through the modeling and also that are reflected in the farmer engagement we are doing. Combined with the monitoring being done through the farmer networks, we hope to be able to link field-level changes with predictions about what is needed to achieve goals at a watershed level.



We've learned that if you look at potential for future climate changes, the cropping systems that are longer do better. The system makes more difference than the actual crops and perennials make the most difference.

We will also be working with MPCA to see if the HSPF model they are now using for the WRAPS process can be modified with scenarios from our process.

With more advanced work on GIS by LSP, we will test methods that can be replicated in other watersheds to more easily predict changes at a landscape level. We will test these analyses against the acreage estimates that will be obtained through the water quality monitoring. We are now confident we can move forward expeditiously.

Funding from the Walton Family Foundation, National Institute of Food and Agriculture and National Fish and Wildlife Foundation was primarily used to pay for most of these deliverables through 12/31/13. Remaining ENRTF funding will be used until June 2014. Note that during the last several months of 2013, we utilized **about $77,000** in Walton Family Foundation funds and **$10,100** from National Institute of Food and Agriculture for Results and $58,500 from National Fish and Wildlife Foundation for results 1, 2 and 3.

Final Report Summary:

Deliverable 1
Despite several efforts related to food co-ops in the region, the University of Minnesota, Morris and several public events on the topics, the market pull component of this project has been a challenge. For example, the University of Minnesota, Morris has had staffing changes in their vendor Sodexho so purchase of regionally grown product has not expanded significantly beyond special events, although that remains a priority for the administration of the institution.

LSP worked closely with the Wallace Center at Winrock International on their efforts to expand farmer connections to growing grass-fed markets. LSP staff also made connections between farmers and Thousand Hills Cattle Company and Grass Run Farms for grass-fed markets. Nevertheless, there is a pushback on what many of the farmers we've engaged view as elitism in grass-fed beef. Further, the high price of beef has made a variety of different approaches to raising beef profitable. While most of the farmers and ranchers were are engaging are quite satisfied with their marketing strategies, there is interest in managing over used pastures to bring them to higher productivity and profit. Since these grass management improvements also result in healthier soil, better erosion control, enhanced wildlife habitat and more stability for grasslands, it seemed prudent for us to focus on this rather than shifting to grass fed production at this time. The Chippewa 10% Project hosted an "Opportunities in Grazing" workshop and panel in January which included buyer from Grass Run Farms, a potential buyer for grass-fed beef in region, as well as a speaker on direct marketing. Fifty people attended this workshop. It sparked some interest and we believe as we go forward with better grazing management, and they see the opportunities for increased feed production that affords, that feeling might soften. As the cyclical nature of the cattle cycle brings prices down and traditional beef continues to occupy a smaller and smaller part of the consumers' plate, our messages about opportunities in grass-fed beef will resonate more powerfully.

The grazing club in the Simon Lake area has repeatedly expressed interest in developing their own branded beef product from this picturesque area. A farmer who produces lamb and beef and a beef farmer have expressed keen interest in rethinking their own marketing strategies and this may hold strong promise in the future.

This contributed to the reduced spending in the LSP subcontract.

Deliverable 2
We began the project with a linkage to the biomass burner at University of Minnesota, Morris with hopes that perennial feedstocks would prove feasible. However, corncobs worked better for them. This objective has been difficult to address as biomass markets for true perennials have not developed. We did conduct a feasibility study early on field-scale options for crop drying, but this showed more costs than benefits and so we discontinued work on this.

This contributed to the reduced spending in the LSP subcontract.

Deliverable 3
Engaging farmers and landowners in one-to-one values conversation continues to be a good strategy for opening doors to talking about how changing some practices can enhance conservation and profit in a relatively safe manner. Conversations are scheduled from a cold call or a follow up with someone who has attended a forum or field event. This affords project staff opportunities to connect them to resources through our partnership with Pope Soil and Water Conservation District, USFWS, DNR, The Nature Conservancy and others. This kind of networking and follow up are critical to success. Robin Moore, Andy Marcum, Terry VanDerPol from Land Stewardship Project (LSP) and Jen Hoffman from Chippewa River Watershed Project (CRWP) completed 29 one-to-ones for a total of 146 substantial face-to-face conversations. In addition, Robin had 19 substantial phone conversations with farmers about grazing, cover crops, no-till farming, and community conservation.

We have focused in the last several months on one to one conversations with farmers in Shakopee Creek, a focal area in the more heavily row cropped part of the watershed. In our outreach efforts in the Shakopee Creek region of the watershed, Jennifer Hoffman of CRWP, who has long-term relationships with some farmers in the area, worked closely with Robin Moore, LSP's Project Coordinator. They visited with eight farmers so far from the Shakopee region. It is a slow building process with more challenges than we experienced in Pope County. One farmer has agreed to experiment with cover crops on a 20 acre piece. He is interested in trying to seed a cover crop following a small grain to harvest as hay for neighboring dairies. Another has agreed to host a field day in fall, 2014 featuring nutrient management and soil health monitoring tools. Although the soil health network we will be developing in this sub-watershed in winter 2014/15 is outside the time frame of this funding, the ground work we have laid with support from ENRTF has contributed substantially to the foundation upon which the network is being built.

Two farmers expressed interest and are following through with the removal of some open tile intakes on their property, which will lead to better water quality. One farmer included his crop consultant when he met with us. This gave us an opportunity to open dialog with this consultant about soil health, something he had heard a little about and was both curious and concerned about. We think this could be a very good opportunity to reach out to his consulting firm about soil health and profitable conservation practices. Finally, by recommendation, we met with a young farmer who is very interested in learning about integrating more livestock into his row crop operation and who would like to learn more about improving both soil health and pasture production.

Workshops held during this period include the following.
-Two presentations by Gene Goven on planned grazing, one to the Glacial Ridge MN Cattlemen's Association and one for the general public.
-One two part workshop on creating a holistic management grazing plan that was held in northeaster IA, drawing farmers from around the region.
-A Field Day featuring a farm transitioning substantial acres from row crops to managed pasture was held for the Glacial Ridge Cattlemen. Thirteen farmers/ranchers attended and topics

included what to plant, interseeding, fencing, water lines and bull management. The discussion's focus was on very "nuts and bolts" questions of managed grazing. One farmer requested a follow-up visit to develop plans to improve a native prairie remnant through managed grazing.
- Previously we reported on seven events.

Deliverable 4
Farmer to farmer networks continue to be a winning strategy for improving practices that also reduce erosion and improve water quality. Four networks of 70 farmers or landowners are learning on 8,500 acres to-date, with viable economic options.

Nitrogen Management Network and Tile Line Monitoring in the Shakopee
Eight members are participating in nitrogen testing through the summer this year. One of those is new farmer monitoring tile lines. Activities include farmers being reimbursed for soil tests and corn stalk nitrate tests in return for sharing those results.

Chippewa River Watershed Project (CRWP) with the aid of Bosch Farms (of Montevideo) identified two fields with accessible tile lines for tile flow monitoring and nitrogen testing. The first location taps into a tile system from a 40 acre field that is pattern tiled with no surface inlets and is currently used to grow corn and soybeans. The second site monitors a tile line that drains an 80 acre corn and soybean field that has many open tile intakes. This is being paid for by the Walton Family Foundation.

Cover Crops and Soil Health
Building soil health, keeping the ground covered, and in some cases providing additional forage for wintering livestock continues to be an area farmers want to learn more about, innovate and demonstrate. Our Cover Crop Network continues to grow with nine core members and another 30+ who have requested to be kept informed of tours and field days.

As part of the Cover Crop network, LSP offers funding for demonstration products made possible by biological soil testing in the spring and fall, a modest stipend for cover crop seed, and field day hosting expenses. Funding from ENTRF and the Walton Family Foundation for these demonstration products has made this possible. We also partner and work closely with ARS soil scientist Sharon Weyers and University of MN Extension agent, and Jim Paulson who has a great working knowledge of cover crops and forages for dairy and beef cattle.

Group activities include experimenting with different mixes of seeds, methods of seeding and ways to utilize the cover crops that will add value to livestock farmers beyond soil building. Farmers in the group get financial support for biological soil testing and seed costs as well as a group consultation from the soil laboratory to assist them in interpreting their soil test reports. In return the farmers agree to sponsor a field day or participate in a multi-farm tour or workshop showing other farmers what they are learning and they agree to make their yield and financial numbers available to the project team to develop and publish educational materials.

This network and biological soil tests we offer, along with assistance from Sharon and Jim, have supported farmers in experimenting and monitoring on their own farms. Dan Jenniges has learned about how diversity encourages more diverse biological soil activity. As a result he seeded a multi-species mix with brassicas, warm season grasses, legumes, and forbs along with his corn and is waiting for the fall soil test but already has seen the benefit of weed suppression. He experimented by not spraying any herbicide on this field. The Moricals are experimenting in building their own implement to inter-seed a cover crop into standing corn. In 2014, we saw 943 acres put into cover crop through this program with a list of cover crop varieties too long to list.

Soil tests we offer have shown that cover crops can result in higher biological activity in fall, due to continued living cover and higher moisture maintained by that cover. In interviews, farmer Jess Berge told me that "the soil tests have taught me to look for and think about way more than just NPK…" and that the tests "make me more curious about what the cover crops do for the soil, it encourages me to try different things to see what the test shows". Rancher Tyler Carlson is very much looking forward to this year and "To have three or more years running in tests, that's where I really start to learn something about my practices".

We hold a meeting at the end of each year to meet with Dr. Weyers and go over the soil tests and what they indicate in the long-term context of that field. Sharon commented how this network has helped her to see the sampling outside of the narrow scientific definition of research, given her a better understanding of the farmer's interaction with each field as a long-term relationship and shown how the test can inform the farmer in that context. The meeting also serves as a forum for all the participants to talk about what they tried, how they managed their fields, and for them to come up with ideas about what they would like to try the following year. Most of what is happening this year is a result of the "what if a guy tried…" around the table last year. The participants appreciated the forum to exchange experience, ideas, and resources as much as the information the tests provided.

Another result of this meeting and testing, eight of the farmers came together to apply for and ultimately receive a USDA Sustainable Agriculture Research and Education Program farmer/rancher grant funding the continuing experimentation with cover crops and soil testing. This is a two year grant and ensures all the farmer's participation through 2015, giving at least three years of monitoring to back up their practices. The farmers wanted to do this out of a desire to continue experimenting with cover crops, the value they think it offers to the greater farming community, and out of a sense of agency and wanted to organize beyond our network.

One of our goals for this network is to help establish a farmer leader/spokesperson for cover crops and planning for better soil health in the Chippewa River Watershed, the Gabe Brown of western Minnesota. We believe there is strong potential for that to happen over the next two years. The network will have powerful stories to tell, documented changes in biological soil test results, and gain to show other farmers.

A member of this network who raises crops and livestock, has also agreed to tile line monitoring on a tiled crop field. This equipment was paid for by a grant from the Walton Family Foundation.

The Chippewa 10% Project held a cover crop soil health field day in August 2012 and in 2013 we held a bus tour featuring three farms and a field day with 37 farmers in attendance. Tours were of interseeding cover crops into standing corn for soil health and fall grazing, following grain with cover crops for soil health and fall grazing. Also included was a discussion of a farm implement to interseed cover crops into corn designed by two farmers in the network along with a soil aggregation and slaking demonstration. We have also published stories in the Land Stewardship Letter (included in the packet) and podcasts on LSP's website (paid for with other funds).

Grazing network

One of the grazing groups in the Simon Lake area of Pope County is a landscape level initiative based on community conservation to address profits from perennials, wildlife corridors and water quality. It is an example of community based conservation in which sound conservation principles are upheld. Farmers, recreational landowners, and public land managers are coming together to cooperate to improve grassland health and enhance its water quality improvement

and wildlife habitat functions. Members of the group recognize they have different goals but are convinced they can all better advance to their goals by cooperating.

This summer, six farmers and 20 landowners with about 6,000 acres have come together to push back on invasive species and establish combined grazing herds to better manage the grass. Grazing public or private grassland is key for two reasons. First, it will give farmers an opportunity to rest some of their overgrazed, worn down pastures and kick-start the success of their holistic grazing plans. The immediate results should engage them in continuing to improve their grazing strategies on their own and other land. Second, this is a region where recreational grassland is valued, but much of it is deteriorated into scrub cedar and sumac diminishing its value as wildlife habitat and as the effective filter for water well managed grass can be. This is an opportunity demonstrate on a peer-to-peer level the value of managed grazing. This will help ensure land currently in grass stays in grass, it will give graziers access to fairly low cost grazing land, boosting their profitability, and will build appreciation in both groups the multi-functional nature of healthy grasslands in providing wildlife habitat and improving water quality.

Working with LSP staff members Terry VanDerPol and Andy Marcum, consultant Chris Halls, with funding from the National Institute of Food and Agriculture (NIFA), reviewed technical aspects of cooperative grazing projects, especially how questions of genetics and breeding, liability, vaccinations programs, fly management are handled. He also worked on surveying the Simon Lake area to identify the amounts of fencing and waterlines needed to begin grazing on the recreational and farmland this summer.

No direct costs were charged to LCCMR for on-farm demonstration products for this grazing network. Costs are being paid from the Walton Family Foundation and sources project partners not directly through the Chippewa 10% Project.

Women Caring for the Land in the Chippewa Watershed

Land Stewardship Project's Non-Operating Landowners Network for women landowners is called "Women Caring for the Land." The Women Caring for the Land group has met four times over the past nine months, with an extended break through the winter months, when many participants leave the area or are reluctant to travel. Five participants who remained in the area over winter were engaged through one-to-ones either on farm or via phone conversation. The group has engaged with 15 women non-operating farm land owners in the watershed (mainly Pope and Douglas Counties), about 2/3 of whom are regular attendees. Presentations on soil health, pollinator habitat, building a better relationship with renters, and cover crops were given by LSP staff, CRWP, NRCS, FSA and US Fish & Wildlife experts.

One of the participants has entered into an agreement with The Nature Conservancy (TNC) to sell a half section of prairie remnant land in the vicinity of Ordway Prairie as a result of her participation in WCL as well as outreach from TNC. Once the sale is finalized, she has agreed to return to the group and talk to other participants about the process. Another participant has enrolled approximately 40 acres of her land that was in an expiring CRP contract into the Wetland Reserve Program. She also co-owns a quarter section with a cousin with whom she has pledged to discuss conservation opportunities like cover crops before approaching their renter.

A third participant, who owns a quarter section of mixed pasture and timber production land in Pope County is actively seeking easement options with the MN Land Trust and DNR.

In addition to these landowners actively engaged in the process of easement and land transfer options, three other participants in the group report that they are actively in conversation with their renters (and/or considering a change in renters) in order to implement conservation

measures including cover crops (3) for better soil health and water quality and increased/improved pollinator and wildlife habitat (2).

The group will meet at least three more times this season in workshops that (based on feedback from participants regarding what they want to learn more about) will focus on perennial crops, soil health, and cover crops.

Engage Community

CRWP, VanDerPol and Rebecca White have led work to engage the community. Values can drive stewardship, but farm profit is critical to the success of a new practice or enterprise. Profit results from decreased input costs and markets for regionally produced grass fed beef can pull more, better managed grasslands. This project has engaged institutions, farmers and businesses that buy grass-fed livestock to learn more about the opportunities. Conservation incentives for learning, and practice change are used in this effort through Natural Resources Conservation Service and the Pope County Soil and Water Conservation District. Hunters, anglers, bird watchers and canoeists can support land stewardship through conversations in coffee shops and by demanding supportive policies for cover and well managed grazing to achieve water quality and sufficient habitat. Recreational landowners and affinity groups can support managing public and private lands with conservation grazing.

CRWP led efforts in the Shakopee Creek and other areas

In addition we held public workshops engaging community members. Preparations were underway in May and June, 2014 for an event held in July called the Bioblitz to engage community members in monitoring the biological health of a Pope County Fen managed with grazing and fire.

Deliverable 5

The project incorporated water quality and field monitoring, simulation of farming systems on 132 CRW soils, GIS analysis to identify areas of sensitivity and predict changes from diversifying. To meet the project's goals within the watershed, respond to water quality monitoring data (see Result 3) and assist farmers to meet stewardship and profitability goals with diversified systems, we identified three focal areas for farmer and landowner engagement. New data and modeling tools were adapted with more robust information on perennials and climate change.

-Chippewa River Watershed Project (CRWP) staff Paul Wymar monitored streams and sub-basins, and tile lines for indicators of water quality and performed Soil and Water Assessment Tool (SWAT) modeling. The C10 Team selected 12-digit sub-watersheds in the Shakopee Creek and Middle Mainstem and East Branch sub-basins based on CRWP stream monitoring and wildlife goals related to the Minnesota Prairie Plan.

Land Stewardship Project (LSP) staff George Boody and Steve Ewest developed rotation analyses and Geographic Information Systems (GIS) mapping to support modeling and farmer outreach. GIS was used to develop crop rotations, identify sensitive lands, map water quality scenarios and for farmer engagement. A rotation analysis with 2010-2013 cropland data layers was the basis for the 2014 iteration of scenario mapping. Sensitive areas included riparian corridors, CRP acres, land in existing pasture-hay and Corn-Soybeans (CS) on LCC 4-8 and LCC 3 on slopes ≥ 6%. Four scenarios for possible adoption of farming systems with greater diversity in ecologically sensitive areas were developed through engaging the C10 Team, farmer advisors, a public meeting and in relation to farmer networks.

Maps are included in the packet as follows:

-Crop rotations in the watershed (top-line types of crop rotations from the 2010-2013 National Agriculture Statistics Service data that relate to information used in the modeling.
-Baseline map showing CS rotation and Pasture Grass areas of the watershed
-Scenario A- CS replacing CRP acres likely to exit with high crop productivity indexes,
-Scenario B- Reduced fertilizer use in C acres (2013) as part of the CS rotation,
-Scenario C- Riparian buffers +Changing sensitive CS fields to management intensive rotational grazing on larger parcels or longer rotations, converting exiting CRP to management intensive rotational grazing
-Scenario D- Scenario C + 10% of CS acres on high quality land (LCC 1-2 and 3<6% slope) to cover crops. A corn-soybean-wheat-alfalfa rotation was used as a proxy since specific data on water quality benefits of cover crops is not readily available for the CRW.

Dr. Abdullah Jaradat and Jon Starr at the ARS North Central Soil Conservation Research Lab (ARS) calibrated and validated the Agricultural Production Systems Simulator (APSIM) model for 2 to 132 soils, cropping systems with corn (C), soybeans (S), wheat (W), alfalfa (A), sugarbeets (Sb) and grazing options with cool and warm season grasses, and for historical and future climate change scenarios. APSIM was calibrated for 8 years of plot data by ARS on 2 soil types and conventional and organic rotations of corn soybeans, alfalfa and wheat. Validation was 0.95 (R2) for past climate. The model was expanded to 12, 24, and finally 132 soil types on 90% of the CRW, grouped by Land Capability Class (LCC) classes 1-2, 3 and 4. In 2014, the model successfully utilized future climate predictions downscaled for the CRW. The model simulations were rerun for the new climate data and rerun again to focus only on the soils in the corn and soybean rotation (our focus for changes to more diversified production where fields might be environmentally sensitive, marginally productive or benefit from soil health improvements). Output includes multiple ecosystem services output coefficients (ESOC) for grain and biomass yields, soil nitrogen, soil carbon, soil loss, nitrate leaching, runoff and drainage in a database housed at the ARS lab. In addition we have ecosystem services output coefficients and grass yield data to compare continuous grazing, basic rotation and managed grazing rotations. Simulations and subsequent multivariate statistical analyses were done for weather data on the past 100 years, as well as simulated changes in future temperature and precipitation based on the Intergovernmental Panel on Climate Change A2 scenario downscaled for localized climate conditions. Two papers were published and at least three major presentations given on the results. At least one more paper will be published later this year after a full analysis of the newer model runs is complete.

-Dr. John Westra of Louisiana State University Agricultural Center gathered economic costs and returns for the cropping and livestock systems from 2008-2013 and developed a baseline model to estimate economic changes in relation to the APSIM output. Project scenarios from 2014 will be run through the model later this year and results published and made available to LCCMR.

An integrated economic model has been developed to analyze the impact of water quality scenarios and to maximize producer welfare in the watershed, subject to provision of ecosystem services described above. Data was assembled for cost of production, production output and profits for each crop rotation and grazing system from the Farm Financial Database (FINBIN), interviews with 25 farmers and APSIM. This was calibrated with 2008-2013 prices and applied to baseline conditions to-date.

-Dr. Brad Heins developed a case study on the transition to an organic dairy grazing herd at West Central Research and Outreach Center (WCROC). The 100% grass-fed cows in the Organic Dairy Transition at WCROC had the highest income over feed costs compared to the other supplementation groups because of lower feed costs, mainly pasture. A one page synopsis of a report to be published is appended.

RESPEC, the consultant hired by Land Stewardship Project, has concluded they are able to integrate Chippewa 10% Project scenarios and APSIM ecosystem services output coefficients for historical climate to predict hydrological impacts of land cover change. Scenarios were modified on conjunction with RESPEC to allow for them to be integrated into the HSPF model. Test runs have been performed using preliminary ASPIM ecosystem services output coefficients. Results from integrating the newly available ecosystem services output coefficients from APSIM will be available this fall and shared with LCCMR. We will be able to compare those to the results from the Integrated Economic Water Quality Model developed through this project. RESPEC is excited to be working with the Chippewa 10% Project team on this test. HSPF is the model of choice for all 8-digit watersheds in MN as part of the Watershed Restoration and Protection Strategy (WRAPS) effort. So this could have a potentially significant impact.

Decision Tools developed with other funding include a transportation calculator for marketing products is on-line at:
http://landstewardshipproject.org/stewardshipfood/tools/forfarmers/understandingyourtransportationcosts
A calculator for farmers to look at the value of crops and livestock in relation to ecosystem services for the Chippewa River Watershed Project will be developed after the Integrated Economic Water Quality Model is run with the new scenarios.

Conclusions thus far are as follows.
Additional analyses and papers will be done throughout 2014 and will be made available to LCCMR.

NO3-N leaching under the future climate change scenario, unlike runoff and soil erosion, was estimated with less certainty (R2 =0.57) in APSIM. Nitrate leaching from a corn-soybean crop rotation is expected to be the highest under future climate change scenario. Widespread perennial crops could reduce this by about ~50%. Biomass and grain yield under past and future climate change scenarios are expected to reach their maximum at about 80% and 45% perennials in the crop rotation, respectively. Simulations suggested that diversifying the corn-soybean crop rotations by including a perennial crop, especially in erosion-prone soil types and locations in the watershed, would mitigate negative environmental effects from corn and soybean production while providing an additional source of income based on new regional markets for food and biomass from perennials and diverse crops.

Diversifying corn and soybean fields that are ecologically sensitive and/or marginally profitable into perennials, cover crops or grazing can help meet water quality and wildlife habitat goals. We estimate that 110,700 CS acres in the watershed and 47,900 in the three focal areas are sensitive, economically marginal or for which cover crops may help improve soil health. Preliminary analysis using rotations and APSIM coefficients indicates that diversification through of about 16% of the corn soybean rotation area (including 10% in cover crops) may result in decreases of 16% in sediment loss and 7% in nitrate-nitrite nitrogen loss from fields.

Economically, despite the prevailing conventional wisdom, there are cropping systems that are close to or more profitable for farmers than growing CS. We found that Corn, Soybean-Alfalfa rotation can net 61% more and grazing 38% more compared to Corn Soybeans on LCC 3. Rotations without alfalfa would fall short by 11% to 24%. New information resulted in published articles and presentations. Later iterations of water quality modeling will use the APSIM climate change scenario and comparisons between different grazing systems. We will determine if predicted changes are sufficient to meet standards in focal areas.

Under contract to Land Stewardship Project, US Geological Survey completed an analysis of bird habitat in relation to Chippewa River Watershed land-use. Partners settled on using the 2006 National Land Cover Dataset enhanced with wetland information for the Chippewa River Watershed and bird listings by the Audubon Society and those included in the Prairie Plan for the area. This is a subset of the species included in the BCR matrix 23 developed by the US Fish and Wildlife Service. Converting row crops on lands in focal areas to grasses on about 45,000 acres could increase grassland birds by 15 to 17%.

Funding from the Walton Family Foundation, National Institute of Food and Agriculture and National Fish and Wildlife Foundation was primarily used to pay for most of these deliverables through 12/31/13. Remaining ENRTF funding will be used until June 2014. Note that during the last several months of 2014, we utilized about $220,000 in Walton Family Foundation funds and $200,000 from National Institute of Food and Agriculture for results 1-3 and more.

RESULT/ACTIVITY 3: Prepare reports, publications, initiate monitoring and plan for continued implementation and future monitoring.

Description: It will take longer than three years to achieve implementation across the landscape and to monitor to see if predicted results are achieve. As a result, goals are to begin monitoring for effects of early implementation, plan the next phase of implementation and long-term monitoring for ecosystem services and economic impacts, and prepare reports detailing the expanded market development, farmer outreach and conservation incentives needed to achieve the level of implementation necessary for change. This result includes several deliverables.

1. *Initiate monitoring of in-stream impacts near the mouth of the Chippewa River at Highway 40 station and two sub-watersheds, selected in the research phase, for sediment, phosphorous (P), nitrate (N) and fecal coliform*. We will compare initial results to predictions in relation to the degree of adoption of perennial cover in sensitive fields achieved by March 31, 2013.
2. *Determine number of landowners and markets and incentives still needed after the end of this project to achieve predicted landscape level results.* The goal of this deliverable is to determine what remains to be done to achieve the level of targeted landscape change identified in result one. Activities will include comparing level of recruitment of landowners achieved to predicted needs. Market development and conservation incentives will be analyzed for adequacy, and we will predict what will still need to be done to complete the enrollment and market development. Activities include a public meeting to gather input, and advisory and team meetings to analyze data and prepare plans.
3. *Identify monitoring strategies and reporting vehicles.* The goals of this deliverable are to develop monitoring plans to determine actual watershed level performance and compare to predicted levels of perennials and estimated benefits. We will develop monitoring plans for continued in-stream water quality monitoring as well as wildlife habitat, other ecological services, on-farm profitability, functioning of value-chains to meet purchasing goals, satisfaction of all parties and other potential community development impacts identified during the research phase. Activities include team calls to prepare plans.
4. *Complete reports identifying ongoing partner roles and future funding strategies.* The goal of this deliverable is to produce a final report to the LCCMR and publish reports

and web-based publications for farmers, watershed managers and policy makers about the project.

Summary Budget Information for Result/Activity 3:

ENRTF Budget:	**$ 54,681.00**
Amount Spent:	**$ 49,428.35**
Balance:	**$ 5,252.65**

Deliverable/Outcome	Completion Date	Budget
1. Implement preliminary monitoring to determine impacts of early implementation in mainstem and two sub-watersheds for sediment, N, P and fecal coliform	-05/30/2014	$-20,000
2. Determine number of landowners and markets and incentives still needed to achieve predicted landscape level results.	-06/30/2014	$-5,000
3. Identify monitoring strategies for continued water quality, other ecosystem services, profitabitliy, value chain functioning and community impacts and plan for future reporting vehicles. Next steps include: • CRWP tile line monitoring (Equipment paid for with Walton funds) • ARS ground truth APSIM soil modeling results on farmers willing to have soil/water tests • Monitoring tool box use and network for observation	-06/30/2014	$-24,644
4. Complete and publish three reports identifying ongoing next steps partner roles and future funding strategies for different audiences along with web-based materials.	-06/30/2014	$ 5,037

Result Completion Date- *06/30/2014*

Result Status as of 12/31/2012:

Deliverable 1

The Chippewa River Watershed Project (CRWP) conducted water quality and quantity monitoring at 3 sites: Highway 40 near the mouth of the Chippewa River, the outlet of Shakopee Creek (major sub-basin of Chippewa River) and the Middle Mainstem of the Chippewa River. Flow was recorded and water quality samples were collected and analyzed at a state certified lab for total suspended solids (TSS), total phosphorous (TP), ortho phosphorus (OP), nitrate/nitrite nitrogen (NO2-3), and E. coli bacteria. In 2009-2010 the percentage of contributions in the watershed from the 3 sites were as follows:

	TSS	TP	OP	NO2-3	E. coli % samples exceeding the standard
Highway 40	26.4%	35.9%	14.0%	17.0%	35%
Shakopee Creek	16.5%	17.0%	18.1%	40.9%	71%
Middle Mainstem	20.6%	16.7%	21.6%	6.5%	56%

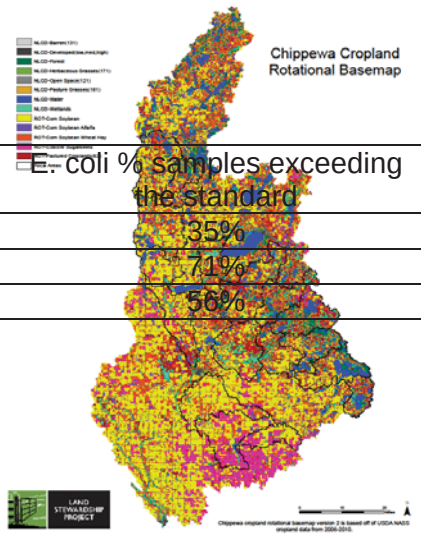


Figure 2 (12/31/12) Chippewa River Watershed 5 year crop rotations (2006-2012) and other land cover (from NASS NLCD)

Deliverable 2

GIS land-use analysis was done by LSP on 5-yr (2006-2010) crop rotations from National Agriculture Statistics Service mapped for the watershed as a whole, focal areas and Land Capability Classes (LCC). Our analysis suggests 70,000 to 101,000 ac of cropland in LCC classes 4-8 (poor row crop lands), depending on what type of crops it is. Row cropland only in LCC 4-8 is about 29,000 acres—an obvious area of sensitivity. We are also parsing out row crops on LCC 3 with slopes > 3% in the focal areas to add to this total.

Deliverable 3

- CRWP continues to monitoring flow and water quality in sub-basins. See http://www.chippewariver.com/water_quality.aspx for results.
- The CRWP will begin monitoring tile line outflow from three different field configurations in the Shakopee Nitrogen Management Network later this year. Additional planning will take place this winter.
- North Central Soil Conservation Research Lab of (ARS) in Morris will validate Agricultural Production Systems Simulator output on fields through collecting up to 400 soil and plant samples on 15-20 cooperating farm with major soils represented in the analysis with at least two fields sponsored by each of the N, Grazing and Cover Crop networks. This will be started this year and accomplished after this grant is completed.

Deliverable 4

Not begun yet

Funding from the Walton Family Foundation and National Institute of Food and Agriculture was primarily used to pay for most of these activities in Deliverables 2 and 3 through 12/31/2012. Funding for Deliverable 1 has been from other Minnesota and federal resources. Remaining ENRTF funding for all four deliverables will be used through June 2013.

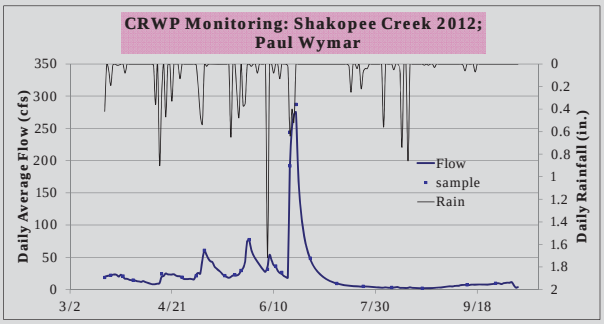
Result Status as of 06/30 /2013:

Deliverable 1

The Chippewa River Watershed Project (CRWP) maintains seven automated sites sampled at least weekly for 12 parameters including flow, sediment and NO3-N. CRWP has 62 Bank erosion survey sites.

Stream monitoring data from 2012 indicate that precipitation extremes can have major impacts on water quantity and quality which can be mitigated by landscapes with sufficient perennial cover. One 2 inch + rain event in 2012 shows how diverse land cover moderates impacts:

- The East Branch of the Chippewa River is 323,629 ac and 68% agriculture. This one event tripled flow and accounted for 35% of sediment & 20% of water volume for 2012. This sub-basin has diverse land uses including trees, prairie, diversified farms with livestock on pasture and row crops. This river branch never went dry later in the summer.



6/14: Shakopee Creek (197,107 acres) 26 CFS,
6/20: Peaked at around 287 CFS
7/5: Down to 18 CFS; 39% of 2012 H2O, 51% sediment

- In the Shakopee creek (197,107 ac, 94% ag) this same event increased flow 11 fold and accounted for 51% sediment & 39% water volume for 2012 . This subbasin has diverse land uses similar to the East Branch in the east and is mostly row crops in the middle and western parts. It is extensively tile-drained for agriculture. Later in the summer this creek dried up in parts.
- In the Dry Weather Creek, which is mostly row crops, ~~shows~~ even more pronounced effects were observed.

Deliverable 2
Further analysis has been done to identify the number of acres of corn-soybean rotation on Land Capability Class (LCC) 4-8 and LCC 3 with slopes greater than 3 %. This acreage is about 62,000 acres.

Deliverable 3
CRWP has indentified one landowner from the N Management Network who has committed to installing a tile-line monitor this summer. Discussions are underway with others.

ARS is determining how many soils needed to be sampled to ascertain the accuracy of predictions from APSIM model.

Nitrogen in corn stalks and soil is being monitored on 13 farms this summer and soil health parameters are being collected on farms in the cover crops network.

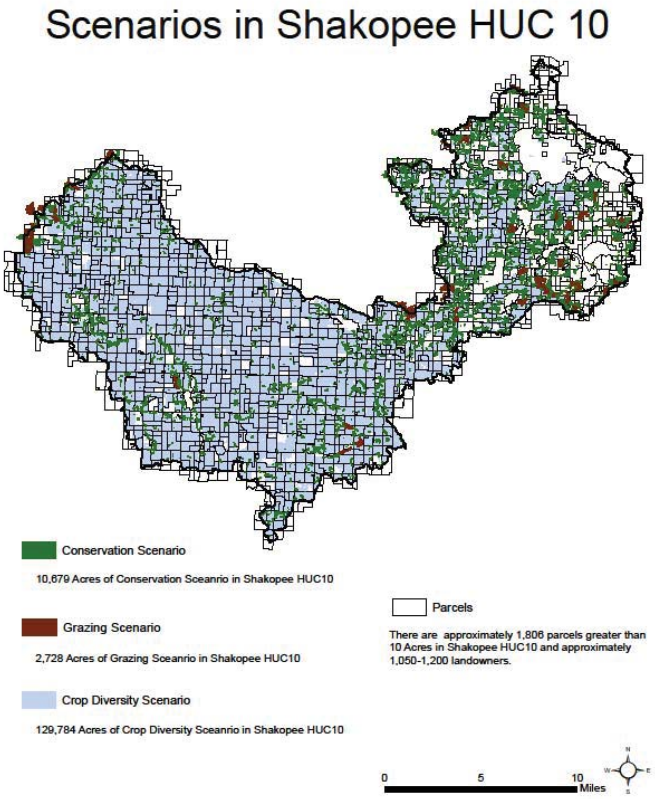
Deliverable 4
Not begun yet

Result Status as of 12/31 /2013:

Deliverable 1
Monitoring continues by the Chippewa River Watershed Project in each major sub-basins of the Chippewa River Watershed. Reports from 2013 are not yet available.

Deliverable 2
Continued analysis has been done to identify the number of acres of corn-soybean rotation on Land Capability Class (LCC) 4-8 and LCC 3 with slopes greater than 6 %. This acreage is about 62,000 acres.

Deliverable 3
CRWP has worked with a landowner from the N Management Network who has committed to installing a tile-line monitor this coming spring in two fields. Installations were tested this past fall. Discussions are underway with others.



ARS is determining how many soils needed to be sampled to ascertain the accuracy of predictions from APSIM model.

Deliverable 4
Not begun yet

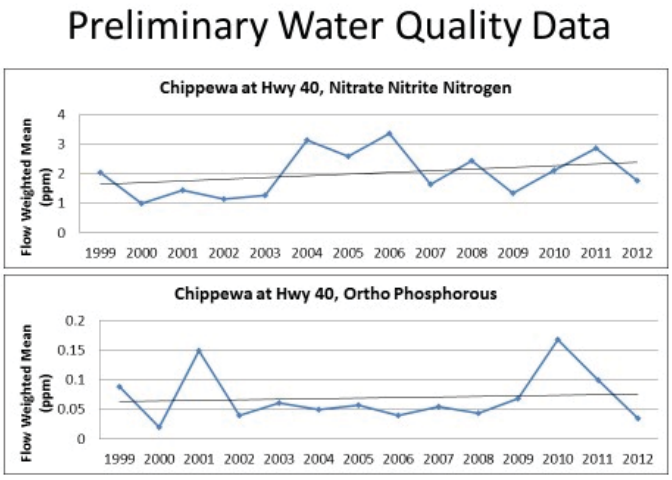
Result Status as of 08/15/2014:

Final Report Summary:

Deliverable 1
The Chippewa River Watershed Project (CRWP) maintains seven automated sites sampled at least weekly for 12 parameters including flow, sediment and NO3-N. CRWP has 62 Bank erosion survey sites. Long term monitoring indicates worsening conditions for nitrate-nitrogen, particularly in areas dominated by the corn-soybean rotation. Comparing different sub-basins clearly shows the difference between areas with more diversified land-use and those that are mainly in row-crops. Other state funds from Minnesota Pollution Control Agency make this monitoring possible. In addition Minnesota Department of Natural Resources contributes to biological monitoring.

Laboratory analyses and sampling supplies were funded with other grants contributing to CRWP's reduced spending.

The chart below shows long-term trends for nitrate-nitrogen and ortho phosphorous increasing, especially nitrogen in the stream. The Chippewa 10% Project is working to address this.



Deliverable 2
As noted in Result 2, we have identified 61,000 acres of corn-soybeans that might be in riparian areas, or otherwise environmentally sensitive or marginally productive. If an additional 10% of corn-soybean acres in the watershed were put into cover crops, along with the sensitive acres would total about 110,000 acres. Preliminary estimates suggest the potential for significant water quality improvements. The community conservation approach embodied in the Simon Lake Challenge illustrates a way to protect vulnerable acres of grass and herbaceous wetlands and restore fuller ecological functioning by removing invasive plants and implanting managed grazing with landowner cooperation on a landscape scale.

In Result 2 we noted that other longer rotations not including alfalfa sold for hay are at a disadvantage compared to corn-soybeans. Market development and possibly an ecosystem services payment program will be needed to address this, along with other conservation incentives.

Deliverable 3

Paul Wymar of CRWP has installed tile line monitors on two lines in the lower Shakopee Creek focal area and one on a site with cover crops in the Middle Mainstem area. Installations were up and running this spring and preliminary data is being collected. This work is supported by the Walton Family Foundation.

The North Central Soil Conservation Research Lab of (ARS) in Morris will validate Agricultural Production Systems Simulator output on fields through collecting up to 400 soil and plant samples on 15-20 cooperating farm with major soils represented in the analysis. As of June 2014 they had multi-year agreements on 6 farms. This will be started this year expanded after this grant is completed. This work is also supported by the Walton Family Foundation and National Institute of Food and Agriculture.

Deliverable 4

Members of the Chippewa 10% Project team have prepared several papers, publications or posters on the results of the project or the approach of the project. These include:

- Rohweder, J.R, G. Boody, S. Vacek. 2012. Modeling Important Bird Habitat Using Multiple Alternative Land Cover Scenarios within the Chippewa River Watershed, Minnesota. US Geological Survey. A study by USGS paid for with funds by National Institute of Food and Agriculture.

DeVore, B. 2012. Feeding the subterranean herd: How putting soil at the center could help revitalize farmland...& farming. September to December 2012. Land Stewardship Project Soil_health_lsl_package_final.pdf

-Olson, K, et al. 2013. The Chippewa 10% Project: Achieving Needed Ecosystem Services in an Agricultural Watershed. Poster and presentation at the Green Lands Blue Waters annual conference section on watersheds. November 20-21, 2013. Minneapolis, MN. Published by Land Stewardship Project.

-LSP et al. 2013. Farmer/Landowner Outreach and Organizing in the Chippewa and Root River Watersheds: Achieving a healthy ecosystem in agricultural watersheds. Poster presented at Green Lands Blue Waters annual conference section on watersheds. November 20-21, 2013. Minneapolis, MN. Published by Land Stewardship Project.

- Jaradat, A.A, J. Starr, G. Boody. 2014. Comparative Assessment of *Organic* and *Conventional* Production of Row Crops under Climate Change: Empirical and Simulated Yield Variation in the Chippewa River Watershed, MN. Poster at MOSES conference on Organic Farming. La Crosse, WI. February 2014

V. TOTAL ENRTF PROJECT BUDGET: *$247,000*

This project is led by the Chippewa River Watershed Project, which has primary responsibilities for outreach to individual farmers, GIS analysis, Soil and Water Assessment Tool modeling, stream quality monitoring and project oversight. The

project includes a subcontractor, the Prairie Country RC and D that acts as a fiscal agent by managing payroll services and accounts payable functions for the Chippewa River Watershed Project. The project also includes a major sub-contractor, the Land Stewardship Project. Because of its financial infrastructure and experience, LSP is managing other subcontracts for scientific partners for applied analyses on individual farms using the tools developed in a research phase also managed by LSP with other funding. LSP has significant experience in community development activities focused on market and value-chain development and will conduct those activities. The summary below and the attached budgets are identified as (A) Chippewa River Watershed Project and (B) Land Stewardship Project sub-contract.

A. Chippewa River Watershed Project

Personnel: 91,521

Kylene Olson for project oversight
Paul Wymar for GIS, SWAT modeling and monitoring
Jenn Hoffman for individual outreach to farmers

Contracts:

- Prairie Country RC&D to manage finances for the CRWP 1,096
(Note: PCRCD closed their doors after the start of this project)
- LSP subcontract (see below for details) 148,350

Travel: To be Paid from Other Funds

Monitoring (analysis of water samples) 4,320

Printing (for biennial reports) 400

Supplies (Plat books and sampling supplies) 1,313

TOTAL ENRTF PROJECT BUDGET: $ 247,000

B. Land Stewardship Project sub-contract (details for total provided above)

Personnel: 95,745

Terry VanDerPol for community development and oversight
Thomas Taylor for market development:
Unfortunately, Tom died unexpectedly this past winter.
Rebecca Terk will do this work instead.
Steve Ewest for Geographic Information Systems analysis
Julia Ahlers Ness, replaced by Robin Moore (hired July, 2013
and Andy Marcum (hired Nov 1, 2012) for
meeting outreach, community development and
one-on-one farmer assistance to adopt changes

Sub-Contracts: 39,000

-ARS Morris lab for predicting impacts of changing individual fields
- RESPEC to integrate C10 scenarios, focal areas and APSIM ecosystem services output coefficients into HSPF for the CRW
Crop consultants to evaluate individual farmer data and present at field days

In-State Travel:	4,000
Publications	2,500
-Outreach publications for farmers	
-Monitoring reports	
-Web content and pod casts	
-Final reports for farmers, watershed managers, and policy-makers	
Meeting Expenses (room rental and field day expenses)	240
On-Farm Demonstration Network Products (field testing and Field-day hosting)	6,400
Conference calls	215

Explanation of Capital Expenditures Greater Than $3,500:
There are none.

VI. PROJECT STRATEGY:

A. Project Partners:

Kylene Olson, Executive Director of the Chippewa River Watershed Project, will serve as the Project Manager and will work closely with Terry VanDerPol, director of Community-Based Food Systems and Economic Development Program at the Land Stewardship Project (LSP), to assure the project operates smoothly to produce the intended results. Kylene will make sure that the project develops in a way that benefits the goals of the Chippewa River Watershed Project, materials are suitable for the watershed, and will oversee one-on-one outreach to watershed farmers as well and monitoring. Terry, working with George Boody, will oversee the use of analysis tools, such as APSIM and DSSAT models, economic decision tool and LINK adapted for the watershed with other funding, during this implementation phase to provide specific information on individual farms. Terry will oversee institutional market development and coordination with farmers who want to participate. LSP will take the lead in developing and publishing reports and other project publications and coordinating public meetings.

Other partners include the Agricultural Research Service North Central Soil Conservation Research Lab (USDA) lab in Morris led by Station Director Dr, Abdullah Jaradat. He will oversee a scientist working on this project. Dennis Johnson, grazing scientist at West Central Research and Outreach Center University of Minnesota, will provide direct assistance to landowners and lessees on planning for grazing activities. Dr. John Westra, an agricultural economist at Louisiana State University Ag Center who has worked closely with LSP in two previous studies on the economic and biophysical modeling, will co-supervise a University of Minnesota graduate student on contract with LSP. The University of Minnesota, Morris is also a partner in the project by cooperating on market development for food and biomass products grown on converted fields.

Other institutions will be asked to provide information to the project such as case studies.

B. Project Impact and Long-term Strategy:

This project uses an interdisciplinary team approach to targeting, recruiting and market development which will help us make practical connections between land-use change at the

field level and watershed goals for multiple ecosystem services. It is innovative because we will employ local food and perennial plant-based energy markets along with conservation incentives to assure the economic viability of farmers. This is expected to create links between farmers and nearby communities that will benefit from enhanced ecosystem services. The design of the project with the team structure, expertise and access to archived data and documented results will ensure the rationality and success of the proposed work. It will also make it easier for other groups create a replicable approach for MN River Basin watersheds needing more perennials, which we are calling a Strategic Resource Management Framework. This is a comprehensive community development strategy based on wildlife and water quality friendly regional food and energy from conversion to perennials in targeted areas. This framework will have been developed with other funding. However, this project will add valuable information from the implementation phase. We will seek continued funding after this project, as necessary, to complete implementation and monitor for long-term changes.

C. Other Funds Proposed to be Spent during the Project Period:

Walton Family Foundation secured – approximately $80,000 during the project period out of a $200,000 grant and a follow-up grant using about $400,000 to complete results by December 2014.

USDA National Institute of Food and Agriculture about $400,000 used during the project period out of a $458,000 total grant.

Other sources To Be Determined will be sought.

D. Spending HIstory:

The National Fish and Wildlife Foundation contributed $100,000 in a previously funded grant that helped lay the groundwork for this project. In addition, secured funding from the Walton Family Foundation of approximately $120,000 will be spent in the 8 months prior to this project that will help conduct outreach and prepare for the research aspects of the project to be funded by National Institute of Food and Agriculture. Results of those efforts will be used to achieve the results described above.

VII. DISSEMINATION:

A reports and materials prepared for this project will be disseminated on Chippewa River Watershed Project, Land Stewardship Project and other partner web sites. Fact sheets and scientific papers will also be available on these and other partner's web sites. A new LSP web page will provide links to all datasets and reports. We will present information at one basin-level conference as well as regional conferences. Information will be made available to state agencies overseeing watershed and natural resource management as well as watershed management organizations throughout the Minnesota River Basin.

12/31/2011

- In addition to press releases about events, LSP communications coordinator Brian DeVore has written 3 blogs. These can be found as follows:
    - http://looncommons.org/2011/09/02/mob-rule-in-livestock-land/

- http://looncommons.org/2011/06/24/stripping-erosion-control-to-its-bare-essentials/
- http://looncommons.org/2011/05/20/restoring-watershed-health-drop-by-drop/

- Brian also recorded three podcasts available for broadcasters and others at http://www.landstewardshipproject.org/podcast.html?y=2011.
  - Ear to the Ground 107 Wed, Sep 28, 2011 01:50:00 PM
    How one farmer used innovative grazing and leasing techniques to start a low-cost livestock operation?
  - Ear to the Ground 105 Mon, Aug 29, 2011 12:36:00 PM
    Farm banks on biodiversity to manage economic & environmental risk.
  - Ear to the Ground 103 Fri, Jun 24, 2011 03:37:00 PM
    Using native prairie strips to make row crop fields more sustainable

- Outside media coverage, including the Greg Judy workshop can be found at http://www.chippewa10.org/news.html

- Presentations made during this period included to the Soil and Water Conservation Society annual meeting and National Institute of Food and Agriculture project directors in Washington, DC; 4th Interagency Conference on Research on the Watershed in Anchorage, AK; the North Central Soil Conservation Research Lab field day in Morris, MN in August; the Prairie Pothole Region Integrated Land Conservation Strategy interagency meeting in St Cloud in September 27; The Minnesota River Watershed Alliance meeting on November 1, 2011 in Hutchinson; and the MN River Interagency Study Team meeting on December 12, 2011 in St. Paul.

Funding from the Walton Foundation and National Institute of Food and Agriculture was also used to pay for these activities through 12/31/2011.

12/31/2012

- In addition to press releases about events, LSP published two blogs:
  - Healthy Soil, Healthy Farms, Healthy Communities (1st of 2 parts) by Brian DeVore • January 1, 2013
  - Restoring the Resource By Julia Ahlers Ness • August 19, 2012
- Brian DeVore recorded one podcast available for broadcasters and others at http://landstewardshipproject.org/posts/podcast
  - Ear to the Ground 121, September 30, 2012, How farmers, scientists and conservationists have teamed up to revolutionize the relationship between ag and soil health.
- New website pages for C10 and soil health went live in July 2012 and September 2012.

- A special article is available combing the twp-part *Land Stewardship Letter* series called “Land Stewardship Letter special report on Burleigh County's Soil Health Team” at http://landstewardshipproject.org/repository/1/676/soil_health_lsl_package_final.pdf

- Presentations made during this period included: Agricultural Research Service meeting in Ames, IA on September 10th, 2012 announcing a new Long-term Agroecological Research Sites initiative that includes the Chippewa River Watershed; the Green Lands Blue Waters Conference in October, 2012 at Ames, IA;

and the EcoSummit 2012 conference in October, 2012 in Ohio.

6/30/2013

- Several articles have been published:
- One podcast on related to issues this period: Ear to the Ground 128 February 28, 2013 "A government conservationist talks about treating soil as a complete ecosystem."
- Blogs on LSP's website: January 28, 2013 and Healthy Soil, Healthy Farms, Healthy Communities (2nd of 2 parts) Brian DeVore
- Two soil health articles were published in the *Land Stewardship Letter* and combined into one stand-alone article (Attached)
- Brian DeVore on soil health http://www.tcdailyplanet.net/blog/brian-devore/teaming-soil-microbes-investing-soil-essential-good-farm-policy
- Presentations made during this period included:
  - National Institute of Food and Agriculture Project Directors meeting June 20th Presentation and poster by George Boody, John Westra and team. Annapolis, MD (paid for with NIFA funds). (Attached)
  - George Boody also presented at the Trout Unlimited annual conference in the section Watershed Management and Monitoring for Success. March 27, 2013 in La Crosse, WI. (with Walton Family Foundation funds)

12/31/2013

- Several articles have been published:
  - Brian DeVore, LSP Communications Director interviewed two of the farmers and developed a podcast on cover crops and soil health.
  - Women, Stewardship and important Conversations. T. VanDerPol Land Stewardship Letter. 21-22 No 3, 2013.
  - Profits from Perennials: The Next Step for Prairie Strips. B. DeVore Page 24-25 Land Stewardship Letter No 3, 2013
  - Profits from Perennials: Can Cover Crops Catch On? B. DeVore. Page 25-27 Land Stewardship Letter No 4, 2013.
  - Blogs on LSP's website:
    - A Disappearing World Beneath Our Feet. Brian DeVore • December 16, 2013
    - Healthy Farms, Healthy Frogs, Healthy Land, Brian DeVore • November 22, 2013
    - It Takes Livestock, Land & People to Keep Nitrogen Out of Our Water, Jim VanDerPol • November 4, 2013
    - Putting Farm Tools in their Proper Place, Brian DeVore • October 11, 2013
    - Purebreds, Pluggers & Profitable Soil, Brian DeVore • September 20, 2013
    - Flash Floods? Flash Drought? Time for a Little Slow Soil, Brian DeVore • September 13, 2013
    - One Woman's Land Story, Robin Moore • September 3, 2013
    - Grazing, Cover Crops, Climate Change & Resilience, Brian DeVore • August 14, 2013
  - Podcasts on LSP's website

- Presentations made during this period included:

- Chippewa 10% Project: At Green Lands Blue Waters national conference in Minneapolis November 20-21, 2013 Front page of AgriNews A.1. on 11/282013
- Tour for Board of Water and Soil Resources staff on October 9th.

6/30/2014

- Several articles have been published:
  - Brian DeVore, LSP Communications Director interviewed two of the farmers and developed a podcast on cover crops and soil health.
  - DeVore, B. 2014. Profits from Perennials: Grazing as a public good: When it comes to grass, farmers and conservationists are sharing a mutual goal. Land Stewardship Letter. 24-25 No 1, 2014.
  - DeVore. B. 2014. Profit from Perennials: Choosing to resist resiliency: New data shows cover crops are paying their way-So why is adoption lagging? Land Stewardship Letter. 26-27. No 1, 2014.
  - White, R. 2014. Farm Transitions: History, hopes and plans: Women caring for the land meetings highlight an important, but often ignored, voice in farm country. Land Stewardship Letter. 22-23 No 2, 2014.
  - Moore, R. 2014. Profits from Perennials: To till or not to till. Land Stewardship Letter. 23-25 No 2, 2014.
  - DeVore, B. 2014. Profits from Perennials: Community Conservation; Good fences make good neighbors, but sometimes so do open gates. Land Stewardship Letter. 26-27 No 2, 2014.

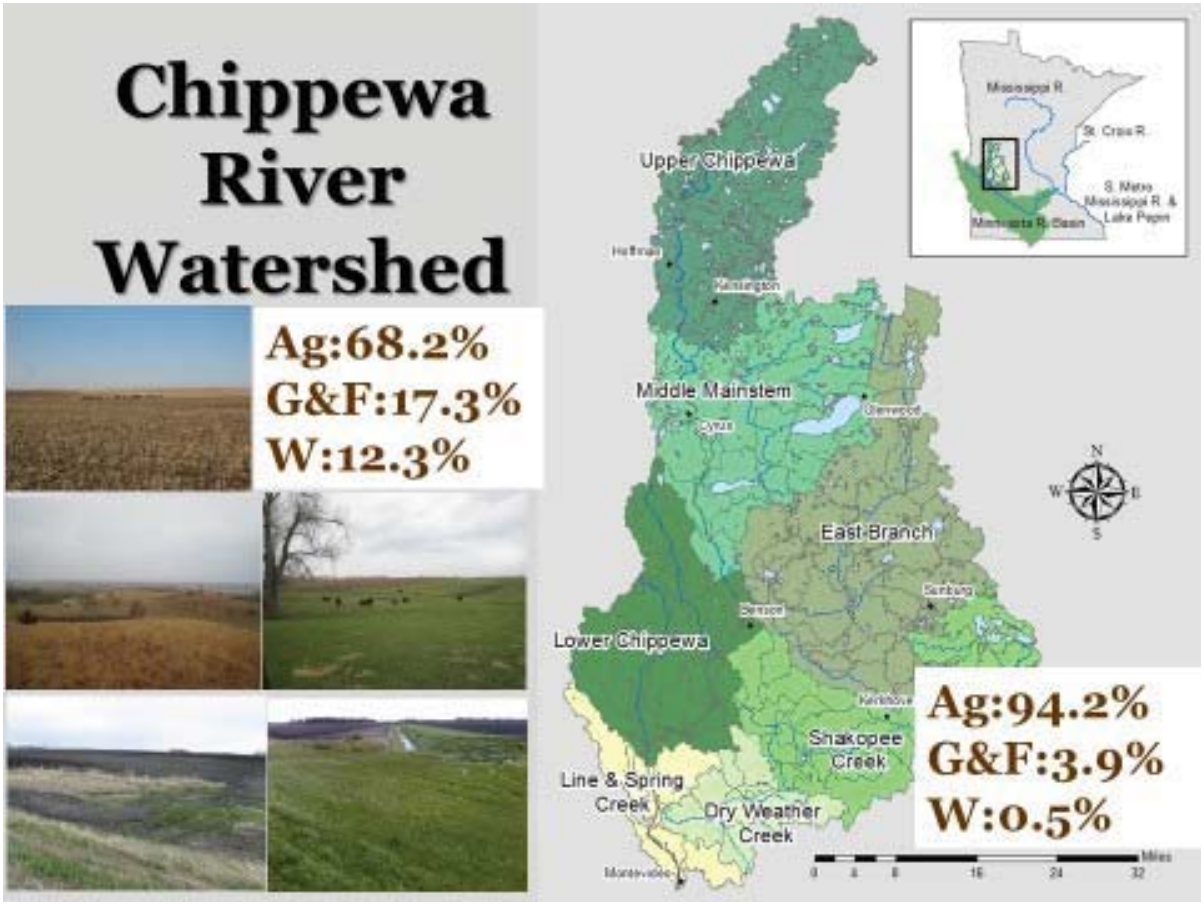
- Blogs on LSP's website:
  - Gene Goven & MN Ranchers: Planning for Change. Robin Moore • May 1, 2014
  - A Graphic View of Diversity's Power. Brian DeVore • April 25, 2014
  - Cover Crops: Not Just Foul Weather Friends. Brian DeVore • February 18, 2014
  - A Smear on the Land. Brian DeVore • January 28, 2014
  - Hitting the Conservation Target with Prairie Strips. Brian DeVore • January 22, 2014

VIII. REPORTING REQUIREMENTS: Periodic work program progress reports were submitted for the periods 12/31/2010, 06/30/2011, 12/31/2011, 06/30//2012, 12/31/2012, 06/30/2013, 12/31/2013

A final work program report and associated products will be submitted by 08/15/2014 as requested by the LCCMR.

IX. RESEARCH PROJECTS:

Attachment: Map of the Chippewa River Watershed and major subbasins.



FINAL Attachment A: Budget Detail for 2010 Projects - Summary and a Budget page for CRWP

Report Date : August 4, 2014 — **May 28, 2014 Work program amendment request (Note that changes are in LSP subcontract, Attachment B columnsA, E and F)**

Project Title: Ecosystem Services in Agricultural Watersheds Project ID 215-G

Project Manager Name: Kylene Olson Chippewa River Watershed Project (and Terry VanDerPol, Land Stewardship Project)

Trust Fund Appropriation: $ *$247,000*

2010 Trust Fund Budget	**Result 1 Budget: Revised 05/9/2013**	**Amount Spent** *(06/30/2014)*	**Balance** *(06/30/2014)*	**Result 2 Budget: Revised 05/9/2013**	**Amount Spent** *(06/30/2014)*	**Balance** *(06/30/2014)*	**Result 3 Budget: Revised 05/9/2013**	**Amount Spent** *(06/30/2014)*	**Balance** *(06/30/2014)*	**TOTAL BUDGET**	**BUDGET SPENT**	**TOTAL BALANCE**
	Targeting ag land-use changes			*Engage farmers, institutional markets and agencies in implementation*			*Monitor, design the next phase of implementation and prepare reports, publications*					
BUDGET ITEM												
PERSONNEL: wages and benefits (76% salary and 23% benefits) for people noted	24,077.00	24,077.00	0.00	27,658.00	27,658.00	0.00	39,786.00	39,786.00	0.00	91,521.00	91,521.00	0.00
Kylene Olson Project Manager % FTE - 76% salaries and 23% benefits												
Paul Wymar, Project Scientist 25% FTE - 76% salaries and 23% benefits (Working on GIS analysis and SWAT modeling, monitoring)												
Jenn Hoffman, Watershed Specialist 14% FTE - 76% salaries and 23% benefits (Outreach to individual farmers)												
										0.00		0.00
Contracts										0.00		0.00
Prairie RC& D 9% FTE Note discontinued after 12/31/12	825.00	0.00	825.00	271.00	0.00	271.00	0.00	0.00	0.00	1,096.00	0.00	1,096.00
LSP subcontract (see separate page for details)	3,000.00	3,000.00	0.00	135,650.00	119,354.59	16,295.41	9,700.00	9,642.35	57.65	148,350.00	131,996.94	16,353.06
Monitoring Expenses, Lab analysis @ $72/sample set for 60 sample sets							4,320.00	0.00	4,320.00	4,320.00	0.00	4,320.00
Printing (for biennial reports)	0.00	0.00	0.00				400.00	0.00	400.00	400.00	0.00	400.00
Supplies										0.00		0.00
E-Plat books @ about $100/county	838.00	838.00	0.00							838.00		0.00
Sampling supplies							475.00	0.00	475.00	475.00	0.00	475.00
Travel expenses in Minnesota										0.00		0.00
COLUMN TOTAL	**28,740.00**	**27,915.00**	**825.00**	**163,579.00**	**147,012.59**	**16,566.41**	**54,681.00**	**49,428.35**	**5,252.65**	**247,000.00**	**224,355.94**	**22,644.06**

Final Attachment B: Budget Detail for 2010 Projects - Budget page for LSP and subcontracts to be made by LSP

Project Title: Ecosystem Services in Agricultural Watersheds Project ID 215-G

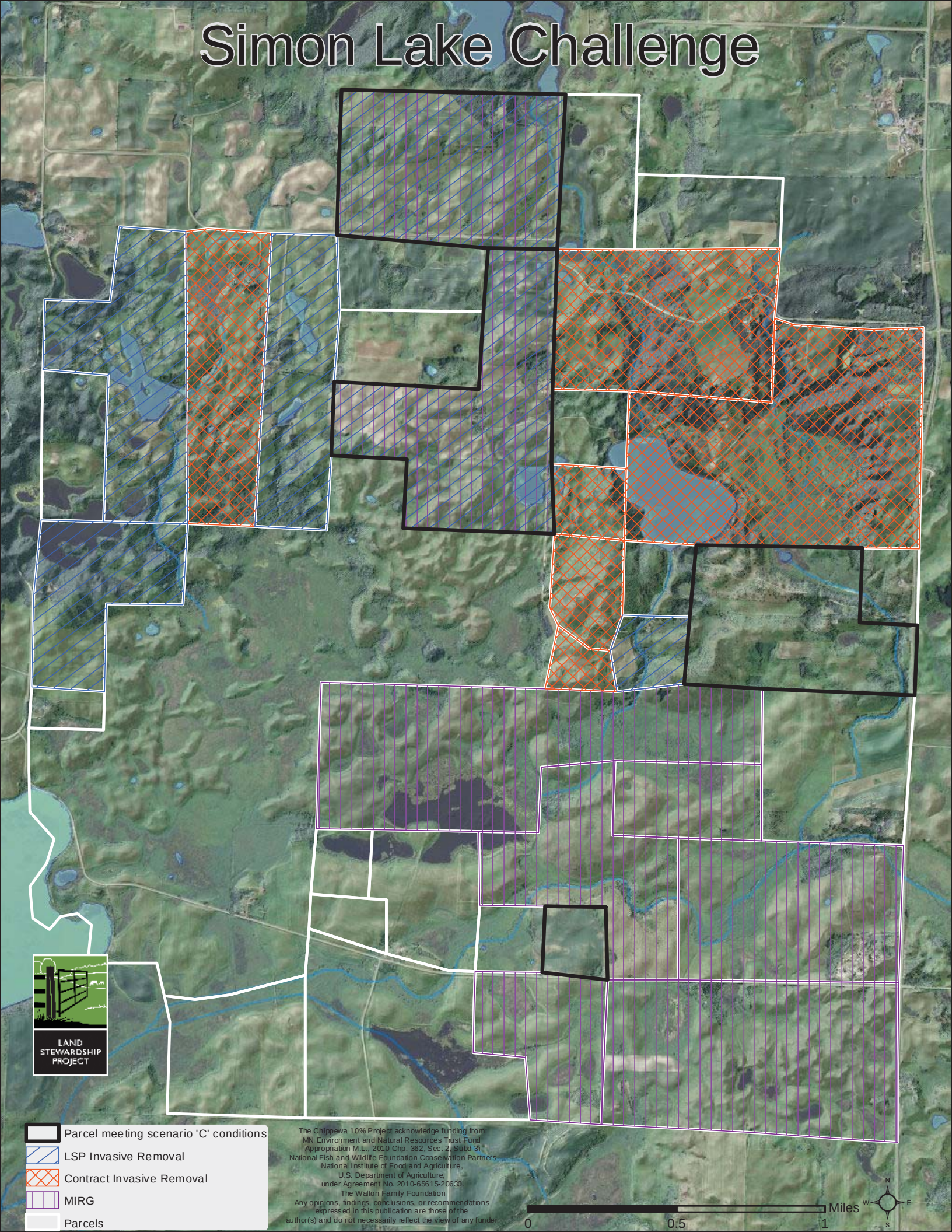
Project Manager Name: Kylene Olson Chippewa River Watershed Project (and Terry VanDerPol, Land Stewardship Project)

Trust Fund Appropriation: $ *$247,000*

2010 Trust Fund Budget	**Revised Result 1 Budget: 5/9/2013**	**Amount Spent** *(06/30/2014)*	**Balance** *(06/30/2014)*	**Result 2 Budget: 5/28/2014**	**Amount Spent** *(06/30/2014)*	**Balance** *(06/30/2014)*	**Result 3 Budget: 05/9/2013**	**Amount Spent** *(06/30/2014)*	**Balance** *(06/30/2014)*	**TOTAL BUDGET**	**TOTAL BALANCE**
BUDGET ITEM											
PERSONNEL: wages and benefits (59% salary and 41% benefits) for people noted below	3,000.00	3,000.00	0.00	83,495.00	69,578.55	13,916.45	9,250.00	9,250.00	0.00	95,745.00	13,916.45
T**erry Van Der Pol** .35 FTE (59% salary and 41% benefits)											
Rebecca Terk.25 FTE: 59% salary and 41% benefits working on marketing connections											
Other program organizer: Steve Ewest while an intern on GIS analysis and for Scenario GiS analysis											
Other program organizer: ~~Julia Ahlers Ness,~~ Replaced by Robin Moore in July 2013 100% FTE part time on LCCMR for farmer											
Andy Marcum hired Nov 1, 2012 100% FTE part time on LCCMR for farmer outreach, kitchen table meetings and education											
Publications:											
A. Design and printing for project brochures, outreach publication (~~25~~5 pages X $.40/page and ~~300~~ 100 copies + $500 design, post monitoring outreach (~~25~~ 5 pages X.$.50/page and 300 100 copies, and reports 50 pages@ $.20/page				300.00	300.00	0.00	250.00	249.98	0.02	550.00	0.02
B. Articles for Land Stewardship Letter about the project written to also be made available to other publications up to $ 359/page for 12 pages and related podcasts on the subject/ result				2,200.00	2,200.02	-0.02	0.00	0.00	0.00	2,200.00	-0.02
C. Web content, layout and posting				0.00		0.00	0.00		0.00	0.00	0.00
Minnesota Travel: @$.45/mile + costs for meals and some overnight stays as needed during travel in the watershed				4,000.00	3,251.99	748.01	0.00	0.00	0.00	4,000.00	748.01
Conference calls/GoToMeeting web calls for Team:				15.00	12.28	2.72	200.00	142.37	57.63	215.00	60.35
Meeting expenses (room rental and field day hosting expenses other than meals, materials)				240.00	240.00	0.00	0.00	0.00	0.00	240.00	0.00
On-farm demonstration network products (reports of aggregated data from on-farm cover crop and grazing demonstrations--up to $900/farm for costs such as soil testing, hosting a field day,)				6,400.00	6,077.62	322.38				6,400.00	322.38

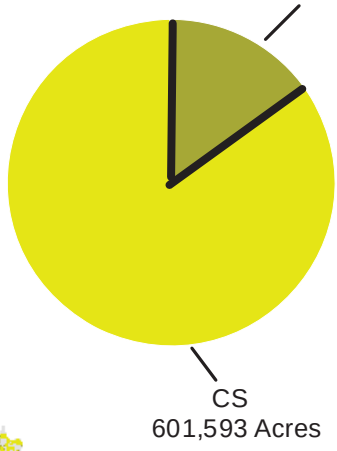
Subcontracted through LSP:										0.00	
A. Agricultural Research Service Personnel: wages and benefits for a GS-5 scientist to downscale climate change predictions for Chippewa River Watershed and rerun APSIM and compare soil tess on individual farms to model projections (100% FTE for five months) with 30% benefits				26,000.00	25,194.13	805.87				26,000.00	805.87
E. Crop consultants to evaluate individual farmer data and present at field days				1,000.00	500.00	500.00				1,000.00	500.00
F. RESPEC for HSPF modeling using C10 scenarios and data				12,000.00	12,000.00	0.00				12,000.00	0.00
COLUMN TOTAL	**3,000.00**	**3,000.00**	**0.00**	**135,650.00**	**119,354.59**	**16,295.41**	**9,700.00**	**9,642.35**	**57.65**	**148,350.00**	**16,353.06**

Simon Lake Challenge



The Chippewa 10% Project acknowledge funding from:
MN Environment and Natural Resources Trust Fund
Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i
National Fish and Wildlife Foundation Conservation Partners
National Institute of Food and Agriculture,
U.S. Department of Agriculture,
under Agreement No. 2010-65615-20630.
The Walton Family Foundation
Any opinions, findings, conclusions, or recommendations
expressed in this publication are those of the
author(s) and do not necessarily reflect the view of any funder.

Baseline



Baseline (Acres)

- CS (601,593)
- Developed
- Forest
- Other
- Pasture/Pairie/Hay (106,344)
- Water

- MN Pairie Plan
- Streams

- Shakopee Focal Area
- EastbranchF Focal Area
- MiddleMain Focal Area

LAND STEWARDSHIP PROJECT

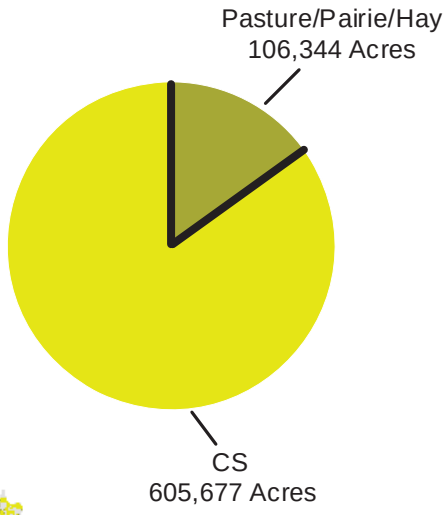
The Chippewa 10% Project acknowledge funding from:
MN Environment and Natural Resources Trust Fund
Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i
National Fish and Wildlife Foundation Conservation Partners
National Institute of Food and Agriculture,
U.S. Department of Agriculture,
under Agreement No. 2010-65615-20630.
The Walton Family Foundation
Any opinions, findings, conclusions, or recommendations
expressed in this publication are those of the
author(s) and do not necessarily reflect the view of any funder.

CS = Corn and soybean rotation.
Baseline generated from
2010-2013 USDA Cropland data layers.

0 5 10 Miles

N W E S

Scenario A: CRP to CS



Baseline (Acres)

- CS (601,593)
- Developed
- Forest
- Other
- Pasture Hay (106,344)
- Water

CRP exiting (4,084)

- Shakopee Focal Area
- EastbranchF Focal Area
- MiddleMain Focal Area

LAND STEWARDSHIP PROJECT

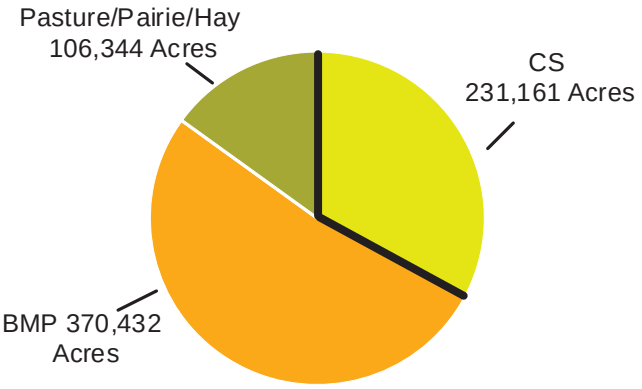
The Chippewa 10% Project acknowledge funding from:
MN Environment and Natural Resources Trust Fund
Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i
National Fish and Wildlife Foundation Conservation Partners
National Institute of Food and Agriculture,
U.S. Department of Agriculture,
under Agreement No. 2010-65615-20630.
The Walton Family Foundation
Any opinions, findings, conclusions, or recommendations
expressed in this publication are those of the
author(s) and do not necessarily reflect the view of any funder.

CRP exiting = Conservation reserve program expiring between 2014-2019 with CPI value >= 60.
CS = Corn and soybean rotation.
Baseline generated from
2010-2013 USDA Cropland data layers.

0 5 10 Miles

N W E S

Scenario B: Reduced Nitrogen Fertlizer



Baseline(Acres)

- CS (231,161)
- Developed
- Forest
- Other
- Pasture/Pairie/Hay (106,344)
- Water

Corn with BMP (370,432)

- Shakopee Focal Area
- EastbranchF Focal Area
- MiddleMain Focal Area

LAND STEWARDSHIP PROJECT

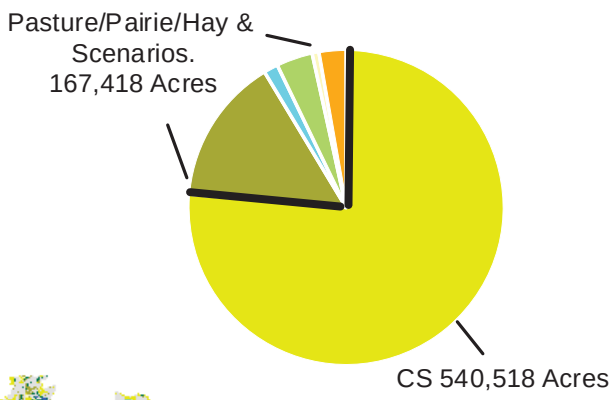
The Chippewa 10% Project acknowledge funding from:
MN Environment and Natural Resources Trust Fund
Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i
National Fish and Wildlife Foundation Conservation Partners
National Institute of Food and Agriculture,
U.S. Department of Agriculture,
under Agreement No. 2010-65615-20630.
The Walton Family Foundation
Any opinions, findings, conclusions, or recommendations
expressed in this publication are those of the
author(s) and do not necessarily reflect the view of any funder.

BMP = Best management practices involve reduction in nitrogen applied.
CS = Corn and soybean rotation.
Baseline generated from
2010-2013 USDA Cropland data layers.

0 5 10 Miles

N W E S

Scenario C: Increased Perennials



Baseline (Acres)

- CS (540, 518)
- Developed
- Forest
- Other
- Pasture/Pairie/Hay (106,344)
- Water

Scenarios (Acres)

- **C1 (10,368)**
- **C2 (26,271)**
- **C3 (4,887)**
- **C4 (19,549)**

- Shakopee Focal Area
- EastbranchF Focal Area
- MiddleMain Focal Area

CS = Corn and soybean rotation.

C1= Corn and soybean converted to perennials in riparian zones.
C2= Corn and soybean converted to perennials on LCC 3 >= 6% slope and LCC 4-8 greater than 40 acres.
C3= Corn and soybean converted to perennials on LCC 3 >= 6% slope and less than 40 acres.
C4=Corn and soybean converted to perennials on LCC 4-8 with less than 40 acres.
Baseline generated from 2010-2013 USDA Cropland data layers.

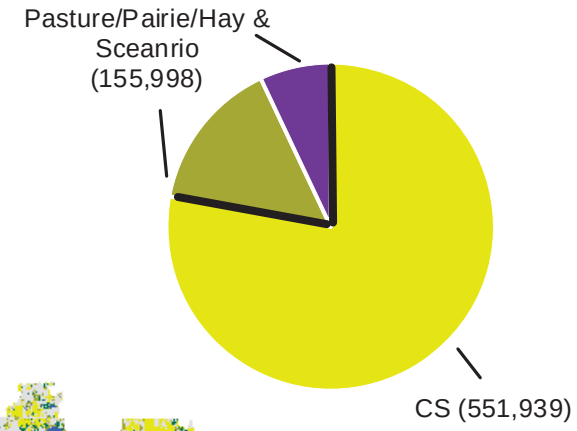
0 5 10 Miles

N W E S

LAND STEWARDSHIP PROJECT

The Chippewa 10% Project acknowledge funding from:
MN Environment and Natural Resources Trust Fund
Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i
National Fish and Wildlife Foundation Conservation Partners
National Institute of Food and Agriculture,
U.S. Department of Agriculture,
under Agreement No. 2010-65615-20630.
The Walton Family Foundation
Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of any funder.

Diversification of Croplands Scenario D



Baseline

- CS (551,939)
- Developed
- Forest
- Other
- Pasture/Pairie/Hay (106,344)
- Water

- Shakopee Focal Area
- EastbranchF Focal Area
- MiddleMain Focal Area

LAND STEWARDSHIP PROJECT

The Chippewa 10% Project acknowledge funding from:
MN Environment and Natural Resources Trust Fund
Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i
National Fish and Wildlife Foundation Conservation Partners
National Institute of Food and Agriculture,
U.S. Department of Agriculture,
under Agreement No. 2010-65615-20630.
The Walton Family Foundation
Any opinions, findings, conclusions, or recommendations
expressed in this publication are those of the
author(s) and do not necessarily reflect the view of any funder.

CS = Corn and soybean rotation.
Baseline generated from
2010-2013 USDA Cropland data layers.
D = Addition of cover crops on corn soybean roation
on LCC 1,2 and 3 slope <6%.

0 5 10 Miles

N W E S

Comparative Assessment of *Organic* and *Conventional* Production of Row Crops under Climate Change: Empirical and Simulated Yield Variation in the Chippewa River Watershed, MN.

Abdullah Jaradat[1], Jon Starr[1], and George Boody[2]

[1]USDA-ARS, Morris, MN; [2]Land Stewardship Project, St. Paul, MN

Abdullah.Jaradat@ars.usda.gov or (320) 589-3411 ext 124

Introduction

- The long-term provision of ecosystem services, including stable crop yields over time, provided by the traditional corn-soybean cropping system in the Chippewa River Watershed (CRW) in west-central Minnesota are being threatened by several anthropogenic and climatic factors.
- We conducted an empirical and simulated study to:
  1) Provide an improved understanding of the role of projected global climate change (GCC) and its interaction with soil types, land use, and management practices on yield variation of conventional (CNV) and organic (ORG) cropping systems, and
  2) Develop prediction models to scale up cumulative yield and its temporal variation from plot to watershed level and predict future impacts on agroecosystem services.

Procedures

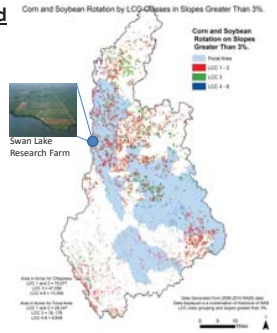
- We quantified the long-term ORG and CNV temporal yield variation of current and expanded, more diverse crop rotations under current (2002-2009; A0), past and future 50-year climate change conditions using four GCC scenarios (A0, A2, A1B & B1)and five representative soil types in CRW.

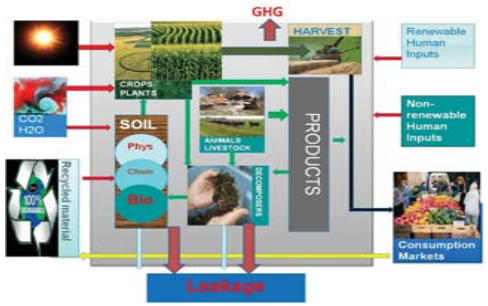
Results

- ORG can enhance a number of ecosystem services, but may have lower and more stable yields compared with CNV;
- Cumulative yield of ORG crop rotations were improved and ranged from 80 to 90% of CNV by expanding crop rotations to include greater crop diversity, especially under projected GCC;
- The largest portion of variation in cumulative yield and its temporal variation within each GCC scenario was attributed to differences between the five soil types, followed, in decreasing order by differences between:
  - ORG and CNV;
  - Crop rotations, and
  - Management practices
- Differences in management practices among ORG and CNV contributed differently to cumulative yield and its temporal variation depending on length and composition of crop rotations and soil types;
- Temporal yield variation under current, past and future GCC in ORG was consistently less than CNV;
- Both can be further reduced by inclusion of perennial crop and adopting improved management practices;
- ORG farmers in CRW can diversify current cropping systems, enhance the buffering capacity of their land, and help mitigate the impact of GCC by:
  - Reducing external inputs, and
  - Adjusting land-use to accommodate more perennials in future crop rotations;
- Significant and positive effect of a perennial forage crop on cumulative yield and its temporal variation is anticipated by the 3rd to 4th year of its inclusion in a crop rotation that includes a small grain crop in addition to corn and soybean

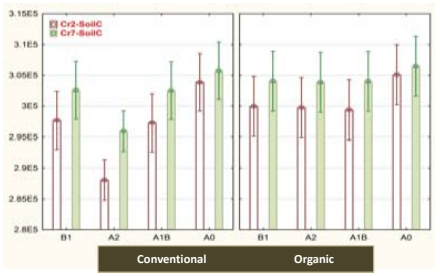
Chippewa River Watershed

- Drains 5,387 km^2 of mixed natural and managed ecosystems
- Several Land Capability Classes
- Commodity production: Corn, Soybean, Wheat, Livestock, Fruits & Vegetables
- Forests, Lakes & Streams

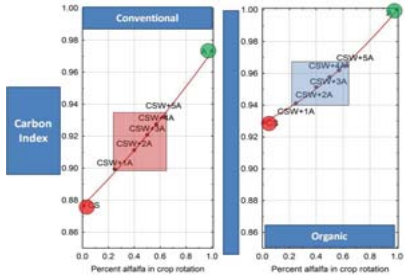




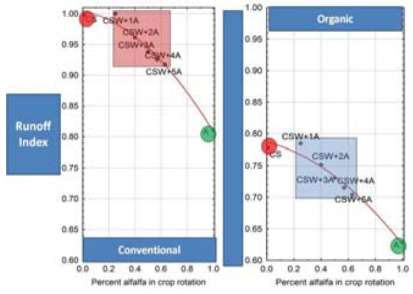
Organic System: [Semi-Closed]..Maximize Renewable Inputs, Decomposers, & Recycling; Minimize non-Renewable Inputs, Leakage & GHG emissions



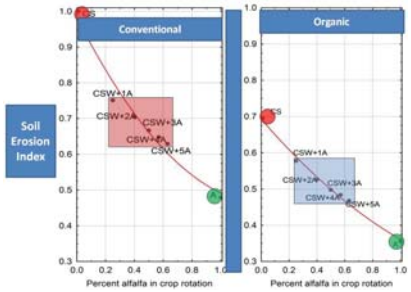
Carbon Sequestration in CNV & ORG due to 2 Yr (Corn-Soybean) & 7 Yr (Corn-Soybean-Wheat- 4 Yr Perennial) Crop Rotation under 4 Climate Change Scenarios)



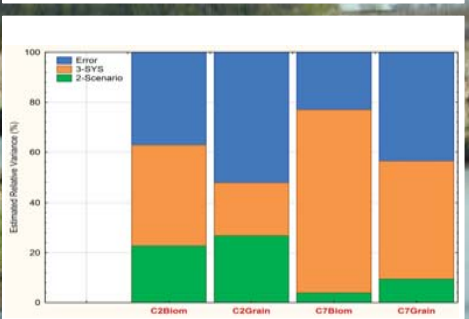
Higher Carbon Index: Effect of Organic Management, Long Crop Rotations & Perennial Crop



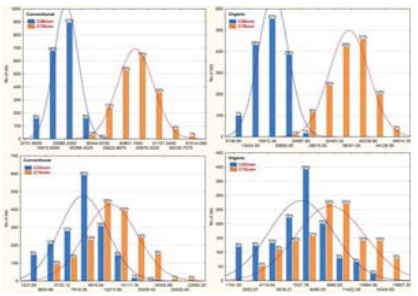
Reduced Runoff: Effect of Organic Management, Long Crop Rotations & Perennial Crop.



Reduced Erosion: Effect of Organic Management, Long Crop Rotations & Perennial Crop



Organic System: More Resilient than CNV. Larger Variances due to "Systems"; Smaller Variance due to "Climate Change Scenarios."



Differences in Biomass & Grain Yield Distribution between Short (C2) and Long (C7) Crop Rotations in CNV & ORG.

Conclusions

- *The combined empirical and simulated results provided guideline to develop multifunctional Organic production systems that can:*
  - *Produce standard commodities (Corn, soybean, wheat, etc.),*
  - *Stabilize crop yields over time, and*
  - *Provide a wide range of other ecosystem services (More Carbon, Lower Runoff, Lower Soil Erosion, Lower N leaching).*

Acknowledgement: This work is supported by the Minnesota Environment and Natural Resources Trust Fund 2010 Chp 362, Sec 2 Subd3i; the National Fish and Wildlife Foundation and its partner the Natural Resources Conservation Service, USDA; the National Institute of Food and Agriculture, USDA, under Agreement no. 2010-65615-20630 and the Walton Family Foundation. Any opinions, conclusions or recommendations do not necessarily reflect the view of any funder.

Farmer/Landowner Outreach and Organizing in the Chippewa and Root River Watersheds:
Achieving a healthy ecosystem in agricultural watersheds

Chippewa Partners: Land Stewardship Project, Chippewa River Watershed Project, Pope County SWCD/NRCS, University of Minnesota Extension, West Central Research and Outreach Center, USDA-ARS Soil Lab, Minnesota DNR, US Fish and Wildlife Service, The Nature Conservancy

Root Partners: Land Stewardship Project, The Nature Conservancy, Fillmore County SWCD/NRCS, Grazing Lands Conservation Initiative of Minnesota

Introduction and Overview

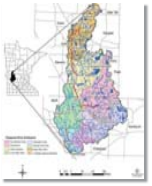
The Root River Watershed is located mostly within the Driftless agro-eco-region. Approximately 97% percent of the 1,064,970 acres are privately owned, including about 3,000 farms. Resource concerns in the watershed include sediment and erosion, nutrient management, and protection of habitat for grassland birds. Forty total maximum daily load (TMDL) studies are underway or finished and several stream reaches are on the list of impaired waters. Long-term, landscape level outcomes we seek are:

- Enhance habitat for grassland birds of greatest conservation need;
- Gain perennial cover through profitable grazing, conservation program incentives, and fostering of a land ethic;
- Measurably reduce nutrient loss; and
- Make progress toward multifunctional landscape goals for water quality, wildlife habitat, and food and energy production.

The Chippewa River Watershed is a 1.3 million acre watershed in west central Minnesota. Nearly 90% of the land is privately owned with over 68% in agriculture. The Chippewa River watershed includes a complex mixture of moraines and till, lake deposits, and outwash plains. The hilly moraines result in a high potential for erosion of sediment into streams. The long-term goal of this initiative is to increase biological diversity and perennial cover on an additional 10% of the row cropped land in the Chippewa River Watershed in the Prairie Pothole Region.

Long-term outcomes we seek are to:

- Improve water quality through reduction in erosion and N loss;
- Enhance prairie and habitat for grassland birds;
- Assist partners to help farmers in the CRW maintain and adopt conservation practices including prescribed grazing, conservation cover, cover crops and native prairie protection and management; and
- Make progress toward water quality goals for the Chippewa River Watershed.



Market, policy and infrastructure pressure in both watersheds has resulted in increased row crop acreage and a reduction in grasslands, including CRP. Much remaining grassland is poorly managed with continuous grazing or as unattended recreational land. Improvement in water quality will require reductions in erosion on row crop fields as well as land use change to perennials in vulnerable areas.

Central to our approach in both watersheds is the belief that good stewardship of the land and soil resources can and must be profitable for farmers.

Talking about Stewardship

Our key strategy for improving agricultural conservation in both watersheds is building relationships with farmers. One to one conversations with farmers and landowners give the opportunity to express stewardship values and begin to identify barriers to pursuing those values.

We identify potential hosts and help organize kitchen table meetings. These informal gatherings of friends and neighbors provide the *challenge and the opportunity* to share in a little more public yet safe setting what is important to participants about their land and stewardship practices they would like to implement. Through these gatherings we

- Nurture the concept of farmers and landowners supporting each other and working together; and
- Begin to contribute to the development of *land ethic*.

Many farmers and landowners we are seeking to build relationships with welcome the opportunity to talk about conservation, stewardship and what their land means to them. Having those conversations publicly, even with friends and neighbors, is a challenge.

What impact does the cultural pressure farmers and landowners experience to tamp down and deny stewardship values in making decisions about practices and land use have on our agricultural landscapes?

Farmer Demonstration & Learning Networks

Peer to peer networks are a great tool for farmers and landowners to try new ideas for enhancing conservation on their land and demonstrate to others in the area what they have learned. They build knowledge and skills, provide working demonstrations to skeptical friends and neighbors and social support for implementing stewardship practices.

Networks include

- Improving nutrient management on row crops
- Cover crop learning groups focusing on improving soil health by building healthy biological activity and cover for soil and, in some instances, providing winter browse for cattle or sheep.
- Grazing networks and groups to improve grazing techniques and profit while enhancing wildlife habitat, building healthy soil and reducing runoff and wind erosion.

Acres owned by non-operating landowners are growing. Over 60% of the farmland in the Upper Minnesota basin, for example, is land that is leased to a farmer/operator. Women who have a strong conservation and community ethic but may not have the tools and confidence to work with renters to implement those values own much of this land. We are implementing learning groups of women landowners to help them understand and provide social support for implementing conservation requirements on farmland they lease to others.

Conservation Leaders

Farmers, landowners and community members speaking out about stewardship and good conservation practices is crucial to developing a strong base to carry the work we are starting forward.

Our work in both watersheds provides opportunities to develop and demonstrate leadership skills and habits by hosting a kitchen table meeting, hosting or speaking at a field day, leading a tour, taking a leadership role in a network, or demonstrating their stewardship values and practices in publications, commentaries and public testimony.

Soil Health

A cornerstone of improving conservation in the Chippewa and Root River watersheds is building healthy soil that is resilient to the pressures of agricultural production. Inspired and informed by the Burleigh County North Dakota network of farmers, ranchers, and NRCS/SWCD staff, we are building awareness of the ***economic, conservation and ecosystem services*** value of biologically healthy soil teeming with micro biotic life.

Tillage, chemicals and monocrops degrade our soil resulting in erosion and increasing demand for more and more purchased inputs to grow our agricultural crops. Stewardship — taking care of the land — starts with taking care of the soil, the foundational resource in any land-based agricultural system. Many of the soil conservation practices that are promoted to farmers and landowners — buffer strips, grassed waterways, sediment dams, etc. — are really only addressing the symptoms of a degraded soil resource. Biologically healthy soil is both rich in nutrients and resilient to wind and water erosion. Learn more about how farmers and landowners can build healthy soil at:

Restoring the Resource

http://landstewardshipproject.org/stewardshipfood/soilquality.

Simon Lake Challenge

Question? ***Can an area of individual parcels of land owned by farmers, ranchers, hunters, and public agencies be developed into a healthy, functioning ecosystem through landowner cooperation, land use planning, careful grazing management?***

The Simon Lake area in southeastern Pope County is preparing to take on the challenge! Farmers, public land managers and outdoor recreationalists are interested in pursuing a cooperative land management strategy to benefit water quality, push back invasive species, provide high quality wildlife habitat and a pleasing landscape, build healthy, resilient soil, and opportunity for profit for farmers and ranchers. Management strategies will include a shared vision, carefully managed ruminant livestock impact, and cover crops.

Still in an early phase of development, Land Stewardship Project, area farmers, and the U.S. Fish and Wildlife Service are initiating this exciting and innovative project

Market Pull

Making the Economic Case

Values for good stewardship are important drivers of improving water quality and other ecosystems services through private agricultural land management decisions but farm profit is critical to the success of these efforts. *Simply put, farmers will not be able to continue farming if they do not make good economic decisions!*

Good stewardship pays.

High quality grassfed beef requiring well managed grass and forages and healthy soil is a market growing at 10-20% per year. Opportunities to market grassfed beef are growing through branded program businesses like **1000 Hills Cattle Company** and **Grass Run Farms.**

A thriving ruminant livestock industry provides opportunity for farmers to lease under performing fields not suitable for row crops to beginning farmers interested in innovative grazing strategies.

Healthy soil builds a farm's most important asset over time and can substantially reduce input costs. A Leopold Center study showed that over 13 years, by building soil health organic crop farmers improve water quality, reap harvest premiums **and reduce input costs** fetching roughly $200 more per acre.
http://www.leopold.iastate.edu/long-term-agroecological-research

Through demonstration site trips and field days, testimonials, case studies, and cost calculators and we are making the economic case for good stewardship.

Community Benefits

"Know your farmer" reminds us to know where our good food comes from and to support the farmers who raise our grassfed beef, chicken, natural pork and weekly CSA box of great produce. Let's also "know our farmer" who manages a healthy grassland along our favorite trout stream, keeps nutrients and soil in place and out of our water, builds healthy, resilient soil for all our futures and provides good wildlife habitat for our recreational and aesthetic well- being. Farmers with stewardship values and a keen eye for economic opportunity work with public land managers to help keep Wildlife Protection Areas and Wildlife Management Areas healthy and productive and make careful choices about how to manage each field they farm

Through field days, events, one to one outreach to community leaders, social and print media we are building awareness of how the natural and the human community benefits from farmers who practice a high level of stewardship. The choices about the food we eat and the energy we use and the local, state and federal policies we support matter.

Acknowledgements

We are grateful for funding from National Institute of Food and Agriculture, U.S. Department of Agriculture, under Agreement No. 2010-65615-20630
The Walton Family Foundation
MN Environment and Natural Resources Trust Fund Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i
National Fish and Wildlife Foundation Conservation Partners
Wallace Center at Winrock
The Schmidt Foundation
Organic Valley Cooperative

LAND STEWARDSHIP PROJECT

The Chippewa 10% Project:

Achieving Needed Ecosystem Services in an Agricultural Watershed

Authors: Kylene Olson (3); Robin Moore (1); Jim Paulson (5); Terry VanDerPol (1); George Boody (1); Paul Wymar (3); Jennifer Hoffman (3); Andy Marcum (1); Abdullah Jaradat (4); Jon Starr (4); Steve Ewest (1) John Westra (2); Brad Heins (6); Bruce Freske (7) Rich Olsen (8); Julia Ahlers Ness (formerly1); Matthew Hyde (formerly1),

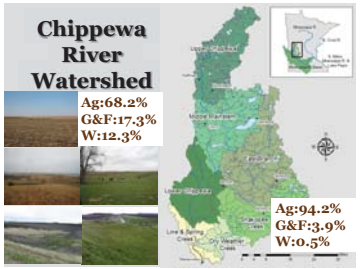
Affiliations: *(1) Land Stewardship Project – MN; (2) Louisiana State University AgCenter - Baton Rouge, LA; (3) Chippewa River Watershed Project - Montevideo, MN; (4) USDA Agricultural Research Service North Central Soil Conservation Research Lab - Morris, MN; (5) University of Minnesota Extension Service - Willmar, MN; (6) University of Minnesota West Central Research and Outreach Center - Morris, MN; (7) US Fish and Wildlife Service Morris Wetland Management District - Morris, MN ; (8) MN Department of Natural Resources, Glenwood, MN.*

Project Partners

Introduction

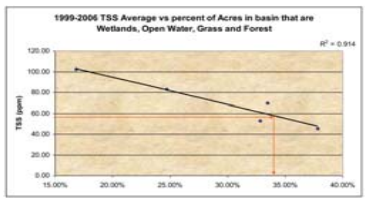
The 8 digit Chippewa River Watershed drains 5,387 km^2 of mixed natural & managed ecosystems. Corn and soybeans dominate throughout the watershed and, with sugarbeets, is almost the exclusive land use in the south. In the eastern and northern sections, grazing livestock and longer crop rotations can be found.

The project incorporates water quality and field monitoring, simulation of farming systems in relation to soils and in response to climate change, GIS analysis to identify areas of sensitivity and organizing to engage farmers and community members.



Why 10%?

Chippewa River Watershed Project CRWP) compared land-use in sub-basins with in-stream water quality. Correlations indicated that a 10% increase in diverse crop rotations, grasses or other perennial cover would be necessary to meet water quality goals.



This graph shows the correlation of in-stream water quality and land-use/land-cover compared to a goal.

Goals

Achieve:

- Water Quality Standards for 12 and 8 digit watersheds
- 5,380 more acres of grass in Minnesota Prairie Plan local corridor
- Farmer goals as they define them

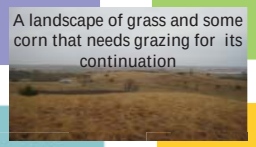
Predicting Changes and Sensitive Fields

- Ecosystem Service Coefficients (ESC) for yields, erosion, nitrate loss, soil carbon, etc. derived from ARS modeling of 132 soils, based on plot data for rotations and historical and future climates
- GIS analysis to identify potentially sensitive fields in focal areas based on monitoring data
- Integrated Water Quality and Economic Model to estimate ESC changes on sensitive corn and Soybean fields for "what if" scenarios in focal areas
- Iterative depending on farmer choices
- Will compare soil tests and farmer network data with modeled results

Engaging Farmers

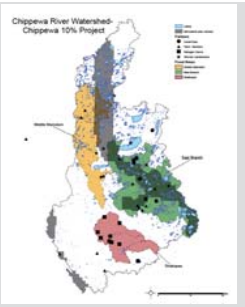
- Our key strategy for engaging farmers is building authentic relationships by holding values conversations about stewardship, including discussing options for changing rotations on fields, adding cover or decreasing tillage
- Information is provided through reports, tours, field days and workshops
- Discovery and innovation is supported through farmer networks focusing on grazing, cover crops and improved nitrogen management and one for women non-operating landowners
- Farmer leaders advising our work and speaking out about stewardship are critical to maintaining positive change

Healthy, resilient soil is the source of a farm's wealth and the link to the farm family's stewardship values and landscape health



Farmer & Landowner Partners

Focal Areas, MN Prairie Plan Core and Corridor



We have learned

- It is important to go beyond outreach to farmers to *engagement with* farmers.
- Farmers respond to individual conversations about values related to conservation and community (held 150 so far).
- 4 Networks of 70 farmers or landowners are learning on 4,470 acres to-date, with viable economic options.
- Climate change impacts are reduced with diverse rotations.
- Policy can drive resource depletion or stewardship– it matters and a well-informed public matters.
- The public discussion about continuous living cover is advancing.

Monitoring Streams and Fields:

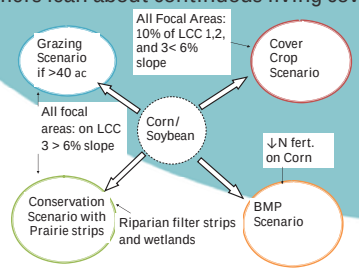
15 Years of water quality monitoring by CRWP led to:

- 10% correlation of land use and goals
- Selection of focal areas (see map on right) and selection of vulnerable sub-watersheds
- Data showing that land cover moderates runoff after extreme rainfalls and drought

Data from farmer networks will:

- Inform landscape level predictions
- Help farmers lean about continuous living cover benefits

Graphic to right shows four "what if" scenarios for modeling changes from corn and soybean fields on different Land Capability Classes (LCC), slopes , riparian areas or N fertilizer rates



Community, Market Pull, and Conservation Incentives

- Values can drive stewardship but farm profit is critical to the success of a new practice or enterprise:
  - Markets for regionally produced grass fed beef can pull more, better managed grasslands
  - Conservation incentives for learning, and practice change are used in this effort
- Hunters, anglers, bird watchers and canoeists can support land stewardship through conversations in coffee shops and by demanding supportive policies for cover and well managed grazing to achieve water quality and sufficient habitat
- Recreational landowners and affinity groups can support managing public and private lands with conservation grazing

Acknowledgements

We are grateful for funding from National Institute of Food and Agriculture, U.S. Department of Agriculture, under Agreement No. 2010-65615-20630.

The Walton Family Foundation

MN Environment and Natural Resources Trust Fund Appropriation M.L., 2010 Chp. 362, Sec. 2, Subd 3i

National Fish and Wildlife Foundation Conservation Partners

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture, the Legislative-Citizen Commission on Minnesota Resources or the Walton Family Foundation.

The Land Stewardship Letter

32 Years of Keeping the Land & People Together

LAND STEWARDSHIP PROJECT

These articles were originally published in the *Land Stewardship Letter*— No. 3 & 4, 2013 and No. 1& 2, 2014

Conservation, cattle and community (*page 26*).

ACKNOWLEDGEMENT: This work is supported by the Minnesota Environment and Natural Resources Trust Fund 2010 Chp 362, Sec 2, Subd3i; the National Fish and Wildlife Foundation and its partner the Natural Resources Conservation Service, USDA; the National Institute of Food and Agriculture, USDA, under Agreement No. 2010-65615-20630; and the Walton Family Foundation. Any opinions, conclusions or recommendations do not necessarily reflect the new of any funder.

Profits from Perennials

The Next Step for Prairie Strips

Once an agricultural conservation technique proves itself, how do we get it established where it matters—on farms?

By Brian DeVore

Gary Van Ryswyk's concern for how his farming methods impact the landscape is obvious. A veteran practitioner of a no-till system that avoids plowing and otherwise disturbing the field's surface, the crop and livestock producer is particularly concerned about keeping soil in its place.

"None of us who farm want the soil to move—we care," Van Ryswyk says one July afternoon while standing in a central Iowa soybean field he has no-tilled for several years.

That's why he is particularly troubled by the amount of eroded soil that's piled up next to a special collection device at the bottom of this field. As an exclamation point, a spade is sticking out of the pile, a reminder that even a cutting edge cropping system can't always prevent land from slipping away.

"I was one of these guys who didn't think we were losing that much soil," says Van Ryswyk. "I was shocked at how much soil was being lost."

And the researchers Van Ryswyk works with have been somewhat surprised at the lack of eroded soil being collected by a testing flue just a few hundred feet away. The soybeans above that particular collection point are also being grown in a no-till system and the slope of the field is the same—6 percent to 10 percent. But planted in strategic spots on the second field plot are patches of native prairie. Van Ryswk is raising crops on the Neal Smith National Wildlife Refuge near Prairie City, east of Des Moines. The prairie plantings are part of an ongoing research study coordinated by Iowa State University's Leopold Center for Sustainable Agriculture. Called STRIPs (Science-based Trials of Rowcrops Integrated with Prairie), the study has produced some impressive results: planting just 10 percent to 20 percent of a crop field to native prairie "strips" (some of the plantings look more like a slice of pie) consistently cuts soil erosion by an astounding 95 percent. The plantings, which have been in place since 2007, also reduce runoff of phosphorus and nitrogen fertilizer by roughly 90 percent.

"It's hard to improve on 95 percent," says Matt Helmers, an ISU agricultural engineer and one of the coordinators of the STRIPs project. The prairie plantings have proven so effective mostly because they have the thick stems and diversity of species that slow down water so effectively. Some have compared it to a pinball machine, with water runoff expending energy with each zig and zag. Researchers say this makes the prairie far superior to, for example, grassed waterways planted to a monoculture of brome grass, which tends to lay down during heavy rains.

Even though less soil leaves a field planted to prairie strips, in-field soil losses can still occur. "We really need a systems approach and think about how we protect that land all the way from the top of that slope to the bottom," says researcher Mat Helmers. "Prairie strips are a polisher." (*LSP photo*)

And it's the ability of the prairie plantings to slow runoff during extreme precipitation events that has researchers most excited. During 2008, 2010 and 2013, the Refuge was pummeled by rains that dumped four inches or more in less than 24 hours. Even no-tilled fields produced significant ephemeral erosion—small channels caused by concentrated flow—under these conditions.

"When you get a four inch rain, nobody's happy," says Van Ryswyk. "Not even no-tillers."

Helmers notes that conservation techniques that can weather increasingly extreme meteorological events are becoming even more key as traditional techniques like no-till and grassed waterways show their limits.

"These practices perform on average but we see a lot of our soil losses from these extreme events, so we need to kind of design and be prepared for these bigger events," he says.

Pauline Drobney, a prairie biologist with the U.S. Fish and Wildlife Service who is working on the STRIPs project, says while patches of native grasses and forbs interspersed with corn or soybeans are not as optimal as having vast tracts of grasslands extending to the horizon, she's excited about the potential for prairie patches to provide ecosystem services. For example, numerous pollinators use the strips, including over 30 native bee species. They have also proven to be important habitat for birds, including several grassland species that have experienced extreme population declines as row crops gobble up pastures, meadows and grassy corners on farms.

"Imagine a landscape where you have prairie plantings like this interspersed," says Drobney as dickcissels sing from grassy perches a few yards away. "It won't be all of the solution—we still need big blocks of grassland landscape. But these diverse prairies in these strips can provide some of the birds places to fledge; it can be a place for a whole host of invertebrates and other things we know that we depend on."

STRIPs researchers are quick to point out that this is not a silver bullet. For one thing, the prairie patches are effective at keeping soil from leaving a field and making its way into local waterways, but in-field erosion still occurs.

"We really need a systems approach and think about how we protect that land all the way from the top of that slope to the bottom," says Helmers, adding that a systems approach could include cover cropping and no-till production, with the prairie strips serving as a "polisher."

Getting onto Working Farms

That's an important message to convey as the STRIPs team takes the next step: trying to get farmers beyond the wildlife refuge to establish prairie plantings on their crop fields. The research team is looking to set up prairie strip demonstrations on farms in various parts of Iowa to get a feel for how they perform in different geographical locations

Prairie Strips, *see page 25…*

…Prairie Strips, *from page 24*

under various weather and soil conditions. In June, a farmer in southwest Iowa established strips on eight acres of a 50-acre field. Once that prairie is established, he hopes to add his own twist to the technique: grazing cattle on the strips.

Use of the prairie strips on working farms in different areas will help answer many of the questions producers are asking Helmers and his colleagues. How should planting and design be undertaken? What are the maintenance requirements? And perhaps most importantly, what is the cost?

The answer to that last question became a bit clearer in September when the STRIPs team released a study showing establishment of prairie strips in row-cropped fields was very cost-effective when compared to other conservation practices. The average cost of using the technique to treat runoff from an acre of corn or soybeans is $24 to $35 annually, according to the analysis. That makes it less expensive in come cases than planting cover crops and much cheaper than establishing a terrace. The analysis found that the cost of establishing and maintaining a prairie strip is minimal—it's the annual lost rent or crop value revenue that planting represents which makes up 90 percent of the expense. This could be a major "hang-up" for farmers, says report author John Tyndall, an ISU economist.

Gary Van Ryswyk, the central Iowa farmer, agrees. He says farming the 200-foot patches (approximately two sprayer widths) of crop ground between the strips is a little more of a hassle than just farming a whole field, but well worth it when he looks at the end results in the collection flues. However, recent sky-high prices for commodities and farmland make every last acre valuable.

"There are a few farmers I know who might want to try it, but with land prices so high and cash rents so high, it's hard to take even 5 or 10 percent of your farm ground out of production," he says.

As with many farm conservation systems, the prairie strips have the potential to produce many more benefits off the farm than on. Even though they cut erosion by 95 percent, Van Ryswyk's example shows that even the most conscientious farmer isn't likely to notice the difference on their own land, given that soil erosion can often slip by unnoticed. The STRIPs economic analysis concluded that federal conservation programs like the Environmental Quality Incentives Program or even the Conservation Reserve Program could help provide economic incentives for establishing and maintaining strips. This could be particularly attractive at a time when cost-conscious conservation experts are looking for techniques that deliver real results.

Van Ryswyk thinks paying for such a public good is a good idea, but it also wouldn't hurt if more farmers were made aware of just how much runoff occurs in even the most well-managed fields.

"One of the big barriers is, like me, most farmers truly believe they aren't losing as much soil as they really area." ❐

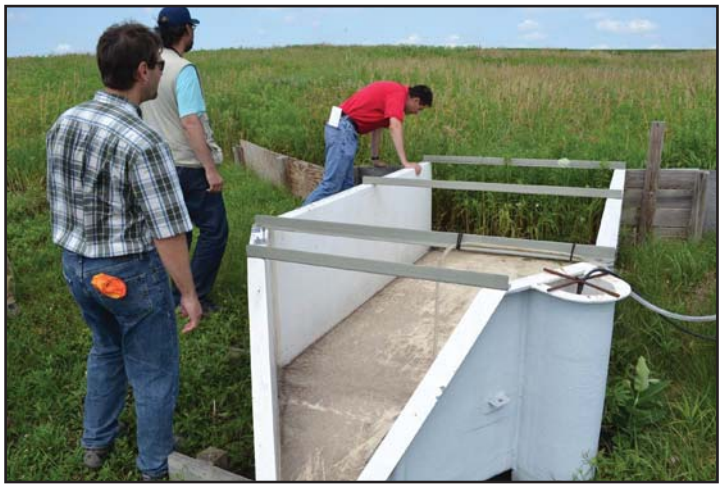
Prairie biologist Pauline Drobney and farmer Gary Van Ryswyk discuss the benefits and challenges of growing prairie strips in crop fields. Drobney says while patches of native grasses and forbs interspersed with corn or soybeans are not as optimal as having vast tracts of grasslands, she's excited about their potential for providing ecosystem services. (*LSP photo***)**

LSP & Prairie Strips

The Land Stewardship Project is working in Minnesota's Chippewa and Root River watersheds to determine if prairie strips are a viable option for balancing water quality protection with profitable farming. For details, see www.landstewardshipproject.org and follow the links under the **Stewardship & Food** section.

Give it a Listen

Matt Helmers, Gary Van Ryswyk, and Pauline Drobney talk about the next steps in getting more prairie strips established in farm country on LSP's *Ear to the Ground* podcast: www.landstewardshipproject.org/posts/podcast/485.



Eroded soil frequently needs to be cleaned out of the testing flue in the left photo, even though the cropped acres above it are in a no-till system. The flue in the right photo, which sits at the base of a field plot's native prairie strips, is virtually free of eroded soil. "I was shocked at how much soil was being lost," says farmer Gary Van Ryswyk of the field plot without prairie. (*LSP photos***)**

Profits from Perennials

Can Cover Crops Catch On?

Long-Term Benefits are One Thing—Short Term Practicality is Another

By Brian DeVore

As soon as Jerry Morical walked into a stand of corn on his west-central Minnesota farm one recent day in August, he entered a scene being replicated on millions of acres around the Midwest: towering green stalks stretching toward the sky, clone-like in their repetition. But then the farmer bent down below the lower leaves and points out an ever so slight difference—biding its time in the deep shade was a diverse mix of small grains and legumes. Not impressive at first glance, but their mere presence is a mini-revolution of sorts.

These are cover crops, and as their name implies, when the corn is harvested in the fall Morical's soil will still be covered in a blanket of living vegetation. Suddenly, this field will look quite different than all of its cousins spread across the landscape—above and below ground.

The plot will also be different because it will still be producing economic activity well after the corn is put into storage or sold. In June, Jerry and his grandson Taylor planted up to 10 species—peas, clover, ryegrass, lentils, vetch, radish, millet, cowpeas, oats and turnips—of cover crops into standing corn. They are hoping that integrating these plants into their farming system will help ease the transition they've recently undertaken into no-till production. Whether the soil building properties of cover cropping pay off could take years to prove. But in the short term, the Moricals already have a Plan B that will help them justify the diverse plantings.

The seed cost $20 to $22 an acre, and on one 40-acre cover cropped cornfield, Taylor figures he can make back that cost with his 21-head beef cow herd.

"If I can graze that 40 acres for 30 days, I can get my seed cost back and it will take pressure off my hay crop," he says, adding that his hope is to build enough soil health that he can save money in other ways. "Maybe we can cut down on fertilizer use down the line."

John Baker, a soil scientist with the USDA's Agricultural Research Service, says using short term gains to open the door to some big picture ones is key if cover cropping is to ever become more common in the Upper Midwest. In the struggle to get soil covered with living plants longer than the typical 90-day growing season that comes with corn and soybean production, cover crops could represent a good compromise between planting land to perennial systems like grass, and growing only annual row crops. Farmers can theoretically slip cover crops into their current production system without completely upending everything.

"Instead of saying to farmers now here's something completely different, you provide ways to transition into something that resembles their current system of cropping," says Baker.

Striking such a balance is worth pursuing, given the multiple benefits such a system can produce. Growing small grains, root crops such as turnips and other so-called "non-commodity" plants on fields before and after cash crops are harvested can build soil organic matter, cut erosion, break up compaction, protect water quality and provide wildlife habitat. Cover cropping can even help sequester greenhouse gases, something Baker is studying in Minnesota.

But at a time when there is intense pressure to grow as much corn and soybeans as possible, planting anything other than cash commodity crops is not a priority with the vast majority of farmers.

According to a National Wildlife Federation survey of seed dealers released this fall, less than 2 percent of farmland in the Mississippi River Basin—an area covering 18 states and encompassing Midwestern states like Minnesota and Southern states like Arkansas and Kentucky—are planted to cover crops.

Cover crops can be particularly difficult to manage in the Upper Midwest, where inclement weather often shortens the growing season considerably. And because most farmers have so little experience with cover crops, there are concerns they will basically compete with corn and soybeans for nutrients, water and other resources. In addition, relatively little research has been done at land grant universities on cover cropping systems—large commodity groups, which foot the bill for a lot of university research, simply aren't interested in non-cash crop science.

However, recently there have been indications in Farm Country that cover cropping may be getting a more positive image in the Corn Belt. Agronomic innovations, the limits of conventional soil conservation methods and challenges posed by a changing climate are making such plantings increasingly attractive. But conservation and agronomy experts agree that for cover cropping to become a consistent presence on Midwestern fields, it will need to cover more than soil—it needs to cover the economic bottom line.

Soil conservationist Jay Fuhrer (*right*) describes the cover cropping system used by Penny Meeker and Todd McPeak (*center*) on land they farm in North Dakota's Burleigh County. Farmers, conservationists and scientists are flocking to the region to view firsthand a system that combines cover cropping, no-till planting and rotational grazing. (*LSP photo*)

Not Flashy, But Reliable

Perhaps no place has gotten people more excited about the potential of cover crops than Burleigh County in south-central North Dakota. Over the past decade or so the Burleigh County Soil Health Team has used a combination of cover crops, rotational grazing and no-till farming to increase soil's natural ability to build its own fertility, resist erosion and make better use of moisture.

…Cover Crops, *see page 26*

Profits from Perennials

…Cover Crops, *from page 25*

The Team consists of local farmers, Natural Resource Conservation Service (NRCS) experts, Soil Conservation District personnel and USDA scientists (*see the No. 3 and No. 4, 2013* Land Stewardship Letter *for more on the Burleigh County Soil Health Team)*.

One thing the Soil Health Team has found is that planting multiple species of cover crops—as many as eight, 10 or more—produces a soil that is a reliable producer, especially in difficult conditions.

"With healthy soil, you may not outyield your neighbor in the best years, but you will out perform them in the not-so-good years," says Kristine Nichols, a soil microbiologist at the USDA's Northern Great Plains Research Laboratory who works with the Soil Health Team.

Nichols made her comments to a contingent of Minnesota farmers and soil experts who had just spent an August day seeing what people in Burleigh County were doing to develop the kind of soil that's not just reliable, but resilient enough to produce profits in even the harshest conditions. This tour was sponsored by the Minnesota NRCS and the USDA's Sustainable Agriculture Research and Education program. This part of North Dakota receives on average only 16 inches of precipitation annually—that's a foot less than what most of Minnesota gets in a typical year. At the time of the tour, there had not been a significant rain in that part of North Dakota for two months, but corn that was raised on ground where cover cropping and other methods had been used to build soil health appeared to be thriving.

"I have worked with irrigators for 20 years and I have never seen a corn crop look this good with eight weeks of no rain," says Brad Wenz, a soil conservationist for the Stearns County Soil and Water Conservation District in central Minnesota who participated in the tour. "There is something going on there."

All that cover crop foliage above ground and living roots beneath the surface can build the kind of soil health that helps fields make better use of available moisture. A bare soil holds 1.7 inches of water while a stand of living plants can hold 4.2 inches of water, according to the NRCS.

That fact was reinforced this summer when the USDA and the Conservation Technology Information Center released the results of a farmer survey showing that cover crops more than paid for themselves in the Upper Mississippi River watershed during the drought of 2012. Corn and soybeans planted in 2012 after cover crops had a 9.6 percent and 11.6 percent yield increase, respectively, when compared with fields that had no cover crops, according to the survey.

David Larson (*left*) describes his cover crop planting of radish and winter rye during a Land Stewardship Project field day in early November. Larson, who farms near Rushford in southeast Minnesota with his wife Sue, planted the cover crops in early August after flooding prevented him from growing corn on a field. The deep tap roots of the radishes helped break up the soil compaction that resulted from the flooding. In addition, the Larsons were able to graze their beef cattle on the radishes this fall, providing cheap forage. (*Photo by Caroline van Schaik*)

Adding Value

During the Burleigh County tour, farmer Jerry Doan showed the Minnesotans a shoulder-high stand of cover crops that included millet, a type of sunflower and grazing corn. He explained that this stand, which was planted June 20, was to be grazed starting in November, providing winter-feed for his beef herd. Doan estimates that in 2011 grazing cover crops produced $50,000 in savings for his operation and took pressure off his regular pastures.

Give it a Listen

The Land Stewardship Project's *Ear to the Ground* podcast features farmers Jerry and Taylor Morical, along with soil scientist Sharon Weyers and forage expert Jim Paulson, talking about cover crops and soil health: www.landstewardshipproject.org/posts/podcast/506.

"I had a goal that every acre of cropland on this place would be profitable," says Doan, who has recently been joined in the farming operation by two sons. "Fifty thousand dollars when you're bringing in another generation is another family income."

This brings up an important point: like the Moricals in west-central Minnesota, many of the Burleigh County farmers are utilizing livestock to make cover crops pay. That's great in an area where livestock like cattle are present on farms, but is increasingly difficult as more Midwestern operations become specialized, with corn and soybean production clustered in areas far away from livestock concentration.

During the recent Burleigh County tour, a typical comment made by Minnesota natural resources professionals was, "This is great where there are cattle on farms, but how can we make cover crops work in a corn-soybean rotation?"

When livestock or other ways to add economic value to cover crops aren't immediately available, the results can be disastrous. For example, a particularly late, wet spring in 2013 made it next to impossible to plant corn and soybeans in parts of Minnesota and Iowa in a timely manner. To stay in compliance with government commodity programs on "prevent plant" acres—those acres too wet to get cash crops planted on—many farmers seeded cover crops, often for the first time. This offered a prime opportunity for farmers to get familiar with this system without exposing themselves to a lot of risk.

But to the chagrin of soil conservationists, by September there were reports that farmers were spraying and plowing up cover crops on prevent plant acres to prepare for the 2014 growing season. Not only are such

…Cover Crops, *see page 27*

Grazing as a Public Good

When it Comes to Grass, Farmers & Conservationists are Sharing a Mutual Goal

By Brian DeVore

1st of 2 articles

As a Nature Conservancy scientist based in a Midwestern state, Steve Chaplin thinks a lot about the impact agriculture has on ecological treasures such as native tallgrass prairie.

"Other than plowing, grazing has probably been responsible for the degradation of more prairie than any other source," says Chaplin, who is in the Conservancy's Minnesota field office. No surprises there. But less expected is Chaplin's next words: "We would like to see grazing on a large scale, which would mean grazing across public-private property lines. To a lot of conservationists it is probably surprising that we need more people, rather than fewer people, to improve the landscape."

More farmers, and by extension, the cattle they manage, means more disturbance, and that's a good thing. It turns out native prairies, other grass-based habitats and even wetlands need a little disruption of growth patterns if they are to remain healthy ecosystems, rather than scrubby patches of land covered by red cedar and other invasives. That's why Chaplin and other natural resource experts are welcoming cattle onto lands that were once verboten to livestock: preserves, wildlife refuges and other natural tracts of real estate. One place where this trend is gaining momentum is western Minnesota, where an agriculture-dominated landscape is dotted with remnant prairies and some of the most valuable waterfowl habitat in the region.

Public agencies and private conservation groups are fast realizing that buying up land and putting up "Nature Preserve" signs won't secure the long-term sustainability of that habitat—it needs active management, the kind that toes the line between stressing the environment and allowing it to recover.

It turns out when cattle are used to provide that well-balanced mix, the result can be a healthier, more diverse habitat, as well as an extra incentive for farmers to keep livestock as a key part of their enterprises.

"We need to keep cowmen on the ground," says J. B. Bright, a U.S. Fish and Wildlife Service refuge specialist who works with graziers in western Minnesota. "The local economies are stronger and the perennial plant systems are stronger."

A Disturbing Development

In the Midwest, cattle's return to prairies and other natural areas is a relatively recent phenomenon. Grazing of public lands has a long history out West, where large herds of cattle have been allowed to roam at will on natural areas during the entire growing season, often with little or no controls. In some cases, the result has been decimated grasslands and destruction of riparian areas, resulting in destroyed wildlife habitat, erosion and polluted water.

Natural resource managers have learned that putting up a sign on the border of a refuge isn't enough to keep wildlife habitat healthy. (*Minnesota DNR photo*)

"When you talk about the West, grazing on public lands has a black eye or two," says Minnesota Department of Natural Resources prairie habitat ecologist Greg Hoch. In these circumstances, banning livestock from natural areas and refuges would appear to be a no-brainer. But such a rigid line in the grass can result in lands that suffer from severe benign neglect.

"This is Minnesota—if you don't graze or burn it, it will become forest," says Bruce Freske, manager of the Fish and Wildlife Service's Morris Wetland District.

Depending on the situation, grasslands require a major disturbance at least every five to 10 years, something bison and wildfires provided in days gone by. More recently natural resource experts have purposely burned off grasslands to keep woody invasives at bay and recharge green growth. But managing a burn can be expensive and it requires optimal weather conditions.

As a result, refuge managers concede they are woefully behind on burning, and they are watching with alarm as pastures purchased from farmers become inundated with cedar, Siberian elm, Russian olive and red-osier dogwood within four or five years.

Fortunately, innovations in grass-based livestock production offer a prime opportunity to bring back the kind of flash disturbances that haven't been around since the time of the bison. Livestock producers utilizing managed rotational grazing are seeing the benefits of moving cattle frequently through numerous paddocks, rather than keeping them on the same pasture all season long, where it becomes overgrazed. This system can extend the grass season, cut costs and in general produce more profits. Advances in watering systems, lightweight moveable electric fencing and automatic gate openers have made rotational grazing even more viable.

This type of grazing system fits well with what refuge managers are looking for: short-term impact (a few weeks) and long-term rest (a year or more), something people like Hoch call "conservation grazing."

"The key is to hit it and rest it," he says. "That's how these prairies evolved with the bison. Keeping livestock on pasture year-after-year will just clobber it, but I'm 100 percent convinced that if we do grazing right, grassland diversity will increase."

Rangeland science backs up Hoch's contention. Studies in numerous states show that conservation grazing can as much as double plant diversity in an area—it not only prevents overgrazing but the cattle's manure and urine helps recharge the soil's biology. Hoch and other habitat experts working

Public Grazing, *see page 25…*

…Public Grazing, *from page 24*

in western Minnesota have observed how grazing has increased native plant communities by knocking back invasive cool season plants like Kentucky bluegrass and smooth brome. Such invasives tend to blanket the land with a homogeneous cover, which limits the diversity wildlife such as deer, waterfowl, shorebirds and grassland songbirds require. Such grasses also tend to go dormant in hot weather and provide limited habitat and foraging areas for pollinators. Cattle are also being used to thin out cattails and reed-canary grass around wetlands, providing the open areas many waterfowl prefer when keeping a lookout for predators. And controlled grazing of riparian areas (*see page 5*) is proving to be an effective way to stabilize areas along waterways and lakes.

The science has become so convincing that conservation groups such as the Nature Conservancy and the National Audubon Society have changed their once decidedly negative view of cattle and now see them as an effective habitat management tool.

Right now a small percentage of Minnesota preserves are being managed via grazing, and conservationists say even if the practice is expanded significantly, it's doubtful it will be present on the majority of acres. For example, of the 50,000 acres the Fish and Wildlife Service manages in the Morris District, around 5,000 acres are grazed by 35 different producers. The Minnesota Department of Natural Resources uses grazing on about 10,000 acres of Wildlife Management Areas statewide and has a goal of pushing that to 50,000 acres by 2015, which would still be only 4 percent of all state refuge acreage. The Nature Conservancy grazes less than 15 percent of the 63,500 acres it owns in Minnesota.

Nevertheless, conservation grazing is seen as a potentially key tool in targeted areas. The Minnesota Prairie Conservation Plan, which was published in June 2011 by 10 conservation agencies and organizations, provides a blueprint on how to save and manage a resource that once covered 18 million acres of the state but is now down to 235,000 acres and shrinking fast. The authors of the report identified conservation grazing as a major method for preserving and managing grasslands.

The Prairie Conservation Plan highlights a shared threat livestock farmers and conservationists face: the plowing up of grass to make way for more corn and soybeans. The *Proceedings of the National Academy of Sciences* reported in 2013 that between 2006 and 2011, 1.3 million acres of grassland were converted to crops in Minnesota, Iowa, North Dakota, South Dakota and Nebraska. Such conversion rates haven't been seen since the 1920s and 1930s.

Bright, who works with a couple dozen cattle producers who graze refuge land, says livestock producers are increasingly getting "desperate" for pasture as acres they rent are switched to row crops. "I had one guy say, 'I lost 240 acres to the plow.' "

It should be kept in mind that although wildlife managers and farmers share a common desire to save grass, they can still differ widely on what that resource should ultimately produce. Livestock producers usually pay a fee to graze refuges and other natural areas, but that doesn't give them carte blanche—the refuge manager's goal of protecting the resource takes precedence over profits.

"The farmer wants the feed and the natural resource manager wants the diversity of plants," says Howard Moechnig, who operates a grazing consulting firm called Midwest Grasslands. "Sometimes the two don't match."

But when they do, it can be a good way to manage an important resource on multiple levels, says Dan Jenniges, who has a cow-calf operation near Glenwood in west-central Minnesota. Jenniges, who has been grazing Fish and Wildlife Service land for eight years and Department of Natural Resources land for two, says the grazing schedule and intensity can vary from year-to-year.

"It depends on what their objectives are for their particular piece of land," he says of the refuge staffers he works with. Sometimes his cattle are brought in during the spring to knock back cool season grasses like brome and bluegrass just as they're starting growth; other times a fall grazing is called for to stymie the same grasses as they are coming out of summer dormancy.

Some of Jenniges' land is adjacent to refuge land, making grazing the public areas convenient; in other cases he has to transport the cattle several miles for a grazing season that may only last around a month. That can be a hassle, but it allows him to give his own pastures a rest and break up pest cycles while contributing to the health of the overall landscape.

"We aren't renting the grassland—we're managing it," says Jenniges. "When you're grazing that public land, you're able to take pressure off your own lands, so in general all the grasslands become better, whether it's for the grass or the wildlife." ❐

The next Land Stewardship Letter *will examine the challenges of using cattle to manage natural areas and how grazing can play a role in "coordinated landscape management" to produce benefits across property lines — both public and private.*

Private Stewards-Public Stewards

Grazing wildlife refuges and other natural areas can be a way to get access to low-cost forage for cattle while resting home pastures, but livestock producers shouldn't rely too heavily on public lands, say conservation experts.

"Refuge managers don't want to hear you're out of grass because you're overstocked or are trying to increase your stocking rate," says Jeff Duchene, a grazing specialist for the USDA's Natural Resources Conservation Service who has done grazing plans for wildlife areas. "It needs to be mutually beneficial."

And don't grow your herd size based on getting access to public lands for grazing—contracts are generally short term. Refuge managers want to work with graziers who are taking care of their own land as well as they would a public area. Such good stewardship can help win the public over on the role grazing can play in conservation, both on preserves and in the larger landscape.

"If you are plowing up your own prairies, don't come knocking on our door to graze — it's a non-starter," says Dave Trauba, manager of the Minnesota Department of Natural Resource's Lac qui Parle Wildlife Management Area in the western part of the state. "We need to, as a society, reward people for keeping grass on the landscape."

Interested in Grazing WMAs?

The Minnesota Department of Agriculture has an online map for livestock producers looking for information on grazing opportunities available at Wildlife Management Areas in the state. Information is at http://gis.mda.state.mn.us/consgrazing or available by contacting Kelly Anderson at 320-808-4424, Kelly.Anderson@state.mn.us.

Give it a Listen

Episode 151 of the Land Stewardship Project's *Ear to the Ground* podcast features wildlife and grazing experts talking about the benefits and challenges involved with using grazing to improve wildlife habitat: www.landstewardshipproject.org/posts/podcast.

Profits from Perennials

Choosing to Resist Resiliency

New Data Shows Cover Crops are Paying their Way—So Why is Adoption Lagging?

By Brian DeVore

It's exciting to hear sustainable agriculture innovators like Gabe Brown and Dave Brandt talk about how cover crops build their soil health, increase profitability and in general create resiliency on their operations. But spend any time with Brown and Brandt and it's clear going against the mainstream of agriculture and challenging conventional wisdom is as natural to them as starting up a tractor. It's an important trait for innovators, but not one that always wins over the "mainstream" of the farm community.

On the other hand, when someone like Ray Gaesser starts talking about protecting his soil with small grains and other non-market crops, a whole new group of folks take notice. Gaesser farms 6,000 acres of corn and soybeans in southwest Iowa and has been 100 percent no-till since 1991. This system worked well for around two decades, especially when it came to preventing soil from eroding off Gaesser's fields.

But in 2010, he started noticing rain events that came so hard and fast they literally floated the crop residue off the field, leaving his soil vulnerable to severe erosion; even grassed waterways and terraces weren't working anymore.

Gaesser is known as an innovator in mainstream agriculture—he's president of the American Soybean Association and has long been active on issues ranging from free trade to biotechnology. Seeing nature outsmart what he considered a cutting-edge cropping system prompted him to start growing cover crops on land that normally would not have any plant life before and after the corn-soybean season. It worked, and he currently has 1,000 acres in cover crops, with plans to double that in the near future.

"Cover crops are the answer for these severe events we're having," he said in February.

Gaesser made these comments at the National Conference on Cover Crops and Soil Health in Omaha, Neb. This invitation-only event was sponsored by the USDA's Sustainable Agriculture Research and Education (SARE) program and the Howard G. Buffett Foundation, and drew farmers, conservation experts, scientists and agribusiness bigwigs from across the country. The two-day event provided a chance to hear about the successes people like Brown, Brandt and Gaesser are having with cover crops, as well as ruminate over big picture statistics showing how this conservation farming system is working for thousands of other producers across the country.

But participants in the conference also had to grapple with a troubling question: if cover crops work so well environmentally and economically, then why are they present on only around 2 percent of farm fields in the Mississippi River Basin?

In fact, conference sponsors expressed the wish more than once of seeing U.S. cover cropped acres grow from the current estimate of three million acres to 20 million acres by 2020. That's a daunting goal. Buffet, who operates a farm in central Illinois and who is using his foundation to fund soil health initiatives, told the gathered crowd that he has traveled the world and seen problems caused by situations where people have no choices.

"Here in this country, we have choices," he said. "We have the resources and the know-how. We should be leaders in this and we're not."

Signs of erosion showed up in many Midwestern road ditches this winter in the form of "snirt"—a combination of snow and eroded dirt. This photo, which was taken in western Minnesota in January, shows the results of tilling a cornfield after fall harvest and leaving it bare. Crop fields that had even a trace of plant cover on them over the winter produced significantly less erosion. (*Photo by John White*)

Cover Crops Pay Their Way

What makes cover cropping's lukewarm reception on the farm even more vexing is a set of new survey numbers unveiled at the conference by Rob Myers, regional director of Extension Programs for North Central SARE. This survey is a follow-up to a groundbreaking farmer study conducted by SARE and others in the Upper Mississippi River watershed in 2012. The 2012 survey found that during that year's brutal drought keeping the soil covered with small grains, radishes and other plants helped fields preserve enough precious moisture to provide a yield bump of, in the case of corn, around 11 bushels per acre. Soybeans planted after cover crops enjoyed a yield advantage as well that year, according to the survey, which was conducted in Minnesota, Wisconsin, Iowa and the Dakotas, among other states.

It must be kept in mind that U.S. corn and soybean yields took major hits in 2012 as a result of the mega-drought. Just about any alternative farming technique that could save even a trace of precipitation had a good chance of providing an advantage. But what about in a more "normal" year?

Myers said a follow-up survey of farmers in the Upper Mississippi River watershed showed that in 2013 corn planted after cover crops produced on average 10 more bushels per acre when compared to its non-cover cropped counterparts. Soybeans after cover crops also yielded well in 2013— a season full of challenges but a widespread drought not being one of them.

When cover cropping starts to prove itself year-after-year in varying conditions, it builds the reputation of being a reliable farming technique. And that yield bump means that cover-cropped corn had a net return advantage of around $35 per acre, according to Myers. That's an important figure to keep in mind because the median cost of

Cover, *see page 27…*

…Cover, *from page 26*

putting in a cover crop—paying for the seed and doing the planting—was around $37, according to the survey.

"That [$35] is close to the cost of seed and seeding, but maybe not enough to convince someone who is on the fence," Myers told the conference attendees.

Maybe not, but as subsequent presenters made clear, the other "extras" provided by cover cropping could go a long ways toward convincing more farmers to hop off that fence. For one thing, cover cropping's ability to build soil health can provide a significant amount of "free" fertility while breaking up pest cycles and reducing compaction. Each 1 percent of organic matter holds the equivalent of $700 in soil nutrients, according to Ohio State University's Extension Service.

During a conference panel discussion farmers from Iowa, Illinois, North Dakota and Ohio talked about how building soil with cover crops has helped them cut fertilizer and pesticide use—in some cases significantly.

"I have used no synthetic fertilizers since 2008," said Gabe Brown, who uses cover cropping on his North Dakota operation as part of a diverse, integrated system that involves no-till and mob grazing (*see issues 3 and 4 of the 2012* Land Stewardship Letter *for more on Brown*). Dave Brandt said his Ohio farm's soil is covered "around 360 days a year" thanks to cover crops and he also has dramatically cut his use of synthetic fertilizers and pesticides.

Myers said farmers are showing that grazing of cover crops not only recovers planting costs quickly, but adds profitability to their livestock operations.

The off-farm "public goods" pluses of cover cropping are also starting to add up. For one thing, cover crops have been shown to provide wildlife habitat while sequestering greenhouse gases. And Iowa State University research presented at the Omaha conference showed cover crops cut nitrogen fertilizer runoff and soil erosion by half.

"I lose less than 100 pounds of soil a year off my farm," said Brandt. In a good year, a typical Midwestern farm is lucky to keep its erosion rate under five tons per acre.

Insuring Against Disaster

Another potential economic plus that was mentioned more than once at the conference has particularly significant implications given the recent passage of a new Farm Bill that is heavily reliant on crop insurance (see pages *4, 12 and 13*). Wouldn't soils made more resilient by cover cropping and other sustainable methods be less likely to produce the kinds of crop failures that result in big insurance payouts? Perhaps farmers who build soil health could be rewarded by having to pay less for crop insurance, said Jason Weller, chief of the USDA's Natural Resources Conservation Service.

"If we can show actuarially that use of cover crops reduces your risk of crop failure, then that could be reflected in your premium," he said.

A quarter of the respondents to the SARE survey said a reduction in insurance premiums would give them an incentive to plant cover crops. In fact, crop insurance's growing clout in federal farm policy makes it one of the last remaining programs for incentivizing farmers to put in place conservation production systems like cover cropping.

"Just tie crop insurance to soil loss and you'd have 20 million acres of cover crops just like that," said Brown, adding that the current crop insurance program impedes innovation in agriculture by taking away the incentives for farmers to try things beyond the typical corn-soybean rotation. "On our farm we've built enough soil resiliency that we don't need crop insurance."

However, the Risk Management Agency (RMA), which administers the crop insurance program, has its hands tied because cover crops aren't recognized as a "best farming practice," said an RMA official who attended the soil health conference. He added that RMA defers to university extension research on what is considered a sound, low-risk farming practice.

Crop insurance reforms that recognize healthier soil as a lower risk to the public coffers may be one way to promote cover cropping. Yet another is outright payments to farmers who agree to protect their fields with off-season plantings.

By the 1990s, the Chesapeake Bay was turning into a dead zone as a result of algal blooms caused by excessive nutrient runoff from farms. In Maryland, which has corn and soybean farms as well as large chicken operations, cover cropping was promoted as a way to reduce runoff, but did not really gain traction among farmers until a "flush tax" was imposed on every property owner in the state. The tax provides millions of dollars for paying farmers directly to plant cover crops—mostly rye grass. Maryland is now 70 percent toward its goal of reducing nutrient runoff.

"We really didn't do the farmer education piece of promoting the benefits of improved soil health," said Ken Staver, a researcher at the University of Maryland's Wye Research and Education Center. "We basically got the general public to pay money to improve water quality."

Staver concedes that the Maryland example is somewhat unique. For one thing, there are relatively few farmers in the state compared to the Midwest—the entire state of Maryland only grows a million acres of corn while Minnesota alone has more than eight million acres. In addition, residents there see the direct result of excessive runoff into the Chesapeake—a far different relationship than what's found in the Midwest, where the Gulf of Mexico's dead zone is caused by farms more than 1,000 miles upstream—out of sight, out of mind.

Choosing Soil Health

Myers said that farmers who adopt cover crops and stick with them tend to use them as part of other innovative practices, like no-till or managed rotational grazing. Using such a comprehensive systems approach to build soil health makes it more likely a farmer will make such practices a permanent part of an operation.

In fact, one surprising finding in the latest SARE survey was that 63 percent of respondents had not received financial assistance to plant cover crops, and 14 percent said they had gotten funding in the past but continued to cover crop after the payments stopped.

"To me, this explodes the myth that people will only plant cover crops if the government pays for it," said Myers.

To Buffet, such results offer a glimmer of hope that farmers will take advantage of the choices they have before such choices are no longer available.

"The heavy stick of regulation is inevitable in the Midwest if we don't get proactive," warned Buffett. "I think the most important message to farmers is we have an opportunity to deal with this problem our way, or we can be told how to do it." ❐

LSP & Soil Health

The Land Stewardship Project is working in western and southeastern Minnesota to promote diversified farming systems that build soil health, are economically viable and improve the environment. For details, see www.landstewardshipproject.org and follow the links to the **Chippewa 10%** page and the **Root River: Promise of Pasture** page. More details are also available by calling our office in southeast Minnesota at 507-523-3366 or Montevideo at 320-269-2105.

More information on LSP's soil health work is also available on the **Soil Health, Profits & Resiliency** page on our website.

Farm Transitions

History, Hopes & Plans

Women Caring for the Land Meetings Highlight an Important, but Often Ignored, Voice in Farm Country

By Rebecca White

Sometimes, the introductions take over an hour.

But it's always an enjoyable part of the free-flowing agenda when women landowners come together to discuss conservation and their farms. There's a lot of history, hopes and plans to share, and the interactions between the mostly 60-and-over assemblage can be alternately informative, supportive and occasionally spur knowing nods of, "Haven't we all been there!"

"I like the idea of a group of women," says Sandra Bessingpas of Kensington, in western Minnesota. "It helps to know there are more people out there [like me], and the group has made me feel a lot more confident talking to my renter."

Bessingpas, who manages pasture and tillable acreage she and her husband purchased 30 years ago, participates in a Women Caring for the Land group, which meets regularly during the spring, summer and autumn months in Glenwood, Minn. Women Caring for the Land brings together women who own land and rent it out for agricultural production, and who are interested in learning more about conservation on that land—whether it be grassed waterways, field windbreaks, strip tillage, grazing or cover crops. Many of the participants are widowed, self-identified "farm wives" or have inherited the land from parents who farmed. Some were active in farming at some point in their lives, and some pursued careers that took them far from their land. All are eager to understand more about what takes place on their land and how to work with their renter or renters to increase stewardship while maintaining good production and good relationships.

Women Caring for the Land groups in both eastern and western Minnesota are facilitated by the Land Stewardship Project. These groups are based on a model developed by the Iowa-based Women, Food and Agriculture Network (WFAN), which was created after it emerged that more than half of all farmland in Iowa is owned by women—most over the age of 65. Like WFAN, Women Caring for the Land groups employ an informal, "learning circle" method of education, support and empowerment for women engaged in agricultural land management—often seen as a "man's world."

Kylene Olson (*second from right*) **led a tour of the Minnewaska Schools prairie area near Glenwood, Minn., during a Women Caring for the Land meeting. The land Minnewaska Schools occupies was once part of Helen Claire Anderson's family farm.** (*Photo by Rebecca White*)

The trend towards women ownership of agricultural land in Minnesota is also on the rise, with the percentage of women farmland owners estimated to rival Iowa's (although exact figures are not known at this time). Coupled with a troubling rise in soil erosion, habitat loss and water quality issues which can be exacerbated by poor farming practices on rented land, it is becoming clear that non-operating landowners, and particularly women, can play a significant role in curbing the degradation of our region's most important resource.

The lengthy introductions process that takes place at the meetings encourages group members to share their connections with the land as well as their needs, values and concerns. The women also participate in pasture walks, field days and other "hands-on" activities as allowed by weather and the physical abilities of those participating. Last summer, Women Caring for the Land participants toured a local USDA service center and met several employees of the Farm Service Agency (FSA), Soil and Water Conservation District (SWCD), and the Natural Resources Conservation Service (NRCS). In the fall, a prairie walk and plant identification field trip was led by Kylene Olson, Director of the Chippewa River Watershed Project. In addition, Susan Stokes of Farmers' Legal Action Group (FLAG) connected with the group via weblink to discuss the basics of conservation leases. The group has also hosted local farmers like Jess Berge, who spoke about soil health and cover crops in his own operation (*see page 25*).

However these women come together, they always find an opportunity to share their stories. For example, Judith Rose, an active participant of the Glenwood area Women Caring for the Land group, lives in Miltona, Minn., but owns farmland on the Pembrina Ridge in North Dakota. The land includes numerous wetlands, a "tree claim" planted under the Timber Culture Act of 1873, and a couple hundred acres of tillable land she rents to a man she baby-sat as a teenager. ("Tree claims" were provided for under the Timber Culture Act of 1873. Under the provision, settlers could claim another quarter section of land provided they planted trees on ¼ of it and maintained them for 10 years.)

When their parents passed away, Rose bought out her siblings, who did not have as strong a connection to their farming roots; she believes that her own "connection to the land is innate—it can be learned, but [I] was born to it." She has a strong relationship with her renter and visits the land three or four times a year to walk the boundaries,

Women, *see page 23…*

…Women, *from page 22*

check on the crops, look for wildlife and maintain the tree claim. She hopes that one day the installation of wind turbines along the ridgeline might fund the "retirement" of her land back to prairie. But for the time being, Rose plans to talk to her renter about including cover crops in his rotation, with the goal of building soil health.

When Helen Claire Anderson inherited her family's farm in Glenwood, much of the original 120 acres had been sold following her father's retirement in the 1970s. Anderson initially placed the remaining land in the Conservation Reserve Program, and when the contract expired, she decided to enroll in the Wetlands Reserve Program. The change entailed removal of scrub trees and planting new grasses and wildflowers. She is delighted with the variety of birds and wildlife that now dwell in the wetland areas and visit her yard. Additionally, Anderson co-owns an 80-acre parcel of tillable land with a cousin, and hopes to engage with their renter about potential conservation measures there. Anderson feels supported in her land management decisions by the members of her Women Caring for the Land group.

"I'm surprised more people don't come," she recently said.

Along with their participation in the Women Caring for the Land group, Bessingpas, Rose and Anderson remain active and engaged in their communities through activities such as quilting classes, the League of Women Voters and the local Garden Club. Their values of stewardship and caring are reflected in positive relationships with their renters, the women's community spirit and an enthusiasm for learning more about how to manage their agricultural assets with both production and conservation in mind. ❒

Rebecca White is a Community Based Food Systems organizer based in western Minnesota. For more information on the Women Caring for the Land group in Glenwood, Minn., contact White at 320-305-9685 or rwhite@landstewardshipproject.org. For information about Women Caring for the Land gatherings in southeastern Minnesota, contact LSP's Caroline van Schaik at 507-523-3366 or caroline@landstewardshipproject.org.

Looking to Transition Your Farm to the Next Generation? Check out the *Farm Transitions Toolkit*

Owners of farmland who are looking to transition their enterprise to the next generation of farmers can now turn to the *Farm Transitions Toolkit*, a comprehensive Land Stewardship Project/Minnesota Institute for Sustainable Agriculture resource. The target audience for the *Toolkit* is those people who want to pass their farm on in a way that supports healthy rural communities, strong local economies and sustainable land stewardship.

The *Toolkit* contains resources, links to services and practical calculation tables to help landowners establish a commonsense plan. It also features user-friendly resources on the economic, legal, governmental, agronomic, ecological and even social issues that must be considered in order to ensure a successful farm transition. It is rounded out with profiles of farmers who are in various stages of transitioning their enterprises to the next generation. For more on the *Toolkit*, see the No. 4, 2013, edition of the *Land Stewardship Letter*.

An online version of the *Toolkit* is at www.landstewardshipproject.org/farmtransitionstoolkit; paper versions can be purchased by calling 800-909-MISA (6472).

Profits from Perennials

To Till or Not to Till

Conservation Tillage in Western Minn.—the Good, the Bad & the Practical

By Robin Moore

In my job with the Chippewa 10% Project in western Minnesota, I get to work with farmers, promoting and supporting practices that will improve this watershed's soil and water quality. One topic that comes up often is no-till farming, which seems like a great solution to a lot of soil and water quality issues. Farmers themselves have said to me, "We need to do a better job of keeping our soil on our fields." No-till farming could be a big step in that direction.

This technique can take many forms, but basically under such a system the residue from the previous year remains on the field during spring planting. No-till planters fitted with narrow disks designed to cut through the litter are used to open the soil just enough to deposit seeds directly into the otherwise undisturbed field. Besides preserving soil, no-till can be a way to cut down on the number of trips a farmer makes across a field, saving expensive fuel.

But it's a hard sell in a region where farmers commonly till fields in the fall to get a jump-start on the following growing season. Farmers face many practical barriers when it comes to adopting and implementing the practice.

I recently asked four farmers in and around the Chippewa River watershed to give me a better perspective on what these barriers are, and what can be done to overcome them. The farmers were: Pat Byrne, who has been no-till and ridge-till farming since the 1970s; Jon Roisen, who employs a combination of conventional and no-till planting; John Ledermann, who started no-till farming in the 1980s and left the practice in the 1990s; and Jess Berge, who just bought a no-till drill for his farm. I asked them what influenced their decisions, what difficulties they have, what advantages they see and what they would recommend to others. They had quite a bit to say for a bunch of quiet Minnesota farmers.

Worth the Extra Trouble

When driving up to Pat Byrne's house for an interview, I could see that the snow around his farm was much whiter than on the rest of the landscape that day, and that all the fields surrounding the neat farm-site had residue poking up from under the snow.

Byrne farms with a combination of no-till and a modified form of conservation tillage called "ridge-till," which consists of creating ridges during the growing season with cultivations that the following year's crop is then planted into. Ridge tilling requires more field time than no-till, but eliminates deep tillage and leaves the field litter undisturbed in the fall. Byrne is quite proud of his system, and wonders why it hasn't become more popular in this area.

Byrne lives in the Mud Creek area and his soils are a mix of heavy and sandy loam, most of which is tiled to drain off excess

No-Till, *see page 24…*

…No-Till, *from page 23*

moisture. He feels that no-tilling is extremely feasible, but less convenient than conventional tillage. By the farmer's account, the practice takes more "fussing," more patience and smaller equipment that is more difficult to operate than larger equipment. These smaller implements are usually older, but also more sensitive to terrain difficulty and often not linked to Global Positioning System (GPS) planting equipment. Many operators, used to big equipment that operates uniformly on most landscapes and with more computer assistance, grow impatient with the slower process.

Sometimes a wet spring will keep Byrne out of a field or from forming ridges. Without the ridges providing an elevated plane to plant on, he will rent his neighbor's chisel plow and do fall or spring tillage to dry out the soil, losing the advantage of ridge-tilling's minimal soil disturbance (however, Byrne said he doesn't resort to that very often).

Ridge-tilling requires the equipment operator to drive the tractor very steady and straight to keep the planter on the ridge, which GPS auto-track would make easier. He says he has good levels of organic matter in his fields and likes leaving cover on the soil. Byrne feels that tiling to drain off wet fields and the Roundup Ready herbicide system are really what make his system feasible. Before Roundup, he had quack grass in his fields and no-till couldn't withstand the pressure from the rhizomatous plant, requiring much more tillage to set back the grass. He thinks that anyone could do no-till and ridge-till with some patience.

Switching to no-till can involve a significant investment in specialty equipment. (*Photo by Robin Moore*)

John Roisen: A Modified System

Jon Roisen, who farms in Lac Qui Parle County, has been using no-till for his soybeans since the 1990s. He has always noticed that when he chisel-plows fields that have been in no-till, the plow "pulls like a knife through butter"—the fields are mellow and have better organic matter. He prefers this method both for erosion control and moisture management. Roisen tries to no-till in fields he knows to be more erodible and prone to water stress. He said that spring plowing can cost an inch of water per pass in a field and prefers to avoid tillage when he can. He doesn't currently no-till corn, although he has tried it by planting the seed into wheat stubble. The farmer found that the soil was too wet and cold under the wheat straw for timely corn germination, and he ran into trouble with mice and grubs going after the seed. Roisen says maybe it would work if he baled the wheat straw, but he feels strongly about leaving that plant material on the field.

Roisen chooses fields according to their fitness for no-till every year, and this year he has modified his planter to be able to accommodate either regular planting or no-till planting with an attachment of no-till coulters and trash whips that he can raise and lower to the ground. This means that he can easily transition between a no-till and a tilled field without going home to change implements. The modification cost about $7,000, which is extremely economical when compared with the price of a new no-till drill. Quality used drills are hard to come by; if you can find one used it's usually already "beaten to death," says Roisen.

Too Much Variability

John Ledermann lives in the glacial till region of the east branch of the Chippewa River. He began farming in the 1980s, started no-till farming in the early 1990s, and by the end of that decade had left the no-till system. Ledermann and his father switched from ridge-tilling to no-tilling with soil conservation in mind, but there were many more advantages. No-till did not require as much precision as ridge tilling, freed up the month of June that one spent cultivating the ridges in the field, and was much easier on equipment—when you have to drive over the ridges to avoid wet spots it's like "driving over piles of rocks," says Ledermann. He noticed that under no-till the organic matter also went up in his fields.

However, this was around the time when Roundup Ready soybeans came onto the market and in using them, Ledermann started to notice a lot of variability in his fields. The best yielding field was always no-till, but so was the worst yielding field. Ledermann couldn't say for sure, but he doesn't believe the soybean genetics were fit for no-till, and after several years of highly

John Ledermann examines a cover crop of tillage radish. He uses such plantings to build nutrients and organic matter, as well as protect the soil from wind and water erosion. (*Photo by Robin Moore*)

variable yields, he started to feel like he needed to change the way he farmed his soybeans. He says that it really wasn't about the money—the no-till system was profitable, but he wasn't happy with the variability of the fields.

"It was sort of an issue of pride," he recalls. "It's a farmer's natural instinct to try and do better, so we went back to something that we knew worked," which was conventional tilling and planting. At this point he also started tiling more acres. Ledermann did retain certain practices of the no-till system, like leaving all of the soybean stubble untouched over winter.

According to Ledermann, no-till farming actually made more sense before Roundup Ready genetics. The no-till system suppressed more weeds by leaving litter on the ground and by reducing soil disturbance, which stimulates weed growth. Weed control used to mean cultivation, which had a very small window to be successful. The weeds have to be small and the ground dry, and the farmer has to have good timing. Because the Roundup Ready system allows the farmer to spray for weeds after the crop is well established, it not only eliminates any need to cultivate but significantly lengthens the window the farmer has available to control weeds.

Ledermann says good used equipment is much more available when one is using a conventional tillage system. In alternative systems like no-till, equipment is expensive and it's difficult to find quality used parts.

No-Till, *see page 25…*

…No-Till, *from page 24*

"It's hard to spend tens of thousands of dollars on a piece of equipment you're not sure about, and no one around you knows anything about," he says, adding that the resale value was unreliable as well.

On the other hand, Ledermann is still disappointed about leaving no-till, and his goal is to get back to that system as soon as he can. He has switched to strip-tilling in the last five years. Strip tilling is the practice of tilling a narrow band—six to eight inches wide and six to eight inches deep—creating a seedbed for the row, while leaving the rest of the field undisturbed. Strip tilling also allows for simultaneous deep application of fertilizer directly into the row, which Ledermann finds more efficient when compared to the broadcasting he used to do with no-till.

Tammy and Jess Berge are integrating no-till into their farm's mix of row crops, small grains, cover crops and livestock. (*Photo by Robin Moore*)

Applying nitrogen in-between the rows of established plants, called side dressing, is also feasible in a no-till system and is generally a more timely and efficient use of fertilizer. However, both Ledermann and Roisen say that unless you own your own equipment, it's hard to get side dressing done in the short weather window available.

For the past two years, Ledermann has been experimenting with cover crops, which he plants in the late summer after he harvests his wheat and leaves over winter undisturbed. He strip-tills into the cover-cropped ground the following spring. The farmer uses the cover crops to build nutrients and organic matter, as well as protect the soil from wind and water erosion.

Adding No-Till to the Mix

Finally, Jess and Tammy Berge are farmers who are ready to commit to integrating no-till into their farm's planting system of soybeans, small grains and cover crops. Jess began with livestock and added row crops in the early 2000s, with his primary focus being forage and feed for his cows and sheep. When I asked Jess why he invested in a no-till drill, the first reason he gave was cost. The row crops take second place to the livestock as a moneymaking enterprise, and Berge doesn't own all of the bigger equipment for cropping, including a combine and deep tillage equipment. When he considered the equipment needed for conventional planting versus no-till, especially with the variety of crops and cover crops he is interested in, it was more economical to go with the no-till drill. That way Berge could skip the plow and the stalk chopper—mainstays of conventional tillage.

For the past several years, he has been hiring the use of his neighbor's no-till drill to plant some of his fields. But lately his neighbor has been too busy doing custom work, and Berge decided that it made sense to have his own drill. He likes the no-till system because it means less time in the field, less equipment and fewer input costs. An initial drop-off in yields is a common problem for farmers who transition from conventional tillage to no-till, but so far Berge has not noticed a yield drag. And although the presence of corn stalks on the soil surface is of concern to farmers who worry about the soil remaining too wet and cold for spring plantings, Berge sees this dead plant material as a way to build organic matter and soil health. These are biological bonuses on top of the economic sense the system makes. The young farmer also thinks the drill will make some custom work available to him.

No Clear-Cut Answer

I have come to realize I had an over-simplified understanding of how no-till farming can be done in this part of western Minnesota. I would love to be able to bite into a clear story about how no-till is the answer to all plowed fields, how no-till works for corn, how it is a no-fail system that will keep soil in the fields. Sustainable agriculture/soil health innovator Gabe Brown has achieved this with many years of dedication and experimentation on his farm in south-central North Dakota. See the No. 3 and 4, 2012, issues of the *Land Stewardship Letter* for more on Brown.

Here in the Chippewa watershed, the farmers I talked to do not have that fix-all solution yet; they all tell me that it's hard, that it doesn't work well with corn, and that the genetics and soil-temperatures make it a challenge. But they are all still committed, all working hard to move in a direction that's good for their farms and the watershed.

All four farmers recognize the need to cover the soil, to build it, to keep the residue on top, to be good stewards, and that, ultimately, no-till does pencil out financially. Most of them express a wish to ultimately move away from the Roundup Ready system, and they see no-till as a way to move in that direction with the weed suppression benefits it provides. I appreciate their honesty and feel more able to talk about no-till with others. I think we need more experimentation, risk mitigation and community support for those who are trying to implement innovative systems like this.

We also need more voices—tell us your experience with no-till in Minnesota, what you've learned and ideas you might have to share. Contact me at 320-269-2105 or rmoore@landstewardshipproject.org. ❐

Robin Moore is the coordinator of the Chippewa 10% Project, a joint effort of the Land Stewardship Project and the Chippewa River Watershed Project. The 10% Project is working to help farmers develop watershed friendly farming systems that are economically viable. More information is at www.landstewardshipproject.org under the **Stewardship & Food** *section.*

Profits from Perennials

Community Conservation

Good Fences Make Good Neighbors, but Sometimes so do Open Gates

By Brian DeVore

2nd of 2 articles

It's that age-old struggle: accepting a little short-term disturbance in the name of long-term stability. Dave Trauba regularly faces the challenge of explaining that tradeoff to hunters who visit the Lac Qui Parle Wildlife Refuge in western Minnesota only to find their favorite spot for shooting pheasants has recently been grazed by cattle from a neighboring farm. Why, they ask sometimes with more than a little anger and frustration, are domestic livestock being allowed to wander around in a place supposedly reserved for wild animals?

"We try to explain to them the big picture, but…," says Trauba, his voice trailing off. Trauba, the manager of the Minnesota Department of Natural Resources (DNR) refuge, knows that the big picture is this: the soil and vegetation on wildlife refuges and other natural areas require regular, sometimes violent, disruption to remain healthy and resilient. That has become evident to natural resource managers in places like western Minnesota as they watch grasslands deteriorate under a ragged blanket of invasive species like red cedar and buckthorn.

In the past, these grasslands were kept healthy thanks to bison and wildfires. Now, innovations in managed rotational grazing make it possible to expose natural habitat to short-term impact followed by long rest periods—just the kind of disturbance it requires to be healthy. The DNR, U.S. Fish and Wildlife Service and even private groups like the Nature Conservancy are inviting domesticated hooves—mostly cattle, some sheep and goats—onto lands to help manage them. In recent years, conservation grazing has proven it can not only bring back threatened habitat like grasslands, but keep it resilient into the future (*see "Grazing as a Public Good," No. 1, 2014,* Land Stewardship Letter).

Minnesota natural resource professionals have ambitious plans for conservation grazing. The DNR is working with farmers to use conservation grazing on around 10,000 acres of its 1.4 million-acre Wildlife Management Area system, for example. The DNR's goal is to use the tool on 50,000 acres by 2015. But numerous obstacles must be overcome before conservation grazing becomes a consistent tool on natural ares. For one thing, many refuges lack the basic infrastructure needed to host livestock (*see sidebar below*).

But perhaps an even bigger challenge is changing the conventional wisdom that livestock and natural areas do not mix. Much of this perception is based on the reality of what's occurred in Western states, where livestock producers have been given almost unfettered, long-term access to public areas, causing major ecological harm in some cases. As a result, mention "public grazing" in any other part of the country, and the typical reaction is decidedly negative.

"Sportsmen beware of this latest craze in grazing on public lands," wrote Renville County (Minn.) Soil and Water Conservation District technician Tom Kalahar in a commentary for *Outdoor News*. "If we go down that path, be ready for fences, cows, and less grass."

Wildlife professionals say privately that agencies like the DNR have been experiencing significant internal and external push back on proposals to increase the use of conservation grazing. That's why Minnesota conservationists are using public tours, articles and other forms of educational outreach to explain the difference between using well-managed rotational grazing systems to manage habitat on a limited basis and simply letting livestock run amuck on the taxpayer's real estate. There has also been an emphasis on working closely with livestock producers and refuge managers to develop grazing plans that put the health of the resource front and center.

"The worst thing we can do is have people use this management system without proper training," says J.B. Bright, a Fish and Wildlife Service specialist who works with graziers in western Minnesota.

The way Dan Jenniges sees it, the best way to get the non-agricultural public on board with conservation grazing is to find a common goal that farmers, wildlife professionals, environmentalists and hunters can agree on. In this case, that means a mutual desire for a healthy grass system.

Jenniges, who has a pasture-based livestock operation in west-central Minnesota, has watched over the years as grasslands in his area get plowed up for crops or are closed off to livestock by conservation

Community Conservation, *see page 27…*

Give it a Listen

Episode 151 of the Land Stewardship Project's *Ear to the Ground* podcast features wildlife and grazing experts talking about the benefits and challenges involved with using grazing to improve natural areas: www.landstewardshipproject.org/posts/podcast.

Grazing Natural Areas: Not Business as Usual

Refuges and other natural areas may have plenty of cheap forage available for grazing, but make no mistake, it's not like having livestock browse pastures on the home place.

"When you're on the Fish and Wildlife land, it's a little more of an inconvenience," says Jim Wulf, a beef cattle producer who grazes U.S. Fish and Wildlife Service land near his operation in west-central Minnesota. "You have to have some flexibility. You can't just do it by the book."

Livestock producers who graze refuges face issues such as lack of fencing and good water supplies, having to transport livestock to get access to an area and difficulties in checking on animals regularly. They also have to be mindful that the health of the resource trumps the farmer's desire to get access to low-cost feed.

Livestock producers pay a fee to graze wildlife refuges and natural areas, but in some cases refuge managers work out deals where farmers receive a discount for putting in fencing and other infrastructure. Acre-for-acre swaps have also been done where a livestock producer rests home pastures that contain valuable native species and in turn can graze public lands. "We can do all sorts of deductions to make it worthwhile," says Bruce Freshke, manager of the Fish and Wildlife Service's Morris Wetland District in Minnesota.

To support grazing infrastructure on public lands, in 2013 the Minnesota Legislature allocated $600,000 of Environment and Natural Resources Trust Fund money for fencing. That's a big help, but doesn't address one of the biggest bugaboos conservationists face when utilizing domestic animals to manage habitat: the loss of local farms that raise livestock.

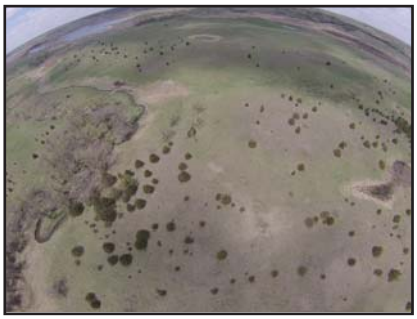
"We have a lot of land we'd love to graze, but there's no cattle, or people don't want to haul them an hour away," says Freshke.

…Community Conservation, *from page 26*

agencies, environmental groups and private landowners who want more wildlife habitat. The result has been less perennial forage, and what remains is being threatened by invasive species on idled land. Meanwhile, livestock producers hoping to graze are forced to put too many animals on too few acres, or get out of the business altogether.

"No matter what they want grass for, nobody's getting it with the way the land is being managed today,"says Jenniges, who grazes cattle and sheep on DNR and U.S. Fish and Wildlife Service land. "Without livestock, there is no reason for a community to have grass."

Bruce Freshke, manager of the Fish and Wildlife Service's Morris Wetland District in Minnesota, agrees. "You see people who change their farming, and if they don't have cattle, the grass is just a waste," he says.



These photos, taken with an aerial drone, show the before (*left*) and after (*right*) effects of cedar tree removal this year on grassland near Simon Lake. The left photo was taken in mid-May and the right photo in late June. Fencing is being erected this summer to prepare it for grazing. (*Photos by Andy Marcum*)

A Team Approach

That's why some years ago Jenniges started talking about an initiative that would help bring together as a community all those individuals and groups who want more grass on the landscape.

Such a system would not only expand the benefits of conservation grazing beyond refuge boundaries, but would make private, non-farming landowners a part of this team effort. Steve Chaplin, senior conservation scientist with the Nature Conservancy's Minnesota field office, calls such a concept "coordinated landscape management"—it's a way to prevent the creation of islands of habitat that are overwhelmed by bad land use throughout the rest of the region

"By having a mixture of private and public lands managed well, we can have a wider landscape level impact," says Chaplin. "We need to talk about the overall landscape and not just a particular plot of ground."

Such a community approach to conservation is the focus of the "Simon Lake Challenge," an initiative launched by the Land Stewardship Project in west-central Minnesota last year. In the vicinity of Simon Lake, which lies mostly in Pope County, is a gently rolling landscape dotted with farms, a mix of DNR and Fish and Wildlife Service land, and property that has been bought up by non-farmers looking to use it for hunting or other recreational purposes.

Unfortunately, much of that land—public and private—is getting overgrown with invasive plants, says Andy Marcum, who does landowner outreach for the Chippewa 10% Project, a joint initiative of LSP and the Chippewa River Watershed Project.

During community meetings in the winter of 2012-2013, it became clear that, despite some differences of opinion, many Simon Lake landowners, farmers and non-farmers alike, share one goal: bring back healthy grasslands and other perennial plant systems. In that light, many landowners are starting to see the value of teaming up to battle a denizen that doesn't respect even the stoutest fence: invasive species.

"Landowners were finding it didn't do any good to control invasives if your neighbors didn't, so they wanted to work communally, across property lines," says Marcum. "You can't spray, mow or chainsaw enough to control these plants, so they are willing to try anything, including livestock, even if they were anti-grazing before."

During 2014, LSP is working with seven landowners representing 1,500 acres in the Simon Lake area—another five landowners are working with the project through the Working Lands Initiative of the Glacial Lakes Prairie Implementation Team. The Nature Conservancy is renting to the participating property owners a skid steer loader with a rugged carbide cutter so they can remove cedar and sumac. Marcum and Chippewa 10% Project coordinator Robin Moore are then meeting with the landowners to set up five-year management plans. These plans will cover getting rid of the invasives as well as setting up, among other things, rotational grazing systems that can keep the plant pests at bay while improving grassland habitat.

Marcum is using an aerial drone to take before and after photos (*see above*) of the impacts of invasives removal.

"It's a huge difference," he says.

Cattle herds owned by four different producers are already this summer being used to control invasives on land in the area. The ultimate goal is to combine many smaller herds that could be moved across public and private property lines in long-term rotations, providing the right mix of large-scale impact and rest natural habitat requires while giving livestock producers flexibility. In the next year or two, around 6,000 acres of public and private land will be included in the Simon Lake demonstration area, but there is the long-term potential for as much as 50,000 acres in the region to be managed this way.

"The focus of this is to create a community-based approach to conservation," says Marcum. "We want to make sure this is completely run by the landowners."

Jenniges, who farms in the Simon Lake area, sees an opportunity where farmers and non-farmers could be a part of a common marketing cooperative in which they own a percentage of the livestock being used to manage the landscape. Such a cooperative would not only help bring together the large numbers of animals needed to manage a large expanse of land, but could provide natural, grass-fed meat and other products to consumers who want to know their food choices support healthy habitat. Through such an effort, a whole new group of people could be drafted into a community effort to create more resiliency: conscientious eaters.

Jenniges says this could have a trickle-down effect. More cattle being marketed directly, for example, means a local locker plant stays busy processing meat, creating economic activity year-round.

"That kind of activity starts to add up," says the farmer. "Somebody coming hunting for a few months in the fall isn't going to do it. It's not going to support schools, churches and businesses the rest of the year." ❐

LSP & Perennial Landscapes

The Land Stewardship Project is working in western Minnesota to promote diversified farming systems that build soil health, are economically viable and improve the environment. This work is centered around the Chippewa 10% Project, a partnership of LSP and the Chippewa River Watershed Project. The Simon Lake Challenge is one aspect of this work.

For details, see the **Chippewa 10%** page at www.landstewardshipproject.org. More information is also available by contacting Robin Moore at 320-269-2105 (rmoore@landstewardshipproject.org) or Andy Marcum at 320-634-5327 (andym@landstewardshipproject.org).

The Land Stewardship Letter

Keeping the Land & People Together

LAND STEWARDSHIP PROJECT

These articles were originally published in the *Land Stewardship Letter*—No. 3 & 4, 2012

Soil Health, Profits & Resiliency

Feeding the subterranean herd

How putting soil at the center could help revitalize farmland...& farming

By Brian DeVore

On a crisp morning in September, North Dakota farmer Gabe Brown held two handfuls of soil and searched for signs of life—theoretically not a difficult task considering one teaspoon of humus contains more organisms than there are humans in the world. But many of the bacteria and invertebrates that lurk in the dark basement of our farm fields exist visually only in the world of high-powered microscopes. So Brown, a compact ball of energy who can somehow combine references to soil biology, farm policy and animal husbandry in the same sentence, uses a less scientific assessment method to compare and contrast the two handfuls—one from his field, the other from a neighbor's.

1st of 2 parts

"When you grab this soil there is no structure," says Brown, referring to his neighbor's soil. Indeed, it has a slabbed, compacted look to it, indicating there isn't much room for worms and roots to facilitate transfer of water and nutrients. It's also a lighter color than Brown's darker soil, which is the consistency of cottage cheese. "If you have this dark color, you know you have organic matter. I look at it as an investment."

It's an investment in a good crop—just a few feet away stands a field of corn that's emerged from Brown's rich soil, and it's thriving, a rarity this year in a part of North Dakota that has been hit especially hard by drought. But to Brown, that healthy soil represents more than more bushels in the bin. It's also an investment in his farm's long-term viability and the future of his entire community—human and natural.

The idea that healthy soil is an investment, not just one of many tools, has led Brown and his neighbors to develop a farming system that combines some of the most exciting advances in sustainable production systems—conservation tillage, multi-species cover cropping, mob grazing and frequent rotations. This system, which is evolving, combines cutting-edge soil science with the desire on the part of natural resource professionals to no longer accept a Band Aid approach to conservation. It also shows how teamwork fueled by a holistic, big picture view of agriculture can produce a farming system that benefits land, farmers and communities.

"What Brown and the others he is working with are doing is one of the most exciting and revolutionary in-the-field developments in agriculture today," says Richard Ness, a Land Stewardship Project staff member who has worked with sustainable farmers throughout the Midwest and who has spent time in south-

Subterranean, *see page 2…*

Farmers in Burleigh County studied the soil profile in a corn field during a recent field tour. Farmers, conservationists and scientists working in that region believe soil's potential to develop its own fertility has yet to be fully tapped. *(LSP photo)*

…Subterranean, *from page 1*

central North Dakota, where Brown farms. "They're pushing scientists, conservationists and sustainable agriculture in general to a new level."

Getting at the root of the matter

At the core of this story is a change in attitude toward soil—perhaps one of the most taken-for-granted resources around. Consider, for example, how Jay Fuhrer used to do his job. Fuhrer is the Burleigh County district conservationist for the USDA's Natural Resources Conservation Service (NRCS). Burleigh County lies near the section of the Missouri River where it passes through the south-central part of North Dakota. Here the flatness of the state gives way to a more rolling landscape—a landscape known for wheat, "wild" pastures that contain native species such as big bluestem, hay ground and, in the past decade or so, corn. This part of the state receives on-average 16 inches of rain a year, making water a dear resource. So for many years Fuhrer and other resource professionals focused on short-term efforts to get more water into the soil profile and keep it where plants could use it.

"We had accepted a degraded resource," Fuhrer recalls as he sits in his office in Bismarck, just a few miles from Brown's farm. "And when you accept a degraded resource you generally work from the viewpoint of minimizing the loss. And so we would apply a lot of practices."

Fuhrer's specialty during the 1980s and early 1990s was putting in grassed waterways in an attempt to keep water from running off so quickly. It helped, but didn't get at the core of the issue: why was that water not infiltrating the soil in the first place?

"In retrospect very few of those waterways were actually needed," he concedes.

What farmers like Brown and soil scientists in the area were starting to figure out was that the production system that had come to predominate—extensive tillage, low crop diversity, no cover crops, livestock kept out all-season long on overgrazed pastures—was compacting the soil to the point where little water could make its way beneath the surface. It was also sharply reducing the amount of soil organic matter, which drives the entire soil food web. Unbroken prairie soils can have as much as 10 percent to 15 percent organic matter. But because of intensive tillage, Midwestern soil organic matter levels have plummeted to below 1 percent of total soil volume in some cases. This means the soil has little opportunity to cook up its own fertility via the exchange of nutrients, making it increasingly dependent on applications of petroleum-based fertilizers.

Learning from failure

There is a photo that has acquired almost legendary status in Burleigh County. It shows one of Gabe Brown's fields after 13 inches of rain fell in 24 hours. The picture shows no standing water on this low-lying field, even though plots on neighboring land are inundated. Brown has created a soil profile that allows water to infiltrate quite efficiently. And unlike a field that's been drained through artificial tiling—sending water at rocket speed through the profile and eventually downstream—Brown's fields retain that moisture in the system, meaning plants can access it during drier periods. Such a healthy water cycle requires a healthy biological food web.

Soil conservationist Jay Fuhrer: "We had accepted a degraded resource." *(LSP photo)*

Kristine Nichols, a soil microbiologist at the USDA's Northern Great Plains Research Laboratory in Mandan, N. Dak., says this photo is a prime indicator that farmers like Brown are able to increase their organic matter to the point where it is able to, for example, make better use of water. As soil organic matter increases from 1 percent to 3 percent, soil's water holding capacity doubles. During the past decade or so, Brown has more than doubled the organic matter in some of his fields, raising it from less than 2 percent to nearly 5 percent.

Nichols says that as a soil scientist she was taught that a farmer couldn't have a positive impact on soil organic matter in a typical lifetime.

"We were told this was something we couldn't change, except in a negative way. Now we realize we can change organic matter," she says while sitting in her office across the Missouri River from Bismarck. That's important, Nichols adds, because in the case of organic matter, "You have something that's less than 5 percent of the soil, but it controls 90 percent of the functions."

Brown came to his own realization that he could have a positive impact on organic matter somewhat by accident. He and his wife Shelly bought their farm from her parents in 1991, and in 1994 they went 100 percent no-till as a way to save moisture in their cropping system, which produced mostly small grains like wheat. Brown liked the no-till system, but bad weather produced a string of crop failures during the late 1990s.

It made things extremely difficult financially, to the point where the Browns were having a hard time borrowing enough money to purchase fertilizer. This forced them to start planting more legumes such as field peas, triticale and hairy vetch that could fix nitrogen and provide more homegrown fertility while feeding their cattle herd.

"I was using cover crops but I didn't really grasp soil health," recalls Brown. What he did grasp was that his wheat often did better when planted into ground that had just produced a cover crop. His soil color and texture was improving, organic matter levels were rising and water seemed to infiltrate the soil profile, rather than simply running off.

"So we had four crop failures in a row, and I tell people today that was absolutely the best thing that could have happened to me and my family, although we didn't think that at the time," Brown says with a laugh as he guides his pickup past beef cattle grazing a cocktail mix of warm season cover crops.

Fuhrer and other soil conservation experts in the region were impressed with Brown's results and began talking about ways of combining cover cropping, livestock impact and no-till agriculture in a way that soil quality could actually be improved, not just maintained at a high enough level to grow a stand of wheat. For Fuhrer, taking such proactive steps couldn't have come at a better time—he had grown frustrated with applying practices that simply maintained the status quo, if that.

Diversity is strength

Frankly, cover crops are nothing new. The NRCS has long promoted planting a soil-friendly crop like rye in the fall after corn or soybeans are harvested as a way to reduce erosion. Such cover crops are often seen as having no immediate economic

Subterranean, *see page 3…*

…Subterranean, *from page 2*

value, making them a tough sell in row crop country.

But in Burleigh County, the cover cropping concept has been taken to whole new level, and farmers have begun to see them as an integral part of their long-term financial viability, as well as the land's ecological health. Again, this breakthrough on cover crops came at failure's doorstep.

In 2006 Fuhrer was examining eight different species of cover crops planted on test plots. In one plot each species had been planted as a monoculture, and the other plots contained various combinations: two-way mix, three-way, etc., all the way up to where all eight species were planted together.

"And then we had one of the driest years on record," recalls Fuhrer. "And then I just thought, oh, everything's failed and we're just not going to learn anything this year. And I was so wrong."

What Fuhrer and his colleagues learned was that the monocultures failed, and the mixes involving just a few species didn't fare much better. But the eight-way mixture didn't seem drought stressed at all, and in fact yielded quite well.

"It really taught us a lot from the viewpoint of how plants won't necessarily compete with each other—they can actually help each other," says Fuhrer.

Long-term studies done in Minnesota, among other places, show that increasing diversity in prairie systems produces a similar positive synergy, making them much more resilient. Fuhrer and his colleagues started thinking that maybe it was a lack of carbon below the soil that was the problem. The difference between soil and dirt is soil produces life, and it can do that because it contains carbon. And socking away that carbon for a rainy day (or a very dry one) pays big dividends.

Those eight species of plants growing above ground may appear to be in competition, but all the while they are creating an incredibly diverse subterranean ecosystem. Soil scientists say a diverse root system can create a soil that is resilient, less erosion prone and able to develop its own fertility.

"We figured out we wanted to stimulate soil biology through nutrient cycling and through roots," says Brown. "Well, let's have something really diverse and try it."

These days most of Brown's cover crop mixes contain as many as 20 species. The goal is to keep the soil covered and spider-webbed with roots year-round, and to extend the subsoil's active biological season as long as possible—the greater variety of species above ground, the greater diversity of species below ground. In a typical year, Brown will do this by planting four crop types: warm season broadleafs such as alfalfa, buckwheat, chick pea, cowpea and sunflower; warm season grasses such as corn, millet, sorghum and Sudan; cool season grasses such as barley, oats and triticale; and cool season broadleafs such as canola, flax, vetch and sweet clover.

A growing season may consist of Brown planting winter wheat, harvesting it in June or July and planting a cocktail mix of warm season crops. Once they've grown up by late summer, these crops can be grazed well into the fall and even into early winter, producing good cash flow through the animals. The manure and urine deposited by the cattle, plus the trampling they execute while browsing, builds nutrients and carbon in the soil while supercharging biological activity, providing the basis for planting another cash crop like corn the following spring.

What must be kept in mind is that this isn't strictly a no-till system, or strictly a grazing system. No-till—planting crops in ground that's been disturbed as little as possible—is better for the soil than heavy tillage, but it doesn't take full advantage of the nutrients and biological activity present deep in the soil profile, says Brown. He points out that the neighbor's soil that's lower in organic matter than his has actually been under a no-till regime since the late 1990s.

And grazing perennial grasses, again a more soil-friendly system when compared to tillage, isn't the final word. Hal Weiser, a soil health specialist with the North Dakota NRCS, estimates that some of the season-long grazed land in the area has water infiltration rates of only a quarter inch. "Which is simply unacceptable," he says.

Several years ago farmers in the region began switching from simply turning cattle out into large pastures for the entire season, to breaking them up into rotated paddocks. This provided extended rest periods for grass, and pastures responded with healthier stands that provided forage longer.

But more recently livestock producers have taken that rotational grazing concept one step further by utilizing mob grazing—a system where a lot of animals are placed in a paddock for sometimes only a few hours. The animals browse the most palatable part of the plants and generate a lot of biological activity, but don't compact the soil. This system comes with the assumption that the cattle won't make the most efficient use of all the forage—in fact they may trample a good amount of it, which is not only acceptable, but may be preferable in some cases. All that trampling just puts carbon underground and generates biological activity, in effect feeding the soil.

Making soil the focus

Nichols says the key to this system is accepting that soil is at the center of one's farming system—not just another input that can be plugged in. That "dirt" is much more complex than we once thought is becoming increasingly evident as new advances in electron microscopes (thanks to medical technology) and DNA testing offer unprecedented glimpses into this fascinating world. But Nichols points out that in a way soil is a "big black box" that's just becoming "blacker" as science churns up new information about what goes on beneath our feet.

"The chemistry happens the way the chemistry happens. But when you throw biology into the mix, it gets complicated," she says while flashing microscopic images of soil organisms on her computer. "In some ways it's a step backwards—we thought we knew 10 percent of the organisms in soil, now we realize it's less than 1 percent."

But that may not necessarily be a bad thing. It's when farmers begin seeing soil as the heart of an extremely complex, oftentimes mysterious, system that they can start taking steps to get at the problem, rather than just treating the symptoms.

Nichols, who grew up on a southwest Minnesota crop farm, says a prime example of treating symptoms without getting at the core of the problem is what's happening in the Minnesota River Valley with erosion. There are indications that field-level erosion in the Valley has gone down, thanks to the adoption of conservation farming techniques, among other things. However, studies show that sedimentation of the river continues at an alarming rate.

"What is going on with the soil now where we can't get the infiltration of water?" Nichols asks. "We addressed some of the symptoms, which was great, but did we address the bottom line?"

An example of the bottom line being addressed is when microorganisms do something called "habitat engineering," which has huge implications for not only cutting erosion, but also making sure soil can cook up its own fertility while staying in place. When soil does not have good aeration and plenty of pore space, it loses its ability to stick together and form strong aggregates.

"The water coming in can actually cause these aggregates to explode with air pressure," says Nichols of a typical soil erosion situation in compacted soils.

But soils with more carbon feed themselves, and extra "food" goes into developing a waxy glue that holds aggregates together, creating a habitat where water can't build up explosive pressure.

Subterranean, *see page 4…*

…Subterranean, *from page 3*

"They've actually engineered an environment that's safe, that has food and has the ability to produce carbon to self-perpetuate," she says. "The more of these aggregates there are, and the larger they are, the less susceptible to erosion the soil is. We've found management can impact this."

Investing in the soil bank

Being able to improve soil's ability to engineer its own healthy environment has huge implications on and off the farm.

Soil provides at least $1.5 trillion in services worldwide annually, according to the journal *Nature*. For example, soil stockpiles 1,500 gigatonnes of carbon, more than the Earth's atmosphere and all the plants on the planet. And it's the organic matter that does the heavy lifting: it can hold 10 to 1,000 times more water and nutrients than the same amount of soil minerals.

In recent decades, great strides have been made in reducing soil erosion to "T", or "tolerable" loss rates—that's the rate at which soil can be lost and still replaced. This is thanks to conservation tillage and structures such as grassed waterways and terraces.

But it's become clear even bigger strides in conservation could be made by increasing soil carbon content, or managing for "C." One NRCS estimate is that if all of our country's cropland was managed for T, soil erosion would decline by 0.85 billion tons annually. If cropland was managed in such a way that C was increased, erosion levels would drop by 1.29 billion tons per year. In financial terms, managing for T is worth $16.5 billion annually; managing for C almost $25 billion per year.

But the health of soil on an international or even national level means little unless those dollars can come home to roost on the farm.

Brown says in his case, they already have. He farms around 5,400 acres—1,300 of that is cropland and most of the rest is pasture. The Browns own about 1,400 acres and rent the rest, so maintaining a regular cash flow is important. The main cash crops are corn, spring wheat, triticale and vetch. They run 400 cow-calf pairs and anywhere from 300 to 800 yearlings, depending on the year

Increasing organic matter on his farm has allowed Brown to reduce the use of commercial fertilizer by over 90 percent, and herbicides by 75 percent, and that's paying off big time. Sitting on a four-wheeler near one of his corn fields, Brown shows a printout that outlines the financials for his 2011 crop. At today's fertilizer prices, each 1 percent of organic matter contains $751 worth of nitrogen, phosphorous, potassium, sulfur and carbon, he estimates. That means Brown's 5 percent organic matter content is worth $3,775 per acre. When he figures in his expenses for the 2011 corn crop—seed, herbicide, planting, storage, etc.—his 2011 return to labor, management and land was

Gabe Brown standing in a field containing a 20-species cocktail mix of cover crops. Much of it will serve as fodder for his cattle, but a significant amount will also feed organisms in the soil. *(LSP photo)*

$5.38 per bushel of corn.

Still, cover crops and grazing aren't attractive to producers farming high-priced land and gunning for bin-busting yields.

"There's such an emphasis on yield and unfortunately with a lot of these systems, there is not an increase in yield," says Nichols of soil building farming techniques. "But if you can afford to buy an input, then you can afford the cover crop seed or the yield drag. You have to look at your goals: yield or long-term viability?"

Brown says he sees planting cover crops and letting cattle graze/trample them as no different than forward-pricing his fertilizer. But he concedes that in these days of record corn prices, planting a cocktail mix of forages, many of which will end up as worm food, may appear financially foolish.

"And now we're going to mob graze this with cow-calf pairs probably starting next week," he says while standing in a former Conservation Reserve Program field he is renting. It was planted to some 20 species of warm season plants on July 20; on this day in early September, the crop is up to his chest. "I've got to pay cropland rate on it but I'm going to seed it back to native grasses next year. Everybody thinks I'm crazy seeding good cropland back to native grass but that's what we want to do. To us, the resource comes first. The cattle can still gain on this and we're still making money."

Given the great strides he and other farmers have made in building soil health while improving profitability, Brown is a little perplexed that more producers aren't focusing on treating the problem, rather than the symptoms. Some of the hesitation may be the result of the "inputs in-results out" model of agriculture that predominates.

Invariably, when Nichols talks to farmers about how fungi can improve soil quality, someone will ask, "Where can I buy them?"

"We are in the mindset that we can always go out and buy something to fix a problem, which may not be a problem, but a symptom," says Nichols.

Brown says government programs like federal crop insurance don't help matters any, since in many ways they reward farmers for raising crops in a way that is risky, but not sustainable. Remember: he credits failure for pulling his operation out of its monocultural rut.

"Adversity drives change," he says.

Without that adversity, farmers aren't forced to take a closer look at whether their system is just a series of reactions to symptoms, or whether it's getting at the root of the problem. And without such a reexamination of systems, the true potential of soil, land and farms may never be reached.

"Gabe did something I thought was impossible and instead of telling him, 'Good job,' I said, 'What more can you do?' " Nichols says. "I don't know how far we can take it, but I like the idea of not putting limitations or constraints on a system. Can we take it a little further?" ❐

The next issue of the Land Stewardship Letter (see page 5) *will describe how Burleigh County's team approach and use of Holistic Management has helped farmers build soil health, increase profitability and create more opportunities for young farmers.*

Teaming with microbes

It's not just about the bugs beneath the surface—it's also the people above

EDITOR's NOTE: The No. 3, 2012, edition of the *Land Stewardship Letter* described innovative work being done in Burleigh County, N. Dak., to create farming systems that integrate soil health with environmental and economic sustainability. In this issue, we look at how a team effort involving farmers, conservationists and scientists is helping perfect those systems while pushing the envelope further.

2nd of 2 parts

By Brian DeVore

Talking about the importance of feeding soil microbes is fine. Speaking with your feet is even better.

"Take a closer look—anything you tramp down is just carbon in the soil," quips soil conservationist Jay Fuhrer on a Friday afternoon in early September. As he says this, he's beckoning some 120 farmers and others to follow him into an impressively diverse, chest-high stand of warm season plants: cowpea, soybean, sorghum sudan, pearl millet, graza radish, rape and sunflower.

This was the first stop on the Soil Health Tour, an event that brings farmers, scientists, students and conservationists from across the Midwest to south-central North Dakota's Burleigh County at the end of each summer. As the name of the tour implies, they come to see thriving soil, and the land does not disappoint on this particular day. Spadefuls of fragrant humus are unearthed, the results of impressive biological and chemical tests are shared, and crop fields and pastures thriving on that soil are put on display. At one stop at a cornfield, a large jar of water sits next to a six-foot deep soil profile trench. Suspended at the top of the jar in a wire cage is a fist-sized clump of soil that came from the cornfield. Even though it's been immersed in the water as part of this "slaking" test for several hours, the clump is intact and the water remains free of dissolved sediment—a sign that the soil's quality is so high that it's able to engineer its own stability. All of this points to a clear-cut conclusion: the farms on this tour are home to some mighty healthy soil.

What makes this tour special is how this soil got this way. A combination of cover crops, livestock grazing and no-till planting techniques has created soil that not only cooks up its own fertility, but naturally resists erosion and makes better use of available moisture. This means healthy crops and grasses even in an area with a short growing season and an average annual precipitation level of just 16 inches.

What this tour showcases is a farming system that puts soil health at the center. Such a system works with the soil's natural ability to maintain a healthy balance, rather than just treating the symptoms of degraded quality with an ever-revolving array of petroleum-based fertilizers and chemicals.

And by the last stop of the day, it's clear that putting soil at the center of farming is about more than which combination of methods will create the healthiest humus—it's also about blending the ideas and goals of farmers, natural resource professionals and scientists who are breaking new ground in sustainable agriculture. The farming innovations being generated by this group are noteworthy, but just as exciting is the team effort that's arisen in Burleigh County. New farming techniques come and go, but Burleigh County's Soil Health Team is a model for creating the kind of environment needed to ensure the roots for creating innovations in the future will always be deep and thriving.

A team effort

To understand why this team effort is so important, one needs to consider Gabe Brown, a Burleigh County farmer whose success with building soil health has been so significant that one would be forgiven for thinking he's an anomaly.

During the past decade or so on his 5,400 acres, Brown has put in place an innovative system for building soil health utilizing extremely diverse mixes of cover crops—as many as 20 species at times—no-till cropping, and a type of rotational grazing, called mob grazing, where cattle are put in pasture paddocks for short bursts of intense feeding.

Brown has more than doubled the organic matter in some of his fields, raising it from less than 2 percent to nearly 5 percent. He has also improved the health of his water cycle, meaning water infiltrates the soil profile instead of running off the surface.

And it's paying off financially. Brown's use of commercial fertilizer has dropped by over 90 percent, and herbicide use by 75 percent. At today's fertilizer prices, each 1 percent of organic matter contains $751 worth of nitrogen, phosphorous, potassium, sulfur and carbon, Brown estimates. That's the main reason his 2011 return to labor, management and land was an impressive $5.38 per bushel of corn.

Brown has arrived at his current system through a combination of trial and error and consulting with scientists and experts like Fuhrer. He's not afraid to get ideas from people far from Burleigh County who are working on soil health. Brown recalls with excitement when he and Fuhrer were both at a conference and saw a presentation about intense cover cropping systems given by a Brazilian scientist.

"I turned to Jay and said, 'That's the next step,' " Brown says.

Walking Gabe Brown's farm or viewing one of his PowerPoint presentations on soil health and profitability can generate a lot of excitement about the potential for linking long-term financial sustainability and soil health. But Brown knows it means little in the bigger picture if farms like his are seen as isolated examples.

"There are people all over doing this. They just don't have the mouth I have," he says with a laugh while giving a tour of his crop fields and pastures. "Now most of my cover crops are close to 20 mixes. I wouldn't recommend a real diverse mix right off the bat—it can be overwhelming. The longer I'm in this, the more questions I have."

That's why Burleigh County is focusing on helping show soil-minded farmers they are not alone in questioning agriculture's conventional wisdom that the land is just a plant stand for the next crop.

New thinking

"Soil biology is like us—it has to eat," says Fuhrer as he churns up a spadeful of North Dakota earth and holds it up for the participants in the September tour to see. And one way to feed it is to allow cover crops to be stamped into the soil while cattle are feeding on them, or while participants in a field tour are taking a closer look.

That plants can serve an important role as food for microbes and aren't only useful if they can be harvested by machines or animals is just one of the counter-intuitive messages emphasized by the Burleigh County Soil Health Team. There are other head-scratchers: planting corn may not always be the best bet financially and agro-

Teaming, *see page 6…*

…Teaming, *from page 5*

nomically; cattle don't need to spend a long time in grazing paddocks; you don't need as much moisture as you once thought to raise a decent crop; no-till cropping systems alone don't save soil; fields with more varieties of plants, not less, are more resilient in the face of drought.

Fuhrer says he identifies with farmers and others who may have to change their worldview to comprehend a farming system that puts soil health at the center. Fuhrer is the district conservationist for the Natural Resources Conservation Service (NRCS) in Burleigh County, and by the 1990s it was becoming clear to him and some farmers that conventional conservation "fixes" weren't the ultimate answer to saving soil.

compacted fields, and the quality of crops and grasses being grown kept deteriorating.

What was needed was a way to test out new approaches to building soil health while spreading that information among farmers as quickly and effectively as possible.

One way the District does that is through experiments at Menoken Farm, a 150-acre educational site started in 2009. Replicated trials on cropping and grazing practices that build soil health are done at Menoken and the District shares the results through field days, workshops and a website (www.bcscd.com). It was this kind of research, for example, that helped show that diverse cover-cropping mixes were more drought tolerant than monocrops because of all the biological diversity created below ground.

But Fuhrer and others know that farmers need to see these practices put into action on real working farms, ones that share the same soil type, geography, weather and even economic conditions. So a few years ago the District promoted "25-acre grants" for seed. The farmers used the grants to establish cover crops, which are generally plantings of low-value species such as small grains. In general, these plantings protect the soil between the growing seasons for more high-value crops like corn. In return for receiving the free seed, the farmers would serve as one of the stops on the annual Soil Health Tour. Those 25-acre test plots were popular, with the District overseeing 30 to 40 a year from 2006 to 2008. With the price of cover crop seed being between $30 to $35 an acre, it was a bargain in terms of the harvest of real-world results it produced.

"So part of the bargain was a willingness to speak at the tour stop—what worked, maybe what didn't work, their observations," says Fuhrer while going over test plot results in his Bismarck office. "And then at the same time it gave people like myself the opportunity to take a look at those soils, maybe do a slake and infiltration test on them. It allowed us to kind of ride along and monitor that and really kind of look at the benefits."

That created a whole lot of on-the-ground results with a relatively small financial risk on the part of the farmer. It also developed an environment where farmers were comfortable sharing their experiences—both good and bad.

A combination of results from the Menoken Farm and the fields planted using the 25-acre grants showed that cover cropping could build soil health year-round, not just during the spring and fall. The Soil Conservation District and the farmers also learned that diverse seed mixes that went beyond the traditional cover crop plantings of small grains such as rye built up an impressive amount of carbon while feeding microbes. This makes soil naturally fertile and less reliant on chemical inputs. It is also increasingly erosion and drought proof. In other words, the soil is more resilient. And this

Teaming, *see page 7…*

Give it a listen

Farmers, conservationists and a scientist talk about improving soil health on episode 121 of LSP's *Ear to the Ground* podcast: www.landstewardshipproject.org/posts/podcast.

Burleigh County's annual Soil Health Tour in south-central North Dakota attracts farmers, natural resource professionals and students from across the Upper Midwest who are seeking information on how to combine sustainable soil management and profitability. (*LSP photo***)**

The Burleigh County Soil Conservation District's supervisors eventually formed a team that consisted of farmers and conservationists. Over the years, this team has promoted no-till, crop diversification and simple cover crop mixtures. It has also worked to get farmers to replace the traditional technique of turning cattle out into large pastures all season long with rotational grazing systems. These farming techniques have been a vast improvement over intense tillage, monocropping and overgrazing. And thanks in part to the Burleigh County Soil Conservation District's soil health work, 70 percent of the county's farmers are now using no-till cropping systems. But Fuhrer and others were finding that even with these conservation improvements, soil was still lost, precious water ran off of increasingly

…Teaming, *from page 6*

resiliency can be attained relatively cheaply by seeding cover crops—plants that, by the way, can serve double duty as livestock forage.

"This isn't a situation where someone is trying to sell a concept," says Fuhrer. "It's based on information and education. And as we share that with each other, we've learned how to build that soil back. You can't help but become excited."

That excitement was on display during the recent Soil Health Tour. The first stop was a field owned by Sanford Williams, who, along with his son Seth, operates a crop and livestock operation. The 68-acre field grew alfalfa from 2006 to 2012. One cutting was taken earlier this year and then on June 22 it was seeded to an eight-species mix of warm season plants. Timely rains before drought set in during the summer helped produce a good stand, which has resulted in a huge amount of biomass and a build-up of fertility. The Williamses plan on letting their cows calve in the small pasture next to the field, and then turning the animals out to graze—and stamp biomass.

Sanford Williams says it's hard to plant cover crops in a field that he knows would grow a good stand of high-priced corn, but that diversifying gives him more flexibility in dealing with issues like drought. (*LSP photo***)**

The farmers on the tour seem to be aware that this is a long-term investment in their land's, and farm's, overall health—a tough sell at a time when a quick applications of fertilizers and chemicals can produce an extremely profitable crop in short order.

"I want to plant corn—you can probably guess why," says Sanford while standing in the mix of cover crops. "Seth wanted to plant cover crops. With crop commodity prices where they are, I'm probably the hard one to convince to do that."

But even the elder Williams concedes that this investment is paying off in ways high corn prices never could—tests show organic matter and fertility are being built up to impressive levels in the field, all without adding extra fertilizer. Later in the tour the father and son show off pastures that have been mob grazed. Sanford explains that a lot of his pastures had been full of unpalatable gumweed before.

"Now I can't believe the grass that's growing there," he says. "I'm not a guy who knows his grasses, but I'm seeing species that are producing more feed. But it didn't turn around right away."

Fuhrer backs up that last point by talking about how although diverse cover cropping and mob grazing can rev up the biology of the soil considerably, farmers must take the long view.

"We didn't get poor soils in one year and we won't solve this in one year," he tells the tour participants.

Out of the lab

To Kristine Nichols, the fact that farmers are having a positive impact on such things as organic matter at all is a major triumph, given that when she was a grad student studying soil science such changes were talked about in terms of geological time—not something that could be impacted in a matter of years.

Nichols is a soil microbiologist at the USDA's Northern Plains Research Station in Mandan, just across the Missouri River from Bismarck. For a scientist in a specialized field, Nichols has a refreshing attitude that appeals to practical-minded farmers

"I'm less concerned about what soil organisms are, and more about what they do," she says. "We could really learn a lot more about functionality of these organisms."

Sitting in her basement office, Nichols is noticeably energized by the fact that farmers in Burleigh County are, for example, creating soil aggregates that engineer their own stability. This kind of self-perpetuating health maintenance is an exciting field of study in microbiology—and now it's being used in the real world.

What these farmers are doing is also causing Nichols to "go back to the textbooks" when questions come up on the land that she's never confronted before. For example, farmers like Brown seem to be able to raise a good crop of corn with less rainfall than one would expect. Why? Nichols has been poring over plant physiology texts looking for clues. Situations like this make it difficult to determine who is pushing who in terms of cutting-edge innovations in building soil health.

"Just like they challenge me to ask questions, I challenge them," says Nichols. "These guys are so innovative, and they so have the desire for challenge that I don't want them to stop, and I don't want them to allow me to stop. Innovations on the part of farmers are forcing us to come at this from a systems approach and ask deeper questions."

Something for everybody

And that's another key to success here—everybody gets something out of this team effort. People involved in the Burleigh County Soil Health Team like to say that if you put soil at the middle, then everything else will follow. It's like giving control over to a powerful, somewhat mysterious force. And ideally, under the general umbrella of improving the life in our land's basement, everyone gets a takeaway.

In simple terms, Fuhrer and his colleagues can say they are reducing erosion and Nichols gets to see scientific theory and research put into practice while she is given new questions to ponder. But just as importantly, farmers who are involved in improving soil health also benefit in some very significant ways. In a sense, it's a very

Teaming, *see page 8…*

…Teaming, *from page 7*

community-based approach to an issue that touches on everything from environmental protection and economic viability to the future of rural communities and quality of life.

A lot of the impetus for this team approach comes from the popularity of Holistic Management in the region. Developed by Allan Savory over three decades ago, this is a decision-making framework that has helped farmers, ranchers, entrepreneurs and natural resource managers from around the world achieve a "triple bottom line" of sustainable economic, environmental and social benefits. This framework is built upon the idea that all human goals are fundamentally dependent upon the proper functioning of the ecosystem processes that support life on this planet—water cycling, energy flow (conversion of solar energy) and community dynamics (biological diversity).

Holistic Management's emphasis on "community dynamics" plays a big part in how the Soil Health Team operates.

"The Holistic model has helped get family members and business team members on the same page, helping them all pull in the same direction," says Joshua Dukart, a Holistic Management certified educator who also works as a technician for the Burleigh County Soil and Water Conservation District. He is also a field representative for the North Dakota Grazing Lands Coalition.

Another important fringe benefit to Holistic Management is that it puts producers in the driver's seat, providing more, for want of a better phrase, creative control, over what they do out on the land.

"When you look at it from the approach of restoring the soil, it's a whole different thing for the farmer," says Fuhrer. "It's a much more positive approach."

Flex farming

What's striking about the farmers who are working on soil health in Burleigh County is that in a way doing things in service of microbes has given them a type of flexibility not present on conventional farms. At each tour stop, host farmers were invariably asked about future plans for this crop field or that pasture. The majority were not set on one concrete choice. They were open-minded—willing to see what nature throws their way before deciding.

For example, Seth and Sanford Williams talked about the future of their cover-cropped field. After the cattle mob graze it, then what?

"We don't have a definite plan," says Sanford, adding that it depends on how much moisture the area receives in the next several months—adequate precipitation may mean corn will be a good fit for the field next spring, while droughty conditions could call for a small grain like wheat. Either way they've gotten cheap cattle (and microbe) feed out of the current stand of cover crops at a time when dry weather has made forage dear.

A version of that think-on-your-feet attitude about the next planting season is heard more than once on the tour.

Cattle and crop farmer Darrell Oswald: "Raising annual crops is exciting for us now." (*LSP photo*)

More on Burleigh County & soil health

For more information on efforts in Burleigh County to improve soil health, see www.bcscd.com or call 701-250-4518, extension 3. The Burleigh County Soil Conservation District is sponsoring a soil health workshop Jan. 8 in Bismarck.

"It gives you flexibility when dealing with drought," says cattle producer Ron Hein while standing next to a 37-acre field that used to be all one pasture—in recent years he's broken it up into 20 grazing paddocks. He points out that while one paddock is being grazed, 19 others are resting and rejuvenating, which is particularly important when moisture is short. "It keeps me from having to sell cows."

Fuhrer says farmers who are actively building soil health don't so much look at specific crops as much as they do at the four major crop *types*—warm season broadleaf, warm season grass, cool season grass and cool season broadleaf—needed in a given year to keep the soil covered and biologically active as much as possible. Within those types there can be dozens of choices.

Such flexibility cannot only pay off agronomically and economically, it can make farming more interesting.

The last stop of the Soil Health Tour is the Darrell and Jody Oswald farm near the tiny town of Wing. Using a combination of cover crops, no-till and mob grazing, the organic matter on the Oswald operation has been raised to a respectable 4 percent. Darrell, a long-time cattleman, talks about how working on soil health has made something he never really enjoyed—cropping—interesting for his family.

"Pretty much everything we do and the decisions we make are based on improving the resource," he says while standing near one of his cornfields, just across the fence from the farm's pastures. "Raising annual crops is exciting for us now."

The next generation

Farmers are results-oriented, and during the tour many mention it's exciting, and even fun, to see positive changes on the land and in the bank account as a result of focusing more on "the resource," as they refer to soil.

That positive energy is infectious and can

Teaming, *see page 9…*

…Teaming, *from page 8*

help attract and keep a younger generation in farming. Gabe and his wife Shelly are thrilled that their son Paul recently joined the farming operation after finishing college. He's helping perfect their integration of crops and livestock while experimenting with enterprises of his own, such as a pastured poultry business.

Seth Williams likes machinery and raising crops, skills integral to his family's goal of improving soil health through diversity. After attending a grazing conference, he

"Slaking" tests involving clumps of soil and jars of water help farmers see firsthand the benefits of building healthy, stable soil. (*LSP photo*)

became convinced animals play a key role in building healthy soil, and he talked his dad into sharing their cattle enterprise with Ron Hein, who is a cousin

Dukart, the Holistic Management educator, says this kind of teamwork has allowed the Williams and Hein families to concentrate on individual strengths and interests, while contributing to the overall goal of improving the base resource: soil.

"Any given acre, Seth would like to crop it, Sanford would like to hay it, and Ron would like to graze it," says Dukart. "But they are able to concentrate on their interests and talents and abilities in certain areas and they're able to complement each other with those. They don't segregate themselves from any other parts of the operation and still stay very involved with the decision making as a whole, but basically take the leadership in one area or another."

A word for the resource

Burleigh County is far from having the ultimate soil-friendly farming system finalized. Nichols, the soil microbiologist, is constantly challenging farmers to push things even further and shoot for organic matter levels that rival native grasslands in the area.

Brown thinks a lot of these practices will stay limited in scope until farmers learn to observe the land closely and not rely on cookie-cutter solutions such as chemicals.

"One of the problems I see is a lot of the farmers and ranchers today —and I'll just be blunt—they're disconnected from the land. They oftentimes hire crop consultants, and the farms are so large and the equipment so big they don't get off the tractor and feel the soil and see what's happening," he says while holding a handful of his own soil.

Fuhrer says a lot of progress has been made—he estimates the NRCS field office in Bismarck works with 200 to 300 farmers on various conservation projects that support soil health one way or the other. But more needs to be done to provide as many options as possible for farmers. The day after the tour, which is one of dozens of soil health-related events put on in the county each year, Fuhrer was back in his office going over the results of Menoken Farm trials involving 98 varieties of cowpea, a warm-season, drought-tolerant legume. Six varieties were chosen for further planting.

Fuhrer is also seeking ways to get the "soil health is important" message out to the non-farming public. After all, non-farmers also benefit from healthy soil in terms of a more resilient food system and a cleaner environment. Getting the average citizen to talk about dirt in a positive way may sound far-fetched, but Fuhrer points out that a number of farmers "spoke for the resource" in a passionate way during the September field tour, something they may not have been so comfortable doing just few years ago.

"It was a good day for the resource," says the conservationist as he and other participants enjoy barbecued sandwiches at a park after the tour.

He was referring to the soil, but he could just have easily been talking about the people who work it. ❒

New LSP 'Soil Health, Profits & Resiliency' web page

On Sept. 21, the Land Stewardship Project helped bring the "Soil Health, Profits & Resiliency" video conference to over 270 farmers, crop consultants and resource conservationists from across Minnesota. Participants heard about new cover crop and livestock management practices, as well as ways of connecting soil health with profitability. Featured presenters were people involved in Burleigh County's soil health improvement initiative.

LSP's new **Soil Health, Profits & Resiliency** web page features video and presentations from that conference, as well as other resources related to soil quality on the farm. It's at www.landstewardshipproject.org/stewardshipfood/foodsystemslandstewardship/chippewa10/soilquality.

ACKNOWLEDGEMENT: This work is supported by the Minnesota Environment and Natural Resources Trust Fund 2010 Chp 362, Sec 2, Subd3i; the National Fish and Wildlife Foundation and its partner the Natural Resources Conservation Service, USDA; the National Institute of Food and Agriculture, USDA, under Agreement No. 2010-65615-20630; and the Walton Family Foundation. Any opinions, conclusions or recommendations do not necessarily reflect the new of any funder.

Cover cropping in western Minnesota

By Julia Ahlers Ness

The Chippewa 10% Project— a joint initiative of the Land Stewardship Project and the Chippewa River Watershed Project—hosted a cover crop field day in late October at the farms of Dan Jenniges and Jess Berge near the western Minnesota communities of Glenwood and Sunburg. Both are livestock farmers whose interest in cover crops comes from their desire to provide high-quality, low-cost feed to their animals. As the article on pages 20 to 26 show, cover crops can do that and so much more.

Upon first arrival at Jenniges' field, the three-dozen attendees might have been a little confused. There wasn't much green cover crop to see at first glance. As the participants' followed Jenniges into the field, however, they started to see green shoots of turnip and rape here and there under or poking through the corn residue. A careful glance across the field revealed other spots with definite green cover crop growing. The reason for the lack of much green cover across the field: the drought.

Jenniges' seeded the cover crop mix into standing corn at the end of June. In a normal rainfall year, the turnips and rape would have gotten established enough to keep them alive until the corn canopy started to lessen in late summer or early fall, when they could start to grow again and then take off after harvest to provide additional green forage for Jenniges' beef cattle.

Despite the challenges Jenniges experienced in trying to establish a cover crop in standing corn during a drought year, he is willing to try again next year.

"If I can postpone having to feed stored feed even by just a couple of weeks or even a month, it's worth the effort and investment," he said.

At the Berge farm, the tour participants saw— and smelled— a successful establishment of a cover crop of turnips and rape on a 40-acre field, which Berge had seeded in July after harvesting a stand of oats and field peas for silage. The abundant, high-quality forage of the cover crop is providing the Berges with inexpensive feed for their 300-head ewe flock and eventually for their cow-calf pairs. "This is ideal feed for those calves," Berge told the mixed group of farmers and natural resource agency staff.

In addition to providing the farmers with low-cost, quality animal feed, cover crops fit with the overall goals of the Chippewa 10% Project. Our belief is that there are economically viable ways for farmers and landowners to get diversity and more living cover on acres in the watershed. That diversity is what will make our soils more resilient and our water cleaner while putting more money into the pockets of farmers. ❐

Dan Jenniges (*right*) helps attendees of a cover crop field day at his farm hunt for green growing plants in the corn residue. Jenniges seeded turnip and rape in the standing corn in late June. (*photo by Julia Ahlers Ness*)

Julia Ahlers Ness coordinates the Chippewa 10% Project out of LSP's office in western Minnesota. She can be contacted at 320-269-2105 or janess@landstewardshipproject.org. Details on the initiative are at www.landstewardshipproject.org.

'Farming for Soil Health' class this winter in west-central Minnesota

The Land Stewardship Project is helping coordinate a two-part "Farming for Soil Health: Setting the Foundation for Success and Profitability" class this winter in Glenwood, Minn.

The first part of the class will be held Jan. 15-17; the second part is Feb. 5-6. All sessions will run from 9 a.m. to 5 p.m. The instructor will be Joshua Dukart (*pictured*), a Holistic Management certified educator who also works for the Burleigh County Soil Conservation District in North Dakota and is a field representative for the North Dakota Grazing Lands Coalition.

For more information, including details on fees, class location and registering, see www.landstewardshipproject.org or contact LSP's Julia Ahlers Ness at 320-269-2105, janess@landstewardshipproject.org. (*LSP photo*)

Agri News

Celebrating 38 years

NNESOTA EDITION, NOVEMBER 28, 2013

Online at www.agrinews.com | 75¢

y talk

ı is ranked No. 1 for
r production and
in the United States.
ry generates $17.46
onomic activity to

-80 pounds of feed
)-pound turkey.
ull grown, tom
raised for about
nd hens are full
5 weeks.
ge turkey has 3,500

turkeys "gobble;"

ow in cholesterol
it free.
urkey can last up to a
reezer.

ow:
American
ıry figure Benjamin
nted to establish the
not the bald eagle as
of our country.
ınksgiving feast
by the Pilgrims may
ned these menu

Increasing continuous living cover

Chippewa 10 Percent Project focuses on data, best practices, partnerships

BY JANET KUBAT WILLETTE
jkubat@agrinews.com

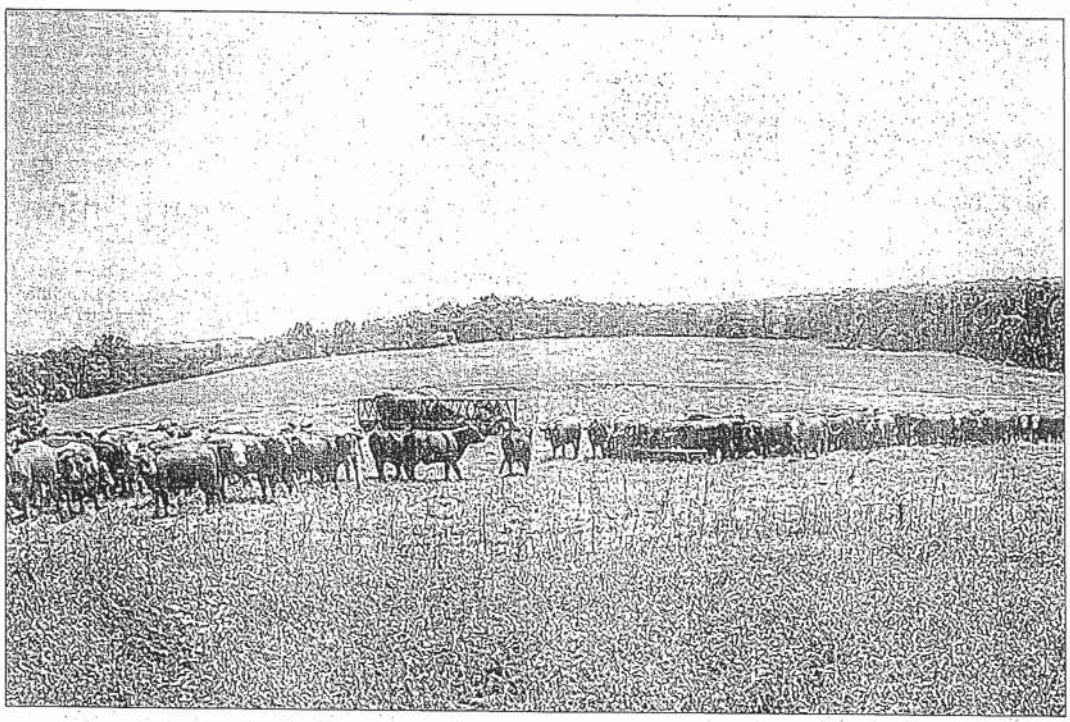
MINNEAPOLIS — Even with implementation of best management practices, nitrogen levels continued to creep upward in the Chippewa River Watershed.

By analyzing their wealth of data, the idea for the Chippewa 10 Percent Project was born.

Data collection is one of their strong points, said Kylene Olson, of the Chippewa River Watershed Project and co-director of the Chippewa 10 Percent Project. Olson spoke Nov. 21 at the Green Lands, Blue Waters conference.

Another one of their strong points is getting best management practices in place, Olson said. Between 2001 and 2011, 453 projects were completed for 742 benefitting landowners. For every $1 contributed by a landowner, the CRWP contributed $1.80, and for every $1, CRWP leveraged $6.70 in matching funds.

A third strength is partnerships. All strengths will be needed to make the 10 percent project a success, she said.



Agri News file photo

The Green Lands, Blue Waters conference was Nov. 20-21 at the University of Minnesota in Minneapolis. Much of the discussion cen-

r talk

is ranked No. 1 for
production and
the United States.
generates $17.46
nomic activity to

80 pounds of feed
pound turkey.
ll grown, tom
aised for about
d hens are full
weeks.
e turkey has 3,500

urkeys "gobble;"

w in cholesterol
t free.
rkey can last up to a
eezer.

ow:
merican
ry figure Benjamin
nted to establish the
ot the bald eagle as
of our country.
nksgiving feast
y the Pilgrims may
ed these menu

eel, clams, lobster,
goose, duck, crane,
dge, eagles' meat,
l grain: wheat flour,
pumpkin, peas,
ns, lettuce, radishes,
ns, grapes, walnuts,
corns, herbs, olive
t, leeks, dried
rsnips.
ng has been an
tion since 1863,
g the Civil War,
braham Lincoln
a national day of
ng and Praise to our
father who dwelleth
ens."

sota Turkey Research
n Council

Increasing continuous living cover

Chippewa 10 Percent Project focuses on data, best practices, partnerships

BY JANET KUBAT WILLETTE
Jkubat@agrinews.com

MINNEAPOLIS — Even with implementation of best management practices, nitrogen levels continued to creep upward in the Chippewa River Watershed.

By analyzing their wealth of data, the idea for the Chippewa 10 Percent Project was born.

Data collection is one of their strong points, said Kylene Olson, of the Chippewa River Watershed Project and co-director of the Chippewa 10 Percent Project. Olson spoke Nov. 21 at the Green Lands, Blue Waters conference.

Another one of their strong points is getting best management practices in place, Olson said. Between 2001 and 2011, 453 projects were completed for 742 benefitting landowners. For every $1 contributed by a landowner, the CRWP contributed $1.80, and for every $1, CRWP leveraged $6.70 in matching funds.

A third strength is partnerships. All strengths will be needed to make the 10 percent project a success, she said.

The Chippewa River Watershed is the most monitored watershed in the United States, Olson said. The watershed has seven automated sites that are sampled at least weekly, 250 longitudinal transect sample sites and 62 bank erosion survey sites.

The watershed project was established in 1998 under the umbrella of the Prairie Country Resource Conservation and Development program. When the federal government cut RC&D funding, the Chippewa River Watershed Project became a joint-powers entity. The joint-powers entity formed in December 2012 with a goal of improving water quality and water quantity issues in the western Minnesota watershed. It is a completely grant-based organization.

Agri News file photo

The Green Lands, Blue Waters conference was Nov. 20-21 at the University of Minnesota in Minneapolis. Much of the discussion centered on ways to keep more continuous living cover on the land.

The Chippewa River Watershed is the largest tributary watershed in the Minnesota River Basin at 2,080 square miles, or 1.3 million acres. There are more than 2,672 miles of ditches, streams and rivers in the watershed. The primary agricultural crops are corn, soybeans and sugar beets. Livestock species include cattle, sheep, hogs and turkeys. The turkeys are confined, and the rest are raised in both confinement and pasture situations.

About 25 percent of the Chippewa River Watershed is covered in perennial grass, Olson said. In subwatersheds, where 35 percent of the landscape is covered in continuous living cover, water quality goals were achieved, she said. Thus, the idea for the Chippewa 10 Percent Project was born. The idea is to increase the amount of acreage in continuous living cover, wetlands, open water and forests by 10 percent throughout the watershed.

The project started three years ago.

Challenges

Meeting the 10 percent goal will not be without challenges, said Robin Moore, a Land Stewardship Project staff organizer and an organizer for the Chippewa 10 Percent Project.

The challenges include:

- The culture of agriculture. There's a belief that good farmers have black fields in the fall.
- The belief that cover crops don't pay.
- A lack of community acceptance.
- Livestock is needed to have a need for continuous cover, and in some areas, there is a scarcity of large animal veterinarians.
- A lack of systems and infrastructure for cover crops. Where does a farmer find a seed drill?
- It's hard to do something with long-term, not necessarily short-term benefits.
- The bottomline focus of agribusiness.

Moore said the best way to increase continuous living cover on the landscape is to meet individually with farmers. There must be trusting relationships for projects to proceed.

There have been hopeful signs, she said. She started with four people last year who were interested in cover crops, and that number has increased to 12 people this year. Township boards also are starting to talk about cover crops.

Extension educator Jim Paulson looks for ways farmers can add value to cover crops. One of the ways is through grazing livestock. Cover crops can provide low-cost forage, he said.

See WATERSHED, page A2

Agricultural economy expected to cool

ndars are available for purchase at $13. Contact your xtension office.

ive species fight divides groups

)RHEAD — Minnesota's fight against aquatic invasive is pitting the government panel that helps allocate Fund money against lake property owners.
Lessard Sams Outdoor Heritage Council angered the ota Coalition of Lake Associations when it replaced up's proposal with one of its own, Minnesota Public eported. The association had proposed to spend lion for boat cleaning stations statewide to stop the of unwanted hitchhikers such as zebra mussels.
ad, the council in September replaced that proposal s own idea for spending $3.6 million to ask local govern- and private groups for ideas to fight invasive species. ideas would be considered for matching grants, pilot s would be developed and their effectiveness moni- t is one of several proposed projects the council is send- he Legislature and Gov. Mark Dayton for approval.

to test 70,000 private wells

AUL — The Minnesota Department of Agriculture o test 70,000 private wells in the state's farming regions sure nitrogen that seeps into the ground after fertil-

state says the level of pollution from tons of fertilizer pplied each year across the southern two-thirds of the rising. A survey in 2011 found excessive pollution in ent of the wells monitored by the state in central Min-

les the well testing, the state hopes to persuade farmers r control their use of fertilizer. That could include ask- mers not to fertilize in the fall when the risk to ground- s greatest or even taking land out of production.
ronmentalists don't think the plan is strong enough. say it assumes landowners will voluntarily protect the

p use at farmers markets increases

'AUL — Farmers markets in Minnesota saw a jump ase of food stamps this year.
it 60 farmers markets in Minnesota accept food
U.S. Department of Agriculture says $226,900 in food were redeemed this year at those farmers markets farmers who sell directly to consumers. That's han three times the $66,900 in food stamps that were ed in 2011.
the spending of food stamps at farmers market nts less than 1 percent of total food stamp spending state.

ections

lews is committed to publishing fair and accurate tion. If you find an error or have a comment about a story, or Mychal Wilmes at 507-285-7659.

Agri News

(PE 686830)
Vol. 36, No. 18,
Thursday, Nov. 28

n independent, agricultural newspaper distributed ouseholds and agribusinesses in southern and cen- nd northern Iowa.

division of and published by the Post-Bulletin Co, vertising and circulation offices at 18 First Ave. SE, he mailing address is PO. Box 6118, Rochester, MN

TELEPHONE NUMBERS:
Minnesota toll-free: 1-800-562-1758.
Midwest toll-free: 1-800-533-1727.
Main number: 507-285-7600.

EDITORIAL: Mychal Wilmes, Managing Editor, ext. 17659; Jean Caspers-Simmet, Staff Writer, ext. 17418; Janet Kuiper Willette, Staff Writer, ext. 17790.

ADVERTISING: Rosanne Allen, Advertising Manager, ext. 17674; Bill Krause, Advertising Sales, ext. 17637; Stacy Bohn,

will pass in 2013.
There is a sense that three years is long enough, said Mary Kay Thatcher, senior director of congressional relations for American Farm Bureau Federation. Thatcher spoke Nov. 23 during the 95th annual meeting of the Minnesota Farm Bureau Federation.


Thatcher

Chandler Goule, vice president of government affairs for National Farmers Union, said members of the agriculture committees in both chambers. They are Sen. Debbie Stabenow, D-Mich., Sen. Thad Cochran, R-Miss., Rep. Frank Lucas, R-Okla., and Rep. Collin Peterson, D-Minn.

Goule, speaking Nov. 24 at the Minnesota Farmers Union 72nd annual convention, said some of the biggest differences are in the nutrition and commodity titles.

The biggest challenge is in the Supplemental Nutrition Assistance Program, Thatcher said. The House bill contains $40 billion in cuts, while the Senate bill contains $4 billion.

Other areas of disagreement include the Dairy Security Act, the Steve King amendment,

Farmers Union gave a list of their priorities to the committee and Goule highlighted six. The priorities are keeping permanent law, setting fixed reference prices, mandatory funding for the energy title, including the dairy stabilization program, opposing changes to Country of Origin Labeling and support for farmers markets.


Goule

Six or seven legislative days are available in December to pass the conference committee report and get it to the presi-

week.
Minnesota is well-represented on the farm bill conference committee, with Peterson, Sen. Amy Klobuchar and Rep. Tim Walz serving on the committee. Texas, California and Minnesota have the most representation on the conference committee, Goule said.

Thatcher said it's important to keep nutrition spending and the farm bill together. The move to split the farm bill is an effort to make more cuts from both, she said. The marriage has worked really well, she said. It garners support from members who don't have agriculture in their districts; a quarter of House members have zero farmers in their district.

WATERSHED

From page A1

One family told him they saved $2 per head per day grazing their cattle on cover crops instead of feeding hay.

Cover crops can be used to fill in gaps in the typical grazing season, be it later in the fall or early in the spring, Paulson said.

Ryegrass, for example, provides high quality forage. Some crop farmers don't like it, saying it's harder to kill.

Other challenges for planting cover crops include when and how to plant. Paulson showed a rig to plant cover crops that a farmer built himself. The rig allows the farmer to plant a cover crop in standing corn. It can sow up to a nine-seed mixture.

When grazing, Paulson encouraged care be taken not to graze too low.

"We built our prairies on roots," he said. Graze half and leave half to regrow.

Terry VanDerPol, who works with the 10 percent project, said she thinks the 10 percent goal is achievable for several reasons. Renewed interest is seen in soil health, and the link between stewardship and profit resonates with people, she said.

With falling commodity prices, VanDerPol sees cover crops as a way to add value to livestock and a way to reduce input costs for crop producers.

She has seen increasing use of cover crops in the three years since the project launched.

The Land Stewardship Project and Chippewa River Watershed Project are co-leaders of the Chippewa 10 Percent Project. Partners include the USDA's North Central Soil Conservation Research Lab, University of Minnesota-Morris, University of Minnesota Extension, University of Minnesota West Central Research and Outreach Center, US Fish and Wildlife Service and Louisiana State University AgCenter. Project collaborators include the Minnesota Department of Natural Resources, The Nature Conservancy as well as farmers, business leaders and institutional/community leaders.

Visit chippewariver.com for more information on the Chippewa River Watershed Project.

U of M cuts Extension nutrition educators

MINNEAPOLIS — The University of Minnesota is cutting nearly half of the staff from a federally funded program that teaches low-income Minnesotans about healthy eating, the university said.

The Supplemental Nutrition Education Program, or SNAP-Ed, will lose 67 of its 152 employees early next year as a result of the automatic federal budget cuts that took effect on March 1.

University of Minnesota Extension Dean Bev Durgan said until now the program has sent nutrition educators to virtually every county in Minnesota to work in schools, food shelves and senior citizen centers. But the cutbacks mean only 45 educators will be left to cover Minnesota's 87 counties.

Under the changes, the program will shed just more than 40 percent of its positions, including supervisors and support staff.

ECONOMY

From page A1

Government payments as a percent of cash receipts have been stagnant since 2010. Judging by the prolonged farm bill debate, Brown said it will be much harder to get congressional support if agriculture falters substantially. That's a risk agriculture hasn't had to deal with for a while.

Direct payments likely will go away in the 2013 farm bill. Why did direct payments start? They started in the 2002 farm bill because they didn't count toward the domestic support cap on farm subsidies.

Brown said he is amazed by how fast production expenses

if it's another good crop.

This year's 14 billion bushel crop is a shock absorber and buffer that will keep corn prices from the $7 per bushel level.

International markets

International markets drive the U.S. agricultural sector, Brown said. Exports have been good, with one in every four rows of soybeans exported, 20 percent of the chicken, 20 percent to 25 percent of the beef, 10 percent of the pork and wheat and 20 percent of the corn.

Crop area in the United States, South America, China and the Ukraine has expanded. There's nothing like $7 corn to get everyone in the world to expand, Brown said.

Depending on foreign

capita has been declining in the United States since 2007.

Fewer corn acres

"I think we have acreage changes coming," Brown said.

The United States doesn't need 97 million acres planted to corn. A lot of acres will need to find another use, be it soybeans, hay, wheat or pasture. He's seen projections that 92 million to 93 million acres of corn will be planted in 2014 and 81 million acres of soybeans.

Where will corn acres fall? "I don't really think Iowa's going to cut corn acres much," he said.

Rather, he said he suspects the states that had the most growth will have the greatest reduction. South Dakota for-

ent today than in the 1980s. Landowners are not leveraged to the extent they were in the 1980s.

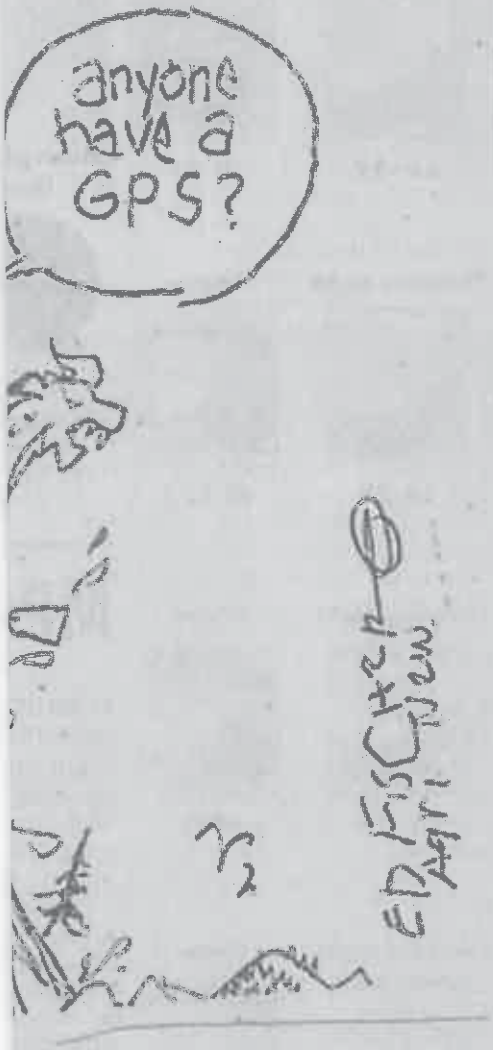
Land value increases have tracked with farm-income growth, Brown said. Signs suggest a weakening in land values is ahead, he added. Pressure is building for higher interest rates.

Livestock and dairy

Record prices for livestock and milk haven't resulted in record returns because of record high input costs. The economic downturn only added to the financial stress faced by these sectors, Brown said.

Going forward, he's optimistic returns will be better. Next year could be very good for cow-calf producers. He

pinions



OUR OPINION

Coming to grips with water issues

A great deal of attention was deservedly paid to the Chippewa 10 Percent Project during the recent Green Lands, Blue Waters Conference in the Twin Cities.

Chippewa 10 Percent represents the best environmental projects have to offer — partnerships, data collection and encouragement of best management practices. The project has a remarkable record of achievement with 453 projects completed by 742 landowners during the decade from 2001 and 2011.

What happens in the Chippewa River Watershed is important because it is the largest watershed in the Minnesota River Basin with 2,672 miles of ditches, streams and rivers.

The project's mission is to increase the number of acres in continuous living cover, wetlands, forests and open water by 10 percent.

Not all the news is positive on the environmental front, particularly in Iowa, where a massive manure spill on a Maschhoff hog operation near Keosauqua polluted a creek near the Des Moines River.

Environmental groups led by the Environmental Integrity Project and the Sierra Club along with the always-active Iowa Citizens for Community Improvement came together to announce that they intend to file a lawsuit within 60 days against Maschhoff Pork.

ICCI and the environmental groups want Iowa to issue Clean Water Act permits for facilities like Maschhoffs, which has had other manure spills. The permit they seek would require farms to follow stricter rules.

The permit process also would result in heavier fines should spills occur.

The Machhoffs insist they operated in compliance within all rules and regulations and are committed to environmental protection.

Farmers insist that the stick approach isn't the best solution when it comes to environmental protection. Public-private partnerships that involve education and cost-share are seen as better alternatives to rigid regulations.

That argument is considerably weakened each time a manure spill occurs and especially so when an operation has had previous spill problems.

Iowa has started the long process that will lead to better water quality. It will take time along with increased cooperation involving landowners and state and federal agencies.

We hope that the Iowa public-private effort will succeed because if it doesn't federal agencies will force the state to take additional regulatory action to protect invaluable natural resources.

Hats off to the Chippewa 10 Percent Project.

It is moving ahead at a time when Minnesota is coming to grips with its own water quality issues.

assive data

z-bang
e stands
t lifts
er and
n the
vice
ent of
it relies
rchase
an Il-

tion, analysis and operational planning."

No one, however, will go boldly into a data-driven tomorrow alone. Everyone sees you and Uncle Sam as partners. Climate Corp. was approved to peddle heavily subsidized — and, very likely, expanding — Federal Crop Insurance


WATERFOWL
PRODUCTION
AREA
Purchased With Duck Stamp Dollars
OPEN
TO PUBLIC HUNTING
U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE