AN ILLINOIS CONSERVATION LAND TRUST TAKES A LEAP OF FAITH

Natural Land Institute's Big Experiment: Developing a working lands initiative for funding long-term stewardship

Prepared by:

NATURAL LAND INSTITUTE
Conserving Land in Northern Illinois

With Support from:

IEC ILLINOIS ENVIRONMENTAL COUNCIL

JO DAVIESS CONSERVATION FOUNDATION

openlands conserving nature for life

delta institute

Funding provided by:

GRAND VICTORIA FOUNDATION

Table of Contents

Executive Summary **2a**
Introduction **3**
Background Summary **4**
Step 1: Strategic Planning Process **5**
Step 2: Establishing a Working Lands Initiative **8**
Step 3: Facing Uncertainty and Risk **15**
Next Steps **19**
Appendix 1: Working Lands Management Program Guiding Principles and Policy **21**
Appendix 2: Soils Program & Foss Farm 2019 Soil Amendment Budget **24**
Appendix 3: Financial Feasibility Analysis **30**
Appendix 4: NRCS Programs and Farmland Leasing Presentations **74**
Appendix 5: Foss Farm Whole Farm Conservation Plan **93**
Appendix 6: Resources **220**

Executive Summary

The development of a newly envisioned working lands initiative by The Natural Land Institute (NLI), an Illinois conservation Land Trust, began simultaneously with the second phase of the Conservation Finance Research project and was therefore ideal to be the subject of the research grant pilot project. This research project has been funded through the Grand Victoria Foundation. NLI is a partner in this research project with Delta Institute, Openlands, Jo Daviess Conservation Foundation, and the Illinois Environmental Coalition.

This pilot project is a process where the staff and board of the Natural Land Institute are exploring how using working lands to fund stewardship activities fits in with our mission and strategic plan, what the public perceptions are, how we can effectively manage our capacity, and how investment in agricultural lands might work. We explored the benefits and challenges of incorporating working lands into our portfolio of fee land ownership. Particularly, how to fully engage biodiversity, clean water, healthy soils and carbon sequestration. We also hope that this work will provide a guiding structure for other conservation groups across the state.

NLI has two donated farms - one of 400 acres and another of 63 acres. This study focused primarily on the 400 acre Foss farm, 200 acres of which are in production.

NLI's mission is to protect natural land. We want to explore the challenges of habitat fragmentation, invasive species and other stressors on a landscape scale using a systems approach to conservation. We are seeing how once unlikely partners are becoming allies through this approach.

Conservation working lands provide us an opportunity to shift from high input practices (fertilizers and pesticides) to practical, agro-ecological conservation farming. Examples are the use of cover crops that support the growth of soil fungi and reduce nutrient losses from the soil, and changes in tilling and other practices that minimize soil disturbance. Healthy soils can naturally sequester large amounts of CO2; restore degraded soil biodiversity; and keep water in the soil, reducing the loss of farm soil through erosion. This also helps protect the water quality of our streams and keeps the nutrients where they belong, in the soil.

Ecologically managed farms provide buffers to help protect the biodiversity of high-quality natural areas. With a suite of conservation agricultural practices setting the stage, some farms may eventually be returned to natural habitat entirely. NLI met with other regional partners and agencies involved in agriculture and habitat initiatives. Our board and staff

also attended roundtables, trainings and field days to become familiar with the concept of the farm as habitat. NLI prepared guiding principles for its Working Lands initiative and developed a policy on farm management. A set of procedures and monitoring protocols to measure goals will be created to determine the success of our approach based on those principles and policy.

A soils consultant was engaged to work with both of our farmers on experimental acreage to use cover crops, practice no till drilling and use biologically-based inputs to counteract the dip in production following the initial use of cover crops. We implemented cost sharing agreements with our farmers for the biological inputs and we paid for the soil testing and the consultant fees. The farmers paid for the cover crops. Results from their first year are contained in the report.

We also focused on creating a *Whole Farm Conservation Plan* based on the community relationship with the land, recovering the soil biota, and the exploration of new markets beyond the traditional corn and soybeans. The Foss Farm Whole Farm Conservation Plan is included in the full report.

Additionally we engaged a consultant to assess working lands as an investment strategy for conservation groups and to look at what it would take to move from conventional agriculture to conservation farming, or even organic or regenerative agricultural practices.

The next phase of the project includes implementing the proposed processes and preparing a template for other land trusts to follow. The implementation process includes establishing procedures, goals and monitoring objectives, drafting a fair conservation lease, analyzing capacity, and developing long term budgets.

We are also asking the following questions: what is the messaging, marketing and framing that needs to occur? What are the market opportunities we can explore for alternatives to row crops and what resources will we need for farm management? How does conservation farming assist us with our preserve buffers and expanding our protected areas to create more of a systems approach to land protection? And finally do we need to develop a business plan to identify the way forward for a more strategic approach that includes identifying risks such as operational management, financial, and human resource risks?

Introduction

The development of a newly envisioned working lands initiative by The Natural Land Institute (NLI), an Illinois conservation Land Trust, began simultaneously with the second phase of the Conservation Finance Research project, and was therefore ideal to be the subject of the research grant pilot project. This research project has been funded through the Grand Victoria Foundation which is interested in exploring innovative options for financing stewardship activities on protected and restored natural areas owned by the conservation land trust community in Illinois. The first phase of the research project identified two primary avenues to explore further for innovative conservation financing for the future. This first phase linked income from a working lands program to fund a regional stewardship cooperative partnership to conduct stewardship and management activities on protected properties with the goal of increasing stewardship capacity for the partners. NLI is a partner is this research project with The Delta Institute, Openlands, Jo Daviess Conservation Foundation, and the Illinois Environmental Coalition.

In 2017, NLI and its partners in NW Illinois also began the development of a regional stewardship cooperative based on collective impact principles. It is anticipated that eventually, NLI's working lands could assist in partially funding that cooperative to assist with managing it's more far flung preserves, or that a regional working lands initiative could evolve with the partners under a different structural umbrella perhaps incorporating an investment strategies involving impact investment partners.

There is a history in Illinois of local governmental conservation entities using working lands to fund their stewardship activities. County Forest Preserve and Conservation Districts have for several years been farming and managing agricultural land and using that income to fund their stewardship and restoration activities. They are, however, limited in their time frames for conversion to natural habitat as their agricultural land was purchased with tax payer dollars specifically for the purpose of habitat restoration. This land is therefore subject to some regulatory oversight. They also have not developed nor funded regional stewardship cooperatives as they are limited by their geography and tax base. Conservation Land Trusts are uniquely suited to experiment with this new model.

Subsequent to releasing the results of the first phase of the Conservation Finance research in a 2016 report titled '*Preparing for Long Term Stewardship, A Dual Approach for Illinois,*'[1] the report was reviewed by several Illinois conservation land trusts through the Prairie State Conservation Coalition and the Vital Lands Illinois network program. They expressed and raised several concerns, specifically related to the missions of conservation land trusts, public perception, internal capacity, and the diversion of scarce resources to

[1] https://www.naturalland.org/wp-content/uploads/2017/03/NLI-2016-Conservation-Finance-Report.pdf

investment in agricultural lands rather than in protecting high quality natural areas. This pilot project is a process where the staff and board of the Natural Land Institute are exploring how using working lands to fund stewardship activities fits in with our mission, what the public perceptions are, how we can effectively manage our capacity, and how investment in agricultural lands might work.

Background Summary

Funding and finding adequate, sustainable resources, including capacity on all levels, for land management and restoration activities on NLI's protected lands and preserves became an urgent challenge a few years ago. This challenge began to affect NLI's ability to continue to protect more land, as well as to steward the land NLI already owns. Other Illinois land trusts are in a similar situation. Gone are the days when it was automatically expected that protected lands would be rolled over to state or local government agencies for them to steward. These agencies are also facing significant resource challenges in meeting the needs of protecting biodiversity. These challenges include the current economic and political environment the state is in, and to a significant degree, the challenges that a changing climate presents.

Invasive species and fragmentation of ecosystems are threatening to destroy much of the biological diversity that has been protected, and the state is also challenged with stewarding and holding new lands. Illinois conservation land trusts are working together to find solutions to this 21st century challenge through the Vital Lands Illinois Network and the Prairie State Conservation Coalition. Together these organizations are stepping outside the box, through conservation finance research with partners statewide to explore multi-revenue business models for a sustainable future. We are also researching and creating collective impact models for working together, and bringing positive experiences of nature home.

In the past, the NLI Board of Directors put a temporary hold on acquiring new lands in order to build up stewardship capacity. It is evident that stewardship will continue to be an ongoing challenge. Fortunately, NLI has risen to that challenge and is now making sure that there is stewardship funding to support its acquisitions. Our board is committed to stewarding our land and to raising the resources needed because we see that natural land protection is more urgent than ever. NLI's Conservation Easement stewardship fund is growing, the endowments are growing, and our capacity is growing. All this is thanks to our donors, to our Foundation funders for supporting our capacity development, our board's efforts, and to our donated working lands.

We must find sustainable resources for future stewardship responsibilities/funding in order to protect and expand natural lands. These efforts must yield a sustainable cash flow to match critical donor contributions moving forward. Thus, was this initiative conceived?

This strategy comes with its own unique set of challenges as NLI seeks to adapt to a changing economic, political and environmental landscape. Some experimentation and creative thinking will be required as NLI proactively creates new opportunities for protecting NLI's special places in the region. Member support, combined with the board's guidance, bravery and thoughtful approach to this new initiative will be critical to successfully meeting these challenges to further NLI's mission and vision into the future. NLI's 2018 strategic plan is NLI's current best effort to meet these challenges head on.[2]

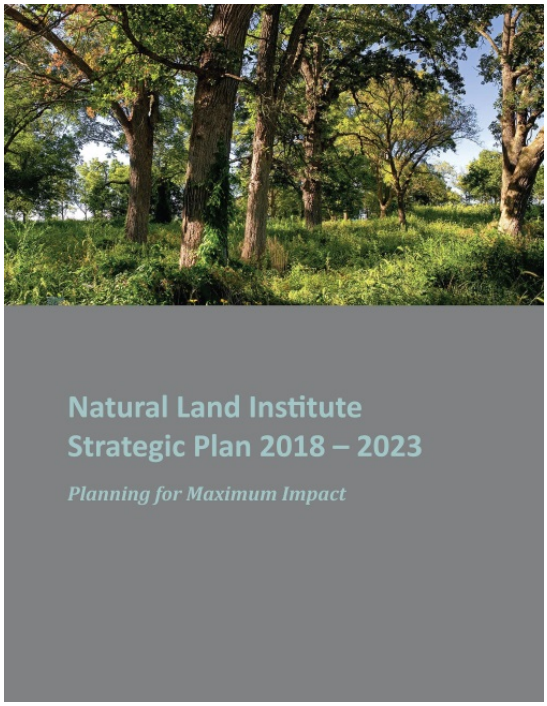
Step 1: Strategic Planning Process – Beginning the Thinking

In 2015, NLI was gifted a 65 acre working farm located in Ogle County. The NLI Board of Trustees had previously not accepted gifts of farmland, particularly if the donors wanted that land to remain in production. These were missed opportunities, as farmland is equity. The Board of Trustees accepted this donation as it was located close to other protected areas, had no donor restrictions other than verbal requests, and had the potential to be restored to grassland bird habitat. This was the beginning of a change of mind towards a fragmented, dislocated landscape. They agreed that the farm could also be a temporary income source for stewardship activities as well as providing revenue for its eventual restoration.

Subsequently, in April of 2017, the Board accepted the donation of a 407 acre farm called the Foss Farm in Winnebago County that did have donor restrictions, however these restrictions were consistent with NLI's mission. This farm has about half of its acreage in production, with the rest being a wooded stream corridor and stream buffer, several acres of mature woods and a small disused gravel quarry area.

Simultaneously, in early 2017, NLI began a year-long strategic planning process for guiding the organization for the next five year period into the year 2023. The strategic plan identified three new strategic initiatives that are mission driven and designed to support the implementation of NLI's Land and Water Protection Program, Stewardship and Land Management Program, and Engagement and Outreach Program. Throughout 2017, the Natural Land Institute Board of Directors, Committees and staff undertook a unique approach to strategic planning.

[2] https://www.naturalland.org/wp-content/uploads/2018/03/NLI-Strategic-Plan-2018-Brochure_final.pdf



Rather than having a board gathering with an outside facilitator, NLI's Board President encouraged a more radical approach. This approach entailed addressing the issues facing NLI through the lens of each committee with their special function and purpose. The committees consist not just of board members and staff, but of interested NLI members as well, which provides an expanded viewpoint and to a limited extent, a 'focus group' perspective.

The Executive Committee meetings served as a sounding board for the committee chairs to bring their respective committees' work to be reviewed by the other committee chairs. This resulted in some interesting cross-pollinating as similar goals were discovered and a synthesis of the ideas and issues discussed. The process was at times challenging, yet very thought provoking. Discussion points centered on identifying benefits and challenges of incorporating working lands into our portfolio.

Benefits of Incorporating Working Lands into our Portfolios:

- Donations and/or acquisitions of working lands increase NLI's potential to achieve its conservation mission by providing long term and sustainable revenue to manage and restore its preserves.
- By holding and managing working lands, NLI partners with the agricultural community to explore an integrative conservation approach, opening the door for new relationships and expanding our land based portfolio.
- Buffers and habitat corridors between protected natural areas are increasingly important for the future of diverse ecosystems. When farms include both income-producing fields and natural places, they act as vectors for animal and plant movement in a fragmented landscape, and serve to mitigate the detrimental impacts of that fragmentation by becoming part of larger ecological complexes. By employing best practices of conservation agriculture, working lands provide expanded potential to market the concept of farms as habitat.[3]

[3] The Farm as Natural Habitat, Reconnecting Food Systems with Ecosystems. Edited by Jackson & Jackson, published by Island Press, 2002

- Regenerative agricultural practices[4] naturally sequester large amounts of carbon into the soil, rebuild soil organic matter and restore degraded soil biodiversity – resulting in both carbon drawdown and improving the water cycle.
- Practicing regenerative agriculture best management practices with local farmers will ultimately prepare soils for potential future restoration.

Challenges of Incorporating Working Lands into our Portfolios:

- Public Perception of donors re: our mission, and the challenge of messaging and cultivating support for a conservation land trust engaging in agriculture
- Developing a business case and a business model, especially with collaborative fundraising for a stewardship cooperative. Does there need to be a separate structure independent from the parent organization?
- How can this model inform a more social enterprise concept in diversifying our investment portfolio?
- Capacity to manage farmland needs to be addressed and a cost benefit analysis done
- How do we define what changes we want to see and how are those changes monitored over time to determine success? What don't we know? Is there readily available data?
- There is a big learning curve that includes day to day management of a working farm such as how to structure a conservation farm lease. What don't we know?
- What alternative markets are available to move away from commodity cropping?
- What are the best ways to identify and manage risk?

This strategic plan report is just the beginning of the process of thinking through new approaches. It provides a guiding structure for the committees as they develop their annual work plans and implement their strategic thinking as they move through the challenges. We also hope that this work will provide a guiding structure for other conservation groups across the state.

[4] https://regenerationinternational.org/why-regenerative-agriculture/

Step 2: Establishing a Working Lands Initiative

Building the Case - Soil, Water, CO2 and a Leap of Faith

As part of NLI's new strategic plan, we wanted to learn how conservation and habitat protection can be enhanced with an expanded perspective. Our board is taking a leap of faith and exploring how our two donated farms can not only help to finance our preserve stewardship activities, but to also fully engage biodiversity, clean water, healthy soils and carbon sequestration in farming.

Looking across our landscape, our towns and cities are surrounded by agricultural and natural lands, much of it in private ownership. NLI's mission has been and continues to be to protect natural land, yet how can we continue to do that when landscape fragmentation, invasive species and other stressors seem to be outrunning us? As we move forward into this era of re-defining land protection to include active **ecosystem restoration**, ecosystem resilience through **habitat connectivity** and lessening fragmentation, and a **landscape scale systems approach** to conservation, we are seeing how once unlikely partners are becoming allies. As we look to these partners across our communities, we can explore shared values and partnerships that go beyond our usual suspects.

What do farms and conservation have in common, you might ask? Well, we did ask, and in the asking, found answers, and more questions! What we do know, is twofold, we want to manage our farms so that they are 1) sustainable with **healthy soils** full of living things, soils that act as a sponge to hold water and reduce erosion, and soils that capture

CO2 by creating an ecological partnership between plants and their soil biota with appropriate farming practices, and 2) reduce natural land **fragmentation** by expanding and connecting our preserves. All this, while also helping to fund our preserve stewardship program!

Conservation working lands provide us an opportunity to shift from high input (fertilizers and pesticides) practices to practical agro-ecological conservation farming. Examples are the use of cover crops that support the growth of soil fungi and reduce nutrient losses from the soil, and changes in tilling and other practices that minimize soil disturbance. Healthy soils can naturally sequester large amounts of CO2, restore degraded soil biodiversity, and keep water in the soils reducing the loss of farm soils through erosion. This also helps protect the water quality of our streams, and keeps the nutrients where they belong, in the soils.

NLI is developing new working relationships among the farming community, scientists and conservationists. Our farmers are working with a soils consultant who is guiding them on soil biologicals, effective cover crops and soil testing, some of which is on a cost share basis with NLI. The farmer also benefits with an increase in productivity from healthy soils. (See Appendix 2)

We are also working with our farmer at Foss Farm, and a conservation farm consultant to create a *Whole Farm Conservation Plan* based on the community relationship with the land, recovering the soil biota, and the exploration of new markets beyond the traditional corn and soybeans. This will not only provide diversity on the farm, but to also benefit the farmer (See Appendix 5 for the Foss Farm Whole Farm Conservation Plan).

All cropland/grazing management decisions NLI makes are with soil health, water quality and wildlife habitat in mind in addition to productivity. Conservation leases will be used, and removing row crop production from highly erodible areas may also be an option. USDA farm programs will also help NLI achieve conservation goals on cropland.

NLI Board Land Conservation Committee on a tour of Foss Farm

Many farms already contain significant natural areas such as streams and wildlife corridors. Ecologically managed farms can also provide buffers to help protect the biodiversity of high quality natural areas. With a suite of conservation agricultural practices setting the stage, some farms may eventually be returned to natural habitat entirely. NLI prepared guiding principles for its working lands initiative, and developed a policy on farm management. Out of those principles and policy, a set of procedures will be created. These will more clearly articulate measureable goals for us to be able to determine the success of our approach. Donations of farmland are being encouraged as a mechanism to support NLI's mission, with NLI honoring the donor's wishes for their land.

Establishing Guiding Principles and a Policy – *Learning as We Go*

For the Land Conservation Committee (LCC) to develop their work plan, they had tasked themselves with drafting a set of guiding principles, a policy and a set of procedures to begin to implement the Working Lands initiative. Recognizing this as a substantive endeavor, they created the Working Lands Sub-Committee (WLSC) to address these and other issues in depth. The Working Lands subcommittee began by developing a set of Guiding Principles, and a Policy (See Appendix 1). To begin this process, they invited the McHenry County Conservation District (District) Director of Conservation to talk with our LCC about how they set up their policies and procedures to manage their nearly 4,000 acres of agricultural land. We met out at the Foss Farm, and before the farm tour, we discussed the District's agricultural holdings, their restoration practices, and their farm management policies. We also discussed how the income from these lands was being used to fund their restoration activities in a tight economic climate, and what they are doing to promote conservation practices on their working lands. The District is also exploring, with

the Delta Institute, developing a set of criteria and a methodology for measuring their success.

Gathering Information, Making Connections....Convening a Regional Meeting

The Working Lands Subcommittee decided to convene several regional conservation groups in Northern Illinois that were working in conservation agriculture to see what projects they were working on, and how we could work together and explore potential synergies in our work. Below is the agenda for the meeting with the participants listed as well as the work they are involved in.

Regional Agricultural Projects Discovery Meeting

Friday March 23, 2018
10 am - noon
Poplar Grove IL. 61065

Agenda

Hosted by: Ron Doetch, Solutions in the Land, LLC
Hope Hellmann, Project Coordinator, SITL
Stacy Cushenbery, Project Coordinator, SITL

Invited: Ed Collins, McHenry Co. Conservation Dist.
Ben Shorosfky, Delta Institute
Olga Landries, Delta Institute
David LeZaks, Delta Institute
Andrew Szwak, Openlands
Aimee Collins, Openlands
Emy Brawley, The Conservation Fund
Jim Johannsen, JoDaviess Conservation Foundation
Linda Balek, The Land Conservancy of McHenry County
Kerry Leigh, NLI
Brian Pruka, NLI consultant
Ray Ferguson, NLI trustee
Ed Eggers, NLI trustee
Zach Grycan, NLI
Matt Van Slyke, Green Agents, NLI consultant
Nathan Aaberg, Liberty Prairie Foundation

1. Introductions
2. Purpose of the Meeting: To understand the agricultural based initiatives going on in the conservation community in northern Illinois and explore synergies
3. Research, Policy Development and Planning Projects currently underway
   NW IL. Strategic Land & Water Conservation Plan & Implementation (NLI and JDCF)
   Working Lands Policy Development as a model for Land Trusts (NLI)
   Conservation Finance Research & Ag. Pilot Project (Delta, NLI, IEC, Openlands & JDCF) Land Access Project for Northeastern Illinois (Liberty Prairie Foundation & Openlands) Farmland Inventory and Stewardship System for McHenry County Conservation District (MCCD, Liberty Prairie Foundation, Delta)
   Agricultural Conservation Easements (ACE-ALE), Learning Circles for Women Farmowners, and a Farmer-Landowner Match program (Land Conservancy of McHenry County)
4. Market Opportunities (Solutions in the Land)
5. Synergies Discussion

Subsequent to this meeting, we began to understand that we are not in this alone, and that there is a huge agricultural conservation movement out there working to regenerate our soils, create healthy ecosystems on productive land and simultaneously foster new relationships. We began to really understand that one does not preclude the other. In the Resources section at the end of this report you can find the reference for the July 2018 report *Managing Farmland Holdings for Sustainability. Profiles of Organizations Undertaking the Challenge* that describes some of these initiatives in more detail.

We would like to acknowledge The McHenry County Conservation District and the Forest Preserves of Lake County and others who have graciously shared with us the work they have already done. They shared their work on creating their guiding principles, policies, and Conservation Farm Plans as well as nitty gritty details on farm nutrient plans, pest and weed control guidelines and communication strategies.

Hosting Roundtables for Learning

The next steps for the sub-committee included creating a Roundtable series in an effort to engage the board and committees in learning about regenerative and conservation practices in agriculture, and the practical implications of implementing such an idea, including creating conservation leases.

The first in a series of roundtables was learning what Natural Resource Conservation Service programs might be available to us and our farmers, what are the options for developing farm leases, and what are conservation farmers currently doing to stay profitable. We invited speakers and had lively conversations at our local brewery with plenty of appetizers! (See Appendix 4 for the two presentations by Andrew Larson, and Josh Franks from the local NRCS office.)

Andrew Larson from First American German Bank speaking about farm lease options at the first roundtable event.

The next board roundtable meeting was held at Weld Memorial Park in Ogle County. From there we toured a field owned by a local conservation farmer that had been harvested and was being planted to cover crops. The tour was an opportunity for him to showcase his conservation farm practices to the committee and board. This farmer participates in our working lands subcommittee. It is important for us to have representation from the conservation agricultural community on this subcommittee to keep us on track and grounded in practicality.

The farmer explained that he had been using no-till as his primary method of soil conservation for 27 years. In the past 10 years he has been experimenting with cover crops for additional soil conservation and soil health benefits. His experimentation with 30 different cover crops has narrowed to using one primary cover crop: cereal rye, a close cousin to barley and wheat. He showed us a seeded rye field and we talked about some of the benefits and challenges of incorporating cover crops. Cereal rye is planted through the existing crop residue immediately following harvest. It over winters and most of its growth occurs in the spring, right before a field is planted. The cereal rye has to be terminated before planting corn, but soybeans can be planted directly into the living cover crop and allowed to grow up to two weeks after planting to maximize the soil health benefits. His preferred method of planting cover crops is to closely follow the harvesting combine with a no-till drill. Each year, the farmer grows additional acres of cereal rye to maturity before harvesting the seed, running it through a cleaner, and storing it until fall, when he uses it for next year's cover seeding.

We walked in the field and he showed us the residue on the soil surface from *last year's* cover crop, which controls erosion and gives microbes carbon on which to feed. At this same time, *this year's* cover crop was germinating in the soil. This "blanket" of both dead and living plant material prevents erosion, while the living roots reduce soil compaction and increase microbe population. Walking across the field we were able to observe little mounds of dirt called *midden piles* where the night crawlers have pulled crop residue together, literally stockpiling food. Under each pile is a night crawler burrow that can extend 3 to 6 feet below the surface. Night crawlers are excellent indicators of soil health because they are so sensitive to disturbance, and they wouldn't be able to exist in a tilled field. Using a spade, the farmer dug up a chunk of soil so that we were able to see its soil structure and the large vertical pore spaces created by the night crawlers, and the horizontal holes created by earthworms. We could also see the root systems spreading out as a filigree network, thus creating a healthy soil sponge.

The farmer's father, a first-generation farmer, occasionally used cover crops in the 1950's to produce these same benefits. Today, this farmer and his son employ the same proven cover crops their father and grandfather used, with the addition of modern technology like GPS, auto-steer tractors, and drone-driven crop scouting. Incorporating new technology makes cover crops more doable in northern Illinois' short time frame between harvest and frozen ground. With 80 percent of their acreage in cover crops now, the goal is to have every acre, every year planted to cover crops to preserve and improve the soil for the future.

Step 3: Facing Uncertainty and Risk

Working with Consultants

3.1.1 A soils consultant

Green Agents Ltd. was engaged to work with both of our farmers on experimental acreage to use cover crops, practice no till drilling and use biologically based inputs to counteract the dip in production following the initial use of cover crops. (See Appendix 2). We did cost sharing with our farmers for the biological inputs, and we paid for the soil testing and the consultant fees. The farmers paid for the cover crops.

The idea is that once the soil organic matter (OM) has built up, the farmer can gradually cut back their traditional fertilizer and herbicide inputs. Depending on soil types, fertilizers can be ultimately be cut back by 50% or less, and herbicides can have a 25% reduction in use. This can be a cultural shift for farmers. Typically 1 lb. of nitrogen fertilizer is put on a field per bushel of corn. The goal would be to reduce that to ½ lb per bushel or less which saves them money (approximately $50 per acre in savings). Potassium and Phosphorus can also eventually be reduced when OM is built up in the soils. They can then use this money to purchase the biologicals until the crops reach their genetic potential with optimal soil conditions. According to our consultant, the buildup of OM in soils happens faster with both cover crops and soil biologicals being used together. The farmers at both farms currently do not have the right equipment to put cover crops on corn and are only doing it for now on their bean rotation.

According to the consultant, the optimum percentage for soil OM on prairie soils is over 4%, and 3% on forest soils. Currently our newly acquired Foss farm has between 1.9 and 2.0 OM on forest soils, so this goal may take 5 to 10 years depending on the amount of biomass (cover crops) used, manure and soil biologicals applied. This tenant practices reduced tillage, with no fall tillage, and no-till at planting.

MST refers to the Mycorrhizal Seed Treatment. The application of Residuce helps decay the crop residue returning the nutrients to the soil and retaining the microbes.

Soils Consultant advisory services included;

(a) soil samples are drawn and testing is completed by the end of each calendar year;
(b) interpret and communicate the results in written form within 30 days of test dates;
(c) make recommendations to improve soil health and productivity;
(d) provide the cover cropping plans;
(e) make on-farm visits before cash crops have reached V-3, V-4 and

stages to determine if side dress or foliar applications are warranted;
(f) submit cost estimates of biologically-based inputs and synthetic input reduction recommendations by February 15th each year;
(g) advise tenant farmers on new practices and application technicalities

2018 findings:
2018 yields with both Foss West and SchloMar Farms:

"*Using the TracePac, microbes and dry fall fertilizer N,P and K, at 100 lbs. per acre in the fall, Foss West yielded 58 bushels per acre, easily their best year on that plot for beans. Liquid spring fertilizer went on the beans last year at planting and they will also use liquid spring fertilizer at planting and a liquid sidedress their corn this June, spoon feeding it to maximize the nitrogen uptake and reduce loss. This is recommended by the FSA Conservation Stewardship Program. The Foss farm has been signed up for that program and if approved, the farmer would get program payments." The farmer does not use anhydrous ammonia at all. 2018 was an outlier year and a lot of farms did very well without those products. There are a lot of other things that contributed to that yield, such as good rainfall. The farmer is curious as to how this works in drier years. It's hard to draw conclusions over just one year. The corn field they used the TracePac and microbes on at their other farm didn't do very well. That field is very porous and it has poor soils. The farmer at NLI's SchloMar Farm is happy as well, reporting by memory only (paperwork not with him at the time), 565 bushels for "just over 2 (trial) acres." That would be roughly 240 to 275 bushels per acre, out yielding all prior years by a few or several dozen more per acre than ever before. At some point the farmer told me he would be happy with 180."*

3.1.2 Whole Farm Conservation Plan consultant

Solutions in the Land was engaged to analyze the existing conditions, identify optimum conservation practices, and develop market strategies 'outside the box' of commodity corn and soybeans for the Foss Farm, both the east and west tracts. (Appendix 5). Below is their scope of services

Foss Farm Conservation Plan and Farm Management Plan Scope of Services

This agreement is broad and flexible to achieve the specific goals of developing a comprehensive operational conservation plan for all areas of responsibility of the Foss Farm and providing NLI an actionable framework to position and operate farmland owned now and in the future. This project will culminate with a final report that details all work, no later than January 31, 2019. The report will be footnoted with references to maintain integrity in the report and to provide future references. A broad-based approach will allow for new discovery and adjusting to yet unknown needs. NLI has already established guiding principles and inventoried the Foss Farm regarding soils, natural areas, history and the region. The following are areas that need to be examined and explored more in-depth to complete the two comprehensive plans for this project. The work will include but will not be limited to the following:

DELIVERABLES SPECIFIC TO THE FOSS FARM:

1) **REGIONAL CONTEXT**
   a) Ecological Region Summary- Specific impact information of the watershed
   b) Regional Planning- How does the Foss Farm fit into the numerous regional plans such as the Winnebago County 2030 Land Resource Management Plan and the Forest Preserve Strategic Purchase Plan.
   c) Transportation and Infrastructure- Processing facilities, rail, highway system and similar that give a market advantage for alternative crop production.

2) **THE FARM**
   a) Site visit, interviews and current practices assessment
   b) Natural resources assessment- Identify metrics that can be regionally acceptable to measure, monitor and gauge successful operations
   c) Agriculture and working Lands evaluation
   d) Built environment and infrastructure evaluation
   e) Social and human resources understanding
   f) Provide draft of operational conservation plan in concert with the Illinois Nutrient Reduction Strategy, specific to the Foss Farm prior to completing final plan

3) **OPPORTUNITIES AND CONSTRAINTS – This will be the bulk of focus**
   a) Cost reduction
   b) Neighborhood
   c) Market opportunities – Food crops, fiber opportunities, water credits, birding, unique native plants, solar farming.
   d) Conservation and farm programs- Invasive control, mined land reclamation, filter strips, crop rotation
   e) Other, including recreation, agro-tourism and opportunities unique to the site.
   f) Ecological Stewardship incentives
   g) Future trends and constraints affecting changing markets – ex. US farmer aversion to organic farming.
   h) Delineate implications of all crops and activities to align with guiding principles – ex. Water and carbon credits.

4) **RECOMMENDATIONS**
   a) Ecological stewardship provisions
   b) Markets/marketing
   c) Tenants, enterprises, responsibility areas
   d) Succession planning and future management

5) **REVENUE GENERATION**
   a) Identify best strategies for revenue generation based on opportunities and recommendations
   b) Identify diverse revenue streams that are disassociated, providing risk management platform

DELIVERABLES SPECIFIC TO NLI LANDHOLDING OPERATIONS AND INVESTMENT:

6) **LEVERAGING FOR IMPACT**
   a) Develop a comprehensive format and learning tool to describe all land holdings that highlight impacts to the environment, impacts to community and financial resilience.

b) **Provide an actionable framework to NLI for the ownership and operation of current and future farmland and position for the greatest impact.**
c) **Message the models to encourage adoption of regenerative practices, inspire others and encourage the releasing of land for sustainable, long-term management of farmland. Farm donations to NLI.**
d) **Identify and empower horizontal relationships and audiences – NLI, and other land trust, land tenants/stewards, local organizations, neighbors, farmers, jurisdictional government employees and others.**
e) **Leveraging partnership and resources.**

7) **SUSTAINING WHOLE FARM MANAGEMENT**
   a) **Revenue benchmarks**
   b) **Critical limits understanding and agreement in all areas – ex. Soil loss.**
   c) **Agriculture and Working Lands personnel utilization**
   d) **Built environment and infrastructure investment opportunity or download**
   e) **Future opportunities for land acquisition and investment – ex. Idle assets or undervalued resources**

8) **FINAL REPORT**
   a) **Deliver a draft report for review that serves as an implementation tool to be adopted for practice**
   b) **Dialog with stakeholders of NLI, the Delta Institute and any committees to complete a comprehensive final report**
   c) **All factual justifications included in the report will be referenced and footnoted to assist in messaging and maintaining factual integrity.**

3.1.3 Investing in Farmland Consultant – Assessing working lands as an investment strategy for conservation groups

Some qualifications we considered when working with an investing consultant (*Hyphae Partners*) were primarily that they must be knowledgeable about local farm prices and commodities and international markets. The must also be versed in conservation and regenerative agricultural practices. We were looking for a work product/ analysis report for conservation non-profits investing in Illinois farmland as a mechanism to fund conservation stewardship activities. The report would include:

- An analysis of what the tangible value benefits and concerns are for becoming a landowner and leasing the land, including current and projected future trends.

- Identifying a set of strategies for achieving a diversified investment portfolio to include productive farmland, including commodity farming and small local food farming.

- Addressing questions such as what would it take to achieve an income equal to or greater than our current minimum of a 4% distribution? We currently take that

percentage from our traditional market investments, and would like to compare that rate of return with agricultural investment. What if we took $500,000 or more out of our investment portfolio to purchase farmland as a diversified investment tool in northern Illinois? What would that look like and what considerations do we need to be aware of?

- What would it take to move from conventional agriculture to conservation practices, organic agriculture or regenerative agricultural practices?

We understand assumptions need to be made to balance cost of land, (currently dropping, good time to buy?) productivity, and perhaps even climate change impacts....as well as external international political and market impacts. We're not looking for a solution per se, but more of an analysis of benefits, costs and risks, and identifying all the parameters we need to be aware of, including even asking a suite of questions that we may not have thought of. (The report can be found at Appendix 3)

Next Steps

Begin the Implementation Process by:

- Establishing Procedures for the working lands initiative with the Working Lands Sub-committee
- Creating Conservation Leases including a Resource Management Systems Plan with our farmers as part of the team and ensuring we are creating a fair conservation lease
- Work with the local NRCS to develop a farm conservation plan
- Determining how we can know we are making a difference. Decide what and how to measure, gather baseline data such as: soil OM, water quality including biological diversity, soil productivity, etc.
- Analyzing Capacity and Developing Long Term Budgets
- Determining if having working lands as an investment strategy is feasible, and would there need to be a separate structure?

Further Discussions across committees on:

- Investing in agricultural land as a Program Related Investment (PRI) with the Finance Committee;
- Encouraging farmland donations with our Resource Development Committee

- Assessing our capacity with Resource Development and Personnel Committees;
- Writing Conservation Farm Management plans and developing leases with the Working Lands Subcommittee.

Additional Questions and Issues to Explore

- What is the public perception of this work for a conservation land trust? Should we do a survey?
- Mission driven initiative to support programs: what is the messaging, marketing and framing that needs to occur?
- Setting up a separate structure such as a private 501c3 and an ag. investment policy;
- Resources for farm management, what is our capacity as we grow? Do we have the expertise?
- Where do we stand on supporting local food and small producers, grazing regimes and nesting birds for example;
- Delving more critically into researching market opportunities for alternatives to row crops,
- Thinking more deeply about the implications of moving from conventional practices to conservation, organic or regenerative practices on soil health. Organic production requires considerable soil tillage, with fewer chemicals, and conservation practices using cover crops requires less tillage but more chemicals. Regenerative often means grazing. We need to learn more and find a level of comfort with our decisions.
- How extensively do we engage our farmer tenants in this process?
- Measuring our success. What does success look like? What do we measure and how? How do we track data?
- How does conservation farming assist us with our preserve buffers and expanding our protected areas to create more of a systems approach to land protection?
- Developing a business plan to identify the way forward for a more strategic approach that includes identifying risks such as operational management, financial and human resource risks.

Appendix 1

Working Lands Management Program Guiding Principles and Policy

Guiding Principles

Our vision is to utilize a working lands program to financially support our growing land stewardship needs to achieve greater mission impact. This program diversifies our income base with a steady, reliable income stream. NLI's mission will also align as we incorporate natural ecosystems into productive agricultural land for clean water, healthy soils, biodiversity and heritage preservation to optimize the value of natural resources on productive lands. When feasible, our working lands may be restored to appropriate habitats.

These draft guiding principles for NLI's Working Lands Program are formulated to guide the development of site stewardship goals, determine the best farm management strategies to include both conservation and economic sustainability, as well as highlighting our values in building long lasting relationships with the farmers and the local communities where they are located.

Principle 1. Sustainable Land Stewardship. Profitable and responsible land management includes practicing restorative agricultural techniques for quality soils and water quality protection. The farm management and production plans for each farm should have a measurable set of goals for soil health and water quality protection based on scientific principles and practices.

Principle 2. Mutually Beneficial Lease Arrangements. Leases will be fair to both parties as well as provide for technical assistance with conservation practices to reduce the economic risk to the farmer in return for implementing sustainable agricultural practices.

Principle 3. Conservation and Restoration. Initial conservation practices may include assessment of marginal lands, remaining habitat remnants on farms such as hedgerows, stream corridors, enhancement of pasture and hay lands with native plants and control of invasive species. The management and production plans for each farm should have short and long term conservation and restoration goals and practices.

Principle 4. Market and Revenue Economic Opportunities. Farms may be assessed as to the economic potentials for valuing the ecosystem services, as well as the potential for local food production, conservation grazing and haying, specialty crops and organic farming as long as they fit within NLI's Working Lands Policy. It is our intent to demonstrate that ecologically managed agricultural lands are profitable and improve our regions natural resources.

Working Lands Policy

NLI will implement farmland management standards that strive to protect and conserve the natural resources of the site.
Farmers who lease NLI working lands shall:

- Use farm practices that protect and minimize degradation of soil and water resources, wildlife habitat, flora, fauna, and cultural resources.
- Promote the long-term ecological health of NLI working lands
- Encourage communication among the Lessee, NLI, and the Natural Resource Conservation Service, the Soil and Water Conservation District and other appropriate resources as outlined in NLI's leases or procedures.

A Resource Management System Plan (RMS Plan) will be developed for each farm, making recommendations regarding farm management and conservation goals, and include an implementation strategy with timelines. The RMS Plan will be developed with technical assistance from the local district of the Natural Resource Conservation Service (NRCS), the local Soil and Water Conservation District (SWCD) and the Consolidated Farm Service Agency
(FSA), the USDA will assist with designing the RMS. The RMS Plan will incorporate soil conservation, water quality, nutrient management, wetland buffer and pesticide management guidelines that will be approved by NLI.

Natural resource conservation on NLI farmlands shall be achieved through implementation of soil and water quality protection standards combined with more comprehensive, site-specific Conservation Plans. These Conservation Plans shall also have nutrient management plans under the umbrella of the RMS Plan.

NLI will build equitable partnerships with the Lessee using their agricultural management capabilities and reducing their economic risk.

NLI will:

- Build partnerships using both short and longer-term leases on parcels based on natural resource management goals for the site. The equitable and efficient assignment of farm leases to farmers shall require standard procedures for the transfer of leases on new land acquisitions, for negotiated lease extensions, or, when negotiations fail, a public bid process, and for farm lease retirements or acreage reductions.
- Ensure that each Lessee maintains adequate insurance coverage for NLI, which must be named as additional insured, and all parties that work on the farmed parcel.
- Provide a clear process for each Lessee to submit annual lease fees timely, as required in its Farm Lease Agreement.

The lessee and NLI will execute a Farm Lease Agreement in a form approved by the Working Lands Sub-Committee of NLI's Land Conservation Committee.

NLI may promote alternative agricultural production where appropriate

- To promote the most appropriate use of productive land, and
- To encourage local beginning farmers

Examples of such leases may include local food production, conservation grazing and haying, specialty crops and organic farming. A Farm Marketing Plan may be developed with the lessee to include an analysis of markets and revenue generation appropriate to each site within the context of its conservation goals.

NLI may reduce or terminate agricultural activities on working lands for ecosystem restoration.

- Restore native plant communities, wildlife habitat or protect cultural resources
- Provide a consistent, fair, and efficient course of action for the acreage reduction and/or termination of leased properties from the program.
- Provide for advance planning for restoration activities by depositing lease rents into a designated revenue fund for restoration and stewardship of leased properties after they are retired from the program

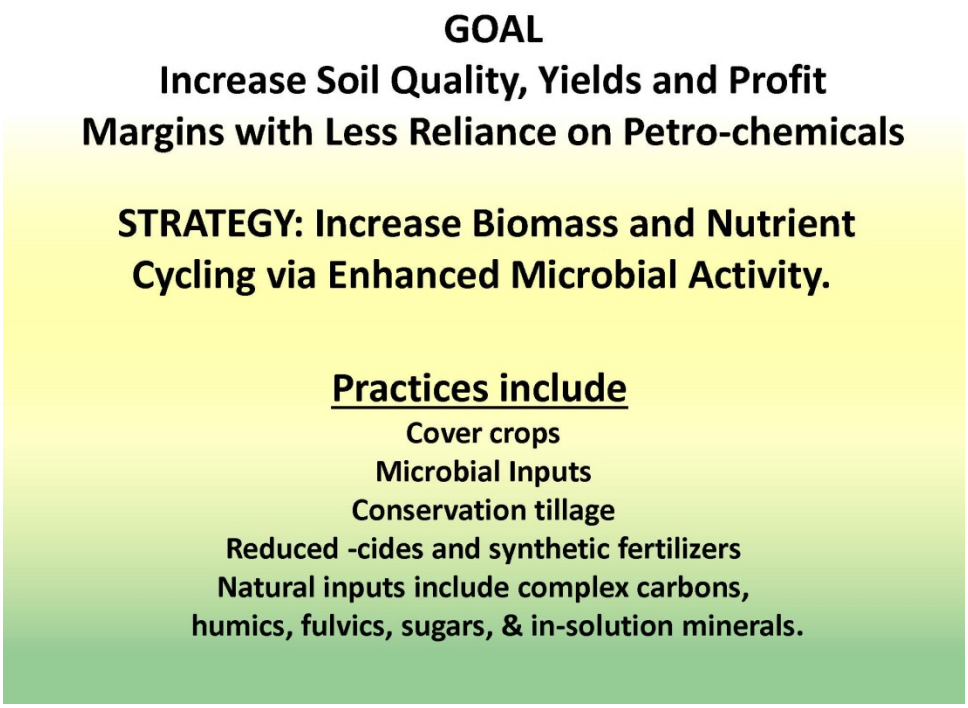
NLI's Land Conservation Committee shall periodically review staff recommendations and determine whether each leased property should a) remain in the program, b) be terminated from the program, or c) be reduced in acreage so that it is partially terminated from the program.

NLI may terminate a leased property from the program or reduce the acreage of a leased property a) because of implementation plans for site habitat restoration, or b) for any other reason related to the management and operation of NLI's properties and affairs.

In advance of the reduction or termination of agricultural activities, if the land is to be restored, NLI shall prepare a restoration plan and budget, and allocate project funds for restoration into which farm lease fees shall be allocated, unless otherwise directed by the Board of Trustees.

Appendix 2

Soils Program



Pre-Plant Soil Amendment

Residuce™ and Humics
Broadcast Spray with Molasses
(mola's sugars + carbons for microbial expansion)

Beneficial fungal microbes in Residuce™

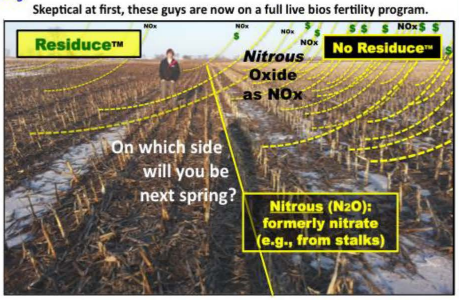
1. *Anchor nutrients more tightly*
2. *Improve accumulation of organic matter*
3. *Break down hard to digest cellulose and lignin*
4. *Make better soil tilth (so soil particles cling together)*
5. *Break down some chemical residues (bioremediation)*
6. *Increase residue decay from improved worm activity*
7. *Absorb soil nutrients so they won't volatize, denitrify or leach*
8. *Reduce disease risk by controlling pathogens via competitive exclusion*
9. *Extend plant roots (increase cubic area for water and nutrient absorption)*
10. *Solubilize soil phosphorus making it available to plants and other microbes*
11. *Capture all nutrients including phosphate, convert it to orthophosphate then back to phosphate for uptake next spring.*

AgriEnergy Resources' Residuce™ Reduces
- Residue
- Disease Risk
- Lost nutrients
- Inputs 10%-15%

for **$11 to $14 per acre***

Skeptical at first, these guys are now on a full live bios fertility program.

15 mi. south of Madison, WI side-by-side Residuce demonstration, March 2014



The Soil Science Society of America Journal found that removing more than a quarter of a field's stover had negative impacts on structural stability and soil fertility.
-- Land Stewardship Project, June, 2014

"Wow, that Residuce stuff really DOES work!"
-- DeKalb County organic grower

***Price includes any one of four food packs for microbial population expansion.**

Humics' *effects on plant cell membranes that result in improved trans-ort of nutritional elements; enhanced protein synthesis; plant hormone-like activity; enhanced photosynthesis & effects on enzyme activities. Indirect modes of action benefit plant growth through solublization of microelements (e.g. Fe, Zn, Mn) and some macro-elements (e.g. K, Ca, P); reduction of active levels of toxic elements & higher microbial populations.*

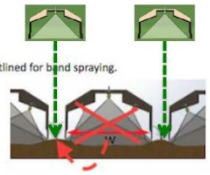
From "30 YEARS OF RESEARCH DOCUMENTS THE INFLUENCE OF HUMIC SUBSTANCES ON SOIL HEALTH, FERTILIZER AND WATER- USE EFFICIENCY"
- Mir M Seyedbagheri

Planting Formulation

SP-1 + Trace Elements
spray at 18 GPA

Since NLI's current tenant cannot apply in-furrow liquids, sprayers can band liquids over narrow strips...

Spray 6" to 8" band over just planted row



Sizing Nozzle

When sizing your nozzle for hooded sprays follow recommendations outlined for band spraying.

Band Spraying

Standard U.S.

$$\text{Volume of Chemical Solution Required (Gallons)} = \frac{\text{Band Width (inches)}}{\text{[Band Width + Spacing between Bands] (inches)}} \times \text{Label Rate of Carrier (GPA)} \times \text{Field Area (Acres)}$$

Height Requirement for Band Spraying

Band Width	Height over Target 80 °	Height over Target 110 °
8"	5"	3"
10"	6"	4"
12"	7"	4"

Big Plus!

MST Dry Seed Treatment

MYCOS or
MYCORRHIIZAE *(plural)*
"My-co-rise-aye"

In a category all their own, mycos' **hair-like extensions** ("hyphae" as "high-fay" pl.) from the root zone's rhizosphere give plants exponentially more **soil exposure into pore spaces** for moisture and nutrients than roots alone (up to **20% vs. 2%**).

PLUS they SHARE nutrients across rows of crops!

Let The Miracle of Mycorrhiza Work for You

Research has shown that Myco Seed Treat™ (MST) is an extremely economical, efficient way to enhance soil biology and boost plant performance. MST™ is a dry microbial package that is used as a planter box treatment to coat the seed. It is an easy first step toward enhancing any grower's productivity.

When applied to the seed prior to planting, it surrounds the seed with high concentrations of diverse beneficial bacteria and fungi, including **Mycorrhizal (my-co-rise-ull)** fungi. These microbes work through out the growing season to help the plant manage its uptake of nutrients that it needs and to continually colonize the roots with these beneficial organisms.

Support nutrients in MST™ promote early rapid growth of microbes that create a more desirable root zone. This extra biological activity supports uniform emergence and vigorous seedling growth due to their bio-active carbons and their ability to hold moisture around the seed. And, for community survival, each host's mycos share nutrients and water across their interconnected web among neighboring host plants (crops).

Visual demonstration of MST™ at work:

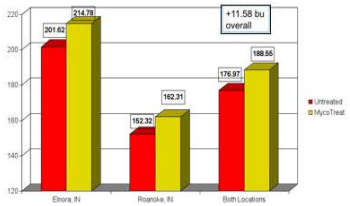
What does all this mean for yield?

In 2006, an organic corn research plot at The Ohio State University's OARDC at Wooster, OH, showed that using MST™ resulted in a yield boost on three different varieties:

Doebler's 2616RR - 1.5 bu/acre increase
Doebler's 3233RR - 3.2 bu/acre increase
Doebler's 3549RR - 6.3 bu/acre increase

Replicated research conducted by Tryon Group, 2007

Here's a more graphical representation of the effects **Myco Seed Treat™** has on Hybrid Corn Seed:



A Soybean Seed Treatment Study conducted by Beck's compared Myco Seed Treat™ to six other treatments. MST™ dominated the three-year (2004-2006) trial averages with a 3.6 bushel/acre increase over the seed treated with 2nd place Sure Gro.

Additionally, research done at Western Illinois University on organic corn, showed a 12.7 bushel/acre increase on Non-GMO Corn, and a 10.6 bushel/acre increase on Organic Blue Corn, when treated with MST™.

Myco Seed Treat™ is used at 4 dry ounces per 100 pounds of seed (4oz/100#) on larger seeds such as corn; and at 8 ounces per 100 pounds of seed (8oz/100#) on smaller seeds such as grass, clover or alfalfa.

It is very easy to do side-by-side MST™ comparisons by splitting the planter or by other methods. One **caution**, however, in doing side-by-side plots: Always plant the untreated seed before planting MST™-treated. This prevents residual MST™ staying in the planter box from getting on the seed in the control plot, which would reduce accuracy.

If you have questions, contact either Matt Van Slyke, Grayslake, IL at 224-433-6527/815-403-1847 or AgriEnergy Resources, 21417 1950 E. Street, Princeton, IL 61356 or dial 815-872-1190.

Make 2017 the year to see for yourself the benefits of using Myco Seed Treat™ (MST)!


Myco treated on the left

MST cost per corn acre $1.75 - $3.00
MST cost per bean acre $4.25 - $7.00

More peer-reviewable studies?

AgriEnergy retained Univ. of Wisconsin to conduct drought trials (no water). In both cases, MST plants vs. untreated survived 25%-30% longer.

Green Agents, Ltd. • Bio Logical Farming for People, Planet & Profit • Matt Van Slyke @ 224-433-6527 or matt@greenagents.biz

Nov 17, 2016, at 3:39 PM, Boone County IL wrote:

Dekalb 53-56 planted 5/18/16 @ 32,500 ppa
(to 3 tons of fresh 7-way cover crop mulch).

1) 4-21-4 + SP1 multi-microbial in a 5 gallon mix with 1.25 gallons of water for a 6.25 gal. in furrow application and cut macros 10%.... .....249.3 bpa.

2) 8-19-3 @ 6.25 gallons in furrow application.....(-10.5)...238.8 bpa

3) check strips.....(-14.7)...234.6 bpa

"Looks good boys."

	$3.25/bu.	PPA	$3.50/bu.	PPA
1) Cost: $19	$ 810	$791	$ 872	$853
2) Cost: $18	$ 776	$758	$ 836	$818
3) Cost $00	$ 762	$762	$ 821	$821

* *

7th generation gent running 1500ac used university extension practices for 37 yrs. in Boone County until 2015. Using #1 above in 2015 to one bean and one corn plot... Live Bios-treated soybeans yielded a minimum of 7 bpa more than all 7 other yields; and for 9 corn plots, 19 bpa was the smallest while 40 was the biggest difference.

Natural Land Institute
2017 Soil Health Program
AgriEnergy Resources Non-synthetic Inputs
& Green Agents Monitoring

Pre-plant

Acres:	19.8						
Mix Special	Spray Applicator - Pre-plant						
Rate	100% -- broadcast						
# of apps:	1	Units	Rate/A	descr.	$ /Unit	CPA	Sub-total
Dilute upon delivery	**Humic Acid (12%)	15	0.8	gal.	$8.42	$6.38	$166.72
decomposers	Residuce™	2	0.1	lb.	$87.82	$8.87	$175.64
	Molasses	20	1	gal.	$5.56	$5.56	$111.20
	Mix Special Rate	19	Gal. water/ac				$453.56
	Mix volume	411.2	GPA=	20.77		CPA	$22.91

Planting

Acres	19.8						
Powder on seed	MST (Mycorrhizal Seed Treatment) dry powder stirred into seed						
Rate	100% [50% With Blow Planters]						
# of apps:	1	Lb-unit	Rate/A		$ /Unit	CPA	
	2 of 1-lb. pouch	2	1.71		45.96	$4.92	$91.92
Mix Special	SP1 + Trace Pak						
Rate	100% -- Liquid in or banded over furrow						
# of apps:	1	Units	Rate/A	descr.	$ /Unit	CPA	Total
polymicrobial	SP1	55	2.8	gal.	$5.73	$15.92	$315.15
Trace elements	Trace Pak	10	0.51	gal.	$12.49	$6.31	$124.90
	Mix Special Rate	3.3	Gal. product/ac				$440.05
	Mix volume	353	GPA=	17.8		CPA	$22.22
						Totals	$985.53
**Reactive liquid:	Dilute 2:1 upon arrival					CPA	$49.77

Working Agreement

Green Agents will conduct plant petiole tests for Brix and submit tissue tests to determine if plants are translocating enough nutrients or if a foliar spray is warranted.

Consulting to NLI's tenant about cover crops will be needed as well.

Green Agents will invoice NLI each month at an hourly rate of $30 for services rendered.

Consulting fees will not exceed $800 for 2017 and will not exceed $500 for 2018.

Signed: Marc VanSyke
Date: March 6, 2017

Signed:
Date:

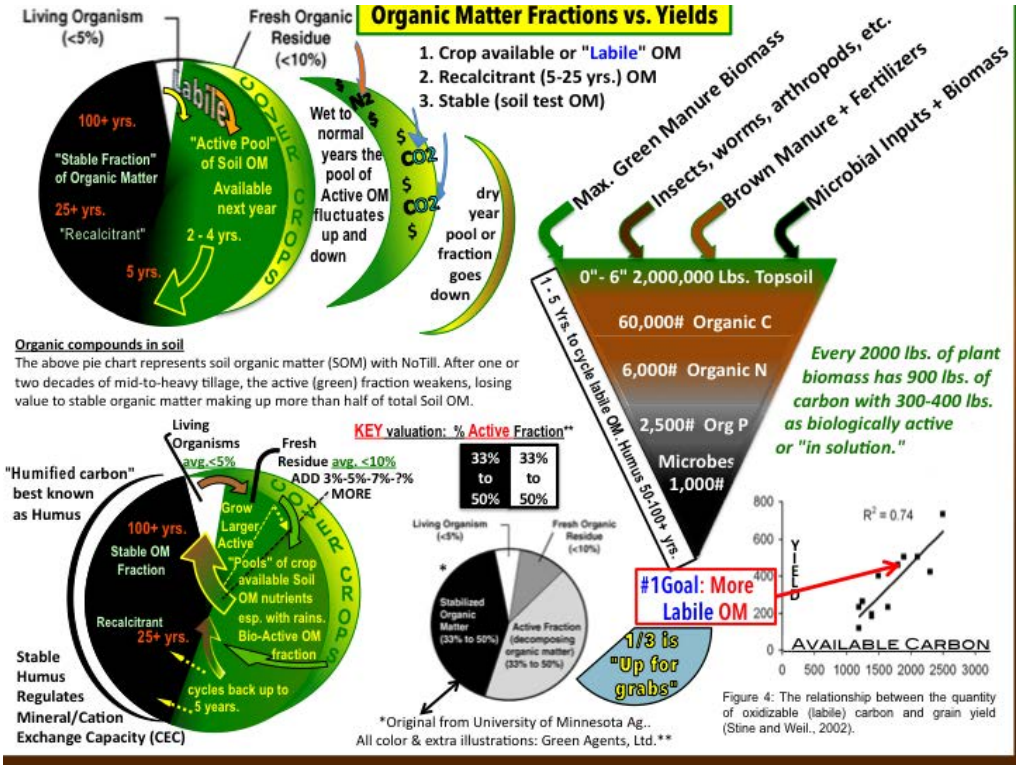


Figure 4: The relationship between the quantity of oxidizable (labile) carbon and grain yield (Stine and Weil., 2002).

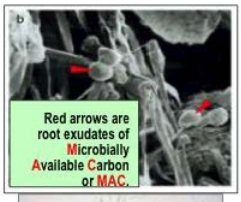
4 + 1 = 5 of the most farm-crucial microbe groups

1. **MINERALIZERS** *convert into soluble (plant usable) form, phosphorous (to phosphate), potassium, calcium, magnesium, sulfur, and other tied-up, insoluble micronutrients. 90% of soil N is organic -- therefore insoluble. Mineralizing microbes also convert organic N to ammonium N.*

2. **NITRIFIERS** *convert ammonium N (NH_4) to (nitrite then) to nitrate (NO_3) for plant uptake.*

3. **N-FIXERS** *hold N for later use, preventing nitrate losses due to leaching and volatizing (into the air as nitrous oxide, a greenhouse gas over 300x more potent than CO_2).*

4. **DIGESTERS** *are fungal organisms plus fewer bacterial strain/types which free up hundreds of pounds per acre of valuable nutrients held by crop residues.*



The 5th Group

MYCOS or MYCORRHIIZAE *(My-co-rise-aye proper name, plural; mycorrhiza, singular)* are in a league all their own. Mycos' hairlike extensions from the root zone's rhizosphere give plants exponentially more soil exposure to pore spaces for moisture and nutrients than roots alone (up to 20% vs. 2%). PLUS they SHARE nutrients across rows of crops!

ILLUSTRATION: DON SMITH

Photo courtesy Aberdeen Mycorrhiza Research Group

"These networks connect plants with each other, enabling exchange of nutrients and water. This may help explain why mixed plant communities often perform better than monocultures."- *Evergreen Farming, Sept. 2009*

When teeming with diverse, ***beneficial*** microbial life, soils breathe much better, so water holding capacity improves. Beneficial "live bios" create crumbly but sticky tilth due to glomulin (gluelike) substances. Some researchers contend only **mycos can make glomalin**. All 5 increase the "labile" organic matter "fraction" or the microbe-crop available pool of inorganic nutrients. When stewarded, these 5 Rehab Groups stop humus and earthworm losses; servicing/feeding plants which then develop more growth and phyto-hormones against bacterial goons and unfriendly fungals.

LEARN HOW TO GROW YOUR MYCO SUPPORT NETWORK THEN PLUG YOUR PLANTS INTO IT!

Contact Matt Van Slyke 224.433.6527 or matt@greenagents.biz

Foss Farm 2019 Soil Amendment Budget

2019 FOSS WEST 30 ACRES CORN

Descr.	Product	$ / unit	units	Descr	Contain	Sub-total	MST Chart	
MST	**Mycorrhizal Seed Treat**	**49.14**	**1**	**Oz.**	**Pouch**	**$ 49.14**		
Trace Pak	**Micronutri-ents+Traces**	**12.43**	**30**	**Gal.**	**1 x 30**	**$ 372.90**		
Multi-Microbial	**SP-1**	**5.86**	**90**	**Gal.**	**3 x 30**	**$ 527.40**	Crop	Corn
4-21-4-0.2 Zn	**Starter**	**$5.99**	**60**	**Gal.**	**2 x 30**	**$ 359.40**	#seeds/bag	80,000
Reduce	**Microbial Decomposers**	**87.62**	**3**	**Lb.**	**1 x 3**	**$ 262.86**	planting seed count	32,000
Reduce XT	**Colonization Starter**	**5.47**	**60**	**Gal.**	**2 x 30**	**$ 328.20**	acres/bag	2.5
			Foss Total Apps			**$1,850.76**	# of acres to be treated	30
							# of 50-lb. bags	12
							# of MST oz./bag	1.3
							# of .oz	15.6
							oz. per ac	0.520
							MST in ounces	16
							Lbs. of MST	1.0
							1-lb. pouch	$ 49.14
							MST App cost	$ 47.91
							COST PER ACRE	$ 1.60

Appendix 3

Financial Feasibility Analysis

Financial Analysis of the Feasibility of a Working Lands Model for Conservation Organizations

4/1/2019

NATURAL LAND INSTITUTE
Conserving Land in Northern Illinois

Hyphae Partners
Integrative Capital Solutions

Appendix 3

Financial Feasibility Analysis

Hyphae Partners
Integrative Capital Solutions

Financial Analysis of the Feasibility of a Working Lands Model for Conservation Organizations

Project Background:

As part of the Working Land Initiative, The Natural Land Institute worked with Hyphae Partners to consider how an impact vehicle could be created in order to attract monetary donations or in-kind (e.g., farmland) donations, to invest in and manage farmland through practices that further serve its conservation mandate. By doing so, NLI hopes to accomplish the dual purpose of 1. generating cash flows that can help support NLI's work with natural land conservation and 2. further serving the conservation goals on working lands via conservation farming practices. NLI also hopes that such an impact vehicle could be replicated to support the Regional Stewardship Coop that is being put together in partnership with other regional land trusts.

By creating such a farmland impact vehicle, NLI and other land trusts could dramatically accelerate land conservation by not only converting farmland currently managed conventionally to conservation practices but also through the synergies existing between such practices and natural lands (e.g., increasing biodiversity, increasing soil health, increasing climate resiliency through flood mitigation, water filtration services, and conservation corridors between protected lands and development). The urgency of such a shift is highlighted by the ominous macro trends such as soil erosion, water pollution, and dwindling beneficial insect populations. Furthermore, 10% of all farmland is set to change hands over the next 5 years[1], presenting a unique opportunity to transition an increasing amount of land to conservation outcomes. By working on this project, NLI could build a model that would also enable the broader land trust community to participate in this method of conservation.

Findings

- The spectrum of farming practices considered were:
    - **Conventional:** Corn & Soy monocultures, no cover crops, deep tillage, herbicide and pesticides
    - **Conservation:** Corn, Soy & Wheat, cover crops, no/shallow tillage, herbicide and pesticides
    - **Organic**: Corn & Soy (& Wheat), cover crops, deep tillage, no herbicides and pesticides, Non-local organic amendments
    - **Regenerative Organic/ Bio-dynamic:** Biodynamic/diversified production, no/shallow tillage, no herbicide and pesticides, on farm/ local fertility management
- Over the past 15 years, farmland owners in Illinois have enjoyed attractive long term returns (~8%) on their land investments in addition to cash rents (2-4%), although the past 5 years have been difficult (~0%). Given that corn and soy farmers have struggled to turn a profit in recent years, they have little capacity to invest in new practices.

[1] http://sustainableagriculture.net/blog/total-2014-results/

- Since farmers have a reduced capacity to invest in new practices, we considered how a Working Lands Impact Vehicle could structure its leases to farmers to encourage the adoption of practices that move them along the agriculture conservation practice spectrum. Our financial analyses found:
    - **Conventional to Conservation:** Switching from conventional to conservation agriculture by adding a rotation of wheat (in order to build soil organic matter) may lead to a lower average annual earnings per acre (~$33 per year), hence lowering the market rate rent by the same amount (~$33) would offset this. Since there does not seem to be too much of a “transitory” period, the lease term can remain relatively short term, somewhere between 1 year and 3 years.
    - **Conventional to Organic:** In the case of organic conversions, significant investment is needed during years one to three, therefore the lease term should be decided as a function of when the farmer can breakeven and turn a profit. If the lease rate were to be $100 for the first three transitional years, the farmer would be expected to breakeven and turn a profit during year five, hence a lease with a five year term would be a good incentive for a conversion.
    - **Conventional to Regenerative:** Given the limited number of biodynamic and regenerative farms in Illinois, we recommend continuing the relationship we formed with the Liberty Prairie Foundation whose farmers are currently implementing regenerative systems. As they move from the implementation stage to the maintenance phase, NLI and like organizations can better understand the economics of these systems.
- **Regional Stewardship Coop:** These learnings can be leveraged by the Regional Stewardship Coop to inform its structure and relationship with farmers. As the Regional Stewardship Coop looks to form, it should consider what its key functions should be. Potential Coop functions include - In kind and capital campaigns; Recruit and hire farmers; Pool equipment for farmers (e.g., strip till bars); Fund for infrastructure (e.g., storage bins for organic); Partnerships with offtakers for farm production; Hire 3rd party manager; Offer services such as land management planning, habitat restoration, invasive removal, and burns.
- Given the number of different specialized functions the cooperative aims to promote, it seems that a non-profit structure that partners with established operating partners would be the least risky and most economical way to structure the cooperative.
- This summary of findings is further detailed in a more comprehensive report that is held by the Natural Land Institute. Please contact Executive Director Kerry Leigh for further details.

Next steps & Further Exploration

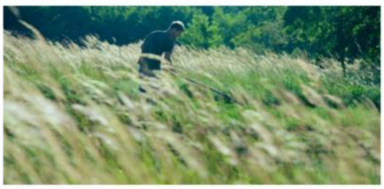
- Finish building a regenerative agriculture model with the Liberty Prairie Foundation
- Work with Precision Conservation Management to further detail the economics of conservation practices
- Review model with collaborators Joe Rothermel, Rob Woodrow and Ron Doetch
- Build a business plan for the Stewardship Cooperative that details its

- Functions; Partner Organizations & Operating Partners; Collaborative Fundraising Strategy; Marketing Materials; Farmland Acquisition & Farmer Pipeline; Model out Bull/Bear/Average Scenarios; Legal Structure; Valuing Regional Ecosystem Services

Agenda

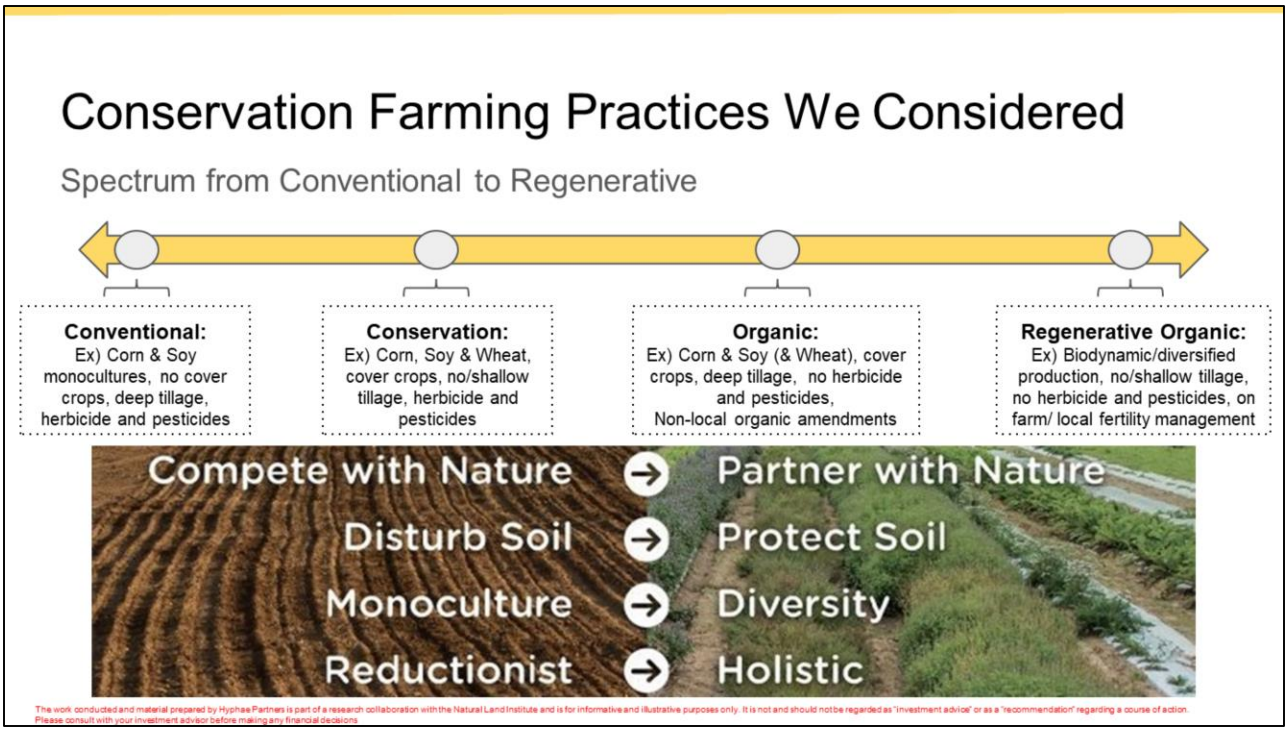
- A spectrum of agriculture practices to choose from
- Financial analysis of farmland investments in Illinois
- The Stewardship Cooperative
- Considerations for implementation

Project Scope



- ***Project goal:*** *How might we...*
  - Analyze farmland investment strategies suited to NLI
  - Assess potential structures to host farmland investment strategies
  - Assess Implementation strategy

- Our approach:
  - What frameworks should land trusts consider?
  - Risk & return profiles for each framework
  - We use data & reports available + Interviews to vet assumptions



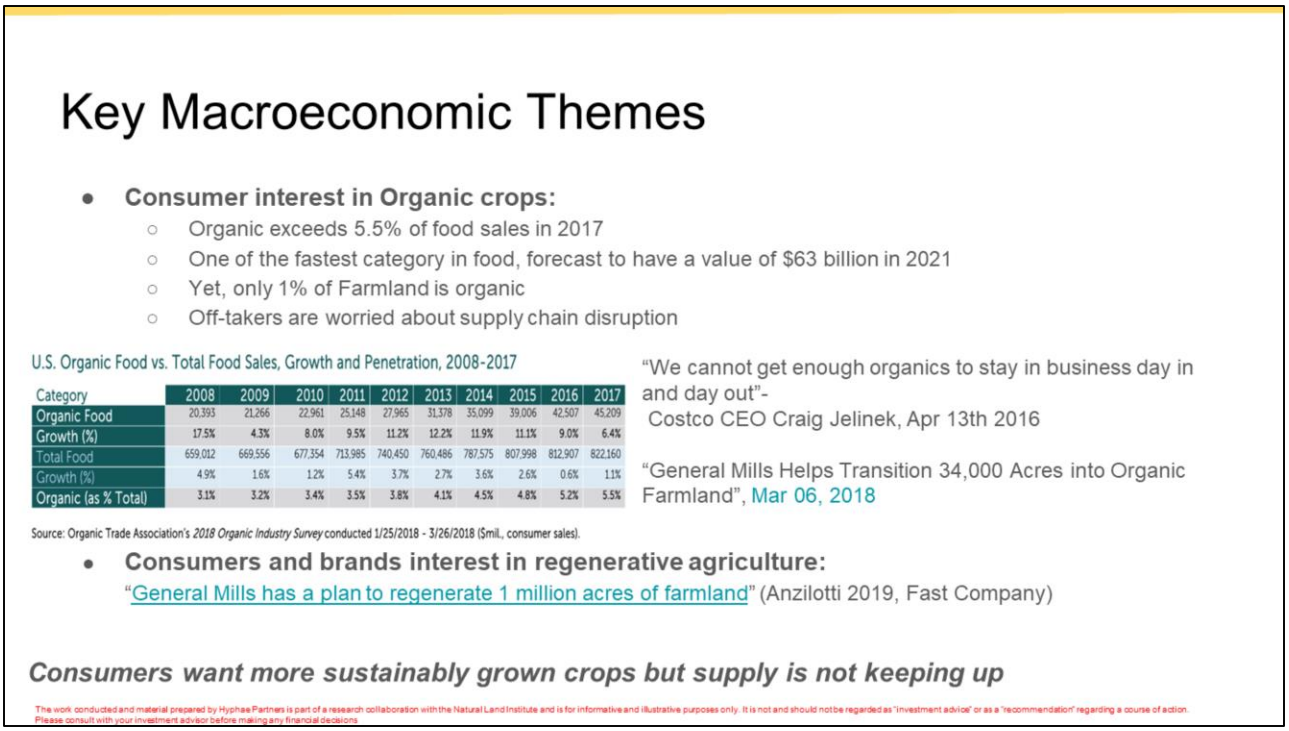
Farming practices that land trusts could consider accepting on their land can be organized as a spectrum of frameworks.

- On the left hand side is conventional management, omnipresent throughout the Midwest.
- Then comes conservation management where farmers, through the minimization of tillage, the addition of cover crops and crop rotations start reducing soil loss and allow for more nutrient management. This is usually accompanied by added herbicide applications to reduce weed pressure and terminate cover crops
- Organic management eliminates pesticides and herbicide, which in some cases will be accompanied by additional tillage to reduce weed pressure.
- Regenerative organic management eliminates pesticides, herbicides but also limits the amount of tillage on the land by introducing more rotations and implementing more diversified farming systems.

Financial Analysis

Here we will review a couple of macro trends that are important to understand the opportunity in crops grown in a more sustainable if not regenerative framework.

We will then look at the historical financial performance of farmland in Illinois and present our findings after building financial models of converting to the different frameworks analyzed in this project.



Before diving into financials, let's highlight a few macro trends that can help inform the opportunity for NLI:

First, a couple of trends emphasize the growth in consumer interest for sustainably grown foods:

- Organic foods is the most relevant proxy for this trend
  - One of the fastest growing food category in the US
  - Presents a stark supply demand imbalance (5.5% of food sales but less than 1% of US farmland according to numbers from the 2016 NASS survey and as reported by Pewresearch)
- Regenerative agriculture is also gaining a lot of tractions with major brands announcing sourcing commitments, such as General Mills.

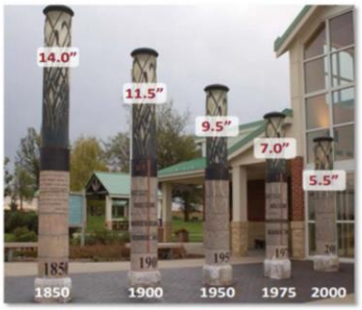
Links:
2016 NASS survey: https://downloads.usda.library.cornell.edu/usda-esmis/files/zg64tk92g/70795b52w/4m90dz33q/OrganicProduction-09-20-2017_correction.pdf

Pewresearch: https://www.pewresearch.org/fact-tank/2019/01/10/organic-farming-is-on-the-rise-in-the-u-s/

Key Macroeconomic Themes

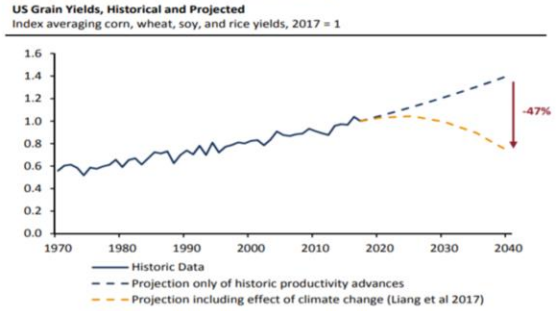
- **Soil is eroding at a rapid rate**

Exhibit 26: Soil Depth in Iowa Has Halved Since Intensive Cultivation Began



Source: Iowa Public Radio, "The Greatest Story Never Told," installation in Adair County, Iowa, by David B. Dahlquist and RDG Planning & Design

Exhibit 27: Effect of Climate Change on Grain Production



As of 4/30/18
Source: USDA NASS; "Determining Climate Effects on US Total Agricultural Productivity", Liang et al, Proceedings of the National Academy of Sciences, GMO

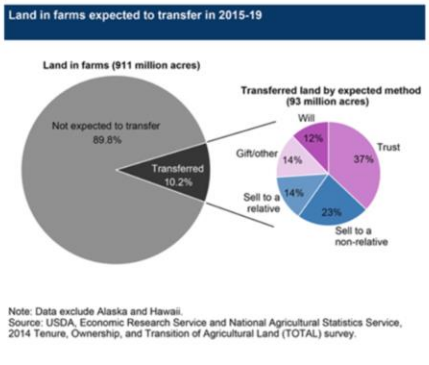
Source of both exhibits: "Race of our Lives Revisited" (Grantham, 2018)

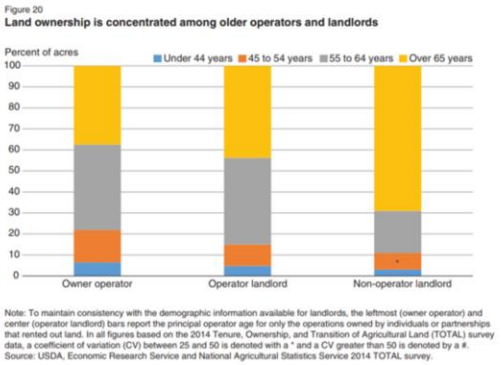
We stand at unprecedented times, with large amounts of land transferring hands while climate change may drastically change the face of agriculture of the next few decades

Soil's rapid erosion and the potential for decreased productivity over time has put emphasis on better soil management practices.

Key Macroeconomic Themes

- **Generational Farmland Transfer:** 40% of farmland is expected to change hands over the next 10-20 years (according to the American Farmland Trust)





An ongoing massive wave of land transfer gives NLI an opportunity to further its mandate

A massive wave of generational farmland transfer may offer a unique opportunity for conservation land trusts to help shape the future of the agricultural sector in the region.

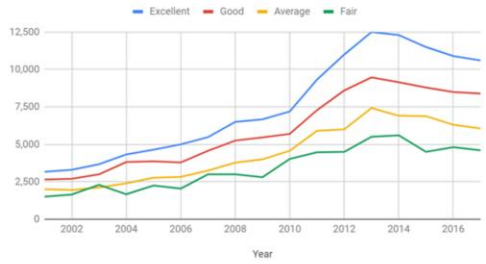
Several sources point towards a massive amount of land being due to transfer hands over the next few years:

- The 2014 Tenure, Ownership, and Transition of Agricultural Land (TOTAL) Survey by the Economic Research Service (or ERS) reported that 10% of farmland, or 93 million acres, were deemed to transfer hands over the period of 2015-2019 (refer to the graph on the left side)
- Although this timeline is soon to be over, given the current age range of landowners (refer to the right hand graph), this trend is likely to continue over time
- In fact, the American Farmland Trust predicts that 40% of farmland will change hands over the next 10 to 20 years.

Links:
TOTAL Survey: https://www.ers.usda.gov/topics/farm-economy/land-use-land-value-tenure/farmland-ownership-and-tenure/
AFT statistic on farmland transfer: https://www.farmland.org/initiatives/farm-legacy

Historical Financial Profile Farmland in Illinois

Land Price in Illinois per category (quality) of farmland



Cash rent over land price for each farmland category

Source: Illinois Society of Professional Farm Managers and Rural Appraisers

Continuously Compounded Annual Growth Rate (CCAGR)				
Selected period	Excellent	Good	Average	Fair
1 year	-2.70%	-1.31%	-4.02%	-4.32%
5 years	-0.73%	-0.50%	0.19%	0.46%
10 years	6.82%	6%	6.42%	4.38%
15 years	8.09%	7.85%	7.85%	7.08%

Farmland owners in Illinois have enjoyed good long term returns (~8%) on their land investments in addition to cash rents (2-4%), although the past 5 years have been difficult (~0%)

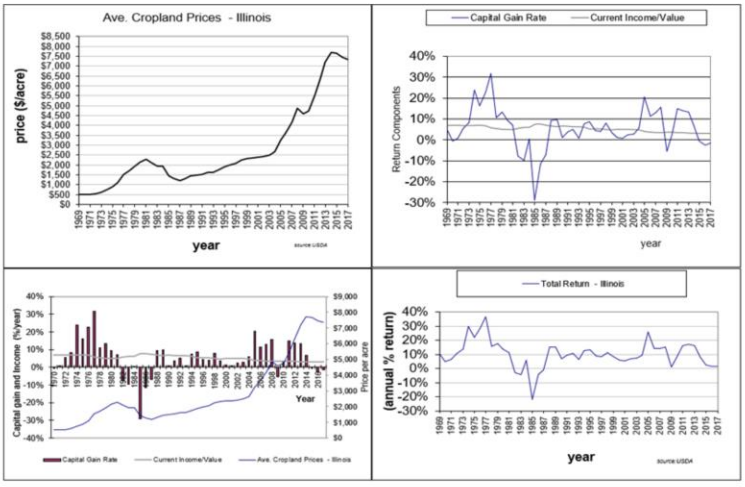
Let's now take a look at the return potential of owning farmland in Illinois for the different framework identified in the spectrum of practices.

Starting with conventional management, the Illinois Society of Professional Farm Managers and Rural Appraisers, through their "Land Values and Lease Trends" reports, give us good data on historical land prices and cash rent in Illinois.

Over the period of 15 years leading to the end of 2017 (the last available data point), land prices have appreciated at a 7-8% Continuously Compounded Annual Growth Rate (CCAGR), depending on the farmland quality (see bottom table).
In addition, cash rents have ranged 2-5% of land value in the 2009-2017 period (upper right graph).

Over the past few years, however land prices have been falling, having reached their peak in 2013, while cash rent have remained at their lowest between 2-3%.
This in parts has been due to a combination of macro forces, including falling commodity prices, rising interest rate environment as well as tariffs resulting from global trade tensions

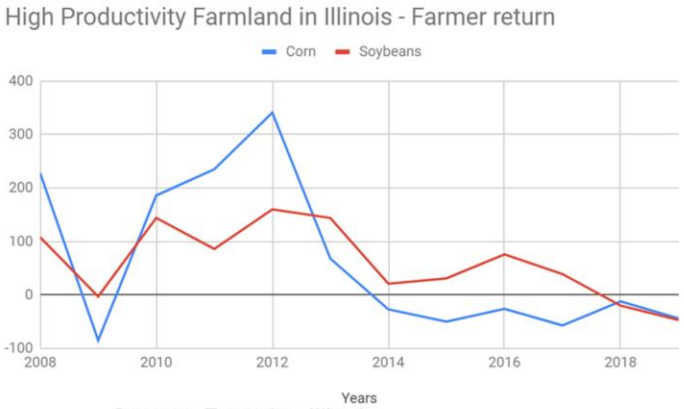
Historical Financial Profile Farmland in Illinois



Source: TIAA Center for farmland research at the University of Illinois, based on USDA data

Total returns have tended to oscillate around 10% over the past 50 years, close to 0% of late

Farmers Have Struggled to Turn a Profit Lately



Source: Farmdoc Illinois

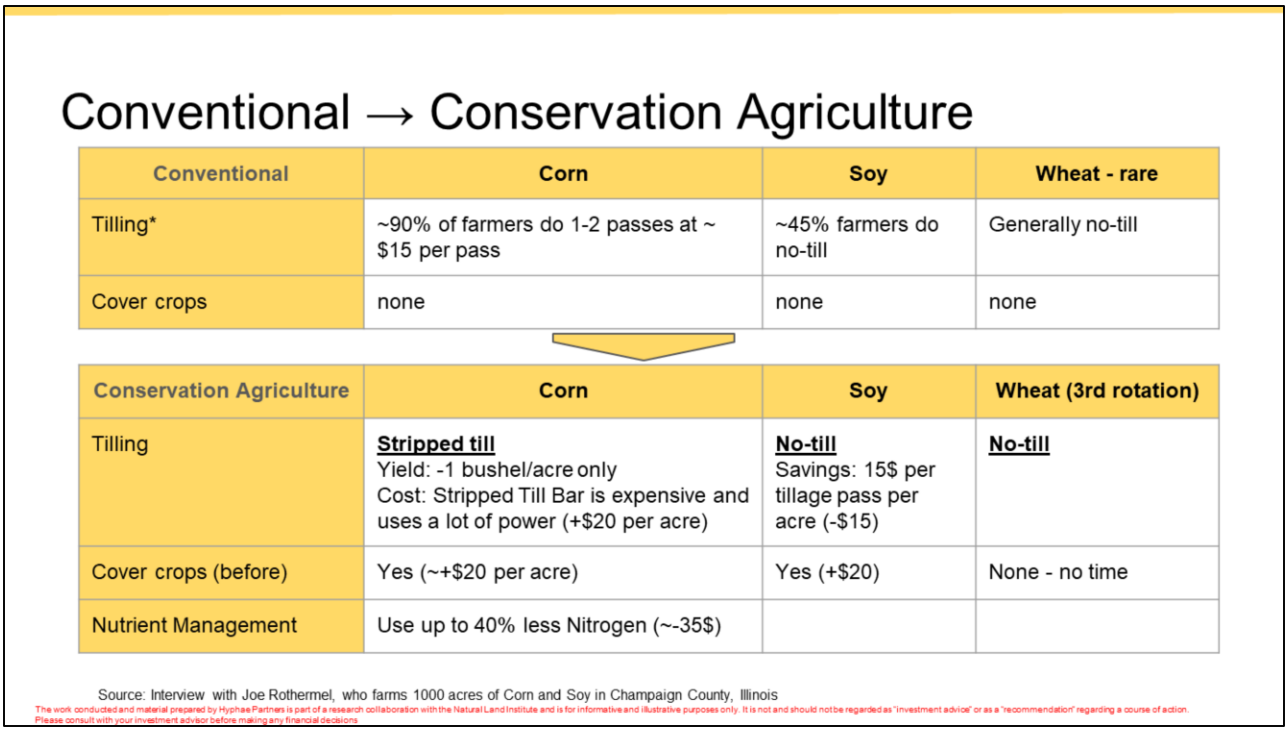
Annual Farmer Returns for High Productivity Farmland in Illinois		
Year	Corn	Soybeans
2008	$228	$108
2009	-$6	$76
2010	$271	$229
2011	$325	$171
2012	$341	$160
2013	$68	$144
2014	-$27	$21
2015	-$50	$31
2016	-$26	$76
2017	-$57	$39
2018 (Projected)	-$12	-$20
2019 (Projected)	-$44	-$47
12 year average	$84	$82

Given that corn and soy farmers have struggled to turn a profit in recent years, they have little capacity to invest in new practices.

How do these returns to the landowner translate into income for the farmer who leases the land?

Since 2008, conventional corn and soy farmers on Illinois high productivity farmland have averaged an income (after cash rent) of around $84 and $82 per acre.

However, income has dropped to the negatives since 2014, which may make it difficult for land trusts to incentivize farmers to implement changes on the farm, especially if there is no clear return on their investment and if lease terms do not reflect the risk they take.



Conventional -> Conservation Agriculture, part 1 (drawn from interviews)

In order to get a sense of costs and returns of switching from conventional to conservation ag, we interviewed Jennifer Filipiak from the American Farmland Trust (or AFT) and Joe Rothermel, who farms 1,000 acres of corn and soy in Champaign county, Illinois.

Joe helped us get a sense of what conservation agriculture practices could help build soil organic matter, and what rough costs and benefits to expect from each practices. Although these numbers were anecdotal, they helped us get a directional sense for the financials of converting to conservation agriculture, which we later cross checked through a literature review (see the next 2 slides)

Practices to consider included:

- Reduced tillage: going no-till for soy and wheat sounded feasible, while more difficult for corn, where he prescribed a stripped till rotation
- Implementing cover crops: cover crops are typically added before the corn and soy rotations, with planting and harvest timing preventing a cover crop before the wheat rotation
- Nutrient Management: Joe estimated nitrogen application reduction benefits at 40%, although pointed out that this depended on adding the wheat rotation to the duo of corn and soy.

The table above summarizes the main differences between conventional and conservation management, as well as a rough impact on costs & yield impacts. The following slide calculates the resulting difference in income per acre, followed by a similar analysis using several research sources.

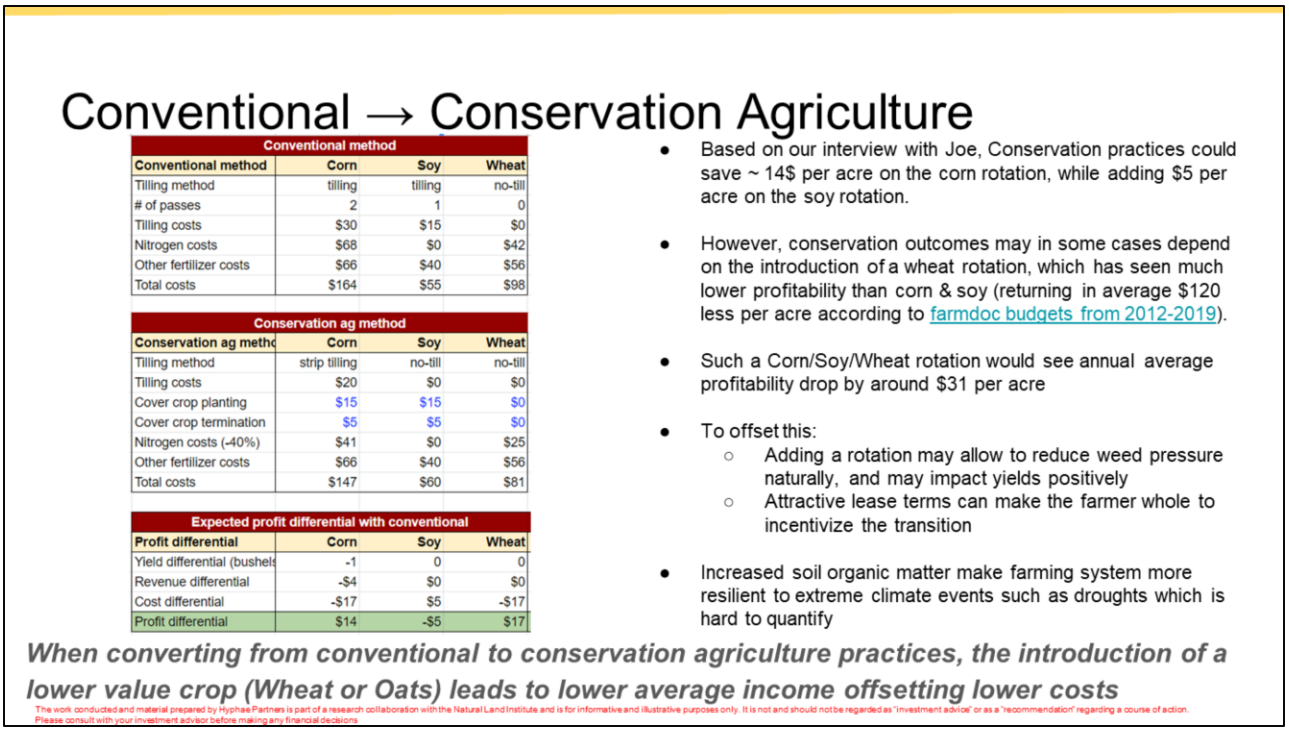
As a potential next step here, in order to access historical data on costs and yield when converting to conservation management, an organization that could be interesting to reach out to would be Precision Conservation Management (or PCM). PCM is an organization that helps farmers in the region implement conservation practices and uses data from farms in their network to inform farm management decision and show farmers the expected costs and benefits of such practices.

(*) The percentage of farmers used was reported by Joe, hence is anecdotal. For more accurate statistics in the region, please see the report Tillage Intensity and Conservation Cropping in the United States (ERS, 2018)!

Links:
Precision Conservation Management: https://www.precisionconservation.org/

Tillage Intensity and Conservation Cropping in the United States (ERS, 2018):
https://www.ers.usda.gov/webdocs/publications/90201/eib-197.pdf?v=7027.1

For more information on Joe's profile and story:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/il/soils/health/?cid=nrcseprd392252



Assumptions used to build the model:

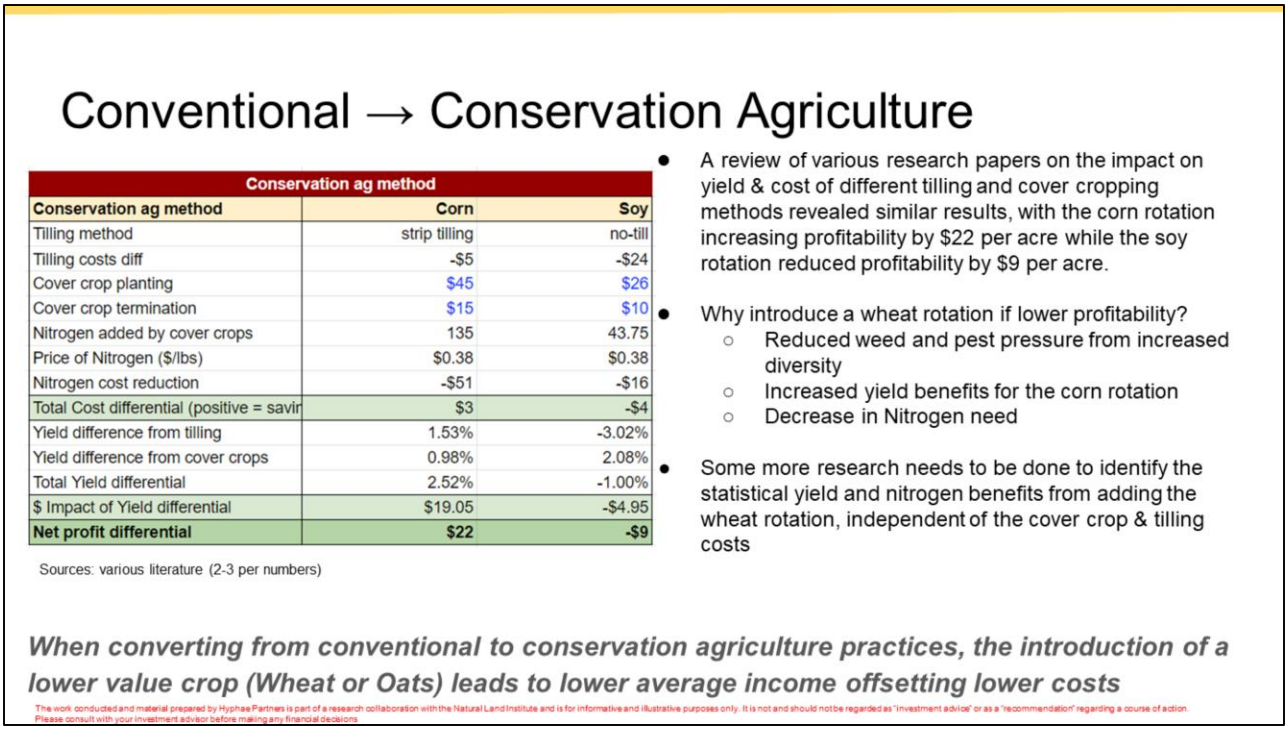
- Costs & yield impacts were drawn from our interview with Joe Rothermel
- Estimated Nitrogen application rates were derived from the Illinois Agronomy Handbook's Managing Nitrogen Chapter as well as the Iowa State Corn Nitrogen Rate Calculator
- Nitrogen Fertilizer prices were derived from AMS
- Other Fertilizer costs from Farmdoc 2019 budget
- Tilling costs, cover crop costs and ultimate savings on nitrogen budgeting were derived from our interview with Joe Rothermel

Links:

Illinois Agronomy Handbook's Managing Nitrogen Chapter:
http://extension.cropsciences.illinois.edu/handbook/pdfs/chapter09.pdf

AMS: https://www.ams.usda.gov/mnreports/gx_gr210.txt

Farmdoc 2019 budget: http://farmdoc.illinois.edu/manage/actual_projected_costs.pdf



Conventional -> Conservation Agriculture, part 2 (drawn from research pieces)

Using the average of numbers drawn from at least 2 literature sources for each assumption, we built a similar model and confirmed the intuitive results from our conversation with Joe.

Assumptions used to build the model:
Average of numbers drawn from several studies were calculated for each parameter:

- Costs of different tilling methods (Tilling vs No Till and Stripped Till):
  - https://www.extension.iastate.edu/agdm/crops/pdf/a3-10.pdf
  - https://ageconsearch.umn.edu/bitstream/236090/2/Climate%20change%20and%20the%20economics%20of%20conservation%20tillage.pdf
- Yield impact of different tilling methods
  - https://dl.sciencesocieties.org/publications/aj/abstracts/104/2/530
  - https://ageconsearch.umn.edu/bitstream/236090/2/Climate%20change%20and%20the%20economics%20of%20conservation%20tillage.pdf
  - https://ipcm.wisc.edu/blog/2016/05/strip-tillage-how-does-it-affect-yield-in-wisconsin/
- Costs of cover crops (Cereal Rye and Hairy Vetch):
  - http://mccc.msu.edu/wp-content/uploads/2016/10/OH_2015_Economics-of-cover-crops-presentation.pdf
  - **https://www.sare.org/Learning-Center/From-the-Field/North-Central-SARE-From-the-Field/2017-Cover-Crop-Survey-Analysis**

    - https://farmdocdaily.illinois.edu/2016/07/costs-and-benefits-of-cover-crops-example.html
    - https://farmdocdaily.illinois.edu/2018/06/understanding-budget-implications-of-cover-crops.html

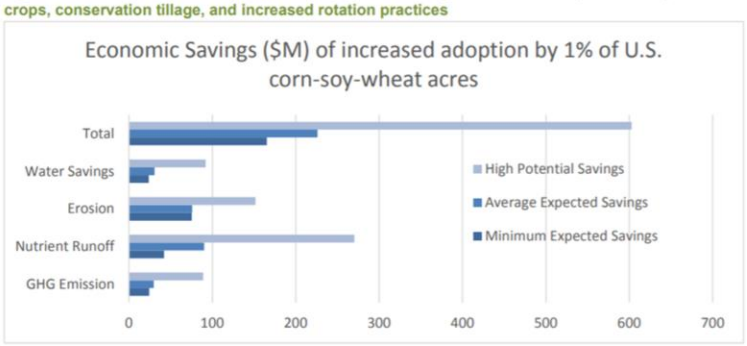
- Yield impact of cover crops
    - https://iopscience.iop.org/article/10.1088/1748-9326/aac4c8/pdf
    - https://www.sare.org/Learning-Center/From-the-Field/North-Central-SARE-From-the-Field/2017-Cover-Crop-Survey-Analysis
- Nitrogen budget impact of cover crops:
    - http://mccc.msu.edu/wp-content/uploads/2016/10/OH_2015_Economics-of-cover-crops-presentation.pdf
    - http://mccc.msu.edu/wp-content/uploads/2016/11/MCCC2016_6-Meta-Economics-of-Cover-Crops-2.pdf
    - https://farmdocdaily.illinois.edu/2018/06/understanding-budget-implications-of-cover-crops.html

On the benefits of wheat in a rotation:
https://www.canr.msu.edu/news/benefits_of_wheat_in_a_rotation

Off-farm Benefits of Conservation Agriculture:

- Off-farm financial benefits include:
  - Water savings
  - Reduced erosion
  - Reduced nutrient runoff
  - Reduced GHG emission
- A study done by TNC in 2016 (Rethink Soils) estimates that the implementation of cover crops, conservation tillage and increased rotations would result in an average of 99$ per acre per year of value generated (and up to $264 per acre per year)

Figure 5: Estimated cost savings based on minimum, average, and maximum potential impacts of cover crops, conservation tillage, and increased rotation practices



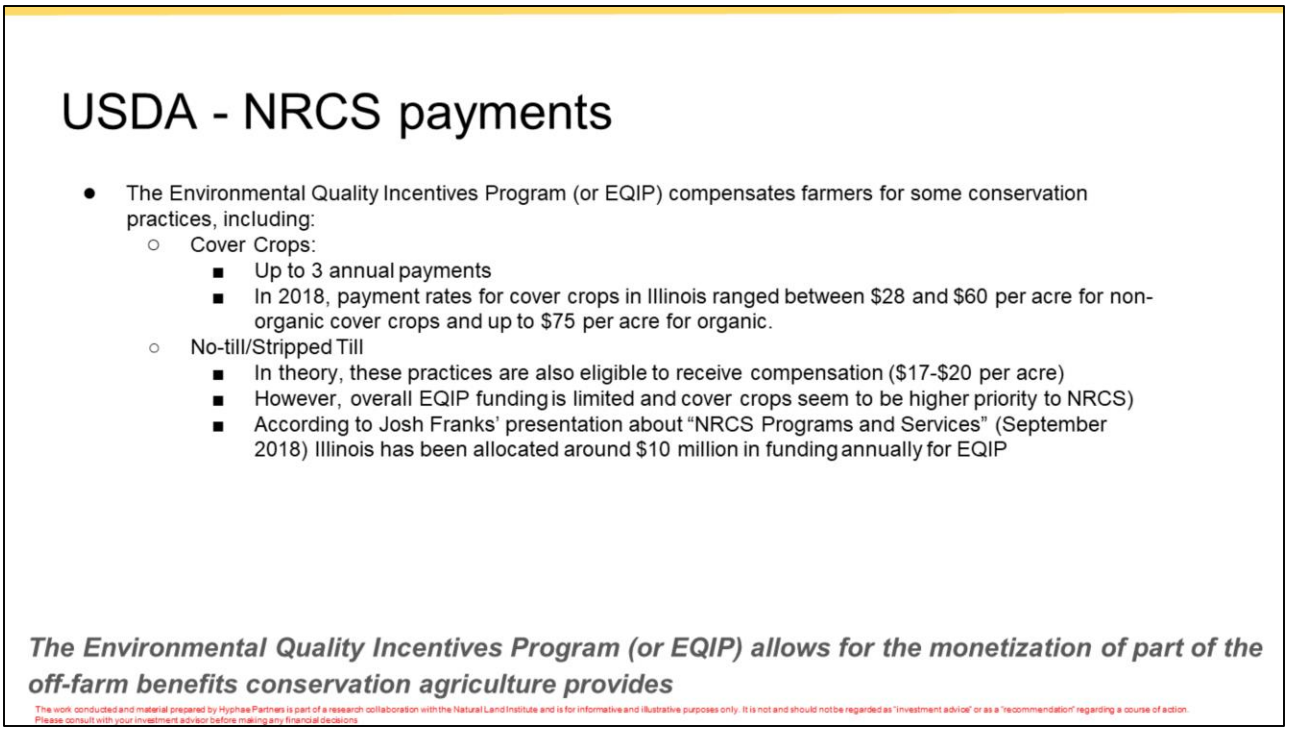
Conservation Agriculture also provides economic benefits outside of agricultural produces to various stakeholders (some valuations at ~ $99 per acre and per year)

In addition to the on-farm financial aspects, it has been found that conservation agriculture practices can add a substantial amount of value to external stakeholders.

For instance, in the "reThink Soil" paper published by The Nature Conservancy (or TNC) in 2016, the value of ecosystem services provided by such practices averaged $99 per acre and per year.

In this report, the services measured included water savings and reductions of erosion, nutrient runoff as well as GHG emission.

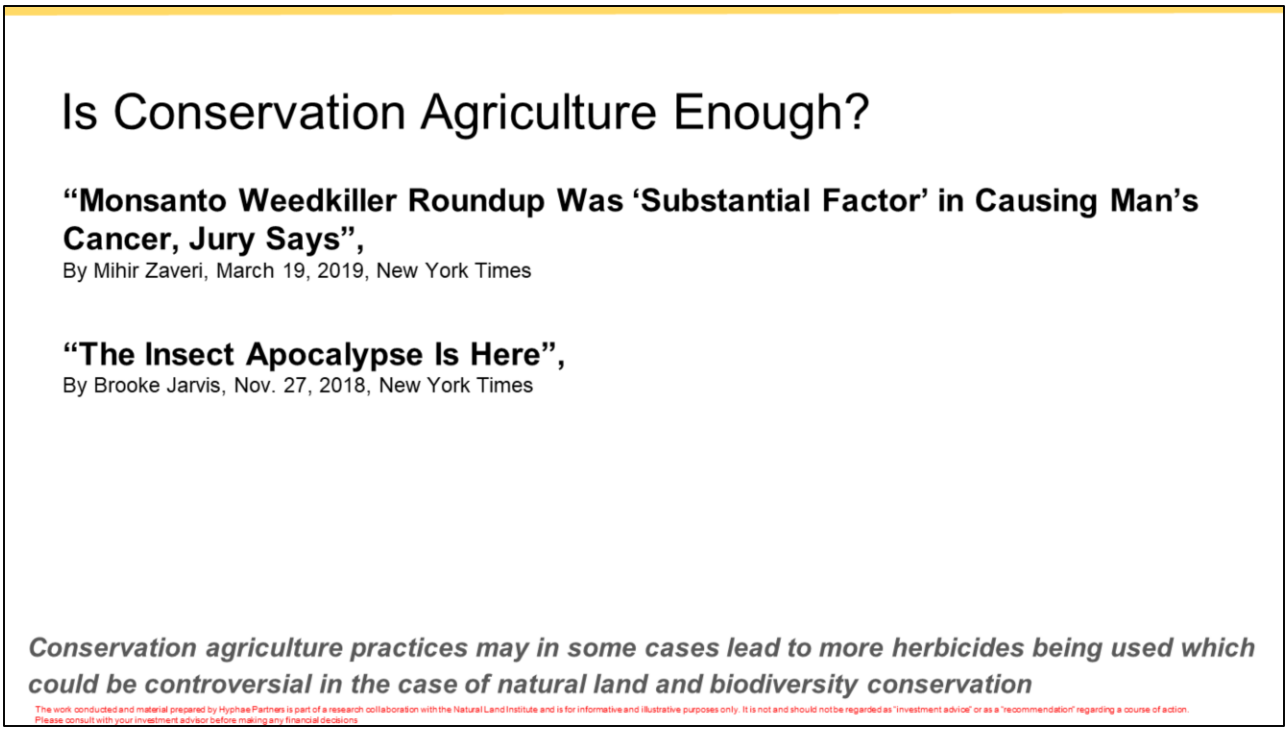
Link to report:
https://www.nature.org/content/dam/tnc/nature/en/documents/rethink-soil-external-paper-103116.pdf



Although it does not appear easy to monetize ecosystem services provided off-the-farm, one could argue that various grant programs are in place to do just that.

For instance the Environmental Quality Incentives Program (or EQIP) compensates farmers for a variety of conservation management practices, cover crops in particular.

Links:
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1082778.pdf
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1367457.pdf
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/?cid=nrcseprd1328235



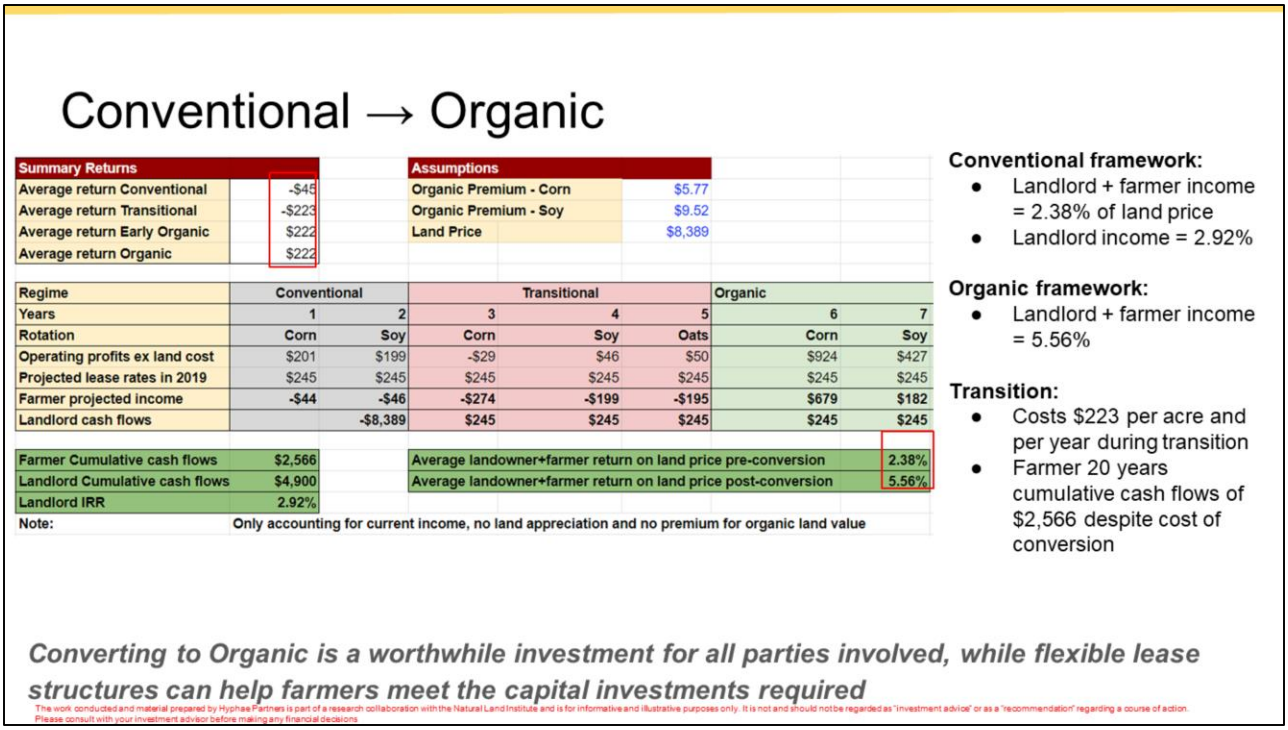
Roundup, whose main active ingredient is Glyphosate, has been found to have played a substantial factor in a man's cancer recently (Zaveri 2019, New York Times) This is bound to raise the question of its impact on biodiversity and may lead to more studies around the subject.

In the meantime, more and more studies have shown that insects are going extinct en masse, with some studies showing drops as high as 75% and 82% (Jarvis 2018, New York Times)

We thought this could be important to mention especially in the context of land trusts looking to conserve natural lands and the biodiversity on it.

One way to manage this potential risk would be to incentivize farmers towards implementing organic management.

Links:
https://www.nytimes.com/2019/03/19/business/monsanto-roundup-cancer.html
https://www.nytimes.com/2018/11/27/magazine/insect-apocalypse.html



In order to get a sense of the financial profile when converting from conventional management to organic management, we built a model for the conventional phase, the transitional phase as well as the organic certification phase.

Takeaways:

- Where conventional corn and soy rotations are expected to yield a **loss of ~ $45** per acre to farmers in 2019, a conversion to organic would be a way to generate value over the long term.

- Assuming lease rates stay constant during the whole period:
  - The farmer could expect a **negative** annual return of ~ $223 per acre during the transition years,
  - Followed by **positive** annual returns of ~ $222 once the crops are certified.
  - The farmer would therefore be expected to breakeven at the end of year 6 and turn a profit on year 7, enjoying much greater income than in the conventional scenario afterwards.

Please note that the model did not account for any land appreciation. In addition to traditional farmland appreciation potential (see earlier slides), it would make sense for organic land to generate additional returns given the increased all-in income per acre. That said, the currently small market share of organic land and limited number of transaction make it difficult to make that case presently.

Assumptions used in building this model:

- Conventional period: The numbers from the conventional period represent 2018 and 2019 projected numbers from FarmDoc Illinois, for high productivity farmland

- Organic Period:
  - Budgeting:
    - We used Iowa State Organic Budget models as a starting point, then adjusted the numbers using 2 other sources:
    - "The Profit Potential of Certified Organic Field Crop Production" (USDA, 2015) reports empirical differences in yields as well as costs between conventional and organic production for corn, soy and wheat production in the US.
      Whenever the model from Iowa State differed by a large margins, we used numbers proportional to findings of the USDA paper, using the conventional models from Farmdoc Illinois as a baseline.
      The 2 primary impacted costs were Machinery costs and Labor costs, which seemed underestimated in the Iowa State models
    - We also interviewed Rob Woodrow from Farmland Solutions LLC, an organization that helps farmer in Illinois and around with farm management strategies, including conversions to organic production. We used his inputs to adapt the Iowa model to the regional context. For instance, his fertilizer costs assumptions were much higher, assuming a need to ship chicken manure from Michigan, given the lack of regional availability.
  - Yields: Yields used by the Iowa State Organic budgets were around 20% and 35% lower for Corn and Soy than conventional yield estimates, in like with the findings of the USDA paper
  - Price premium: we used the most recent price premium over conventional corn and soy (prices are from USDA's AMS service), although we have ran some scenario analysis in subsequent pages
  - Land Price: Most recent year (2017) prices from the "Land Values and Lease Trends" reports by The Illinois Society of Professional Farm Managers and Rural Appraisers, were used, assuming a "good" land quality

- Transition period:
  - Same costs as for the Organic period but with conventional prices

Links:
Iowa State Organic Budget: https://www.extension.iastate.edu/agdm/crops/pdf/a1-18.pdf

The Profit Potential of Certified Organic Field Crop Production: https://www.ers.usda.gov/publications/pub-details/?pubid=45383

Farmland Solutions LLC: http://farmlandsolutionsllc.com/

Conventional → Organic

Alternative lease structures could help the farmer convert to organic.

- In the below example, the cash rent is reduced to $100 from $245 during the transitional period and then increased to $300 during the organic certification phase to reflect higher farmer income.
- This has the dual benefit of increasing landlord's income as a percentage of farmland value (in this case to 3.58% from 2.92%) while reducing the cash outflows for the farmer during the transition years (in this case down to -$78 per year in average from -$222).
- Despite paying a higher rent post conversion, the conversion is still worth it for the farmer, who makes $2,176 per acre over the 20 year period modelled out here.

Regime	Conventional		Transitional			Organic	
Years	1	2	3	4	5	6	7
Rotation	Corn	Soy	Corn	Soy	Oats	Corn	Soy
Alternative lease	$245	$245	$100	$100	$100	$300	$300
Farmer projected income	-$44	-$46	-$129	-$54	-$50	$624	$127
Landlord cash flows		-$8,389	$100	$100	$100	$300	$300

(Note: Land Price=$8,389 per acre)

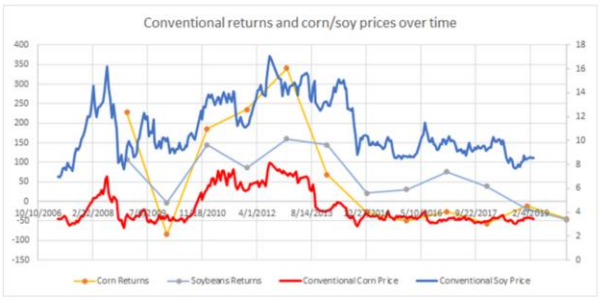
Farmer Cumulative cash flows	$2,176	Landlord IRR	3.08%
Landlord Cumulative cash flows	$5,290	Landlord income over land price	2.92%
		Landlord income over land price	3.58%

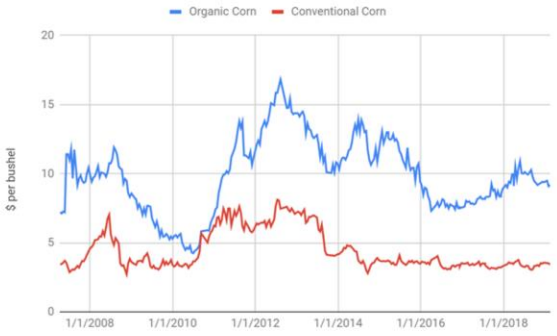
Note: Only accounting for current income, no land appreciation and no premium for organic land value

Converting to Organic is a worthwhile investment for all parties involved, while flexible lease structures can help farmers meet the capital investments required

- A more flexible lease structure would allow the farmer to breakeven sooner, without impacting NLI's rate of return:
  - Assuming a lower lease payment of $100 (versus the $245 projected by FarmDoc for high productivity farmland) during the transition years followed by a higher lease payment of $300 subsequently:
    - The farmer would see an average loss of $77 during transition years, followed by an average gain of $167 subsequently
    - Therefore the farmer would breakeven and turn a profit during year 5 of the conversion process
    - The landlord would see an increased rate of return of 3.08%from 2.92% (using a period of 18 years in this model), despite the loss in near term income due to subsidizing farmer rent in the transition years.
    - Please note that at $300 in lease rate, the annual income represents ~ 3.6% of land value
  - Crop Share leases, where farmer and landlord share in costs and revenues according to a specific percentage, could prove even more profitable (but also more risky) to landowners, while reducing risk for the farmer.

Scenario Analysis





Conventional Corn and Soy Prices have driven farmer profitability.

Although Organic prices are much higher, they have exhibited a fair amount of volatility

Commodity prices are one of the primary drivers of farmer profitability, and the organic conversion models we built use only recent organic price premiums over conventional.

Given the fair amount of volatility in organic premiums, it is fair to wonder what would happen if organic premiums moved from here.

Scenario Analysis

Organic transition scenario analysis			
	Organic (annual)	Conventional (annual current)	Conventional (annual 12 year average)
Good Case	$372	-$45	$83
Base Case	$222	-$45	$83
Bad Case	$46	-$45	$83

Where conventional farm management is currently expected to return -$45 and has returned ~83$ per year to farmers, organic farm management could return somewhere between $46 to $372

We found historical price premiums for organic corn and organic soy from AMS, back to 2007 and analyzed its probability distribution

- Corn organic premium have averaged ~ $5.4 per bushel with a standard deviation of ~ $2.2 per bushel
- Soybeans organic premium have averaged ~$9.87 per bushel with a standard deviation of ~ $3.18 per bushel

The prices used for our model earlier used recent prices which are actually fairly close to the average of both processes ($5.77 and $9.52), and it made sense to us to see how our model would evolve if price premiums would end up staying at the +/- 1 standard deviation levels (highlighted in the red and blue dotted lines in the graph) for the entire organic period (a pretty extreme scenario)

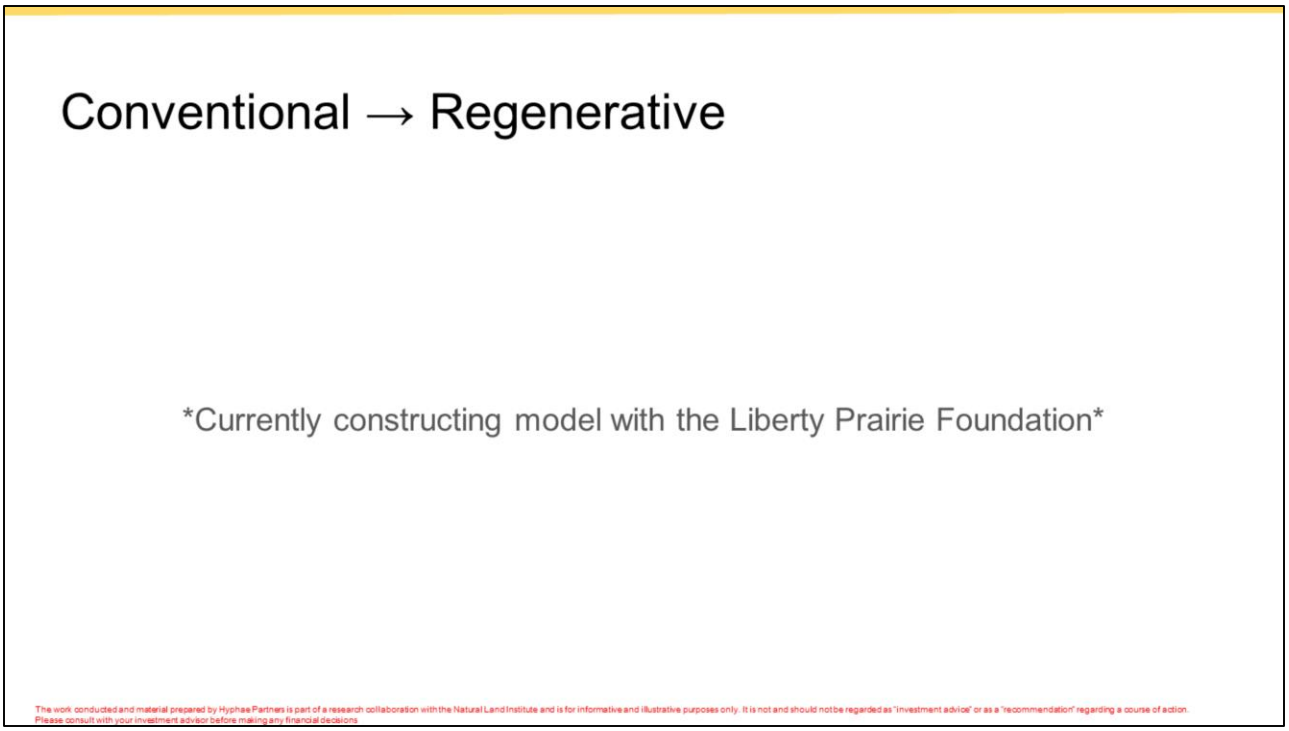
- At the +1 standard deviation level, we calculated organic income of ~ $372 per acre and per year
- At the -1 standard deviation level, we calculated organic income of ~ $46 per acre and per year
- This, in all cases, favorably compares to a negative income of $45 per acre and per year currently expected for conventional farmers.
- It also compares fairly favorably with historical average returns of ~ $83 per acre for conventional corn/soy farmers, including a time where prices were higher (and therefore would also be higher than assumed here for the organic model)

Other Considerations

- Capital costs not included in the model
  - Drainage pipes ("tiles") may be needed depending on the soil, and can be expensive (~$800-$1000 per acre)
  - Organic storage bins would most likely be needed ($2.5-$3.5 per bushel or $413-$578 per acre in the organic conversion case)
- Processing infrastructure
- Marketing risk - offtakers, price volatility
- Knowledge factors
- Cultural factors
- Input availability

There could be a need for a centralized effort (e.g., the stewardship cooperative) to help farmers navigate the ins and outs of converting to organic agriculture

Drainage tiles - cost - http://nmsp.cals.cornell.edu/publications/factsheets/factsheet57.pdf

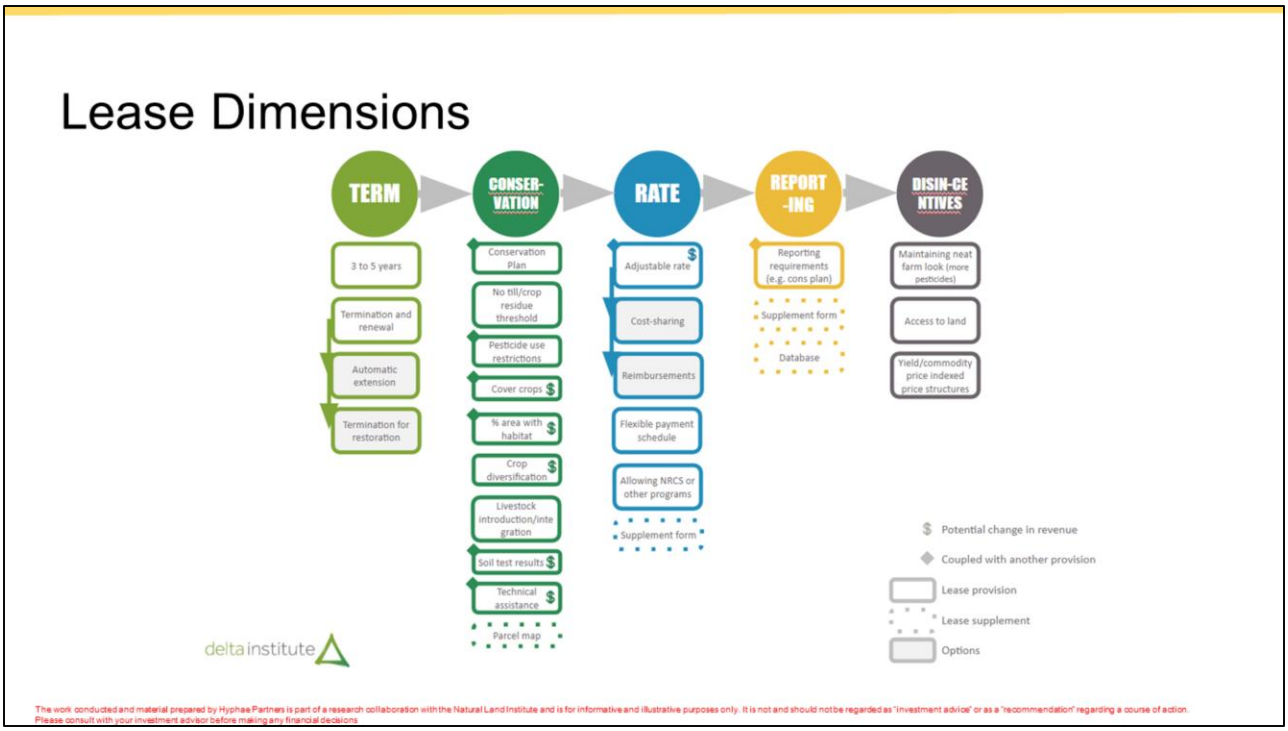


Although organic management eliminates pesticides and herbicide, it can in some case lead to increased usage of tillage to reduce weed pressure.

Regenerative organic management eliminates pesticides, herbicides but also limits the amount of tillage on the land by introducing more rotations and implementing more diversified farming systems.

Potential Partnerships to Consider

- Regional farm planning specialists versed in conservation, organic or regenerative agriculture
- Pipeline Foods → Infrastructure funding & offtaking agreements
- Iroquois Valley → Land fund management
- General Mills → Offtaking agreements and capital support
- Kashi → “Certified Transitional” program



The Delta Institute has done an outstanding job at identifying the different dimensions that go into drafting a sustainable lease with farmers for conservation land trusts.

In our presentation we focus primarily on using the models that we have built to inform certain terms (e.g., rate and length) so that the lease incentivizes a farmer to convert to specific frameworks.

Potential Lease Terms

	Length of lease	Rate	Other lease structures to consider
Conventional	1 year	Market - $245 flat	
Conservation	1-3 years to overcome initial investment	Market minus $31	Crop share lease Custom Farming
Organic	Ideal lease term 4-5 years • Farmer turns first profit on year 4 • Farmer breakevens on year 6-7 with conventional lease rate • Farmer breakevens on year 4 with a subsidized lease (Market minus $145)	A subsidized rate of 50-$100 (Market minus $145-$195) during transition allows for breakeven year 4-5	Crop share lease Custom Farming
Regenerative	TBD	TBD	TBD

For instance, switching from conventional to conservation agriculture by adding a rotation of wheat (in order to build soil organic matter) may lead to significantly lower average annual earnings to the farmer (~$31 in average per year), hence lowering rent by the same amount (~$31) would make sense.

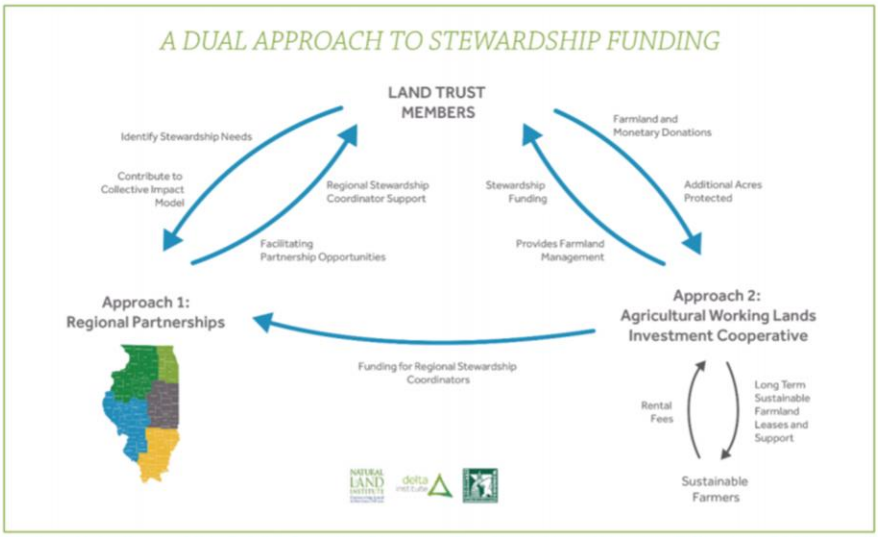
Since there does not seem to be too much of a "transitory" period, the term can remain relatively short term, somewhere between 1 year and 3 years.

In the case of organic conversions however, significant investment needs to be put into the land during years one to three, therefore the lease term should be decided as a function of when the farmer can breakeven and turn a profit.

If the lease rate were to be $100 for the three years during transition for instance, the farmer would be expected to breakeven and turn a profit during year five, hence a lease with a five year term would be a good incentive for a conversion

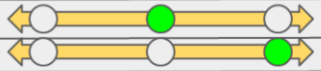
The Stewardship Cooperative

The Stewardship Cooperative



Source: https://delta-institute.org/2017/01/a-dual-approach-to-long-term-land-stewardship-in-illinois/

Potential Stewardship Cooperative Functions

	Internal ← Hybrid → Outsourced	Notes:
• In kind farmland donations		
• Capital campaigns		
• Recruit and hire farmers		Partnership w/ Liberty Prairie
• Pooled equipment purchases (strip till bars)		Arrange, but externally managed
• Pooled infrastructure purchases (organic storage bins)		Arrange, but externally managed
• Offtaker agreements		Partnership w/ fund manager
• Fund management		
• Services such as		
○ Land management planning		Arrange, but externally managed
○ Habitat restoration		Arrange, but externally managed
○ Invasive removal		Arrange, but externally managed
○ Burns		Arrange, but externally managed

As the stewardship cooperative evolves and coalesces its business model, these are several key dimensions that it will need to define as internal, outsourced or hybrid capabilities.

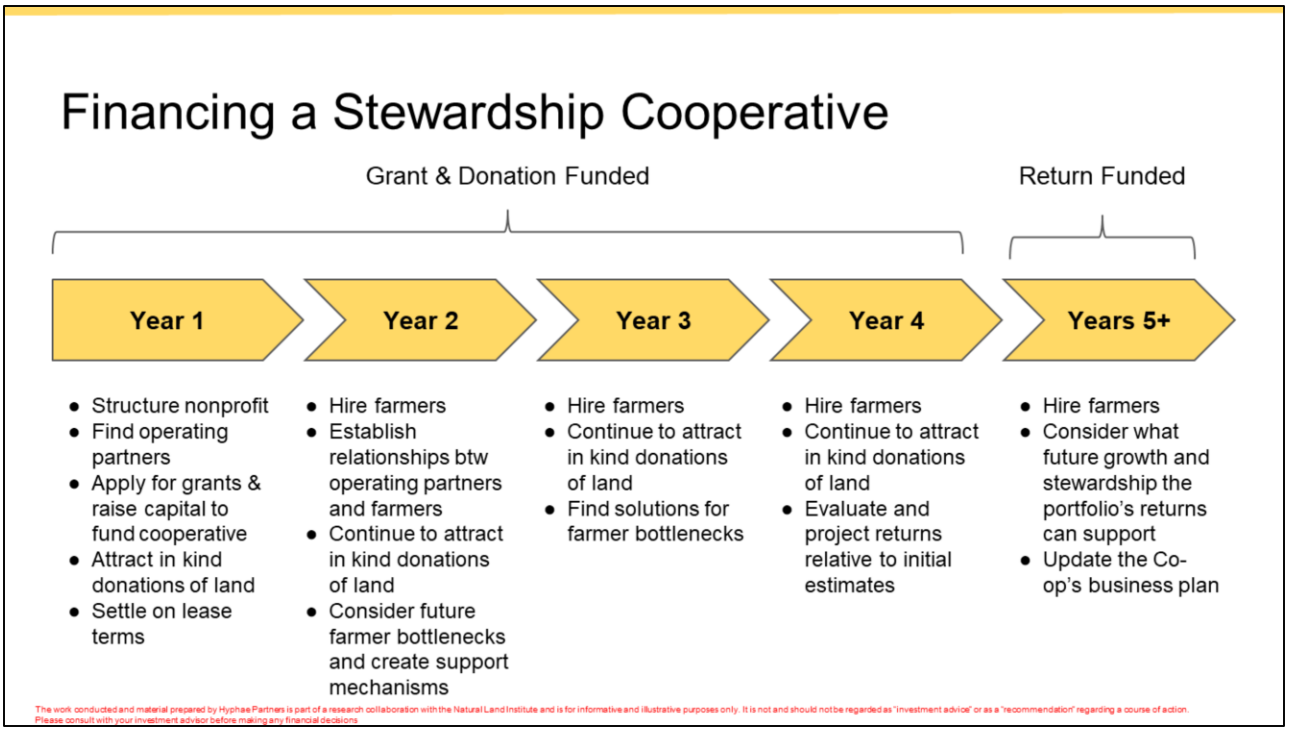
The above green circles are early suggestions and our recommendation is that the stewardship cooperative spend the remainder of the year distilling and codifying its business model through a guided visioning process that includes stakeholder interviews and moderated group discussions.

Stewardship Cooperative Structure

Given the potential functions of the stewardship cooperative, is a non-profit or for profit structure best for the cooperative.

	Non - profit	For Profit
Pros	- Can partner w/ experienced operating partners - Doesn't onboard operating and execution risks - Ideal if activities require low capital investments - Ability to be long term oriented - No need to show attractive risk adjusted returns	- Higher level of customization - Potential to accept capital from private investors - Ideal for taking on large capital investments
Cons	- Lower level of customization - Not ideal if taking on heavy capital investments	- Lack of track record means expensive cost of capital - Specialized functions are costly to establish - Attracting and retaining talent is costly - Current scale may not support costs - Need to show attractive risk adjusted returns

Given the number of different specialized functions the cooperative aims to promote, it seems that a non-profit structure that partners with established operating partners would be the least risky and most economical way to structure the cooperative.



As the stewardship cooperative looks to the future, it should think about how it is funded.

We suggest using grant and donation funding for ~4 years and then reassessing the ability of the land portfolio to fund future operations.

Next Steps

- Build a business plan for the Stewardship Cooperative
  - Functions
  - Partner Organizations & Operating Partners
  - Collaborative Fundraising Strategy
  - Marketing Materials
  - Farmland Acquisition & Farmer Pipeline
  - Model out Bull/Bear/Average Scenarios
  - Legal Structure
  - Valuing Regional Ecosystem Services

APPENDIX

List of interviews performed

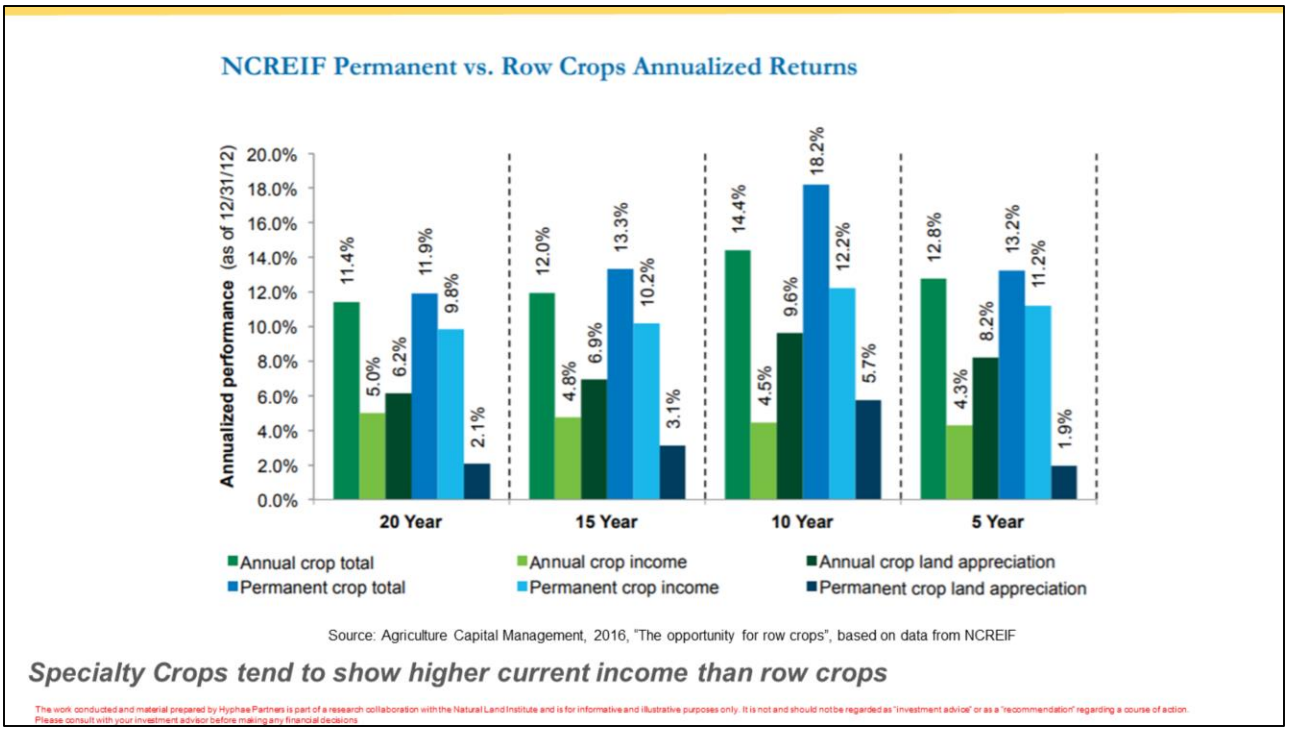
- Jennifer Filipiak – American Farmland Trust
- Emt Brawley – The Conservation Fund
- Joe Rothermel – Farmer
- Rob Woodrow – Farmland Solutions LLC
- Ron Doetch – Solutions in the land, LLC
- Matt Van Slykes – Green Agents
- Russ Higgins – University of Illinois Extension
- Alex Mckay – Iroquois Valley

Financial Profile of Owning Farmland in Illinois

Capital Gains/Loss				
Year	Excellent	Good	Average	Fair
2002	4.2%	1.9%	-2.5%	9.4%
2003	11.2%	11.1%	8.8%	39.4%
2004	17.8%	27.3%	13.2%	-27.4%
2005	7.4%	1.4%	15.3%	34.7%
2006	7.6%	-2.0%	2.1%	-9.1%
2007	9.6%	20.5%	15.0%	46.6%
2008	18.6%	14.9%	16.3%	0.0%
2009	2.6%	4.1%	5.8%	-6.4%
2010	8.0%	4.3%	14.4%	43.4%
2011	29.5%	27.8%	29.1%	11.0%
2012	18.0%	18.1%	1.6%	0.7%
2013	13.6%	10.2%	23.8%	22.4%
2014	-1.6%	-3.4%	-6.9%	1.7%
2015	-6.5%	-3.8%	-0.4%	-19.7%
2016	-5.2%	-3.4%	-8.3%	6.9%
2017	-2.7%	-1.3%	-4.0%	-4.3%

Capitalization Rates				
Year	Excellent	Good	Average	Fair
2009	3.8%	3.8%	4.3%	4.8%
2010	3.7%	3.8%	3.8%	3.5%
2011	3.5%	3.8%	4.0%	4.1%
2012	3.2%	3.4%	4.0%	4.3%
2013	2.8%	3.0%	3.3%	3.6%
2014	2.4%	2.7%	2.9%	2.7%
2015	2.3%	2.7%	2.8%	3.2%
2016	2.3%	2.6%	2.9%	2.9%
2017	2.2%	2.5%	3.0%	3.0%

Source: Illinois Society of Professional Farm Managers and Rural Appraisers



It appeared very hard to find historical land and income performance of organic land, due to the limited history and limited penetration of organic crops relative to conventional. However, permanent crops offer perspective on the difference between conventional row crops and specialty crops that take heavy initial investments while offering better revenues once matured.

Data from the NCREIF and compiled by Agriculture Capital Management in their report "The opportunity for row crops" (2013) shows that over long periods of time ranging from 5 to 20 years, Annual income from permanent crops has significantly exceeded annual income from row crops, by a factor of ~ 2x.

Although part of this outperformance was offset by underperformance in land appreciation, long term land holders such as NLI may see more value in higher annual income.

Owning Farmland - Value Drivers

General Value Drivers

- Land prices, impacted by yields, demand (e.g., population growth), natural resources, development value
- Crop Prices
- Regulations - subsidies
- Yield
- Climate & Pests
- Input costs

Sustainable Farmland Added Value Drivers

- Market access,
- Lower costs,
- Risk mitigation,
- Consistent yield

Owning Farmland - Risks

Risks of Farmland Ownership

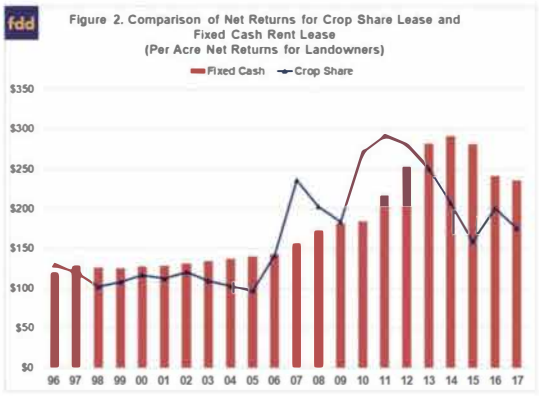
- **Production risks:** weather & pest, operational mismanagement
- **Marketing risks:** price & volumes
- **Financial risks:** lack of access to credit for working capital needs, equipment purchases
- **Regulatory:** insurance & subsidy programs
- **Human resources:** finding skilled farm manager & workers

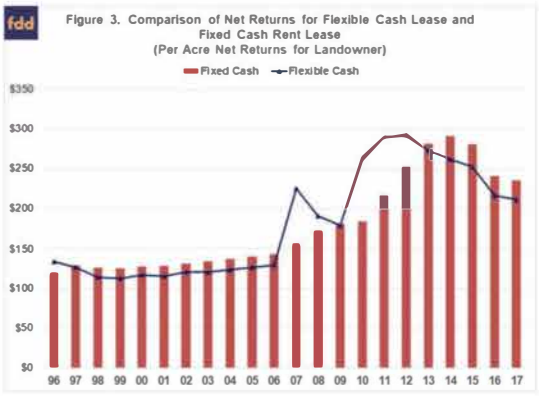
Sustainable Farmland Added Risks

- **Production risks:** finding skilled operators, finding needed inputs
- **Marketing risks:** Volatility in price premiums
- **Financial risks:** Establishment costs
- **Regulatory:** Lack of supportive regulations

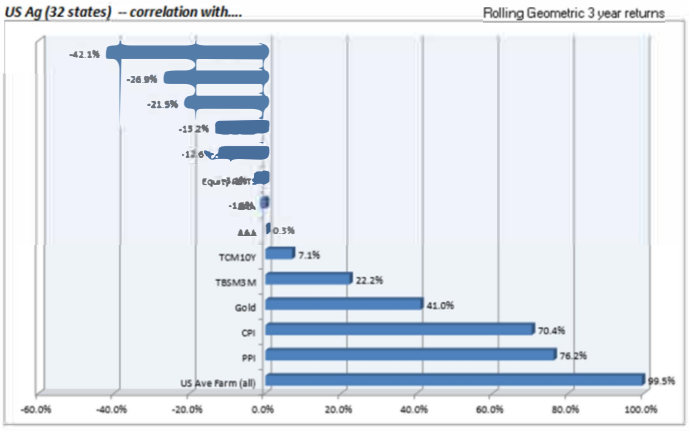
The work conducted and material prepared by Hyphae Partners is part of a research collaboration with the Natural Land Institute and is for informative and illustrative purposes only. It is not and should not be regarded as "investment advice" or as a "recommendation" regarding a course of action. Please consult with your investment advisor before making any financial decisions.

Historical performance of alternative lease structures





Farmland is Non Correlated to stocks = reduces portfolio risk



Check with your investment advisor - Hyphae cannot give investment advice

NLI endowment too small to hold farmland probably

No Representation as Fiduciary or Investment Advisor:

The work conducted and material prepared by Hyphae Partners is part of a research collaboration with the Natural Land Institute and is for informative and illustrative purposes only. It is not and should not be regarded as “investment advice” or as a “recommendation” regarding a course of action. This information is provided with the understanding that: (1) Hyphae Partners is not acting in a fiduciary or advisory capacity; (2) that any decision made or course of action taken in connection herewith will be based upon an independent assessment of whether such action is appropriate or advisable after considering the specific circumstances and objectives of the Natural Land Institute; and (3) that any and all findings in this report should be vetted by the Natural Land Institute’s retained fiduciary or investment advisor.

The work conducted and material prepared by Hyphae Partners is part of a research collaboration with the Natural Land Institute and is for informative and illustrative purposes only. It is not and should not be regarded as "investment advice" or as a "recommendation" regarding a course of action. Please consult with your investment advisor before making any financial decisions.

NRCS Programs and Services

Josh Franks
Soil Conservationist
September 12, 2018

Who we are and what do we do

- Our agency was formed back in the dust bowl days in 1935 as the Soil Erosion Service (SES), later became the Soil Conservation Service (SCS), and today are the Natural Resource Conservation Service (NRCS)
- We are a federal agency within the USDA and focus on private land conservation efforts with technical assistance and cost share authorized through the farm bill
- Most counties have a local office typically in the county seat
  - I manage the Winnebago County office out of Rockford
  - I have 13 years in with the agency and 7 in Rockford

USDA-NRCS Programs available

- CTA – Conservation Technical Assistance
- EQIP – Environmental Quality Incentives Program
- CStP – Conservation Stewardship Program
- ACEP – Ag Conservation Easement Program
- CRP – Partner with FSA and provide technical assistance to landowners
- CPP – Partner with SWCD to administer State Cost Share
- RCPP – Regional Conservation Partnership Program

Local SWCD's

- Soil and Water Conservation Districts
- Composed of locally elected volunteers
- NRCS works hand-in-hand with SWCDs to address local conservation issues
- Funding is partially from the state, local, and own programs
- Often complete cooperate agreements with NRCS

CTA

- Conservation Planning
  - Identify Resource Concerns
  - Evaluate alternatives
  - Document decisions
  - Survey/Design for resource concerns
  - Provide conservation practice specifications
    - Job Sheet (seeding recommendation)
  - Becomes the basis for program applications

EQIP

- NRCS Flagship conservation cost share program
- 60% is reserved for livestock, 40% for all other projects
- Competitive process, applications are taken year round but only batched 2-3 times per year for funding consideration
- We received approximately $10 million for IL annually
- Projects include grazing, confinement, organic, high tunnels, waterways, forestry, cover crops, monarch initiative, pollinator planting from small $ to $450,000.
- In FY18 Winnebago county is funding 1 cover crop/no till application, 4 seasonal high tunnels, 2 forest management plans, and 1 multi plot totaling 7 acres monarch planting
- We have several state watershed projects as well as national initiatives so contact your local office to see what is available

RCPP – DALCI (Available in 2019)

- EQIP Priority Conservation Practices
  - Includes all Winnebago Co Farms that drain into the Pecatonica River Watershed
  - In FY14 IL received $743,000 for the NW counties of IL that are located in the watershed
  - Much of the funding went towards forestry and cover crops
  - Main target will be water quality, streams and forestry
  - We do not currently have signup info for FY19
  - Splitting $9.2 million between 4 states, part of RCPP

CStP

- Taking applications year round also but typically only considered for funding 1 time per year
- Not sure of future with new farm bill
- Contracts are for 5 years and applies to all acres that you farm in your control for those next 5 years
- Currently have approximately 20,051 acres enrolled in Winnebago County with 25 producers and in the processs of obligating another 7 producers on an additional 8,247 acres
- Available for cropland, forestland, and pastureland
- Receive annual payment for existing conservation and newly adopted enhancements such as cover crops, energy, nutrient timing and placement, etc

ACEP

- ALE (Ag Land Easement) and WRE (Wetland Reserve Easement) are the two available programs
- WRE replaced the popular WRP of which we have 6 easements and approximately 1,600 acres enrolled here in Winnebago County
- ALE replace the old GRP (Grassland Reserve Program) and is for ground to remain in ag production
  - Requires a partner to front 50% of the cost
  - NLI could look into something like this
- Application signup for FY18 has passed but let me know if you have any interest

CRP

- Administered by our partner agency FSA (Farm Service Agency)
- NRCS provides technical assistance such as establishment, maintenance, compliance
- Very popular throughout the country
- Contracts range from 10-15 yrs depending on the practice
- Eligible land must have cropping history established with FSA (current cropping history is 2008-2013)
- Current Cap is 24 million nationwide, likely to go up with new farm bill
- To determine eligibility contact your local FSA office, for Winnebago you would contact the Freeport office

CRP continued

- 435 landowners, 557 active contracts, 6859 ac, and $1,473,595 of annual payments
- Practices range from grassed waterways, filterstrips, pollinator plantings, riparian buffers, native grass establishments, tree planting, wetland restoration, shelter belts
- Continuous, General, HELI, and SAFE are all available in Winnebago County pending available acres

CPP

- State cost share administered by local SWCD (Soil and Water Conservation Districts)
- When funds are available projects range from grass waterways, well sealings, rain gardens, streambank restoration, among others
- State budget changes allocation annually but in recent yrs local cost share has been less than $10,000 per county
- NRCS assists with the technical assistance in this program

HEL/WC Compliance

- This is NRCS area of regulation for ag lands
- All producers must be HEL/WC to participant in any USDA program or crop insurance
- Any tree clearing, tiling, land leveling is subject to HEL/WC and should be requested on FSA form AD-1026 for a determination from NRCS
- We refer creek channel questions, pond construction to the Rock Island Corps of Engineers
- Steep lands require a conservation plan with reduced tillage and in some cases requiring no-till


With NRCS technical assistance, landowners can nurture beautiful prairie areas that reflect the natural historical environment of the area.
7. 19. 2000

Thank you!

Josh Franks (815) 965-2392 x3

Josh.franks@il.usda.gov

Any Questions?

www.il.nrcs.usda.gov

NRCS: Helping People Help The Land.

USDA-NRCS is an equal opportunity employer and provider.


FARMLAND LEASES, FLEXIBILITY, & CONSERVATION
ANDY LARSON
AGRICULTURE & COMMERCIAL LOAN OFFICER
GERMAN AMERICAN STATE BANK
German American
State Bank

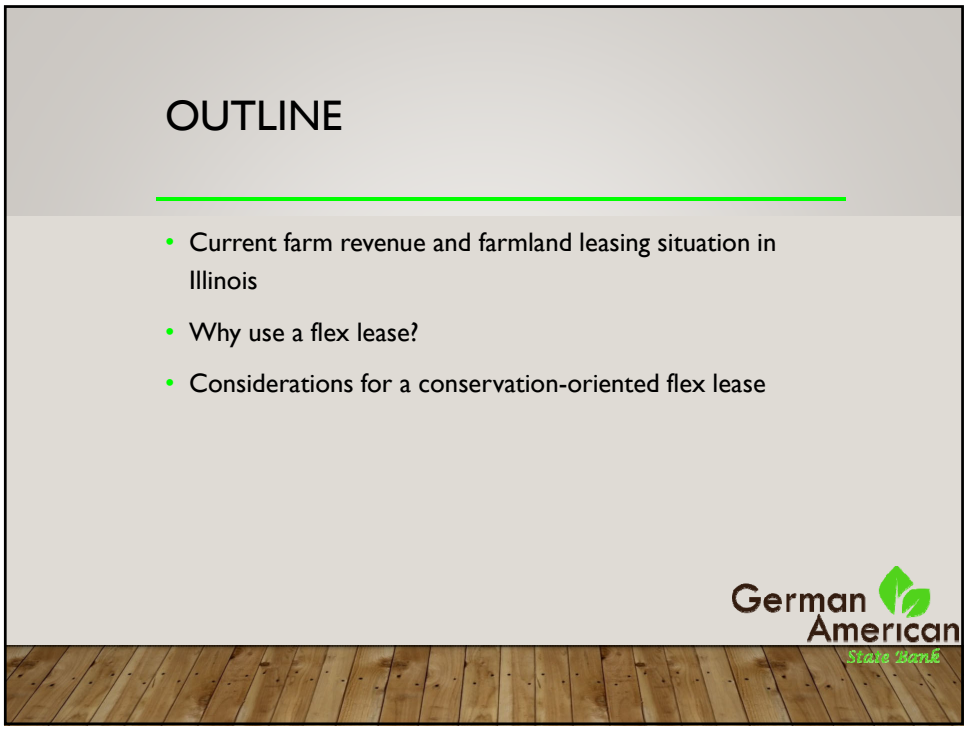

OUTLINE
• Current farm revenue and farmland leasing situation in Illinois
• Why use a flex lease?
• Considerations for a conservation-oriented flex lease
German American
State Bank

Table 1. Corn Revenues and Costs, Northern Illinois
Actual for 2011 through 2017, Projected for 2018.[1]

	Year							
	2011	2012	2013	2014	2015	2016	2017	2018P
Yield per acre	177	143	204	208	194	223	219	202
Price per bu	$6.10	$6.75	$4.61	$3.91	$3.72	$3.52	$3.55	$3.60
Crop revenue	$1,080	$965	$940	$813	$722	$785	$777	$727
ARC/PLC or ACRE	0	0	0	38	55	22	5	0
Other gov't payments	23	23	21	0	0	0	0	0
Crop insurance proceeds	7	173	48	46	27	1	10	0
Gross revenue	**$1,110**	**$1,161**	**$1,009**	**$897**	**$804**	**$808**	**$792**	**$727**
Fertilizers	158	200	199	174	161	144	124	120
Pesticides	47	57	60	65	59	56	58	58
Seed	97	110	118	123	120	118	115	114
Drying	21	18	29	34	17	15	23	23
Storage	5	4	5	7	7	9	8	8
Crop insurance	34	28	28	28	24	24	24	24
Total direct costs	**$362**	**$417**	**$439**	**$431**	**$388**	**$366**	**$352**	**$347**
Machine hire/lease	18	16	19	20	18	18	20	20
Utilities	5	5	5	6	6	6	6	6
Machine repair	21	25	28	30	26	26	27	27
Fuel and oil	23	24	27	29	18	18	17	17
Light vehicle	2	2	2	2	2	2	2	2
Mach. depreciation	44	57	69	74	72	67	66	65
Total power costs	**$113**	**$129**	**$150**	**$161**	**$142**	**$137**	**$138**	**$137**
Hired labor	18	17	18	19	19	19	20	20
Building repair and rent	11	11	9	10	8	8	9	9
Building depreciation	13	15	16	18	18	18	19	19
Insurance	7	9	13	9	11	11	12	12
Misc	9	9	8	10	9	9	10	10
Interest (non-land)	16	14	17	17	18	18	20	21
Total overhead costs	**$74**	**$75**	**$81**	**$83**	**$83**	**$83**	**$90**	**$91**
Total non-land costs	**$549**	**$621**	**$670**	**$675**	**$613**	**$586**	**$580**	**$575**
Operator and land return	**$561**	**$540**	**$339**	**$222**	**$191**	**$222**	**$212**	**$152**
Land costs	222	247	262	265	252	253	241	238
Farmer return	**$339**	**$293**	**$77**	**-$43**	**-$61**	**-$31**	**-$29**	**-$86**

[1]Results for 2011 through 2017 are summarized from grain farms enrolled in Illinois Farm Business Farm Management. Projections are made for 2018.

Prepared by: Gary Schnitkey, University of Illinois, schnitke@illinois.edu, 217 244-9595, June 2018.
Available in the management section of *farmdoc* (www.farmdoc.illinois.edu).

Table 2. Soybean Revenues and Costs, Northern Illinois
Actual for 2011 through 2017, Projected for 2018.[1]

	Year							
	2011	2012	2013	2014	2015	2016	2017	2018P
Yield per acre	60	51	59	61	61	66	59	62
Price per bu	$12.71	$14.51	$13.21	$10.49	$9.18	$9.66	$9.85	$9.60
Crop revenue	$763	$740	$779	$640	$560	$638	$581	$595
ARC/PLC or ACRE	0	0	0	38	55	22	5	0
Other gov't payments	23	23	20	0	0	0	0	0
Crop insurance proceeds	4	25	5	4	7	1	8	0
Gross revenue	**$790**	**$788**	**$804**	**$682**	**$622**	**$661**	**$594**	**$595**
Fertilizers	38	49	49	44	41	37	31	28
Pesticides	28	34	35	39	35	34	35	35
Seed	53	62	68	71	69	69	67	73
Drying	1	1	1	1	0	0	0	0
Storage	2	2	2	2	3	3	3	3
Crop insurance	23	19	19	19	16	16	16	16
Total direct costs	**$145**	**$167**	**$174**	**$176**	**$164**	**$159**	**$152**	**$155**
Machine hire/lease	16	15	16	17	16	16	17	17
Utilities	4	4	5	5	5	5	5	5
Machine repair	18	24	24	26	22	22	23	23
Fuel and oil	21	23	23	24	15	15	15	15
Light vehicle	2	2	2	2	2	2	2	2
Mach. depreciation	26	49	60	63	62	57	57	56
Total power costs	**$87**	**$117**	**$130**	**$137**	**$122**	**$117**	**$119**	**$118**
Hired labor	17	16	16	17	17	17	18	18
Building repair and rent	6	5	5	5	4	4	4	4
Building depreciation	7	8	8	9	9	9	10	10
Insurance	7	9	12	9	11	11	12	12
Misc	9	9	8	10	9	9	10	10
Interest (non-land)	13	13	14	14	15	15	17	18
Total overhead costs	**$59**	**$60**	**$63**	**$64**	**$65**	**$65**	**$71**	**$72**
Total non-land costs	**$291**	**$344**	**$367**	**$377**	**$351**	**$341**	**$342**	**$345**
Operator and land return	**$499**	**$444**	**$437**	**$305**	**$271**	**$320**	**$252**	**$250**
Land costs	222	247	262	265	252	253	241	238
Farmer return	**$277**	**$197**	**$175**	**$40**	**$19**	**$67**	**$11**	**$12**

[1]Results for 2011 through 2017 are summarized from grain farms enrolled in Illinois Farm Business Farm Management. Projections are made for 2018.

Prepared by: Gary Schnitkey, University of Illinois, schnitke@illinois.edu, 217 244-9595, June 2018.
Available in the management section of *farmdoc* (www.farmdoc.illinois.edu).

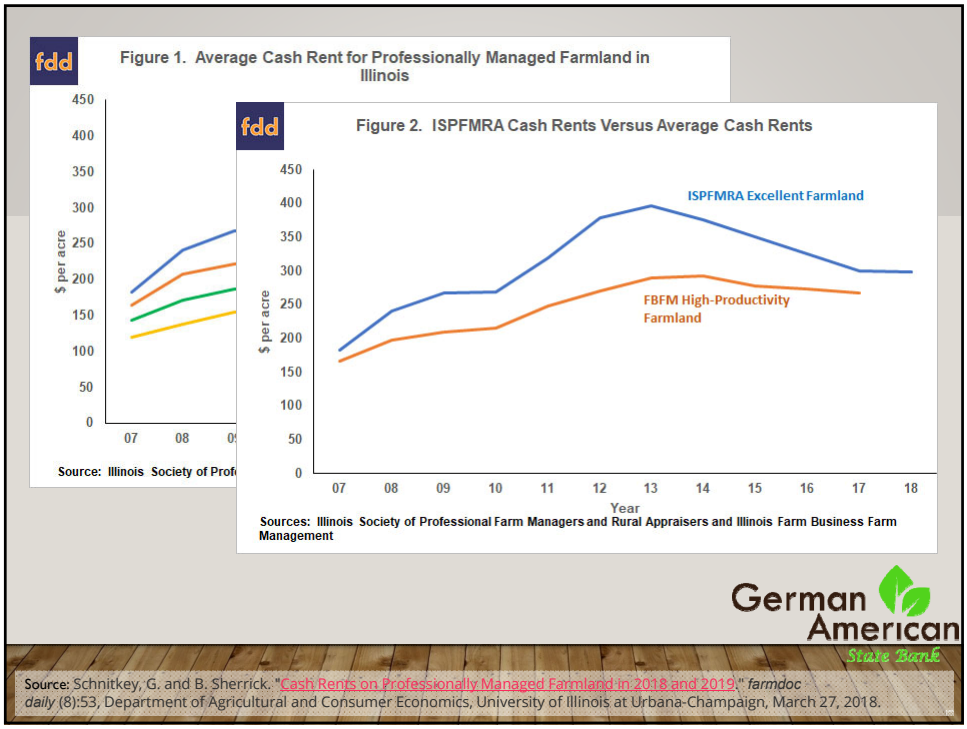
American State Bank

Source: Gary Schnitkey. "Revenue and Costs for Corn, Soybeans, Wheat, and Double-Crop Soybeans, Actual for 2011 through 2017, Projected 2018." June 2018. University of Illinois Dept of Agriculture & Consumer Economics.

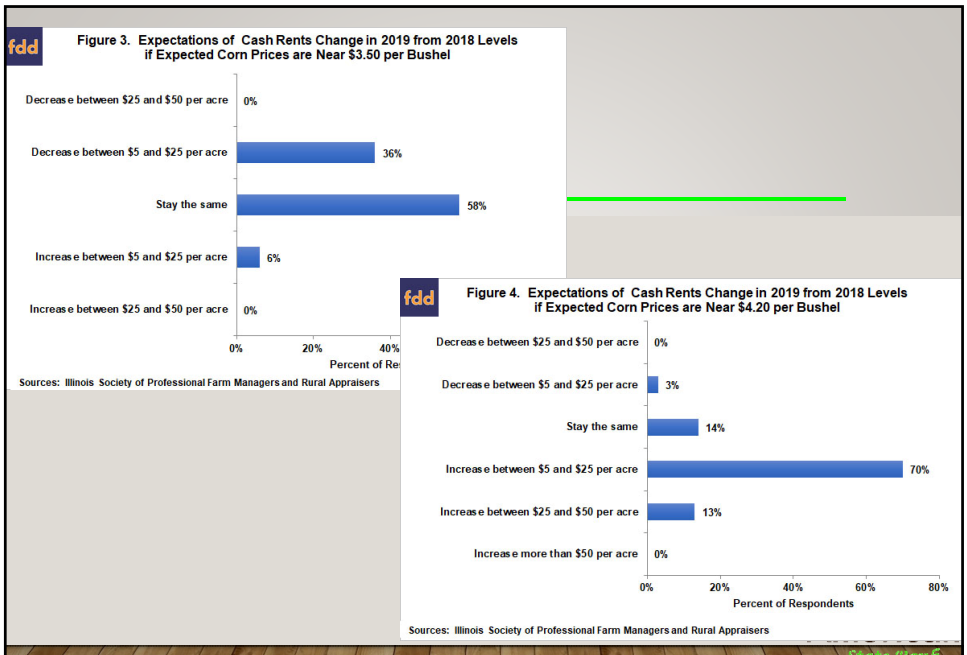
2018 Projected Cash Rents, By Professional Farm Managers

Land Quality - Category	Excellent	Good	Average	Fair
		--Per acre--		
High 1/3	$317	$276	$237	$201
Mid 1/3	$298	$260	$225	$186
Low 1/3	$258	$223	$188	$151

Source: Illinois Society of Professional Farmland Managers and Rural Appraisers. "2018 Illinois Farmland Values and Lease Trends." http://www.ispfmra.org/land-values-archive/



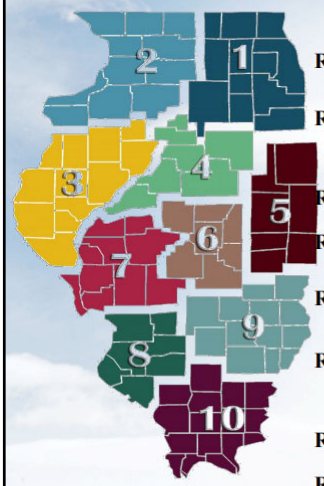
Source: Schnitkey, G. and B. Sherrick. "Cash Rents on Professionally Managed Farmland in 2018 and 2019," *farmdoc daily* (8):53, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, March 27, 2018.



Source: Schnitkey, G. and B. Sherrick. "Cash Rents on Professionally Managed Farmland in 2018 and 2019," *farmdoc daily* (8):53, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, March 27, 2018.

2017 Lease Observations

Our membership has offered detailed observations on leasing trends in each region. Here are some highlights:



Region 1 Cash rents steady, however noted an increased turnover rate as older farmers are retiring rather than continuing with same rent.

Region 2 Tenants really trying to move to more variable cash rents. Northern part of region is slower to convert. Really high property taxes pressure landowners to keep rents where they are at as their returns drop as taxes increase.

Region 3 Lower grain prices were offset by very high yields and kept rents very similar as we head into 2018.

Region 4 Leases tend to vary with the land class in this region. Several straight cash and variable cash rents remained the same.

Region 5 Noted some operators willing to relinquish the lease when no concession on rent was made by the landowner for 2018. Several old crop share leases still holding strong. Fewer custom leases.

Region 6 Tenants not giving up leases in this area and landowners unwilling to reduce rents. Lenders and tenants may have additional discussions this spring. Extremely good grain basis at Decatur may be a positive influence.

Region 7 Starting to see an increase in tenancy turnover, but less than expected. The "economic rent" and the "market rent" are different.

Region 8 Still many 33%/66% or 40/60 leases, or variable cash rents based on these ratios. Bonus rents were triggered in 2017. Still seeing aggressive cash rent bids in areas of Region 8.

Region 9 Cash rents generally down 10% from 2017 as we head into 2018 here.

Source: Illinois Society of Professional Farmland Managers and Rural Appraisers. "2018 Illinois Farmland Values and Lease Trends." http://www.ispfmra.org/land-values-archive/

WHAT IS A FLEX LEASE?

- Variable cash rent lease where cash rent amount is based on some measure of productivity of the farm, e.g. crop yields, grain prices, etc.

Method I - Flexing for Price Only

Crop(s)	Base Rent	×	(Current Price ÷ Base Price)	=	Rent Per Acre[1]	×	Acres Grown	=	Adjusted Rent for the Year
		×		=		×		=	
		×		=		×		=	
		×		=		×		=	

Method II - Flexing for Price and Yield

Crop(s)	Base Rent	×	(Current Price ÷ Base Price)	×	(Current Yield ÷ Base Yield)[2]	=	Rent Per Acre[1]	×	Acres Grown	=	Adjusted Rent for the Year
		×		×		=		×		=	
		×		×		=		×		=	
		×		×		=		×		=	

Method III - Flexing for Price, Yield and Input Costs

Crop(s)	Base Rent	×	(Current Price ÷ Base Price)	×	(Current Yield ÷ Base Yield)[2]	×	(Base Costs ÷ Current Costs)	×	Acres Grown	=	Flexible Rent
		×		×		×		×		=	
		×		×		×		×		=	
		×		×		×		×		=	

German American State Bank

Source: North Central Farm Management Extension Committee. December 2011. "Fixed and Flexible Cash Rental Arrangements For Your Farm." https://aglease101.org/DocLib/docs/NCFMEC-01.pdf

PROS OF A FLEX LEASE

- Can be more equitable for changing economic conditions
- Landowner can share in additional revenues
- Risk levels to operator can be reduced
- Don't necessarily have to be renegotiated each year

German American State Bank

Source: Dale Lattz. "Variable Cash Rent Leases." 2011. University of Illinois Dept of Agriculture & Consumer Economics. http://www.farmdoc.illinois.edu/manage/Variable_Cash_Rent_Lease_Fact_Sheet.pdf

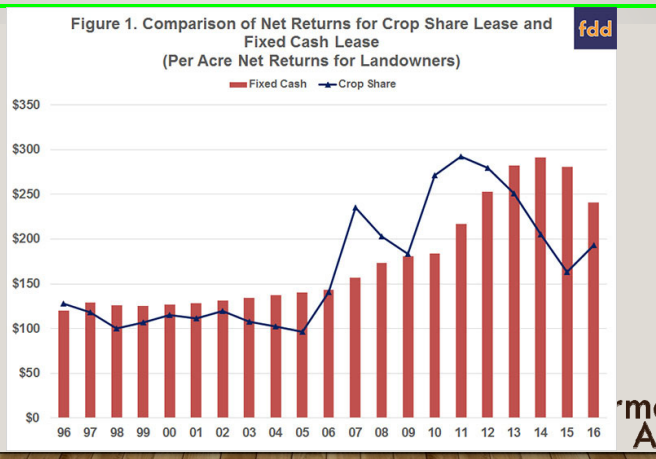
CONS OF A FLEX LEASE

- Generally shift additional risk to landowner
- Profits in high-income years are shared, reducing upside potential to operator
- Less incentive for operator to maximize yields/revenues
- More negotiation in writing the lease

German American State Bank

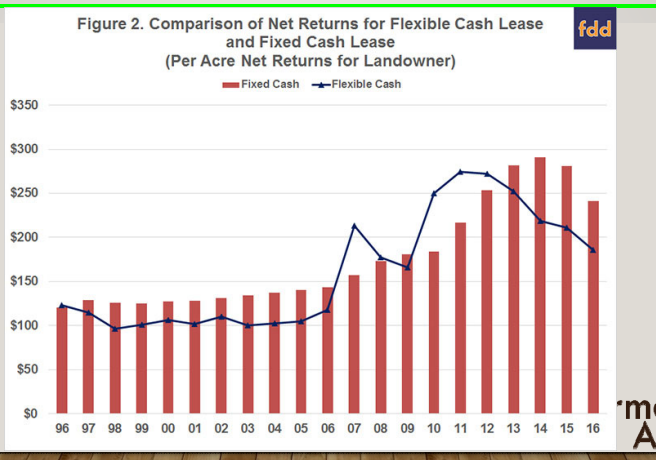
Source: Dale Lattz. "Variable Cash Rent Leases." 2011. University of Illinois Dept of Agriculture & Consumer Economics. http://www.farmdoc.illinois.edu/manage/Variable_Cash_Rent_Lease_Fact_Sheet.pdf

HOW DO THE DIFFERENT TYPES OF LEASES PERFORM?



Source: Langemeier, M. "Comparing Net Returns for Alternative Leasing Arrangements." *farmdoc daily* (6):209, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, November 4, 2016.

HOW DO THE DIFFERENT TYPES OF LEASES PERFORM?



Source: Langemeier, M. "Comparing Net Returns for Alternative Leasing Arrangements." *farmdoc daily* (6):209, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, November 4, 2016.

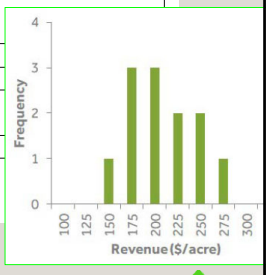
FLEX LEASES, CONSERVATION, AND NOT-FOR-PROFITS

- Only about 20% of farmland leases in IL are flex leases
- Flex leases require more work than fixed cash leases:
  - Initial lease negotiation
  - Ongoing planning and communication
  - Novel production and conservation practices
  - Working around prohibited practices
  - Yield and price reporting

German American State Bank

Organization	Tillage	Buffers	Conserva-tion plan	Pesticide application	Other BMPs
Will Co FPD	No-till	Required - 60ft			Cover crops for some leases
Cook Co FPD					No haying before Aug. 1.
Lake Co FPD	No fall tillage		Required		No fall fertilizer on erodible land
FPD of Dupage Co		Required			
FPD of Winnebago Co	No-till				
Bureau Co SWCD	Reduced/no-till in the spring		Required		
Kane Co FPD	75% residue			Restricted	
Macon Co CD	No-till				
McHenry Co CD	No fall tillage	Required - 30 ft	Required	Restricted	
Vermillion Co CD	No-till			Report use	

Table 6. Conservation practice requirements/restrictions included in leases.



German American State Bank

Source: Delta Institute. "Illinois Public Farmland Inventory." July 2018. https://delta-institute.org/tools/

WHEN ENTERING A CONSERVATION FLEX LEASE

CONSIDER WHAT BENEFITS THE OPERATOR:

- Affordable rent
- Efficient operations
- Excellent yields
- Longer-term land tenure
- Access to infrastructure

CONSIDER WHAT BENEFITS THE OWNER:

- Alignment of values
- High-integrity planning and operating
- Prompt and honest reporting
- Achieving conservation objectives
- Adequate return/income

German American State Bank

ADDITIONAL CONSIDERATIONS

- Define key terms
  - e.g. conservation tillage, soil health, regenerative agriculture
- Make sure benchmarks are reasonable and measurable
  - e.g. fertility levels, SOM, % residue coverage, etc
- Seek to understand why certain practices are used
  - And to explain why you'd prefer to avoid certain practices
- Consider long-term purpose of the land
  - Farmed indefinitely? Held for restoration?

German American State Bank

THANKS FOR YOUR ATTENTION!

- What questions do you have?

- Andy Larson
  Agriculture & Commercial Loan Officer
  German American State Bank
  815-335-1900
  alarson@germanamericanstatebank.com

German American State Bank

Appendix 5

Foss Farm Whole Farm Conservation Plan

NATURAL LAND INSTITUTE: FOSS FARM

WHOLE FARM CONSERVATION PLAN 2019

This report was prepared by Solutions in the Land, LLC
for Natural Land Institute
March 2019

Authors:
Hope Hellmann
Ron Doetch

Solutions in the Land, LLC.
Poplar Grove, IL
815.742.3450
info@solutionsintheland.com
solutionsintheland.com

SOLUTIONS
IN THE LAND

TABLE OF CONTENTS

INTRODUCTION // 04
GUIDING PRINCIPLES // 04
REGIONAL CONTEXT // 05
THE FARM // 09
OPPORTUNITIES AND CONSTRAINTS // 14
RECOMMENDATIONS // 24
ACTION PLAN // 27
APPENDICES // 28

INTRODUCTION

Whole farm plans are intended to assist land owners, managers and producers chart a course for sustainable land use; they enable a piece of land to perpetuate the landowner's values and vision for decades to come. Farm plans are site-specific, addressing the unique challenges and opportunities at each site.

The Foss Farm was donated to the Natural Land Institute (NLI) in 2017 with the intent that the land "in perpetuity remain in its natural state", and "never can be developed", though rental is still a permitted use for income.

This report will analyze the condition of the farm, summarize the regional context, and assess opportunities and challenges with a focus on agricultural and revenue generating opportunities. Drawing on these opportunities, this report will make recommendations for management of the farm, but also strategies for sustainable planning on this property. This report will offer outline both short and long-term strategies for management and conservation on this property in order for its best use to align with the mission of NLI and the estate of Addison Burr Foss.

GUIDING PRINCIPLES

The goal of each farm plan is to chart a course for sustainability: a land use plan that is environmentally friendly, economically viable and socially acceptable within the context of the region and the landowner's principles. In addition to Solutions in the Land's mission of sustainability, the Natural Land Institutes's Working Land Policy provides a set of guiding principles for land management at the Foss Farm.

Principle 1. Sustainable Land Stewardship Profitable and responsible land management includes practicing restorative agricultural techniques for quality soils and water quality protection. The farm management and production plans for each farm should have a measurable set of goals for soil health and water quality protection based on scientific principles and practices.

Principle 2. Mutually Beneficial Lease Arrangements
Leases will be fair to both parties as well as provide for technical assistance with conservation practices to reduce the economic risk to the farmer in return for implementing sustainable agricultural practices.

Principle 3. Conservation and Restoration.
Initial conservation practices may include assessment of marginal lands, remaining habitat remnants on farms such as hedgerows, stream corridors, enhancement of pasture and hay lands with native plants and control of invasive species. The management and production plans for each farm should have short and long term conservation and restoration goals and practices.

Principle 4. Market and Revenue Economic Opportunities.
Farms may be assessed as to the economic potentials for valuing the ecosystem services, as well as the potential for local food production, conservation grazing and haying, specialty crops and organic farming as long as they fit within NLI's Working Lands Policy. It is our intent to demonstrate that ecologically managed agricultural lands are profitable and improve our region's natural resources.

REGIONAL CONTEXT

The Foss Farm is located in Winnebago County, in northern Illinois. This ecological region is a unique landscape called the Rock River Drift Plains[1] (referred to as Rock River Old Drift Country in Wisconsin) that spans the Illinois-Wisconsin border through Boone, Winnebago and Stephenson counties. This subsection of the southeastern Wisconsin till plains (or glacial plains) was not glaciated by the most recent Wisconsin glacial episode[2,3], instead formed by the previous Illinois glacial advances. This landscape was still influenced by the most recent glacial episode in the form of erosion and deposition of outwash material, which created variable soils that are often sandier, shallower and more vulnerable to erosion that other soils in Illinois and the geographical region.[4]

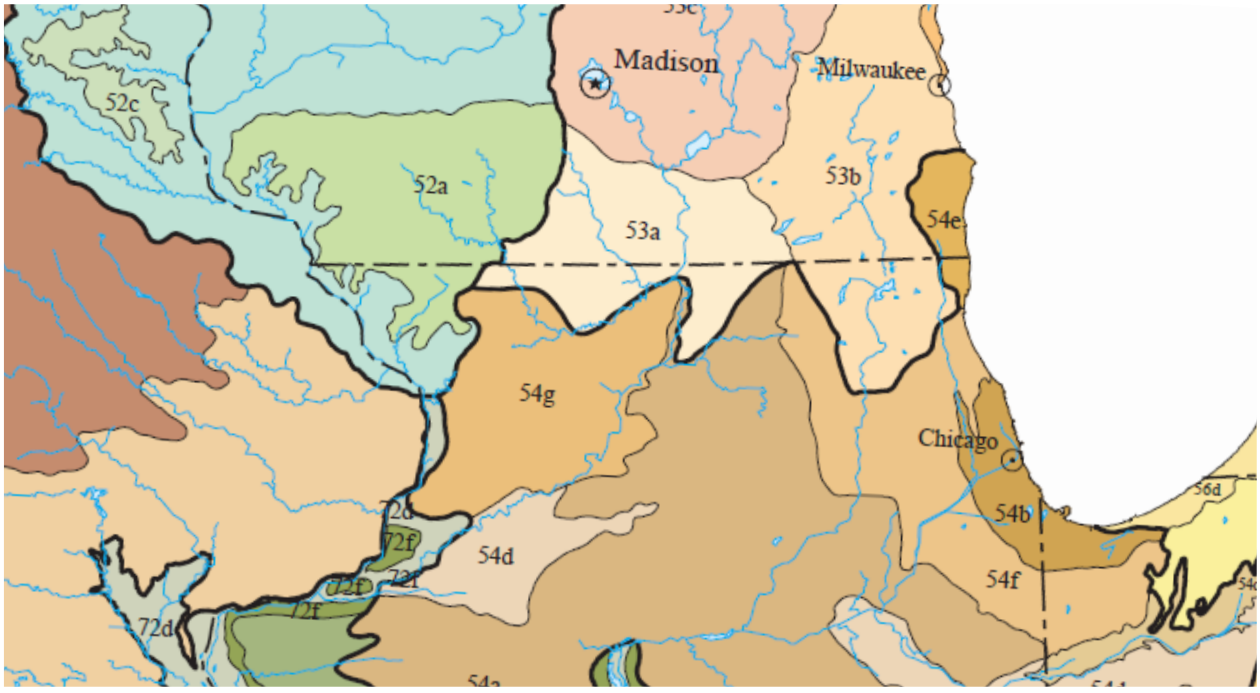
Today the Rock River Drift Plain ecoregion is principally composed of till and outwash plains. The western part of the region is hillier, and the eastern part is level or gently rolling. This region is distinct from its younger neighboring subsection of the Southeastern Wisconsin Till Plains: the Kettle Moraines, as well as from the older Driftless Area to the west, and the Central Corn Belt Plains (including Rock River Hills and Illinois/ Indiana Prairies) to the south. Distinguishing features include well developed stream networks, deeper glacial deposits than the Driftless area but shallower than the plains. Agriculture is a significant land use across many landscapes in the state line area. Cropland is more common in the

1 EPA Level IV Ecoregion 53a

2 http://isgs.illinois.edu/outreach/geology-resources/quaternary-glaciations-illinois

3 This differs from the Driftless area, which is thought to have been unglaciated through the Wisconsin and Illinois glacial episodes, and perhaps even advances before that. The Rock River Drift plains were glaciated in the early advances of the Illinois glacial episode..

4 Wisconsin Department of Natural Resources. 2015. *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 18, Southeast Glacial Plains Ecological Landscape.* Page T-12. Wisconsin Department of Natural Resources, PUB-SS-1131T 2015, Madison.



Above: A snapshot from the EPA's national map of level 4 ecoregions depicting region 53a, the Rock River Drift Plains. See Appendix A for a full map of Illinois Level III and IV Ecoregions.

Rock River Drift Plains than the Kettle Moraines, but less common than the Rock River Hills and Illinois/Indiana Prairies.[5]

In the early 19th century, oak savanna, prairie, and, on fire-protected dissected uplands and along water courses, forest occurred.[6]

Level III and IV Ecoregions of Illinois and the Ecological Landscapes of Wisconsin, Chapter 18 both describe an 18th century landscape mosaic of prairie, oak savanna, and forest along waterways and in fire-protected areas. Like much of the Midwest, the landscape has been significantly altered since European settlement. Most native plant communities were destroyed for timber, settlement or agriculture as the region developed. The Foss Farm is a microcosm of the impacts to the regional landscape post-European settlement. While native plants and isolated pockets may remain at the Foss Farm, the pre-settlement landscape has been effectively erased. It is highly unlikely that any undisturbed pre-settlement plant communities remain on this site. An assessment by NLI describes farmland, forest laden with invasive species and lapsed conservation land now taken over by aggressive shrub species. Between the quarry for gravel, farmland depleted of topsoil and any historical forest razed for timber or farmland, this farm has been depleted of many of its natural resources.

The ecological landscape of the farm occupies a region nearly one and the same with the Lower Rock River Watershed. This property drains to a network of tributaries to the Rock River. This watershed faces challenges from point and non-point pollution from urban, industrial and rural land use. In farm planning, a watershed-focused plan often informs decisions about water management. There is no watershed plan for the Rock River watershed within the state of IL. However, the Rock River is a priority watershed in the Illinois Nutrient Loss Reduction Strategy. The Rock River is identified by the plan for non-point source nitrate loading, which will be relevant to this report as agriculture is a major contributor of non-point source nitrogen loads, and point sources of nitrates and phosphorus, which are not relevant to the Foss Farm.

A 2006 IL EPA assessment of the Rock River Basin also discussed surface water bodies susceptible to pollution by nitrogen. The Rock River Basin also mentioned the threat posed to groundwater by chemical leaching, specifically from agricultural inputs, both nitrogen and pesticides. According to the assessment, "More than 50 percent of the Rock River basin is underlain by aquifer materials within 20 feet of land surface; an additional 13 percent of the watershed is underlain by aquifer materials at depths between 20 and 50 feet." Appendix B contains maps from the assessment indicating the depth to aquifer materials, and the vulnerability to pesticide and nitrogen contamination. It is difficult to decipher from these maps how high the risk for contamination from activities on the Foss Farm. It is clear that in the neighborhood of the Foss Farm, the threat varies from "somewhat limited to excessive".

The Rock River Basin Assessment and the Greenways: A Green Infrastructure Plan for Boone and Winnebago Counties point to urban growth as threats to the health of the landscape.[7,8] Residential sprawl especially threatens the watershed, agricultural land and remaining natural landscapes. The Greenways plan describes the regional need to protect green infrastructure in these two counties. The Natural Land Institute was named as a member of the 2015 Greenways Planning Committee. In green infrastructure planning, it is essential to protect connectivity between areas of value. The Foss Farm is isolated from other natural areas in the region with the exception of the streams. Riparian areas are critical connectors between protected areas. Riparian buffers are highlighted as Critical and Sensitive areas in the Greenways Plan[9].

The Rock River region lies along critical

5 Woods, Omernik, Peterson and Moran. 2006. *Level III and IV Ecoregions of Illinois*. Page 7.

6 Ibid., Page 7.

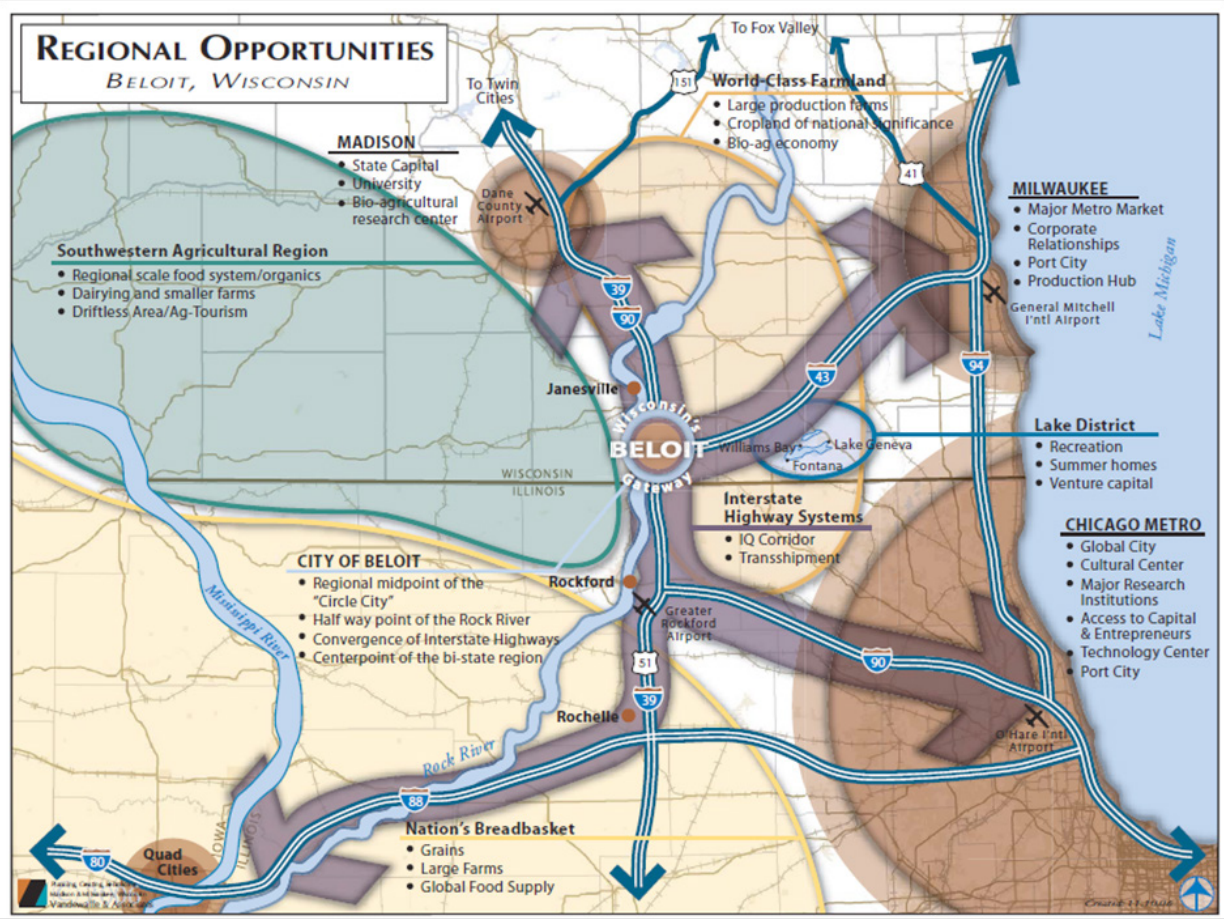
7 State of Illinois Environmental Protection Agency, Bureau of Water. *Rock River Basin Assessment: An overview of the Rock River watershed in Illinois*. 2006. Page 60. https://www2.illinois.gov/epa/Documents/epa.state.il.us/water/watershed/facility-planning/rock-basin.pdf

8 Rockford Metropolitan Agency for Planning. *Greenways: A Green Infrastructure Plan for Boone and Winnebago Counties*. 2015. Page 6-7 Rockford, IL. http://www.rmapil.org/assets/documents/greenways_document_2015.pdf

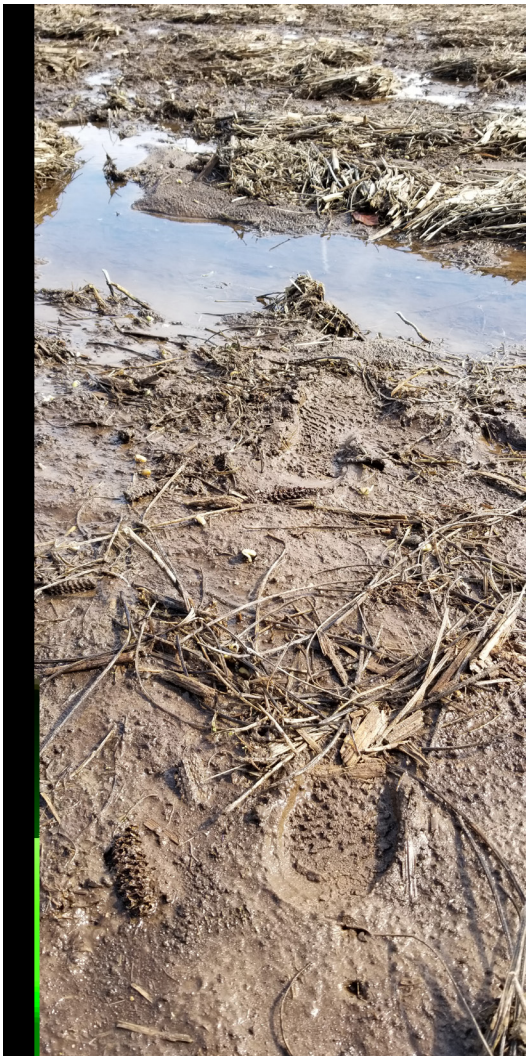
9 Ibid., Appendix 9 A.

Midwestern transportation arteries. Producers in this region have quick highway access, connecting them directly to major metro markets in Madison, Milwaukee, and Chicago, as well as a neighboring Rockford. This region is dotted with a network of smaller regional hubs for food processing, like Rochelle and Beloit, and buyer networks of elevators thanks to the Corn Belt's dominance as a commodity grain producing region.

The geological and ecological history of the land inform decisions and land use, including restoration and conservation. This history also sheds light on the cultural and agricultural heritage of the region. The prairies and plains, with deep rich soils and minimal slope, located to the south of this region allowed for industrial scale grain production to arise. The dissected, varied landscapes to the north gave rise to the diverse agriculture that defines Wisconsin. In the Rockford region, we see these two land uses and agricultural cultures intersect. Conclusions drawn from spending time in the region are confirmed by data from the USDA National Agricultural Statistics Service (See Appendix C); large- scale corn and soybean farmers as well as small livestock and hobby farms producing for niche markets are well represented in Boone, Winnebago and Stephenson counties. The large number of hobby farms and small agricultural hamlets reflects a cultural connection to agriculture and the land. Agriculture is part of the lifestyle of many people in the region. Even large scale commodity grain growers demonstrate conservation competencies that are integral to the cropping practices of more challenging landscapes encountered to the west and north in the Driftless area. In short, the unique meeting of landscapes in the Rock River Drift plains provides a platform for the interface of varied forms of agriculture.



Above: A map indication major transportation arteries in the region and highlighting major regional markets, including Madison, Milwaukee, Chicago. Map Credit: Regional Opportunities from Beloit Downtown Development Plan Draft, 2008. Vandewalle & Associates.



Above: Wheat seedlings in corn and soybean residue. Note the erosion in the aisles in the foreground and the waterway and ponding in the distance.

Left: A very shallow layer of mud on the field after a 3.5 inch rainfall, indicating a combination of rapid drainage, surface runoff, low infiltration and/or compacted soils.

Opposite: The Foss Farm west tracts after a heavy late-season rainfall event.

Site Visit October 8, 2018

- Recent heavy rains (approximately 3.5 inches) led to an overflowing creek and flooded quarry on west tract, and the bridge washout on the east tract. The quarry was completely flooded, and visitors could only enter approximately 300 feet from road before encountering flooding.
- In the west fields, ground was firm despite 4 inches of rain. Soil showed obvious signs of runoff, but little erosion. Provides a picture of likely rapid rainfall and drainage, but also possible compaction and low infiltration.
- Corn residue from the 2017 growing season was still visible and had not broken down, in addition to the 2018 soybean residue.
- Rows were planted with, not against slope of hill, leading to increased erosion and runoff in aisles.
- The cover crop of rye was showing signs of chemical carryover.

THE FARM

Overview

The Foss Farm is divided into two tracts, Foss East and West. Together they total about 400 acres of land, including approximately 197 acres of rented cropland. The remaining acreage is composed of mostly wooded area, some grassland, pine plantation, and an abandoned quarry.

Farmland

There are approximately 140 acres of currently operated farmland between the two tracts. The tenant rents an additional 50 acres that are being restored for use as additional cropland.

In 2017, the operator grew corn, followed in 2018 by soybeans. A cover crop was planted and had germinated shortly before a site visit in October. In 2019, the tenant will Farmland on the west tracts is of marginal quality, relative to other Northern Illinois cropland. Farmland on the east tracts would appear to be slightly higher quality than the west fields, but lower than Northern Illinois. See the box to on the opposing page for a summary of a site visit in October, 2018.

Topography

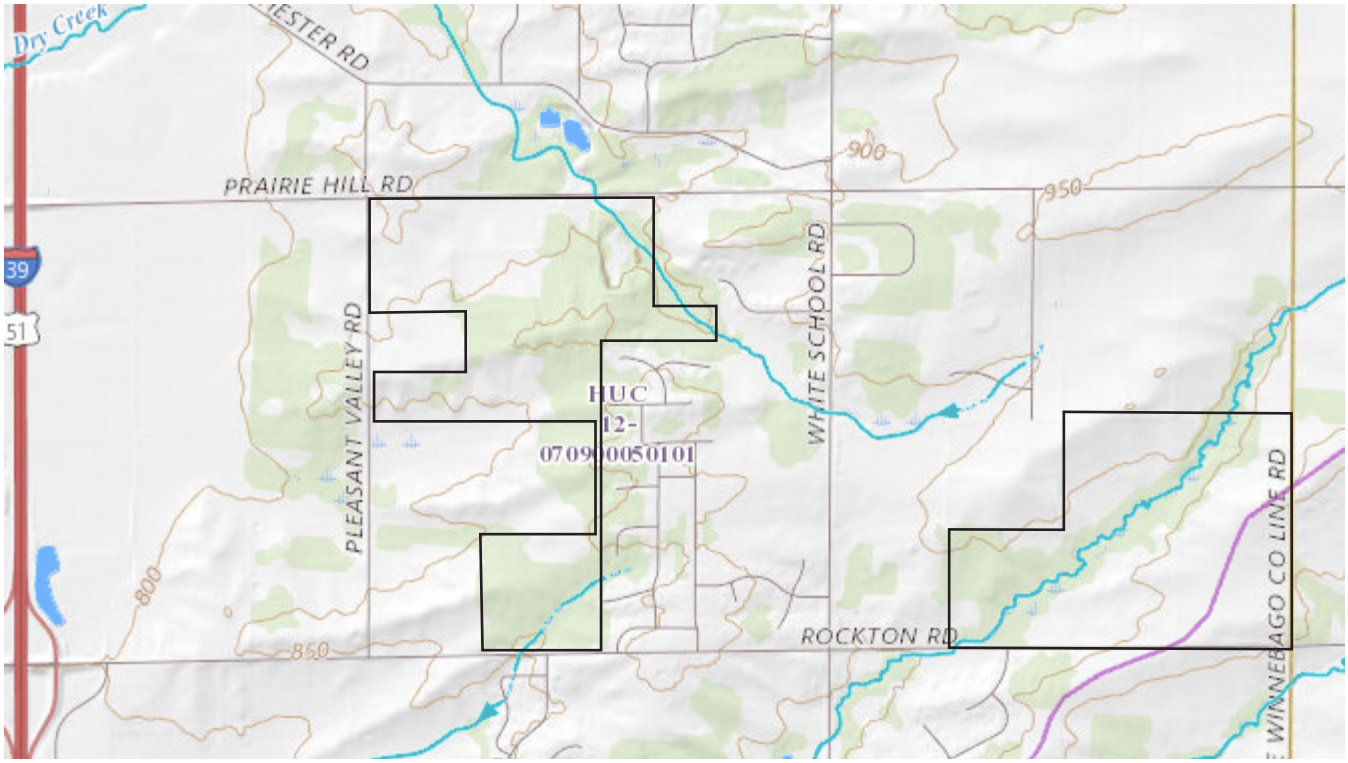
This farm is rolling, with moderate topographical changes and high potential for water erosion. A series of ridges cross the farm from east to west, creating sloping fields with clearly indicated drainage to a network of small streams.

Soils

Foss West farmland is composed primarily of Griswold Loam, 6-12% slope, eroded and Jasper silt loam, 2-5% slope. These soils are well-drained loam on the surface, underlain by clay loam and sandy loam, with a high capacity for transmitting water and storing water. These soils are classified as prime farmland or farmland of statewide importance[1]. The limiting factors on these fields are erosion, water holding capacity, and nutrient holding capacity. Much of the loamy topsoil has likely eroded away.

The agronomist's characterization of sandy, coarse soils at Foss West can be reconciled with the soil report's description of loamy soils (which also may not be entirely accurate at the ground

1 Farmland of statewide importance means not prime farmland, but important to agricultural production in the state, and often with good management still quite productive.



Above: The National Map topography and hydrology of the Foss Farm. The black outlines indicate the approximate boundaries of the Foss east and West tracts.

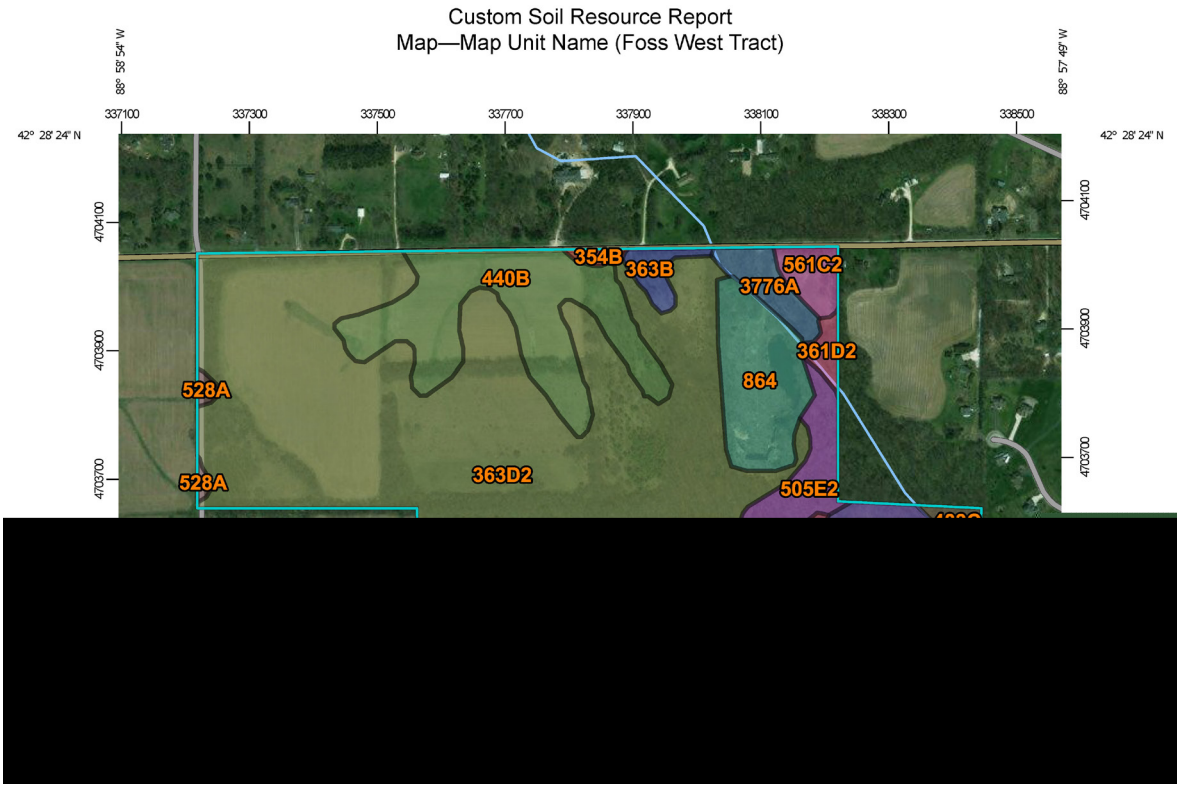
level) when erosion is taken into account. The Griswold loam estimated to make up most of the farmland on the west tracts is categorized as eroded by USGS. In a larger landscape setting already vulnerable to erosive forces, deforestation, plowing under of prairies, and continued agricultural use have could easily strip away the upper layer of loam (estimated at 12-24" depending on soil type) over the course of a century. The underlying soil layers are composed of sandy outwash subsoil with very little organic matter, characteristic of the soils observed today.

Foss East has soils composed of St. Charles silt loam at varying slopes, McHenry silt loam at varying slopes, Kidder loam (6-12 % eroded) Flagg silt loam, a smattering of Grelton fine sandy loam (varying slope, eroded), and Orion silt loam along the creek. All are well drained, mostly non-hydric, and are defined as prime farmland or farmland of statewide importance. These soils have 2e and 3e classifications, and are composed of relatively shallow loams over gravelly sandy or clay subsoils.

Soil tests have offered a few key insights:

- Organic matter is very low across all fields
- CEC is low in some sample sites
- Tenant is doing a good job managing nutrients despite the above two challenges
- Results from Haney tests (indicating soil health and microbial activity) are widely variable. The two sample sites from converted CRP returned much higher scores, but across the rest of the fields there were varied results.
- Sampling error may also be indicated in some of the observed nutrient gains and variance in sample results.

The soil health scorecard found in Appendix F offers insights from the field to compliment the above. SITL scores soil physical properties on Foss west somewhat lower than the tenant, but the tenant offered valuable insight into crop health and challenges related to the soil. This assessment suggests that qualities including water storage, compaction, infiltration and other physical properties indicate that the soils are below optimal. They are neither severely impaired not perfectly healthy, falling somewhere in the middle of the spectrum.

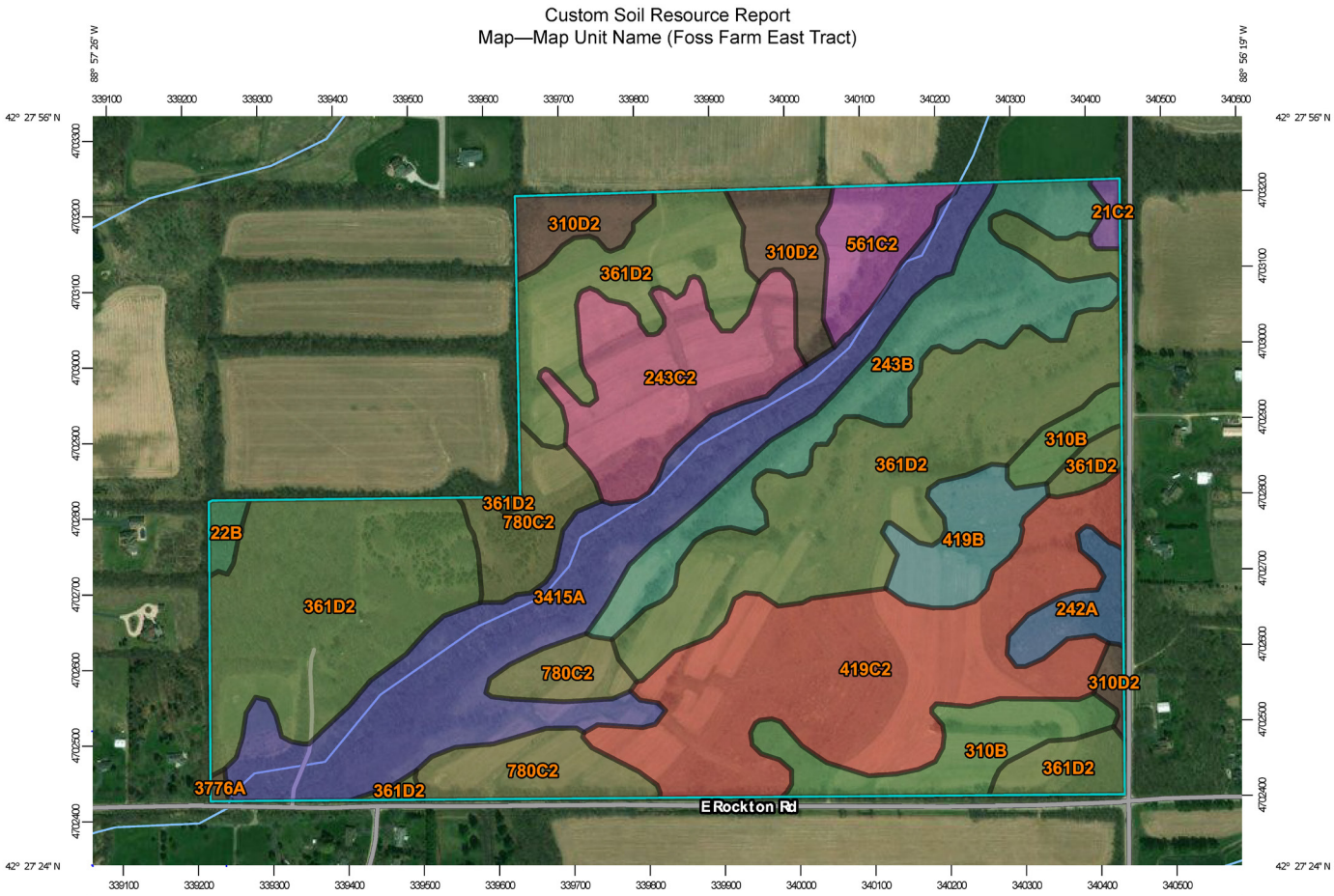


Above: A map of the soil types at Foss West from the NRCS WebSoilSurvey for the Foss Farm. The wooded acreage south of the agricultural land has been trimmed for space. Soils in the current agricultural areas are likely composed of two soil types: Griswold loam and Jasper silt loam. See Appendix E for a full report, or visit the USDA NRCS's Web Soil Survey page at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm to explore more about soil types and mapping.

Right: A chart listing the corresponding names of the soil types in the map above.

Table—Map Unit Name (Foss West Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
22B	Westville silt loam, 2 to 5 percent slopes	Westville silt loam, 2 to 5 percent slopes	8.0	3.8%
22C2	Westville silt loam, 5 to 10 percent slopes, eroded	Westville silt loam, 5 to 10 percent slopes, eroded	0.9	0.4%
152A	Drummer silty clay loam, 0 to 2 percent slopes	Drummer silty clay loam, 0 to 2 percent slopes	0.2	0.1%
354B	Hononegah loamy coarse sand, 2 to 6 percent slopes	Hononegah loamy coarse sand, 2 to 6 percent slopes	0.5	0.2%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Kidder loam, 6 to 12 percent slopes, eroded	29.0	13.7%
363B	Griswold loam, 2 to 4 percent slopes	Griswold loam, 2 to 4 percent slopes	1.5	0.7%
363D2	Griswold loam, 6 to 12 percent slopes, eroded	Griswold loam, 6 to 12 percent slopes, eroded	113.1	53.3%
403C	Elizabeth silt loam, 5 to 10 percent slopes	Elizabeth silt loam, 5 to 10 percent slopes	1.0	0.5%
440B	Jasper silt loam, 2 to 5 percent slopes	Jasper silt loam, 2 to 5 percent slopes	33.9	16.0%
505E2	Dunbarton silt loam, 12 to 20 percent slopes, eroded	Dunbarton silt loam, 12 to 20 percent slopes, eroded	4.0	1.9%
528A	Lahoguess loam, 0 to 2 percent slopes	Lahoguess loam, 0 to 2 percent slopes	0.6	0.3%
529A	Selmass loam, 0 to 2 percent slopes	Selmass loam, 0 to 2 percent slopes	1.5	0.7%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	2.0	1.0%
570B	Martinsville silt loam, 2 to 4 percent slopes	Martinsville silt loam, 2 to 4 percent slopes	5.4	2.6%
864	Pits, quarries	Pits, quarries	8.2	3.9%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Comfrey loam, 0 to 2 percent slopes, frequently flooded	2.5	1.2%
Totals for Area of Interest			**212.2**	**100.0%**



Table—Map Unit Name (Foss Farm East Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
21C2	Pecatonica silt loam, 5 to 10 percent slopes, eroded	Pecatonica silt loam, 5 to 10 percent slopes, eroded	0.7	0.4%
22B	Westville silt loam, 2 to 5 percent slopes	Westville silt loam, 2 to 5 percent slopes	1.0	0.5%
242A	Kendall silt loam, 0 to 2 percent slopes	Kendall silt loam, 0 to 2 percent slopes	3.1	1.6%
243B	St. Charles silt loam, 2 to 5 percent slopes	St. Charles silt loam, 2 to 5 percent slopes	16.2	8.1%
243C2	St. Charles silt loam, 5 to 10 percent slopes, eroded	St. Charles silt loam, 5 to 10 percent slopes, eroded	13.9	6.9%
310B	McHenry silt loam, 2 to 4 percent slopes	McHenry silt loam, 2 to 4 percent slopes	9.4	4.7%
310D2	McHenry silt loam, 6 to 12 percent slopes, eroded	McHenry silt loam, 6 to 12 percent slopes, eroded	8.2	4.1%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Kidder loam, 6 to 12 percent slopes, eroded	64.2	31.9%
419B	Flagg silt loam, 2 to 5 percent slopes	Flagg silt loam, 2 to 5 percent slopes	5.7	2.8%
419C2	Flagg silt loam, 5 to 10 percent slopes, eroded	Flagg silt loam, 5 to 10 percent slopes, eroded	31.3	15.6%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	5.3	2.6%
780C2	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	13.6	6.8%
3415A	Orion silt loam, 0 to 2 percent slopes, frequently flooded	Orion silt loam, 0 to 2 percent slopes, frequently flooded	28.2	14.0%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Comfrey loam, 0 to 2 percent slopes, frequently flooded	0.2	0.1%
Totals for Area of Interest			**201.1**	**100.0%**

Above: A map of the soil types at Foss East from the NRCS WebSoilSurvey for the Foss Farm. Soils in the current agricultural areas are varied, composed of several silt loams and loams. See Appendix E for a full report, or visit the USDA NRCS's Web Soil Survey page at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm to explore more about soil types and mapping.

Right: A chart listing the corresponding names of the soil types in the map above.

Water

Rolling topography and well developed stream networks create well established (though difficult to follow at the ground level) drainage at the Foss Farm. There is no drain tile at the Foss Farm due to the natural drainage. With the exception of a small corner on the east tracts, all of the Foss Farm drains to the Dry Creek sub-watershed of the Rock River. Drainage occurs through several small tributaries, two of which form perennial streams on the property. The drainage basins of these two streams are highlighted in Appendix G. The stream on Foss west drains approximately 400 acres of residential and agricultural land; the stream on Foss east drains around 900 acres of primarily agricultural land.

As mentioned in the regional context, there is no current watershed plan for the Rock River watershed in Illinois. Highlights from the Rock River Basin Assessment (2006) suggest the watershed is vulnerable to groundwater contamination from agriculture, primarily from pesticides and nitrates. The report also predicted that urbanization would be a threat to this watershed. In the fifteen years following the report, the Rock River basin has indeed faced challenges due to residential development and urban expansion.

Lapsed CRP Ground

When NLI acquired the land, there were approximately 110 acres of lapsed CRP ground between the two tracts. In 2018, the lapsed acres were restored and plowed for cropland on Foss East. 12 acres on the west tract are slated to be restored to cropland in 2019. The restoration is a cost-share agreement between the tenant and NLI, and the tenant is managing the conversion back to cropland.

Remaining Property and Infrastructure

Access to the remaining acreage is limited and overgrown. Access to two barns and an active well and pump has been improved and moved to the west on Rockton Road to remove the need for a creek crossing.

NLI's Foss Farm Management Plan (Appendix D) includes a basic assessment and budget for restorations of the remaining property, including the wooded acreage, pine plantations, quarry, and abandoned homestead area. We will recommend further assessment of there areas, and addressing liabilities and/or risks to human and environmental health.

Human Resources

- Executive Director, NLI
- Director of Stewardship, NLI
- Tenant Farmer
- Agronomist
- NLI Working Lands Committee
- Solutions in the Land, Sustainable Agriculture Consultants

NLI hosted an event in 2018 welcoming neighbors to discuss their concerns or interests regarding new activities on the Foss Farm. Attendees were most interested in hunting on the property (both the opportunities pertaining to the hunt club that uses the land and related safety concerns) and in understanding the restoration work they had observed, largely the observed removal of invasive species.

Below: The creeks at the access road to the quarry on the west tracts (left) and at the retired access path on the east tract (right). The access entrance to the barns on Foss East has been moved after a flood event washed out the culvert under the access road (see the photo on page 15).

OPPORTUNITIES AND CONSTRAINTS

This chapter will outline observations from the previous two chapters, as well as opportunities and challenges posed by the regional context and current state of the farm. SITL will make recommendations for management, environmental stewardship and revenue generation where there is sufficient evidence to support action, or we will point out where further analysis is needed.

Foss Farm as a Model for the Region

The property has essentially been stripped of its resources, including minerals, timber, topsoil and plant communities. The habitat, agricultural land and infrastructure on the property is degraded. The challenges at the Foss Farm are numerous, but so are the opportunities. The challenges faced by the Foss Farm are common throughout the Midwest, making restoration opportunities on this farm translatable to many other properties in the region. In addition to providing ecological benefit to the regional landscape and watershed, successful restoration activities at the Foss Farm have the potential to be a model for rehabilitation of properties across NLI's land holdings and across the Midwestern United States.

Conflicting Priorities

In reviewing NLI's management plan, it seems that there are competing priorities at the Foss Farm. Long term goals of ecology restoration (on the surface) conflict with strategies for short term revenue generation. Agricultural use seems to be in conflict with environmental stewardship. These conflicting priorities need a unifying goal to bring them together. At SITL, we believe that soil health should be that goal. Focusing on soil health will lead to strategies that produce returns for the producer and landowner, that improve stewardship in terms of land and water quality, and that will lead to, or incorporate, restoration practices at the Foss Farm.

Environmental Stewardship

There are numerous opportunities for environmental stewardship at the Foss Farm. We will discuss the principal opportunities on the agricultural lands, recognizing that there are also stewardship opportunities on other parts of the property, but that forest management and quarry reclamation are beyond the scope of this report.

Soil Health

Soils at the Foss Farm present a challenge to agricultural production and an opportunity for ecological stewardship. In the farm overview, we determined that the shallow, loamy topsoils suggested by the soil report (Appendix E) at the Foss Farm have likely eroded away since deforestation and tillage of prairies a century ago. The sloped ground at the Foss Farm is vulnerable to erosion from surface runoff when uncovered by permanent vegetation. It is likely that the tenant is farming a very shallow layer of topsoil, if any. Regardless of the label on the soil, we know that organic matter is very low, and that there are issues of microbial activity, compaction, moisture retention and erosion. The tenant seems to be managing nutrients well, but the cost of inputs is reducing his profitability. Building soil health should be a primary goal of agricultural operations at the Foss Farm. This strategy creates an opportunity to adjust cropping rotations and implement other practices in line with NLI's goals on the land. Practices employed to build soil health may include:

- Extending the crop rotation to include small grains or winter cover
- Reducing bare soil and continuing to employ minimum tillage principles
- Limiting erosion through soil cover, extended waterways, buffers, and planting across rather than with the slope of the hill.
- Increasing organic matter through crop residue, green manure and compost
- Protecting soil life by continuing to use

minimal tillage, providing "food", and minimizing synthetic inputs or high-nitrogen inputs that harm soil organisms

In order to understand the effects of agricultural practices on soil health, soil tests and evaluation should be performed annually. Most of the information about the health of the soil can be gained through a comprehensive soils test (one which includes a soil health score and indicator for microbial activity) and observation of tilth and texture. In order to draw conclusions from soil tests, it will be important to minimize error by sampling on a grid, taking samples from the same sites each year and at the same time of year (preferably in the fall after harvest) and sending to the same lab for evaluation.

Soil Organic Matter

Soil organic matter (SOM) is a key indicator of soil health and quality. The NRCS identifies the following benefits of soil organic matter[1]:

- Provides a mineralizable source of nutrients for crops.
- Supports micro-organisms that facilitate the availability of nutrient
- Increases the availability of most nutrients
- Buffers the effects of high acidity
- Increases the available water capacity and moisture retention of the soil
- Increases water infiltration
- Helps to minimize compaction and surface crusting, and hold soil aggregates together
- Acts as a carbon sink

The value of these ecosystem services can be difficult to quantify. The NRCS provides estimates on the value of some properties of soil organic matter. The available nitrogen and phosphorus annually in each percent of organic matter are estimated to be worth $11/acre and water holding capacity worth $18/acre.[2]

Measuring soil organic matter change can be an excellent way to monitor long-term changes in the health of agricultural soils. Increasing organic matter requires two steps: increasing the amount of organic material incorporated into the soil through plant residue and root mass, compost or manure, and subsequently protecting and retaining this organic matter. Practices that can increase and maintain soil organic matter include: minimizing tillage, minimizing erosion, maintaining soil cover, keeping living roots in the soil for as much of the year as possible (through perennial or cover crops in a rotation) and incorporating livestock or composted manure when applicable.

1 NRCS *Soil Health - Guides for Educators: Soil Organic Matter*. 2014. Page 1.
2 NRCS Iowa. *Value of Soil Health.* Page 3. See Appendix H for full factsheet.

Below: The bridge over the creek on the east tracts washed out after a large rainfall in October, 2018.

Water Quality

There is an opportunity to protect water quality in the streams of the Rock River watershed. Monitoring impacts from one site on water quality is very challenging. Fortunately the same practices that will have the best effect on soil health will also protect water quality. Practices that prevent erosion will slow water, reduce sediment loading, and may reduce phosphorus loading the water. Building soil organic matter will improve retention of water, and possibly infiltration, also slowing the rate of release to surface bodies of water.

The upstream drainage basins of the two perennial streams are highlighted in Appendix G. The stream on Foss East drains about 900 acres of mostly farmland. Records indicate 3.5 inches of rainfall the day before SITL's site visit in October, 2018. A rapid 3.5 inch rainfall, assuming minimal infiltration into the soil, would have resulted in about 70 million gallons of water running off of those 900 acres, downstream, and wiping out the bridge. On Foss West, the same rainfall event overflowed the banks of the small creek that drains approximately 400 acres, flooding the quarry and limiting access further than a few hundred feet from the gate.

900 acres may not seem a large drainage basin, yet the effects of water on this scale had a dramatic effect at the Foss Farm. The management of a few farms can have a powerful impact downstream; shared land management strategies can have a profound effect on a watershed, negative or positive.

Illinois Nutrient Loss Reduction Strategy (NLRS)

The IL NLRS identifies the Rock River Watershed as a priority watershed for nitrogen reduction from urban and industrial sources points sources, and non-point agricultural sources. The Foss Farm has an opportunity to ensure that management practices are implemented to reduce or prevent nutrient loss from the Foss Farm into this watershed. The practices suggested by the NLRS to reduce nitrate loading in water bodies are listed below. Practices relevant to the Foss Farm and warranting further discussion are in bold, with italicized practices already being pursued by the tenant. As mentioned on page 13, there is no drain tile on the Foss Farm. Practices recommended for tile-drained land do not apply here.

Practices to reduce N:

- **Reduce N application by 10%**
- Nitrification inhibitor on tile drained land
- Split 50/50 spring fall application of N
- ***All spring application of N (tenant performs spring application in two parts- optimal)***
- Spring/fall side dress for producers doing fall application
- Cover crops on tiled corn/soybean land
- ***Cover crops on non-tiled corn/soybean land (applied on Foss west)***
- Bioreactors on 50 % tile drained land
- Wetlands on 35% tile drained land
- **Buffers on all applicable crop land**
- Perennial/energy crops on 10 percent tile drained land

Below: Grassed waterways on the Foss west tracts. Note erosion uphill and downhill of the waterway.

Reducing applications of nitrogen and expanding buffers and waterways on the Foss Farm would likely have the most significant and cost-effective impact on nitrogen runoff when combined with the existing conservation practices of the tenant.

While the Rock River was not indicated as a priority watershed for phosphorus reduction, we have also listed the practices recommended by the NLRS for reducing P in water bodies:

- ***Highly erosive land converted from conventional till to mulch or no-till (applied on Foss West)***
- P rate reduction on fields above recommended maintenance level
- Cover crops on all corn/soybean tiled acres
- ***Cover crops on highly erosive land currently in reduced, mulch or no-till (applied on Foss West)***
- **Buffers on all applicable farmland**
- Perennial energy crops on highly eroded land, or 10 percent tile drained land

The tenant is already incorporating NLRS recommended practices for reducing phosphorus loading into his production strategy. Expanding buffers at Foss Farm would likely be the next most practical and impactful way to reduce any phosphorus (and associated sediment) loading.

Habitat and Ecological Restoration

Agriculture at the Foss Farm can compliment ecological restoration. Agricultural management practices and the interface between agricultural land and natural landscapes are the primary areas for impact. In the field, crop choice and input applications affect organisms in the soil, downwind, and downstream. Crop choices can provide or reduce habitat through the growing season or winter. Integrated Pest management (IPM) is a strategy employing chemical, biological and cultural techniques to reduce pest pressures, instead of relying solely on pesticides.

At the interface between agriculture and natural areas, buffers bridge the divide and protect natural areas from agricultural inputs and activities. Buffers can be designed with specific intent to provide habitat or increase biodiversity, in addition to reducing runoff and erosion. One such concept for buffers is the STRIPS program from Iowa State, described in the next section.

IOWA STATE STRIPS

Strategic addition of 10% prairie to row crop land in the form of buffers creates the following effects:

- 44 percent reduction in water runoff
- 95 percent reduction in soil loss
- 90 percent reduction in P runoff
- 84 percent reduction in N runoff
- No difference in per acre corn and soybean yields
- No difference in weed abundance
- Reduced emissions of heat-trapping gases, especially nitrous oxide
- Potentially improved beneficial insects and wildlife

STRIPS

STRIPS (Science-based Trials of Rowcrops Integrated with Prairie Strips) is a project from Iowa State University studying the strategic conversion of 10 percent of cropland to prairie strips as a conservation practice. In research trials, this program returned promising results, highlighted in the box above. The STRIPS program could be an excellent conservation practice to implement at the Foss Farm, resolving conflicts between restoration and production goals, as well as demonstrating impacts in an attractive and easy to explain format. See the box above and Appendix H for more information.

CRP Land

There are remaining acres of lapsed CRP land. This land is a high priority for restoration as invasive shrubs have already begun to encroach on these fields and adjoining landscapes. There are costs associated with restoration whether for farmland or for prairie/savanna. If possible, the landowner should try to re-enroll the land in CRP for assistance with the restoration and maintenance. If not possible, and the farmer has the capacity to farm extra acreage, then NLI can offset some of the cost of restoration by continuing to generate revenue on these acres through sustainable agricultural use. Continued agricultural use will create additional revenue for the tenant, buy time until the budget can include restoration work, and prevent further invasive species pressure.

Climate Mitigation and Carbon Sequestration

Agriculture is receiving increased attention for its role in contributing to climate change. From the emissions associated with manufacturing synthetic inputs and food miles, to the release of nitrous oxide, to destruction of native landscapes to make way for agricultural land around the globe, agriculture has played a role in driving climate change. The Federation of American Scientists estimates that agriculture contributes to 10% of US greenhouse gas emissions.[3,4] Emissions producing activities identified by FAS which are relevant to the Foss Farm include soil management, nutrient management, machinery related emissions and potentially manure management.

Climate disruption will have a profound effect on agriculture. Fortunately, cropland and native landscapes are also being recognized for their potential for carbon sequestration and their role in mitigation of climate changes' effects. Agricultural lands and native landscapes can both play an important role in mitigation through managing the flow of water, increasing biodiversity and sequestering carbon. Research is ongoing about the best management strategies, but as we learn more, climate change should be a factor in decision making at the Foss farm.

Climate change will create challenges for landscapes found at the Foss Farm, both native and agricultural. Changing weather patterns, including increased drought and more intense rainfall events, increased pest and disease pressure to crops and native plants alike, disruption of plant and insect life cycles, as well as disruptions to agricultural markets are all predicted effects of climate change. The best defense against many of these threats will be to build resiliency and diversity on the Foss Farm and surrounding area. General strategies for increasing biodiversity include avoiding large monocultures on cropland, maintaining rich plant and insect communities and building soil health.

The National Climate Assessment[5] recommends diversifying crop rotations, integrating livestock with crop production systems, improving soil quality, minimizing off-farm flows of nutrients and pesticides and other practices typically associated with sustainable agriculture to increase the resiliency of agricultural systems in the United States to climate impacts. The NCA also predicts that climate change will exacerbate the effects of management practices that do not protect the soil surface from the forces of rainfall. As such, maintaining soil cover and implementing practices that prevent erosion will also be important.

The Nature Conservancy's 20 Pathways of Natural Climate Solutions[6] include several agricultural practices. The practices applicable to the Foss Farm include establishing trees on current cropland, improved nutrient management, and conservation agriculture.[7]

The FAS discusses land use and associated emissions. Converting farmland to resource conserving landscapes, like forest, grassland and wetland sequesters more carbon than farmland alone. However, farmland sequesters more carbon than converting land to industrial or residential uses. Sequestration on farmland can be improved by conversion of vulnerable land to buffers and installing hedgerows, reducing soil disturbance, and increasing biomass.

Grain Market Opportunities[8]

There are numerous market opportunities in addition to conventional grain spot markets in Northern Illinois and the surrounding region. For farmers, producing for a specific market can result

3 Renee Johnson. *Greenhouse Gas Emissions and Sinks in U.S. Agriculture*. 2018. https://fas.org/sgp/crs/misc/IF10979.pdf

4 This estimate does not include other parts of the food system like transportation, which may account for up to a third of global greenhouse gas emissions.

5 http://nca2014.globalchange.gov/report/sectors/agriculture

6 20 Pathways of Natural Climate Solutions is a proposed set of land use and management strategies on natural and agricultural landscapes that combined could offer 37% of the mitigation needed between now and 2030 to reduce global temperature rise.

7 https://www.nature.org/en-us/what-we-do/our-insights/perspectives/natures-make-or-break-potential-for-climate-change/ October 16, 2017

8 These markets are too dynamic to be able to make specific lasting recommendations for relationships and contracts in this report as market opportunities continually shift but this report seeks to provide relevant management strategies for years to come. Specialty contracts fill up and vary by season depending on producer interest.

in premium prices. We will break down some of the market concepts below, but in general, the buyer is often willing to pay more when requiring more from the producer.

Market opportunities can be sorted into several categories. The following qualities can be applied to organic or conventionally grown grains. The next section will discuss organic agriculture separately.

Specialty grains: Generally refers to the production of untraditional varieties such as waxy corn, white corn, or food-grade soybeans; or it may refer to raising identity-preserved crops. In some cases, it refers to traditional grains that are marketed for non-traditional or industrial uses. In any case, the attraction of specialty-grain production is the ability to enter a new or niche market that offers a price premium. Entering the specialty- crop market may simply depend on the producer's ability to find a buyer who will pay a higher price to guarantee a supply for the alternative use rather than unique plant genetics or production methods.

Value added: A general and comprehensive term that describes the production of commodities that sell for a price premium. The term can also refer to the marketing of traditional commodities that increases their value or the producer's returns, such as food-grade soybeans or processing corn for ethanol.

Identity preserved (IP): Grain (or oilseeds) segregated and handled separately from commodity grain. IP grain typically has characteristics, such as high protein, oil content or food grade that are desirable for specific end uses. These grains need to be segregated in order to preserve those traits and their value. To preserve a product's unique traits or value, identity preservation demands significant steps during production, harvesting, storage and processing to segregate the crop from other varieties.[9]

These qualities are not mutually exclusive. Specialty grains may be identity-preserved, and organic crops may be value added. Securing contracts for each of these specialty market opportunities requires the investment of time in forming relationships with buyers. Producers must also be willing to adjust their cropping plans to accommodate special handling, production and/or storage to the buyer specifications. In exchange for this flexibility and burden, the producer will be rewarded with a premium price. Relationships with the buyer are important in order to access new contract opportunities as demand is met for buyer needs and contract opportunities are in constant flux.

In this region, opportunities could include IP non-GMO corn or soybeans, food grade grains, specialty baking wheats and specialty soybeans intended for aquaculture and feed use. To better understand current opportunities, a producer would need to assess their capacity to meet buyer specifications for production, handling and storage, and then inquire with buyers to better

9 Iowa State University Extension, Specialty Grain Terms. https://www.extension.iastate.edu/agdm/crops/html/a3-50.html

REGIONAL MARKET OPPORTUNITIES

- Consolidated Grain and Barge. Premium grains program. Locations throughout the Mid-west. Hennepin IL would be point of contact. https://www.cgbgrain.com/PremiumGrains
- The Delong Company, Clinton WI. Contact for contract opportunities. Organic program also buys organic commodity wheat, soybeans, yellow corn.
- Scoular Grain https://www.scoular.com/markets/specialty-grains
- Sunopta, Hope, MN. Certified Organic, Identity Preserved, non-GMO, Conventional and Food Grade grower programs.
- Kaytee, Northeastern WI. Buys milo (grain sorghum) from around the nation for bird seed.
- Regional Distillers require specialty corn and rye.
- Spectrum Premium Buyers: View the map at https://www.spectrumseed.com/premiums/ for non-GMO premium grain opportunities.

understand contract opportunities. See the box on the previous page for opportunities for inquiry in the region.

SITL farm plans have the goal of ***sustainable management****, meaning that agriculture is profitable, environmentally friendly and socially acceptable. Any farm, large or small, conventional or organic, producing grain, produce or livestock, can employ sustainable management practices that protect the producer's long-term profitability, minimize negative impacts to the environment, provide ecosystem services to the region and protect the long term health and productivity of the land. When discussing cropping strategies and market opportunities, it is important to emphasize that* ***sustainable agriculture is about stewardship of the land, regardless of the market, while organic and conventional agriculture are market options, that may or may not represent sustainable farms.*** *The cropping opportunities in this chapter explore the various ways in which producers can be rewarded for sustainable management in the market.*

Organic Agriculture

Organic agriculture is the production of crops or livestock without the use of synthetic inputs. Organic certification requires documentation of 36 months of chemical free- land use. Organic crops can be sold on contract, commodity markets, or direct to consumers in the same manner as conventionally grown products.

Organic agriculture is the most widely successful market model for rewarding producers with premiums for engaging in sustainable practices and accepting the burden of adhering to the organic standard. However, organic agriculture is not inherently sustainable. Conventional producers can utilize sustainable management strategies, and conversely organic producers can have operations that are not profitable, socially acceptable or environmentally sound. As such, organic certification should be considered only when the regional market incentive is greater than the burden on the tenant.

If the market incentive is not present, but environmental concerns are driving an interest in organic agriculture, listed below are a few practices often associated with organic agriculture that many operations can adopt to lead to improved environmental outcomes without incurring the certification burden of organic:

- Extend crop rotations to include crops with lower nutrient demands, resulting in decreased applications of synthetic fertilizers
- Incorporate alternatives to synthetically derived nutrients, including compost/ organic matter, nitrogen fixing crops and increasing favorable soil conditions for soil-dwelling microbes that fix and make available nutrients
- Integrated Pest Management
- Establishing adequate buffers for natural areas, erosion prone areas and waterways.
- Maintaining soil cover through cover crops, extended rotations, and or reduced/ no-till systems.

On the Foss Farm, there is both opportunity and constraints for organic agriculture. Organic markets exist in the region. Many regional buyers with specialty grain programs also have organic grain programs. There are also environmental incentives for organic agriculture at the Foss Farm, including the vulnerability of regional groundwater and surface water bodies to contamination by agricultural inputs; the challenges of the soils and topography; and the restoration goals of diverse native landscapes.

However, the current tenant's competencies favor a conventional system with conservation practices. Dividing his operation into conventional and organic operations would prove a significant burden. Organic management practices, such as cultivation for weed control, conflict with the tenant's use of no-till practices. There is not a strong tradition of organic agriculture in the Rock River Drift Plains. For this reason, the tenant may find himself without adequate support if considering a transition to organic.

As discussed above, there are conservation and sustainable management strategies that can achieve many of the ecological goals without the certification burdens of organic agriculture.

The tenant has other options for alternative grain markets beyond organic agriculture, which could also compliment the tenant's style of conservation agriculture. Organic production will remain a long-term opportunity on the Foss Farm as the market segment continues to grow.

Integrated Pest Management (IPM) is a strategy for managing pest pressures on a site. IPM is simply the integration of biological, cultural and chemical practices to reduce pest pressures. IPM is a strategy that can be utilized on any farm, regardless of size and production style. NRCS has practice codes for IPM, and it can be integrated in to a tenant's CSP program. See Appendix I for more information about IPM practices.

Alternative Cropping Strategies

Agriculture can take many exciting forms when discussing the options beyond conventional commodity corn and soybean production. These ideas will vary in feasibility on any given site. Listed below are few common alternatives to row crop agriculture and their viability at the Foss Farm:

- *Pasture*: permanent grassland may be a long term option at the Foss Farm, especially on more delicate soils. The best option for pasture would be to contract with a dairy or cattle operation for custom (daily) rotational grazing. With proper management, pasture is a good way to protect and build impaired and erosion-prone soils.
- *Orchards and perennial fruit and nut production* are always appealing in restoration agriculture, often part of the idea of "permaculture". The financial reality at the Foss Farm is that there is little market for fresh market fruits and nuts, and that the labor costs are prohibitive for such an operation. For similar appeal, consider installing buffers or multifunctional recreation areas with fruit trees, where they provide benefit to wildlife or enhance recreation opportunities, but are not intended to be harvested for a profit.
- *Fresh market vegetable production* is an appealing way to connect to the community and local food movement, but the economic reality is that there is no market demand for increased vegetable production in this region, and that similar to fruits and orchards, labor will prove a prohibitive cost to growing vegetables. Furthermore, vegetable production is demanding of the soil, and there are no unique advantages or well-suited soils at this farm for vegetable production.
- *Grain sorghum*, a staple of southern and western growers may be an option for soils that struggle to retain moisture, but further analysis of climate is needed to assure that late summer temperatures will be sufficient for good production.
- *Hemp* is generating interest as a new commodity crop, but research on production strategies for the Midwest is lacking, current information suggests that it is labor and management intensive, and markets have yet to be established, making this an unlikely crop for the Foss Farm. For a producer seeking a new crop and improved returns, there are better short and long term opportunities in the specialty grains market.

Neighborhood Relationships: Ledges Show Grounds

We encourage forming horizontal relationships in the region for access to resources and to strengthen local ties. By hosting an event for neighbors to ask questions about the Foss Farm, NLI has opened the door to making further connections in the neighborhood. Relationships with neighbors can be powerful leverage for the protection of natural resources, like water or important landscapes, but also can be mutually beneficial for businesses.

One such opportunity for neighborhood relationships is with Ledges Sporting Horses and Show Grounds, located just south of the Foss Farm on Love Road (near Love and McCurry Road, and the Ledges Golf Course).

Ledges has struggled to dispose of horse manure and wood chips from its facilities. The facility currently pays to have the wood chips hauled away across the river which is "composted" for years (in a lagoon, anaerobic decomposition is a long process that also involves the production of methane, a greenhouse gas, while aerobic decomposition is a faster process that occurs in well-managed compost) in unmanaged bunker-

style pits. The Foss Farm is in desperate need of a source of compost and organic matter for its soils, but ideally this organic matter can be found at minimum cost to the operator or landowner.

The wood chips and manure could be hauled from Ledges to the Foss Farm. There is ample space for composting. The addition of certain microbial inputs, likely similar (or the same) to the microbial applications on the fields that break down residue, will break down wood chips within 12 months into crumbly compost for use on the agricultural fields.

The second option for a partnership with Ledges is as a potential buyer for oats. Oats are a good low-input option in a soil building crop rotation, but also make a great transition crop if the Foss tenant were to transition to organic systems in the future.

Tenancy

There is an established relationship with the current tenant at Foss. The farmer is familiar with the land and has been receptive to new practices and inputs. The tenant has competencies with conservation farming, including his participation in the NRCS Conservation Stewardship Program, and has demonstrated his willingness to invest in improvements to the property. There is opportunity to continue to work with the same tenant to create cropping strategies and management practices that are mutually beneficial: meeting NLI's stewardship goals, maximizing returns to the tenant, and maintaining revenue from rental payments. Finding a new tenant would be a management burden on NLI; having a productive relationship with the current tenant is an asset.

A strong partnership with the tenant is also an opportunity to embrace the tenant's involvement, and to incentivize the tenant to invest in the health of the land, treat it with a sense of ownership, and engage in practices that reward both the tenant and NLI's investments in the Foss Farm.

Opportunities to strengthen the relationship with the tenant and align his goals with those of NLI will fall within the parameters of the lease. The land is currently leased on an annual basis, renewed on March 1 every year. Extended leases give the tenant incentive to invest in the health of the land. Lease hold improvements value the improvements made to the property by the tenant. Leases also are the most significant point of leverage for ensuring the land is managed in sustainable manner. Each of these considerations should be included in the next iteration of the Foss farm rental agreement.

Cost Reduction Strategies

When addressing revenue generating strategies, it is also important to discuss cost reduction, as well as risk reduction. Strategies at the Foss Farm may include:

- Grow prairie seed for harvest and use in restoration work. New technology like seed sorters could lead to this cost reduction strategy becoming a revenue generating activity, but further production and market research is needed, and conflicts between agricultural and prairie seed production areas first need to be resolved. Prairie seed is a significant cost in restoration work. Producing seed on the Foss Farm could reduce these costs.
- Evaluate restoration costs and compare cost of labor-intensive methods vs mechanical methods for restoration activities.
- Reduce the cost of inputs by reducing cropping rotations reliant on expensive inputs, taking advantage of ecosystem services, using alternative sources for nutrients including compost and nitrogen fixing crops.
- Promote practices that reduce weather-related risk, like building healthy soil and reducing nutrient and water runoff.
- Reduce future restoration burden by leveraging regenerative agriculture to generate rental income and reduce the spread of invasive species to unmanaged landscapes.
- Produce needed inputs on the Foss Farm, including seed, compost, green manure/crop residue, and gravel.

Revenue Generating Strategies

There are several short term and long term revenue generating strategies. Rental payments for agricultural land use are a primary revenue generating strategy at the Foss Farm. Agricultural markets have been addressed in the previous sections. For landowning organizations with a conservation driven mission, selling conservation rights or development rights can be a strategy

for revenue generation. The USDA (through conservation programs), land conservancies and other organizations may purchase these rights. Other strategies may include:

- Tradeable development rights.
- Solar farms: Visit the Illinois Solar Energy Association's website (illiniossolar.org) for more information about solar energy opportunities in Illinois.
- Growing poplar trees for timber.
- Limited recreational uses: Recreational use would compliment and highlight restoration and land management goals at the Foss Farm. This may include highlighting the Foss Farm as an ambassador landscape and establishing walking trails for fundraising and educational events, as well as potentially hosting nature walks. There is also potential to lease land for recreational use to a recreation-focused organization.

Quarry and Other Management Units

Reclamation of the quarry will pose a challenge at the Foss Farm. The initial priority is to understand what, if any effects an open quarry can have on the surface and groundwater. As highlighted throughout this report, this region is vulnerable to groundwater contamination by agricultural runoff. The quarry appears flood in part as a result of agricultural runoff from the small perennial stream to the north. More information about the quarry is needed to understand whether this flooding is an environmental concern.

Consulting with an expert in reclamation of surface mines may shed light on options for adaptive reuse or reclamation of this area at the Foss Farm, as well as associated costs. Possibilities for reclamation are intriguing. High profile cases like Buchart Gardens and Quarry Falls, as well as regional examples like Three Oaks Recreation Area, Harrington Beach State Park, and Independence Grove highlight reclamation and reuse of quarries and mines. These examples are well-funded and focused on recreation and development, which is far from the restoration and management goals at the Foss Farm. However, they are mentioned in this report to initiate conversation and further investigation of quarry reclamation as part of the rehabilitation of the Foss Farm landscape.

Other landscapes at the Foss Farm requiring further evaluation will include the wooded areas and pine plantations. If not already performed, a botanic inventory to assess the current quality of natural landscapes may also be helpful in achieving restoration goals.

Above: The quarry holding water on Foss West.

RECOMMENDATIONS FOR MANAGEMENT

These recommendations are intended to compliment the site management schedule and budget in the Foss Farm Management Plan and resolve conflicts in Natural Land Institute's priorities for management.

Environmental Stewardship

There are four common themes in the environmental stewardship opportunities at the Foss Farm: Reduced tillage, cover crops, buffers and nutrient management. Assessment of opportunities in soil health, water quality, the IL NLRS, climate change all point to these four strategies for improved ecological outcomes.

1. Implement Reduced Tillage or No-till Systems

Reduced tillage scenarios are already being incorporated into the tenant's cropping system. This system should be applied to all possible acreage at the Foss Farm. Reduced or no-till can protect soil health and organic matter, reduce soil erosion and associated phosphorus runoff, improve infiltration, protect soil organic matter and reduce emissions associated with soil disruption.

2. Include Cover Crops in Crop Rotations

Cover crops offer soil cover and many similar benefits to reduced/no-till systems. Cover crops can also expand a crop rotation, provide nutrition and organic matter to the soil, provide forage/cover for wildlife and insects in addition to reducing soil erosion, nutrient runoff and increasing infiltration rates. Cover crops are currently incorporated into the tenant's crop rotation, and should be applied to all possible acreage at the Foss Farm.

3. Expand Buffers

"Buffers" being used broadly here to describe agriculture-adjacent areas planted with permanent vegetation, including filter strips, riparian buffers, waterways and hedgerows. Buffers reduce and capture sediment and nutrient runoff, increase biodiversity, sequester carbon, provide habitat for wildlife and pollinators/ beneficial insects, increase soil carbon storage, and prevent negative impacts from agriculture on to other landscapes.

4. Evaluate and Improve Nutrient Management

Nutrient application rates and crop uptake should be assessed to identify any excess in application. Where possible, provide nutrients through strategic rotations of crops that fix nitrogen or provide ample residue. Include crops with lower demand for nutrients when possible. Apply compost to increase soil organic matter and provide nutrients. Create soil conditions that encourage healthy populations of soil microbes that fix and make available nutrients in the soil.

Assessing Impacts

1. Soil Health Assessment

On agricultural lands, soil health should be both a key concern and indicator. We recommend annual soil health assessments, including soil sampling. Sample on a grid, and send samples for comprehensive testing to the same lab every year.

2. Soil Erosion

Seek NRCS assistance to estimate soil loss scenarios on agricultural land using RUSLE2 [1] to ensure adherence to lease principles or to assess the impact of changing practices on soil loss.

3. Water Quality Assessment

The Illinois Corn Growers Association recommends that producers test the water that drains from their property as a starting point for understanding

1 RUSLE2 stands for Revised Universal Soil Loss Equation, Version 2. It is a tool used to model erosion due to rainfall and surface runoff. Find a useful presentation at on RUSLE2 at https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=stelprdb1247540&ext=pdf

their impact on the watershed. The organization acknowledges that water testing offers only a snapshot of the greater picture of nutrient loading, and suggests use of water sampling as a starting point for education.

For the same reasons, we do not recommend testing water samples for chemical properties as an assessment of progress on the Foss Farm; there are too many confounding variables. Weather, rainfall, and the practices of upstream neighbors all affect test results. Large data sets are needed to be able to draw reliable conclusions. Testing is useful on a watershed scale, but is not the best indicator for the impact of a single farm on the watershed.

Other options exist, like nutrient modeling, or extrapolating impact based upon implementation of practices known to have certain impacts. For example, documenting the acreage of buffer strips and extrapolating the percentage of reduction in nutrient runoff that buffers have been found to prevent. Late season corn stalk nitrate tests could also be performed to understand how much nitrogen was taken up by the crop, and whether there was an excess.

4. Other Assessments

Additional options for assessment at the Foss Farm could include annual updates on the restoration progress, recording the acreage of completed or ongoing restoration projects, inventories of flora or fauna, and assessments of riparian areas. The above mentioned concepts could be used to assess impacts on the ecological landscape at and surrounding the Foss Farm.

Climate

1. Reduce weather related risk and increase soil carbon storage by building soil health and organic matter, reducing surface runoff of water and nutrients, and reducing soil loss through practices recommended in Environmental Stewardship.

2. Build biodiversity on the farm through restoration and the agricultural practices recommended in Environmental Stewardship.

3. Continue to assess climate change risks and mitigation strategies on the Foss Farm.

Tenancy

1. Retain the current tenant.

2. Offer the tenant a longer lease term between 3 to 5 years to better enable the tenant to participate in long term conservation programs, invest in the health of the land, and expand his crop rotation.

3. Update conservation requirements in the lease. Consider placing a limit on the acceptable rate of soil loss as calculated by RUSLE.

4. Include lease hold improvements as part of the lease. The tenant's contribution to restoration of agricultural land should be considered a lease hold improvement and assigned appropriate value. See Appendix J for more information.

Cropping

Corn and soybean rotations are intensive and demanding on the landscape. Even with the conservation practices the tenant utilizes, this rotation requires careful management to maintain soil health, and may make building soil difficult. We recommend that the tenant consider expanding his crop rotation to include crops that are less demanding on the soil and/or markets that provide better returns.

1. Extend current crop rotation to include crops that are either

- Less demanding on soil than a corn and soybean rotation
- Offer better returns than the spot market through value added, identity preserved or other specialty grains.
- Build soil nitrogen
- Reduce erosion

SITL can consult with the tenant assess market opportunities best suited to his production capacities.

2. The tenant should expand CSP participation to include the Foss Farm if he has not already initiated the process.

Revenue Generation

1. Set goal of $1000/acre gross revenue for the tenant to increase return to landowner, averaged across/ cropping years/ rotation.

Maximize county, state, federal conservation programs.

Property

1. Identify and close abandoned wells.

2. Improve access to all areas of the Foss Farm. Mow paths, then to establish gravel pathways and walkways for better vehicle and walking access to all parts of the property. Creating and maintaining ample access paths will is a straightforward way to improve the image of the property and set the stage to better demonstrate activities at the Foss Farm. Better access will facilitate additional restoration and assessment activities.

3. Create a map with naming conventions for all management units of the farm for easier representation of the property and goals for each unit.

Further Assessment ($750-1000 each) and Consulting

1. Forestry Assessment
2. Quarry/ Surface Mining Expert
3. Botanic Plant Inventory
4. Stream / Riparian Quality Assessment

Above: A sign discovered near the quarry in the woods indicating an old well.

Below: Overgrown pathways at the Foss Farm. Mowing and access maintenance has been improved since the summer of 2018, when this photo was taken, but improving access on the Foss Farm should be a priority for 2019.

2019-2020 SUGGESTED ACTION/ FIRST STEPS FOR IMPLEMENTATION PLAN

Listed below are the most urgent activities and recommendations for implementation over the next two years at the Foss Farm.

- Update and extend cropland leases at the Foss Farm to better align with NLI values and restoration goals.
- Encourage tenant to investigate additional grain market opportunities.
- Establish naming convention for management units.
- Develop Comprehensive Management Plan for activities associated with each management unit.
- Establish better access through mowed and gravel surfaced paths.
- Determine the soil lab of choice and begin annual soil testing protocol.
- Determine metrics for progress on the Foss Farm consistent with a NLI Comprehensive Management Plan, and establish baseline for each metric as the first step for implementation of this plan.
- Continued invasive species removal and containment.
- Hire consultants for further assessments of quarry, wooded areas, riparian areas, and botanic inventories.
- Evaluate further strategies and benchmarks for revenue generation.

APPENDICES

APPENDIX A: EPA LEVEL III AND IV ECOREGIONS OF ILLINOIS

APPENDIX B: SELECTED MAPS, EPA ROCK RIVER BASIN ASSESSMENT, 2006

APPENDIX C: USDA NASS CENSUS OF AG, BOONE, WINNEBAGO, STEPHENSON COUNTIES

APPENDIX D: TOPOGRAPHICAL MAP, U.S. TOPO

APPENDIX E: FOSS EAST AND WEST SOIL REPORTS

APPENDIX F: SOIL HEALTH SCORECARD, COMPLETED BY TENANT

APPENDIX G: STREAM STATS DRAINAGE BASIN FOR PERENNIAL STREAMS AT THE FOSS FARM

APPENDIX H: NRCS IOWA VALUE OF SOIL HEALTH

APPENDIX I: ISU STRIPS FACT SHEET

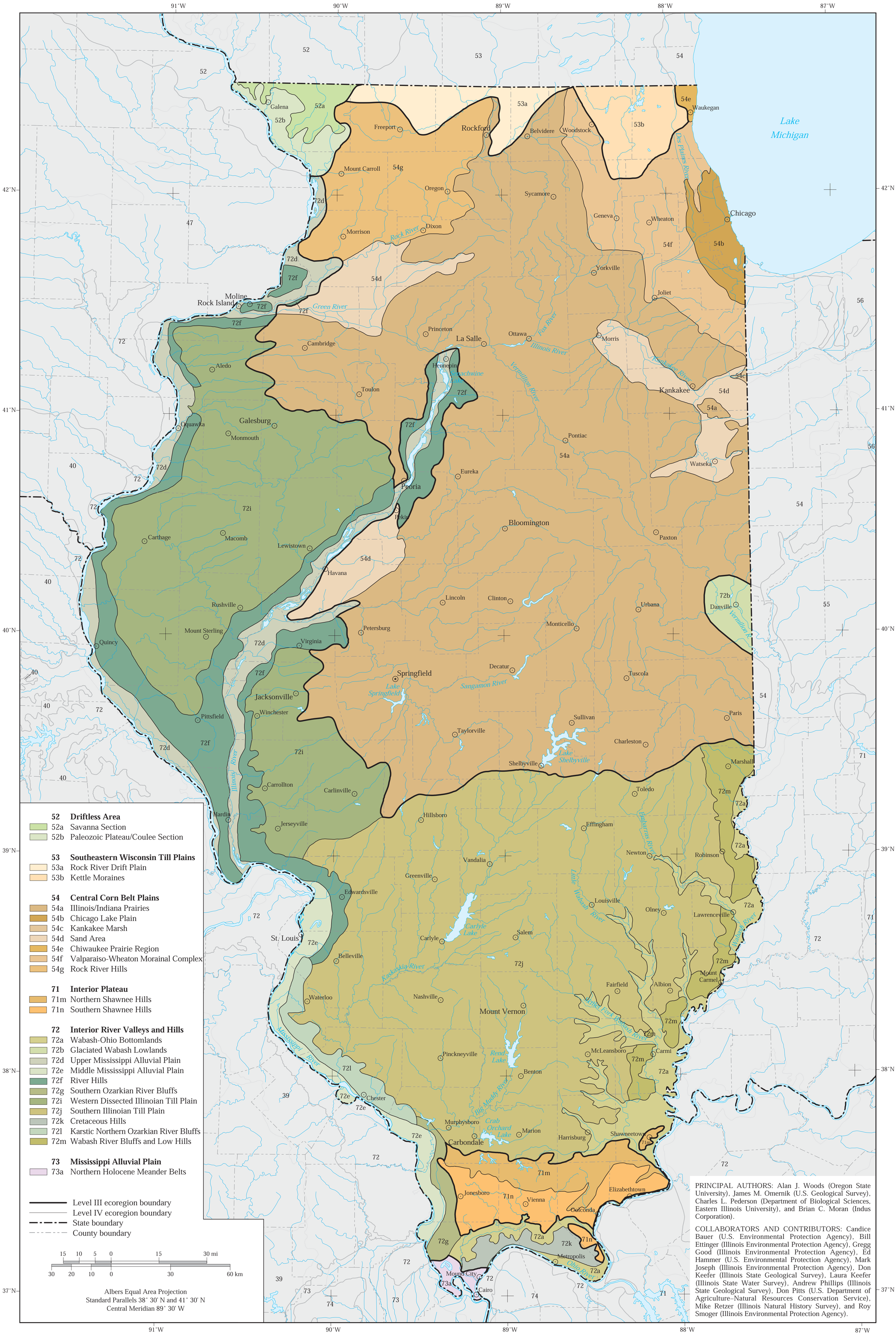
APPENDIX J: NRCS IPM PRACTICE SHEET

APPENDIX K: LEASHOLD IMPROVEMENTS

APPENDIX A

EPA LEVEL III AND IV ECOREGIONS OF ILLINOIS

ILLINOIS LEVEL III AND LEVEL IV ECOREGIONS



52 Driftless Area
- 52a Savanna Section
- 52b Paleozoic Plateau/Coulee Section

53 Southeastern Wisconsin Till Plains
- 53a Rock River Drift Plain
- 53b Kettle Moraines

54 Central Corn Belt Plains
- 54a Illinois/Indiana Prairies
- 54b Chicago Lake Plain
- 54c Kankakee Marsh
- 54d Sand Area
- 54e Chiwaukee Prairie Region
- 54f Valparaiso-Wheaton Morainal Complex
- 54g Rock River Hills

71 Interior Plateau
- 71m Northern Shawnee Hills
- 71n Southern Shawnee Hills

72 Interior River Valleys and Hills
- 72a Wabash-Ohio Bottomlands
- 72b Glaciated Wabash Lowlands
- 72d Upper Mississippi Alluvial Plain
- 72e Middle Mississippi Alluvial Plain
- 72f River Hills
- 72g Southern Ozarkian River Bluffs
- 72i Western Dissected Illinoian Till Plain
- 72j Southern Illinoian Till Plain
- 72k Cretaceous Hills
- 72l Karstic Northern Ozarkian River Bluffs
- 72m Wabash River Bluffs and Low Hills

73 Mississippi Alluvial Plain
- 73a Northern Holocene Meander Belts

Level III ecoregion boundary
Level IV ecoregion boundary
State boundary
County boundary

15 10 5 0 15 30 mi
30 20 10 0 30 60 km

Albers Equal Area Projection
Standard Parallels 38° 30' N and 41° 30' N
Central Meridian 89° 30' W

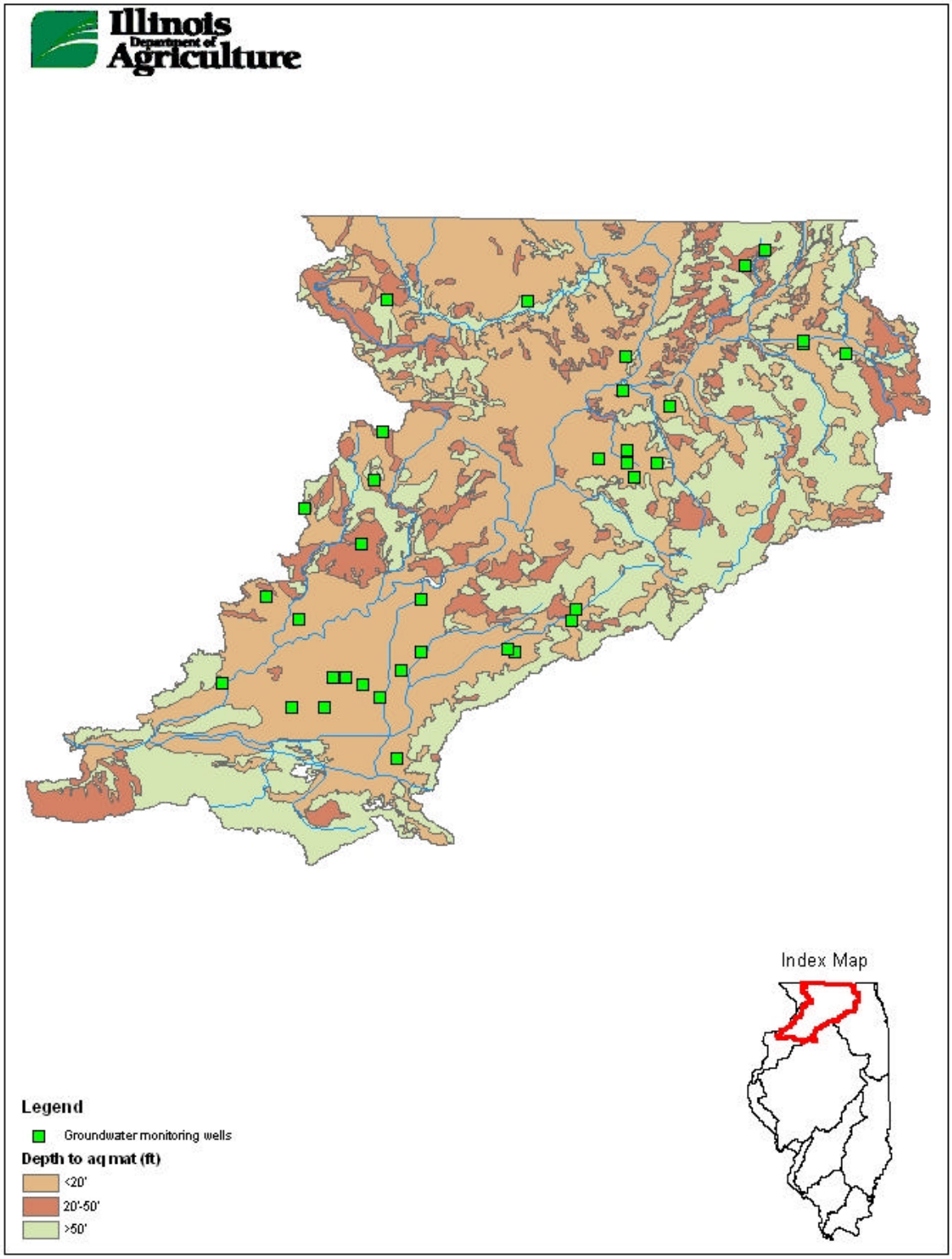
PRINCIPAL AUTHORS: Alan J. Woods (Oregon State University), James M. Omernik (U.S. Geological Survey), Charles L. Pederson (Department of Biological Sciences, Eastern Illinois University), and Brian C. Moran (Indus Corporation).

COLLABORATORS AND CONTRIBUTORS: Candice Bauer (U.S. Environmental Protection Agency), Bill Ettinger (Illinois Environmental Protection Agency), Gregg Good (Illinois Environmental Protection Agency), Ed Hammer (U.S. Environmental Protection Agency), Mark Joseph (Illinois Environmental Protection Agency), Don Keefer (Illinois State Geological Survey), Laura Keefer (Illinois State Water Survey), Andrew Phillips (Illinois State Geological Survey), Don Pitts (U.S. Department of Agriculture–Natural Resources Conservation Service), Mike Retzer (Illinois Natural History Survey), and Roy Smoger (Illinois Environmental Protection Agency).

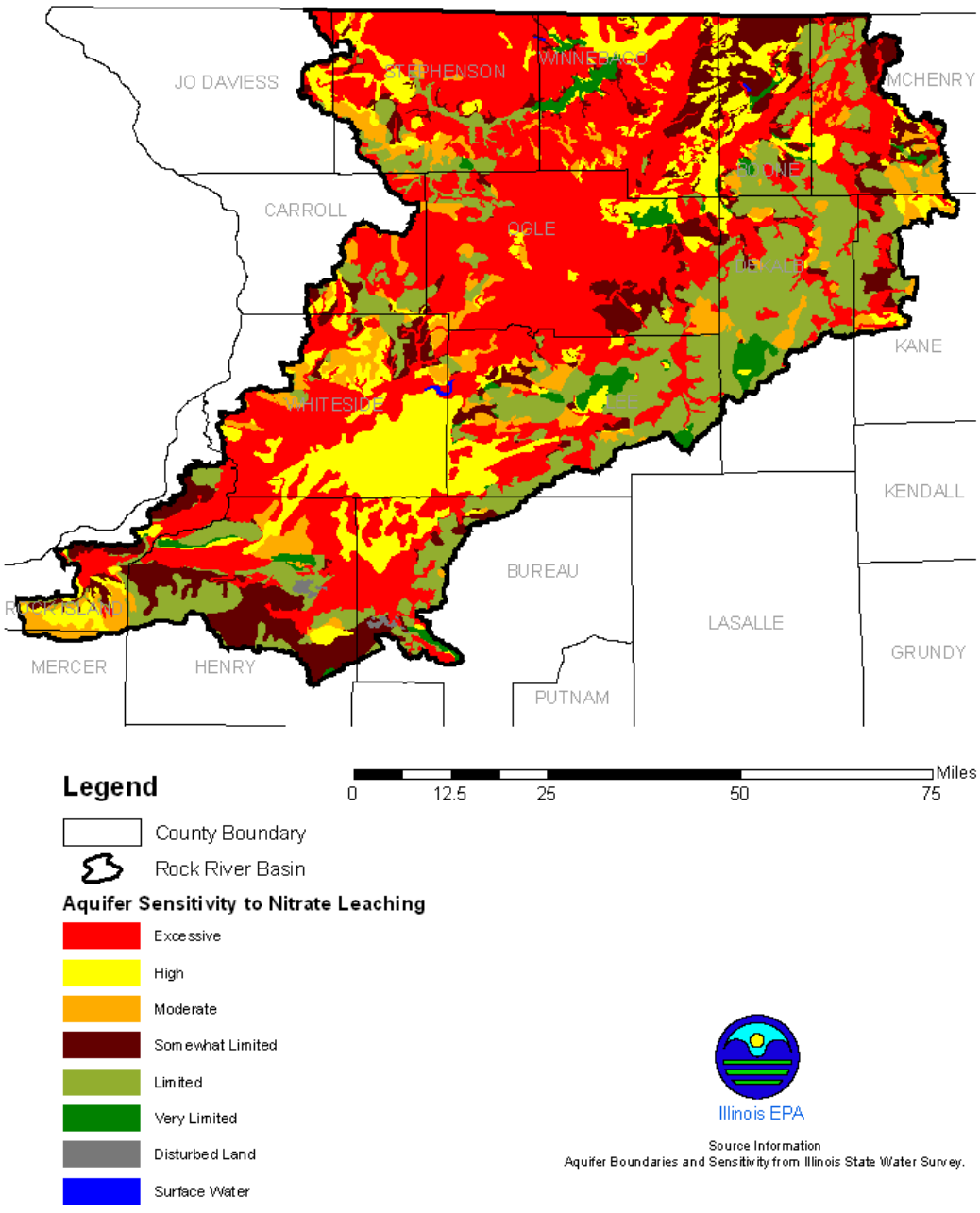
APPENDIX B

SELECTED MAPS, EPA ROCK RIVER BASIN ASSESSMENT, 2006

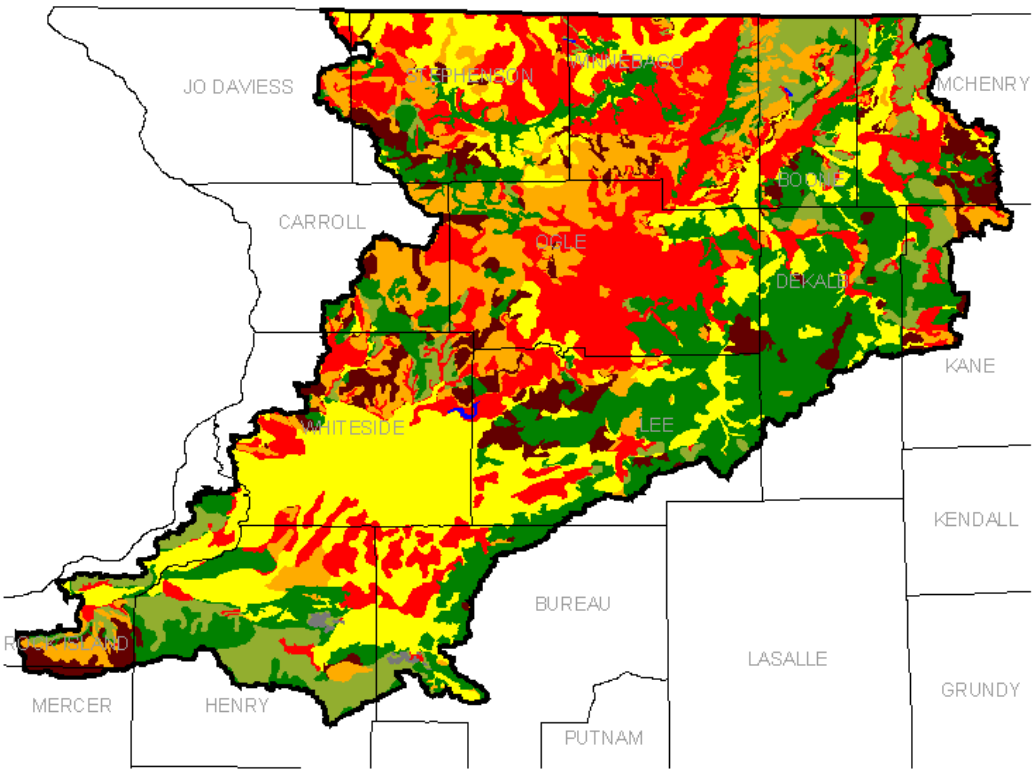
Figure 25. IDA Pesticide Monitoring Network wells and depth to uppermost aquifer in the Rock River Basin (Keefer 1995).



Appendix FF. Potential For Nitrate Leaching in the Rock River Basin.



Appendix II. Potential for Pesticide Leaching in the Rock River Basin.

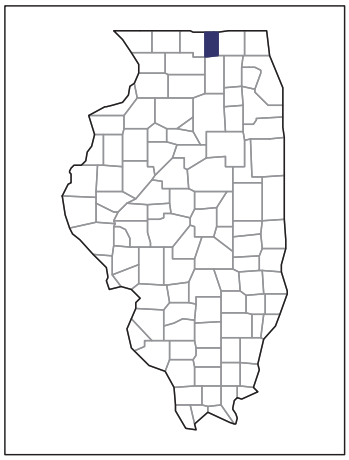


APPENDIX C

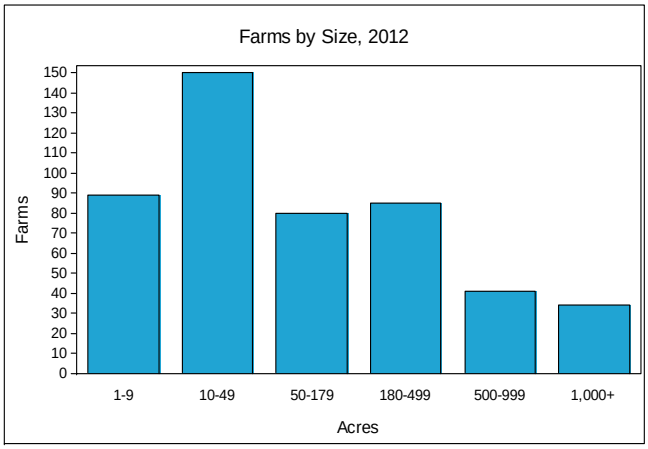
USDA NASS CENSUS OF AG
BOONE, WINNEBAGO AND STEPHENSON COUNTIES

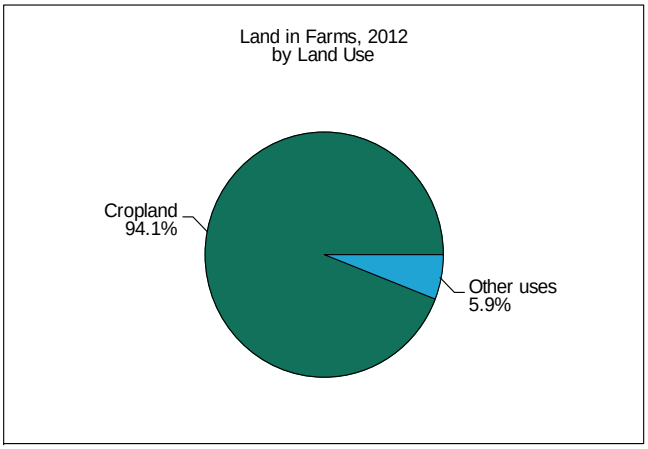
2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

Boone County
Illinois



	2012	2007	% change
Number of Farms	479	540	- 11
Land in Farms	134,759 acres	137,162 acres	- 2
Average Size of Farm	281 acres	254 acres	+ 11
Market Value of Products Sold	$98,998,000	$81,413,000	+ 22
Crop Sales $88,248,000 (89 percent) Livestock Sales $10,751,000 (11 percent)			
Average Per Farm	$206,677	$150,765	+ 37
Government Payments	$3,391,000	$3,711,000	- 9
Average Per Farm Receiving Payments	$13,783	$12,709	+ 8





2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

Boone County – Illinois

Ranked items among the 102 state counties and 3,079 U.S. counties, 2012

Item	Quantity	State Rank	Universe [1]	U.S. Rank	Universe [1]
MARKET VALUE OF AGRICULTURAL PRODUCTS SOLD ($1,000)					
Total value of agricultural products sold	98,998	68	102	1,183	3,077
Value of crops including nursery and greenhouse	88,248	63	102	735	3,072
Value of livestock, poultry, and their products	10,751	70	102	2,054	3,076
VALUE OF SALES BY COMMODITY GROUP ($1,000)					
Grains, oilseeds, dry beans, and dry peas	78,101	67	102	607	2,926
Tobacco	-	-	10	-	436
Cotton and cottonseed	-	-	-	-	635
Vegetables, melons, potatoes, and sweet potatoes	1,465	22	94	689	2,802
Fruits, tree nuts, and berries	341	11	97	860	2,724
Nursery, greenhouse, floriculture, and sod	8,010	12	95	306	2,678
Cut Christmas trees and short rotation woody crops	(D)	(D)	71	(D)	1,530
Other crops and hay	(D)	69	102	(D)	3,049
Poultry and eggs	62	47	102	1,542	3,013
Cattle and calves	1,551	81	102	2,449	3,056
Milk from cows	6,223	13	82	646	2,038
Hogs and pigs	2,042	76	100	744	2,827
Sheep, goats, wool, mohair, and milk	422	4	100	396	2,988
Horses, ponies, mules, burros, and donkeys	436	16	101	646	3,011
Aquaculture	(D)	27	27	1,328	1,366
Other animals and other animal products	(D)	63	98	(D)	2,924
TOP CROP ITEMS (acres)					
Corn for grain	76,244	67	102	408	2,638
Soybeans for beans	37,716	85	102	709	2,162
Forage-land used for all hay and haylage, grass silage, and greenchop	3,908	55	102	2,369	3,057
Wheat for grain, all	2,669	53	101	1,235	2,537
Winter wheat for grain	2,669	53	101	1,161	2,480
TOP LIVESTOCK INVENTORY ITEMS (number)					
Hogs and pigs	7,431	75	98	693	2,889
Cattle and calves	5,603	64	102	2,337	3,063
Layers	1,542	33	102	1,515	3,040
Goats, all	1,026	1	102	543	2,996
Horses and ponies	735	26	102	1,603	3,072

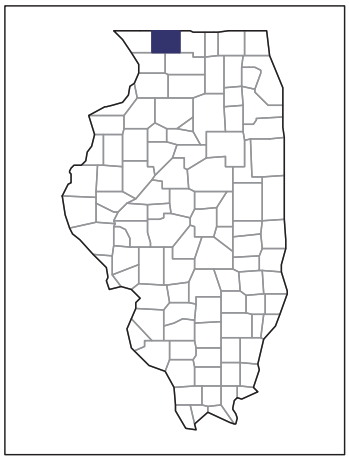
Other County Highlights, 2012

Economic Characteristics	Quantity
Farms by value of sales:	
Less than $1,000	93
$1,000 to $2,499	51
$2,500 to $4,999	23
$5,000 to $9,999	40
$10,000 to $19,999	32
$20,000 to $24,999	16
$25,000 to $39,999	12
$40,000 to $49,999	7
$50,000 to $99,999	35
$100,000 to $249,999	72
$250,000 to $499,999	44
$500,000 or more	54
Total farm production expenses ($1,000)	86,019
Average per farm ($)	179,580
Net cash farm income of operation ($1,000)	25,112
Average per farm ($)	52,425

Operator Characteristics	Quantity
Principal operators by primary occupation:	
Farming	254
Other	225
Principal operators by sex:	
Male	431
Female	48
Average age of principal operator (years)	57.6
All operators by race [2]:	
American Indian or Alaska Native	-
Asian	-
Black or African American	-
Native Hawaiian or Other Pacific Islander	-
White	745
More than one race	4
All operators of Spanish, Hispanic, or Latino Origin [2]	11

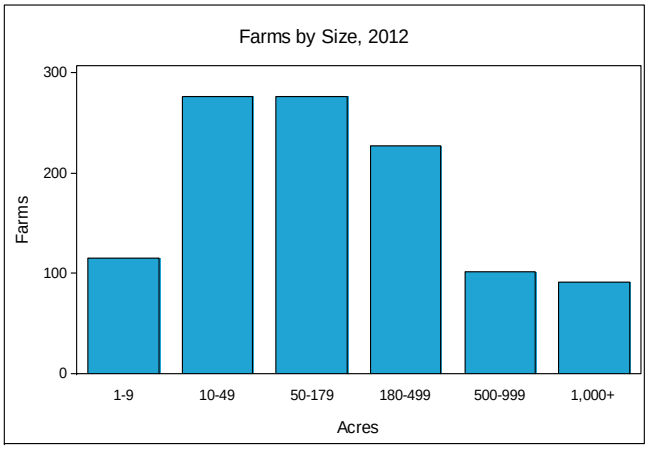
See "Census of Agriculture, Volume 1, Geographic Area Series" for complete footnotes, explanations, definitions, and methodology.
- Represents zero. (D) Withheld to avoid disclosing data for individual operations.
[1] Universe is number of counties in state or U.S. with item. [2] Data were collected for a maximum of three operators per farm.

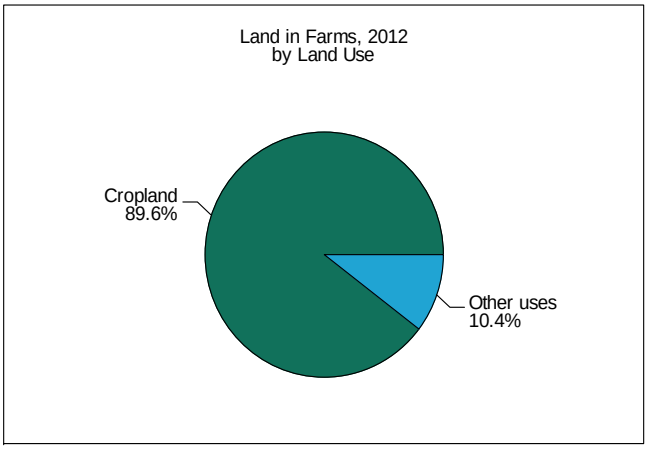
2012 CENSUS OF AGRICULTURE
COUNTY PROFILE



Stephenson County
Illinois

	2012	2007	% change
Number of Farms	1,087	1,178	- 8
Land in Farms	352,481 acres	337,932 acres	+ 4
Average Size of Farm	324 acres	287 acres	+ 13
Market Value of Products Sold	$313,158,000	$246,797,000	+ 27
Crop Sales $180,685,000 (58 percent) Livestock Sales $132,472,000 (42 percent)			
Average Per Farm	$288,094	$209,505	+ 38
Government Payments	$9,449,000	$7,527,000	+ 26
Average Per Farm Receiving Payments	$11,870	$9,157	+ 30





2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

Stephenson County – Illinois

Ranked items among the 102 state counties and 3,079 U.S. counties, 2012

Item	Quantity	State Rank	Universe [1]	U.S. Rank	Universe [1]
MARKET VALUE OF AGRICULTURAL PRODUCTS SOLD ($1,000)					
Total value of agricultural products sold	313,158	14	102	256	3,077
Value of crops including nursery and greenhouse	180,685	26	102	273	3,072
Value of livestock, poultry, and their products	132,472	2	102	328	3,076
VALUE OF SALES BY COMMODITY GROUP ($1,000)					
Grains, oilseeds, dry beans, and dry peas	(D)	27	102	(D)	2,926
Tobacco	-	-	10	-	436
Cotton and cottonseed	-	-	-	-	635
Vegetables, melons, potatoes, and sweet potatoes	69	68	94	2,014	2,802
Fruits, tree nuts, and berries	87	44	97	1,498	2,724
Nursery, greenhouse, floriculture, and sod	30	85	95	2,342	2,678
Cut Christmas trees and short rotation woody crops	16	27	71	810	1,530
Other crops and hay	(D)	2	102	(D)	3,049
Poultry and eggs	(D)	1	102	(D)	3,013
Cattle and calves	41,241	6	102	357	3,056
Milk from cows	47,949	2	82	175	2,038
Hogs and pigs	(D)	(D)	100	(D)	2,827
Sheep, goats, wool, mohair, and milk	250	12	100	681	2,988
Horses, ponies, mules, burros, and donkeys	682	10	101	397	3,011
Aquaculture	(D)	25	27	(D)	1,366
Other animals and other animal products	11	69	98	2,191	2,924
TOP CROP ITEMS (acres)					
Corn for grain	191,694	17	102	60	2,638
Soybeans for beans	69,499	66	102	451	2,162
Forage-land used for all hay and haylage, grass silage, and greenchop	19,441	2	102	1,005	3,057
Corn for silage	14,204	2	99	106	2,237
Wheat for grain, all	2,702	52	101	1,233	2,537
TOP LIVESTOCK INVENTORY ITEMS (number)					
Layers	(D)	2	102	(D)	3,040
Pullets for laying flock replacement	(D)	1	86	(D)	2,637
Hogs and pigs	71,436	23	98	227	2,889
Cattle and calves	53,505	1	102	455	3,063
Sheep and lambs	1,802	6	100	521	2,897

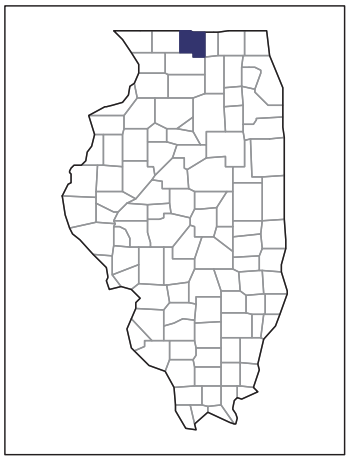
Other County Highlights, 2012

Economic Characteristics	Quantity
Farms by value of sales:	
Less than $1,000	284
$1,000 to $2,499	58
$2,500 to $4,999	48
$5,000 to $9,999	61
$10,000 to $19,999	63
$20,000 to $24,999	25
$25,000 to $39,999	30
$40,000 to $49,999	21
$50,000 to $99,999	101
$100,000 to $249,999	143
$250,000 to $499,999	98
$500,000 or more	155
Total farm production expenses ($1,000)	287,872
Average per farm ($)	264,832
Net cash farm income of operation ($1,000)	55,717
Average per farm ($)	51,258

Operator Characteristics	Quantity
Principal operators by primary occupation:	
Farming	618
Other	469
Principal operators by sex:	
Male	1,007
Female	80
Average age of principal operator (years)	57.0
All operators by race [2]:	
American Indian or Alaska Native	-
Asian	3
Black or African American	-
Native Hawaiian or Other Pacific Islander	-
White	1,691
More than one race	6
All operators of Spanish, Hispanic, or Latino Origin [2]	18

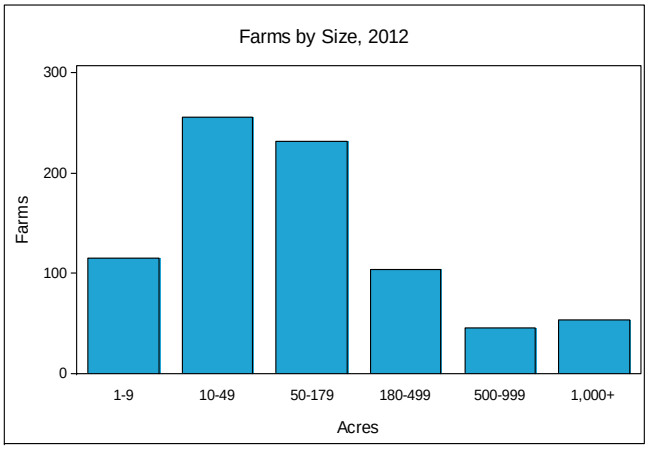
See "Census of Agriculture, Volume 1, Geographic Area Series" for complete footnotes, explanations, definitions, and methodology.
- Represents zero. (D) Withheld to avoid disclosing data for individual operations.
[1] Universe is number of counties in state or U.S. with item. [2] Data were collected for a maximum of three operators per farm.

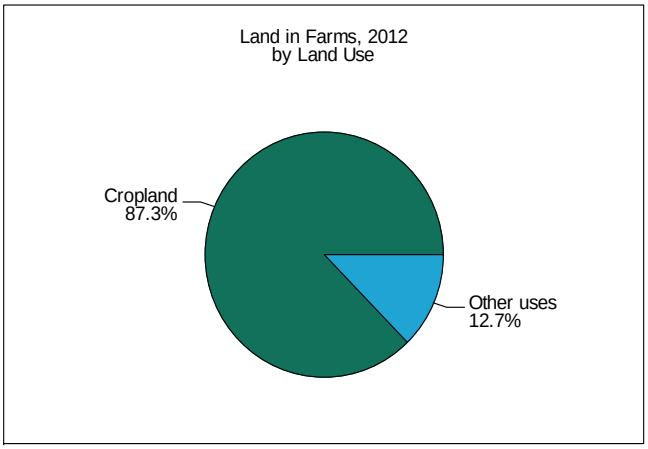
2012 CENSUS OF AGRICULTURE
COUNTY PROFILE



Winnebago County
Illinois

	2012	2007	% change
Number of Farms	807	860	- 6
Land in Farms	182,905 acres	183,615 acres	0
Average Size of Farm	227 acres	214 acres	+ 6
Market Value of Products Sold	$106,380,000	$89,906,000	+ 18
Crop Sales $84,143,000 (79 percent) Livestock Sales $22,237,000 (21 percent)			
Average Per Farm	$131,822	$104,542	+ 26
Government Payments	$5,109,000	$4,068,000	+ 26
Average Per Farm Receiving Payments	$10,279	$8,319	+ 24





2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

Winnebago County – Illinois

Ranked items among the 102 state counties and 3,079 U.S. counties, 2012

Item	Quantity	State Rank	Universe [1]	U.S. Rank	Universe [1]
MARKET VALUE OF AGRICULTURAL PRODUCTS SOLD ($1,000)					
Total value of agricultural products sold	106,380	63	102	1,111	3,077
Value of crops including nursery and greenhouse	84,143	65	102	770	3,072
Value of livestock, poultry, and their products	22,237	50	102	1,538	3,076
VALUE OF SALES BY COMMODITY GROUP ($1,000)					
Grains, oilseeds, dry beans, and dry peas	78,836	66	102	603	2,926
Tobacco	-	-	10	-	436
Cotton and cottonseed	-	-	-	-	635
Vegetables, melons, potatoes, and sweet potatoes	353	42	94	1,249	2,802
Fruits, tree nuts, and berries	(D)	13	97	(D)	2,724
Nursery, greenhouse, floriculture, and sod	4,143	17	95	500	2,678
Cut Christmas trees and short rotation woody crops	(D)	23	71	(D)	1,530
Other crops and hay	493	50	102	2,432	3,049
Poultry and eggs	(D)	49	102	(D)	3,013
Cattle and calves	11,375	26	102	1,225	3,056
Milk from cows	8,547	9	82	551	2,038
Hogs and pigs	1,792	78	100	771	2,827
Sheep, goats, wool, mohair, and milk	(D)	28	100	1,169	2,988
Horses, ponies, mules, burros, and donkeys	173	34	101	1,367	3,011
Aquaculture	-	-	27	-	1,366
Other animals and other animal products	172	11	98	822	2,924
TOP CROP ITEMS (acres)					
Corn for grain	90,433	63	102	346	2,638
Soybeans for beans	39,995	83	102	689	2,162
Forage-land used for all hay and haylage, grass silage, and greenchop	7,083	23	102	1,945	3,057
Wheat for grain, all	3,566	44	101	1,118	2,537
Winter wheat for grain	3,566	44	101	1,039	2,480
TOP LIVESTOCK INVENTORY ITEMS (number)					
Cattle and calves	11,556	31	102	1,815	3,063
Hogs and pigs	4,807	76	98	771	2,889
Layers	2,170	24	102	1,231	3,040
Broilers and other meat-type chickens	1,879	5	88	780	2,723
Horses and ponies	1,241	10	102	924	3,072

Other County Highlights, 2012

Economic Characteristics	Quantity
Farms by value of sales:	
Less than $1,000	291
$1,000 to $2,499	50
$2,500 to $4,999	65
$5,000 to $9,999	52
$10,000 to $19,999	47
$20,000 to $24,999	10
$25,000 to $39,999	30
$40,000 to $49,999	9
$50,000 to $99,999	64
$100,000 to $249,999	77
$250,000 to $499,999	48
$500,000 or more	64
Total farm production expenses ($1,000)	92,914
Average per farm ($)	115,135
Net cash farm income of operation ($1,000)	32,322
Average per farm ($)	40,052

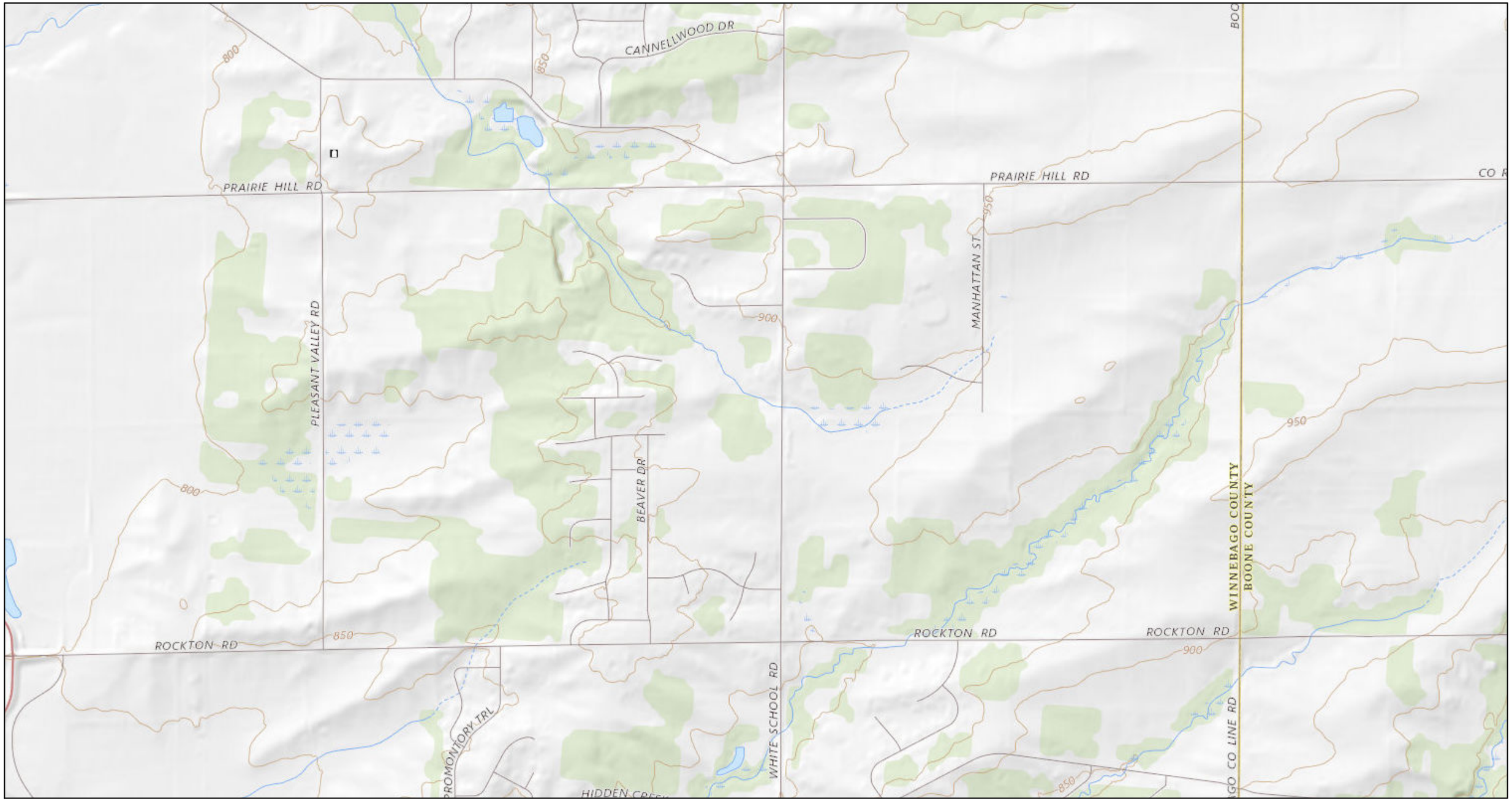
Operator Characteristics	Quantity
Principal operators by primary occupation:	
Farming	357
Other	450
Principal operators by sex:	
Male	679
Female	128
Average age of principal operator (years)	59.3
All operators by race [2]:	
American Indian or Alaska Native	3
Asian	-
Black or African American	-
Native Hawaiian or Other Pacific Islander	-
White	1,166
More than one race	1
All operators of Spanish, Hispanic, or Latino Origin [2]	14

See "Census of Agriculture, Volume 1, Geographic Area Series" for complete footnotes, explanations, definitions, and methodology.
- Represents zero. (D) Withheld to avoid disclosing data for individual operations.
[1] Universe is number of counties in state or U.S. with item. [2] Data were collected for a maximum of three operators per farm.

APPENDIX D

TOPOGRAPHICAL MAP, U.S. TOPO

The National Map Advanced Viewer



2/3/2019, 11:30:02 AM

1:18,056

0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS

USGS
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line

APPENDIX E

FOSS EAST AND WEST SOIL REPORTS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Winnebago County, Illinois

Foss East Tract

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

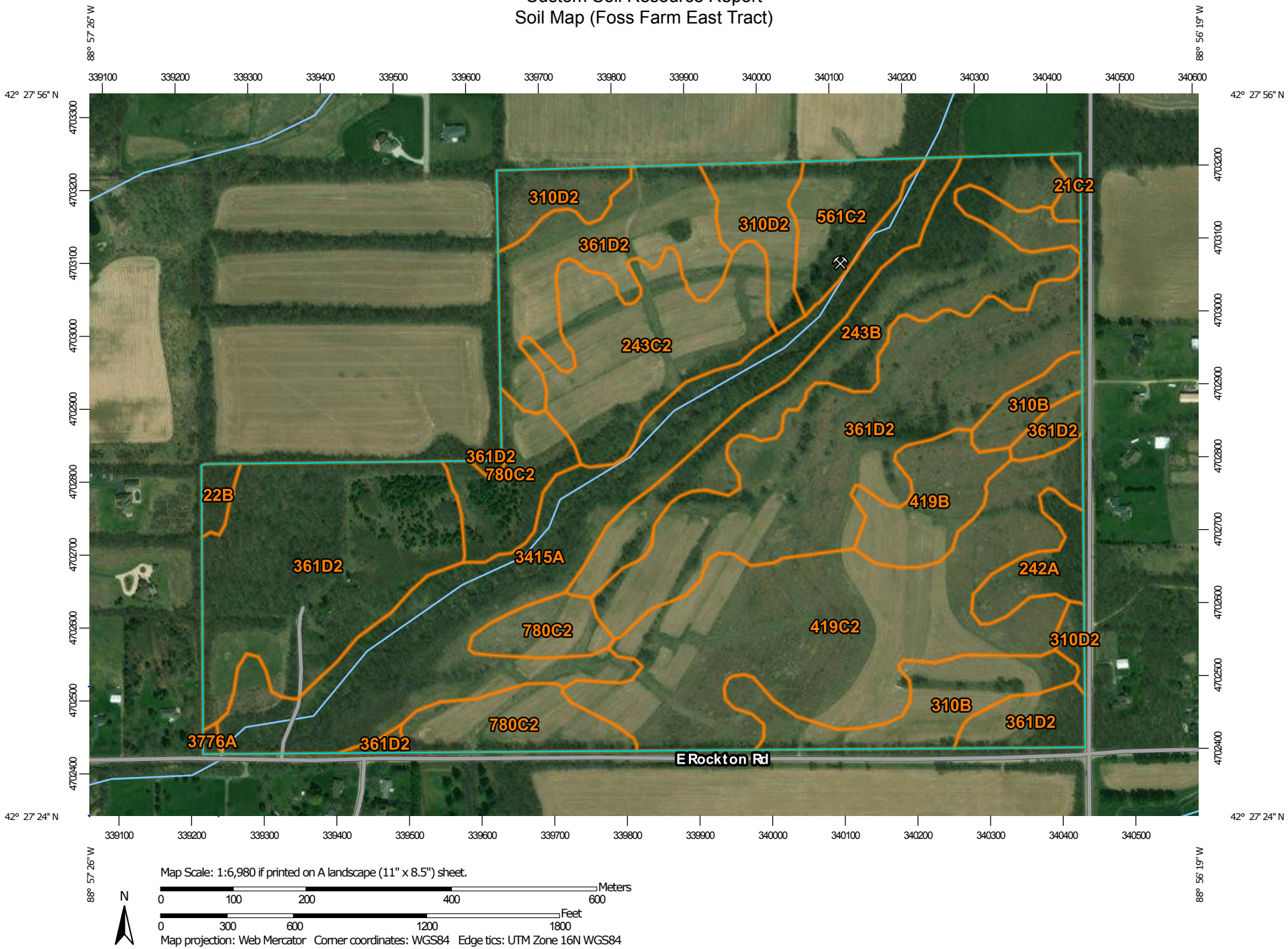
Contents

Preface..... 2
Soil Map..... 5
Soil Map (Foss Farm East Tract)..... 6
Legend..... 7
Map Unit Legend (Foss Farm East Tract)..... 8
Soil Information for All Uses..... 9
Suitabilities and Limitations for Use..... 9
Land Classifications..... 9
Farmland Classification (Foss Farm East Tract)..... 9
Hydric Rating by Map Unit (Foss Farm East Tract)..... 14
Soil Properties and Qualities..... 19
Soil Qualities and Features..... 19
Map Unit Name (Foss Farm East Tract)..... 19
Drainage Class (Foss Farm East Tract)..... 24
References..... 28

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Foss Farm East Tract)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Foss Farm East Tract)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
21C2	Pecatonica silt loam, 5 to 10 percent slopes, eroded	0.7	0.4%
22B	Westville silt loam, 2 to 5 percent slopes	1.0	0.5%
242A	Kendall silt loam, 0 to 2 percent slopes	3.1	1.6%
243B	St. Charles silt loam, 2 to 5 percent slopes	16.2	8.1%
243C2	St. Charles silt loam, 5 to 10 percent slopes, eroded	13.9	6.9%
310B	McHenry silt loam, 2 to 4 percent slopes	9.4	4.7%
310D2	McHenry silt loam, 6 to 12 percent slopes, eroded	8.2	4.1%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	64.2	31.9%
419B	Flagg silt loam, 2 to 5 percent slopes	5.7	2.8%
419C2	Flagg silt loam, 5 to 10 percent slopes, eroded	31.3	15.6%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	5.3	2.6%
780C2	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	13.6	6.8%
3415A	Orion silt loam, 0 to 2 percent slopes, frequently flooded	28.2	14.0%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	0.2	0.1%
Totals for Area of Interest		**201.1**	**100.0%**

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

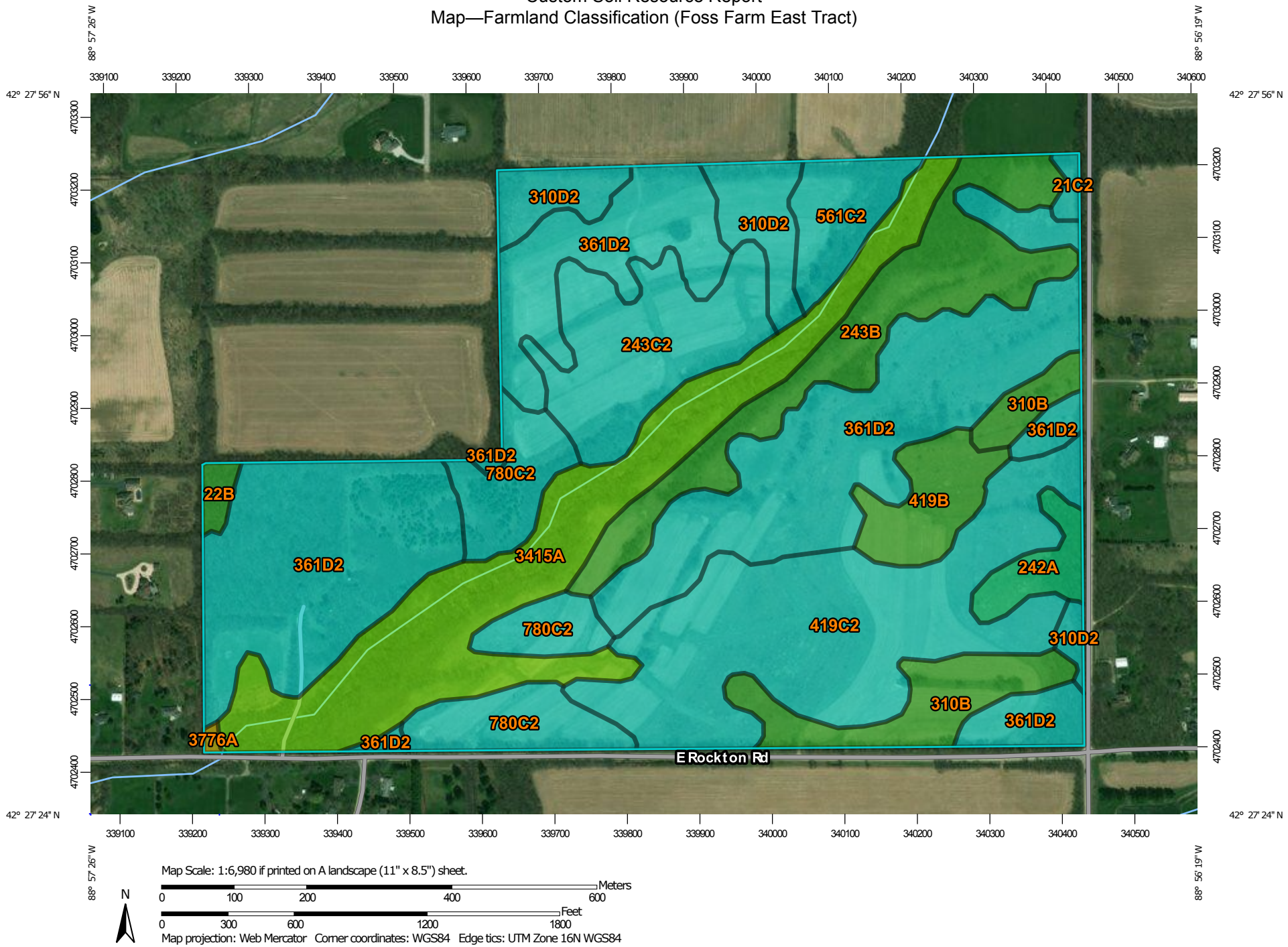
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification (Foss Farm East Tract)

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Custom Soil Resource Report
Map—Farmland Classification (Foss Farm East Tract)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification (Foss Farm East Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
21C2	Pecatonica silt loam, 5 to 10 percent slopes, eroded	Farmland of statewide importance	0.7	0.4%
22B	Westville silt loam, 2 to 5 percent slopes	All areas are prime farmland	1.0	0.5%
242A	Kendall silt loam, 0 to 2 percent slopes	Prime farmland if drained	3.1	1.6%
243B	St. Charles silt loam, 2 to 5 percent slopes	All areas are prime farmland	16.2	8.1%
243C2	St. Charles silt loam, 5 to 10 percent slopes, eroded	Farmland of statewide importance	13.9	6.9%
310B	McHenry silt loam, 2 to 4 percent slopes	All areas are prime farmland	9.4	4.7%
310D2	McHenry silt loam, 6 to 12 percent slopes, eroded	Farmland of statewide importance	8.2	4.1%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Farmland of statewide importance	64.2	31.9%
419B	Flagg silt loam, 2 to 5 percent slopes	All areas are prime farmland	5.7	2.8%
419C2	Flagg silt loam, 5 to 10 percent slopes, eroded	Farmland of statewide importance	31.3	15.6%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Farmland of statewide importance	5.3	2.6%
780C2	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	Farmland of statewide importance	13.6	6.8%
3415A	Orion silt loam, 0 to 2 percent slopes, frequently flooded	Prime farmland if protected from flooding or not frequently flooded during the growing season	28.2	14.0%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	0.2	0.1%
Totals for Area of Interest			**201.1**	**100.0%**

Rating Options—Farmland Classification (Foss Farm East Tract)

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Hydric Rating by Map Unit (Foss Farm East Tract)

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

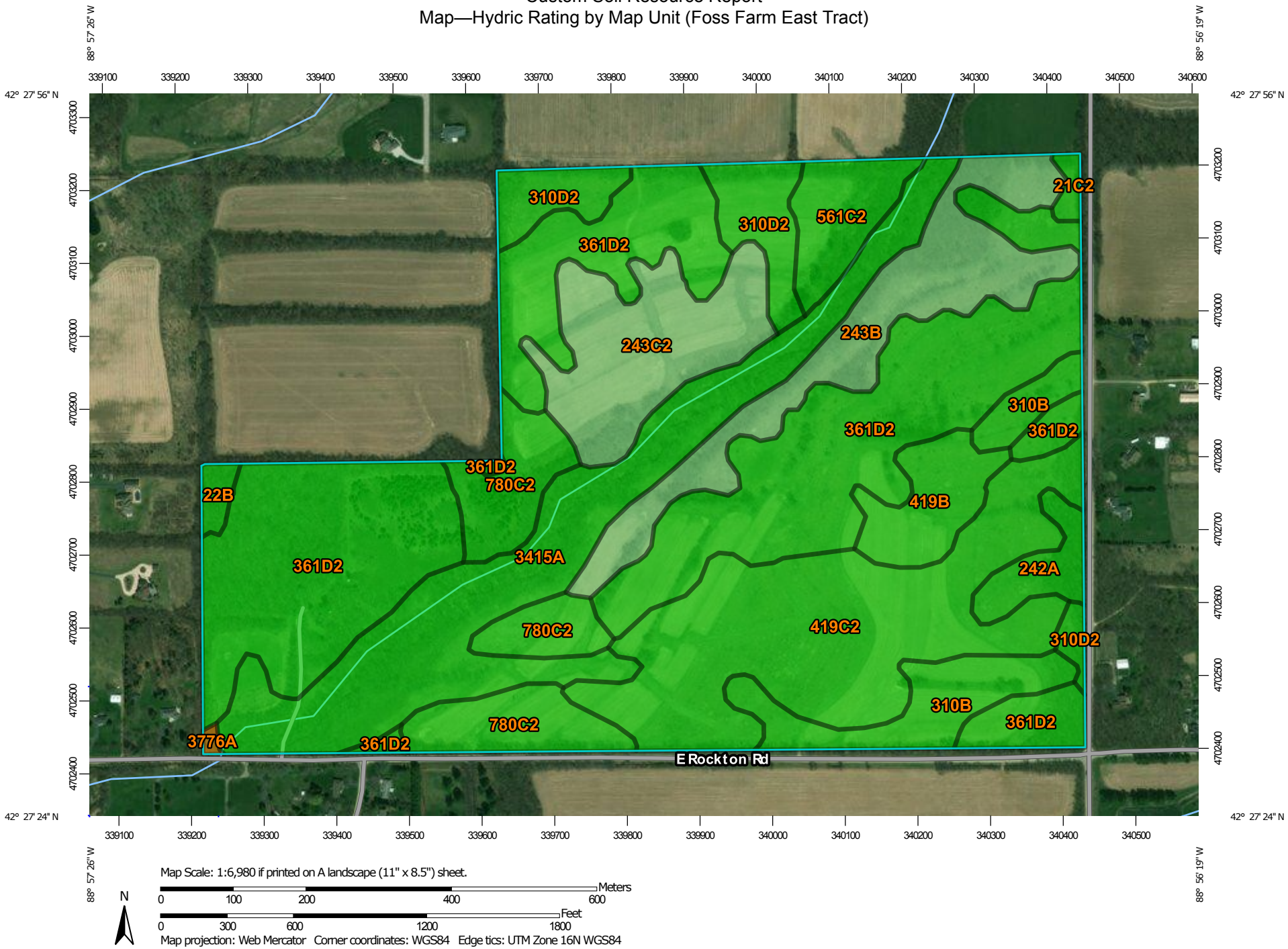
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Map—Hydric Rating by Map Unit (Foss Farm East Tract)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydric Rating by Map Unit (Foss Farm East Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
21C2	Pecatonica silt loam, 5 to 10 percent slopes, eroded	0	0.7	0.4%
22B	Westville silt loam, 2 to 5 percent slopes	0	1.0	0.5%
242A	Kendall silt loam, 0 to 2 percent slopes	0	3.1	1.6%
243B	St. Charles silt loam, 2 to 5 percent slopes	2	16.2	8.1%
243C2	St. Charles silt loam, 5 to 10 percent slopes, eroded	1	13.9	6.9%
310B	McHenry silt loam, 2 to 4 percent slopes	0	9.4	4.7%
310D2	McHenry silt loam, 6 to 12 percent slopes, eroded	0	8.2	4.1%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	0	64.2	31.9%
419B	Flagg silt loam, 2 to 5 percent slopes	0	5.7	2.8%
419C2	Flagg silt loam, 5 to 10 percent slopes, eroded	0	31.3	15.6%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	0	5.3	2.6%
780C2	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	0	13.6	6.8%
3415A	Orion silt loam, 0 to 2 percent slopes, frequently flooded	0	28.2	14.0%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	90	0.2	0.1%
Totals for Area of Interest			**201.1**	**100.0%**

Rating Options—Hydric Rating by Map Unit (Foss Farm East Tract)

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

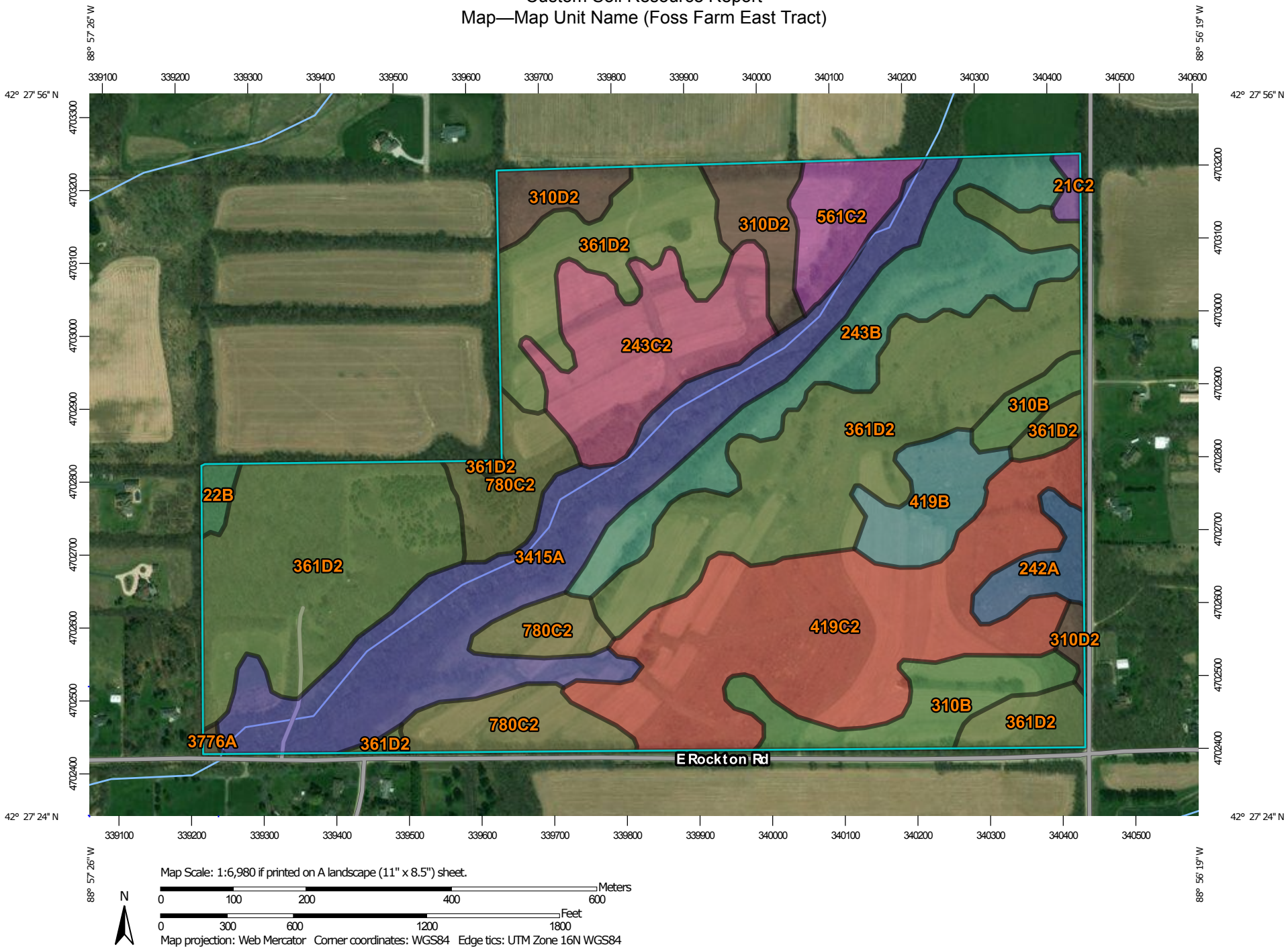
Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Map Unit Name (Foss Farm East Tract)

A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.

Map—Map Unit Name (Foss Farm East Tract)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Comfrey loam, 0 to 2 percent slopes, frequently flooded
- Flagg silt loam, 2 to 5 percent slopes
- Flagg silt loam, 5 to 10 percent slopes, eroded
- Grellton fine sandy loam, 5 to 10 percent slopes, eroded
- Kendall silt loam, 0 to 2 percent slopes
- Kidder loam, 6 to 12 percent slopes, eroded
- McHenry silt loam, 2 to 4 percent slopes
- McHenry silt loam, 6 to 12 percent slopes, eroded
- Orion silt loam, 0 to 2 percent slopes, frequently flooded
- Pecatonica silt loam, 5 to 10 percent slopes, eroded
- St. Charles silt loam, 2 to 5 percent slopes
- St. Charles silt loam, 5 to 10 percent slopes, eroded
- Westville silt loam, 2 to 5 percent slopes
- Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded
- Not rated or not available

Soil Rating Lines

- Comfrey loam, 0 to 2 percent slopes, frequently flooded
- Flagg silt loam, 2 to 5 percent slopes
- Flagg silt loam, 5 to 10 percent slopes, eroded
- Grellton fine sandy loam, 5 to 10 percent slopes, eroded
- Kendall silt loam, 0 to 2 percent slopes
- Kidder loam, 6 to 12 percent slopes, eroded
- McHenry silt loam, 2 to 4 percent slopes
- McHenry silt loam, 6 to 12 percent slopes, eroded
- Orion silt loam, 0 to 2 percent slopes, frequently flooded
- Pecatonica silt loam, 5 to 10 percent slopes, eroded
- St. Charles silt loam, 2 to 5 percent slopes
- St. Charles silt loam, 5 to 10 percent slopes, eroded
- Westville silt loam, 2 to 5 percent slopes
- Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded
- Not rated or not available

Soil Rating Points

- Comfrey loam, 0 to 2 percent slopes, frequently flooded
- Flagg silt loam, 2 to 5 percent slopes
- Flagg silt loam, 5 to 10 percent slopes, eroded
- Grellton fine sandy loam, 5 to 10 percent slopes, eroded
- Kendall silt loam, 0 to 2 percent slopes
- Kidder loam, 6 to 12 percent slopes, eroded
- McHenry silt loam, 2 to 4 percent slopes
- McHenry silt loam, 6 to 12 percent slopes, eroded
- Orion silt loam, 0 to 2 percent slopes, frequently flooded
- Pecatonica silt loam, 5 to 10 percent slopes, eroded
- St. Charles silt loam, 2 to 5 percent slopes
- St. Charles silt loam, 5 to 10 percent slopes, eroded
- Westville silt loam, 2 to 5 percent slopes
- Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Map Unit Name (Foss Farm East Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
21C2	Pecatonica silt loam, 5 to 10 percent slopes, eroded	Pecatonica silt loam, 5 to 10 percent slopes, eroded	0.7	0.4%
22B	Westville silt loam, 2 to 5 percent slopes	Westville silt loam, 2 to 5 percent slopes	1.0	0.5%
242A	Kendall silt loam, 0 to 2 percent slopes	Kendall silt loam, 0 to 2 percent slopes	3.1	1.6%
243B	St. Charles silt loam, 2 to 5 percent slopes	St. Charles silt loam, 2 to 5 percent slopes	16.2	8.1%
243C2	St. Charles silt loam, 5 to 10 percent slopes, eroded	St. Charles silt loam, 5 to 10 percent slopes, eroded	13.9	6.9%
310B	McHenry silt loam, 2 to 4 percent slopes	McHenry silt loam, 2 to 4 percent slopes	9.4	4.7%
310D2	McHenry silt loam, 6 to 12 percent slopes, eroded	McHenry silt loam, 6 to 12 percent slopes, eroded	8.2	4.1%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Kidder loam, 6 to 12 percent slopes, eroded	64.2	31.9%
419B	Flagg silt loam, 2 to 5 percent slopes	Flagg silt loam, 2 to 5 percent slopes	5.7	2.8%
419C2	Flagg silt loam, 5 to 10 percent slopes, eroded	Flagg silt loam, 5 to 10 percent slopes, eroded	31.3	15.6%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	5.3	2.6%
780C2	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	13.6	6.8%
3415A	Orion silt loam, 0 to 2 percent slopes, frequently flooded	Orion silt loam, 0 to 2 percent slopes, frequently flooded	28.2	14.0%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Comfrey loam, 0 to 2 percent slopes, frequently flooded	0.2	0.1%
Totals for Area of Interest			**201.1**	**100.0%**

Rating Options—Map Unit Name (Foss Farm East Tract)

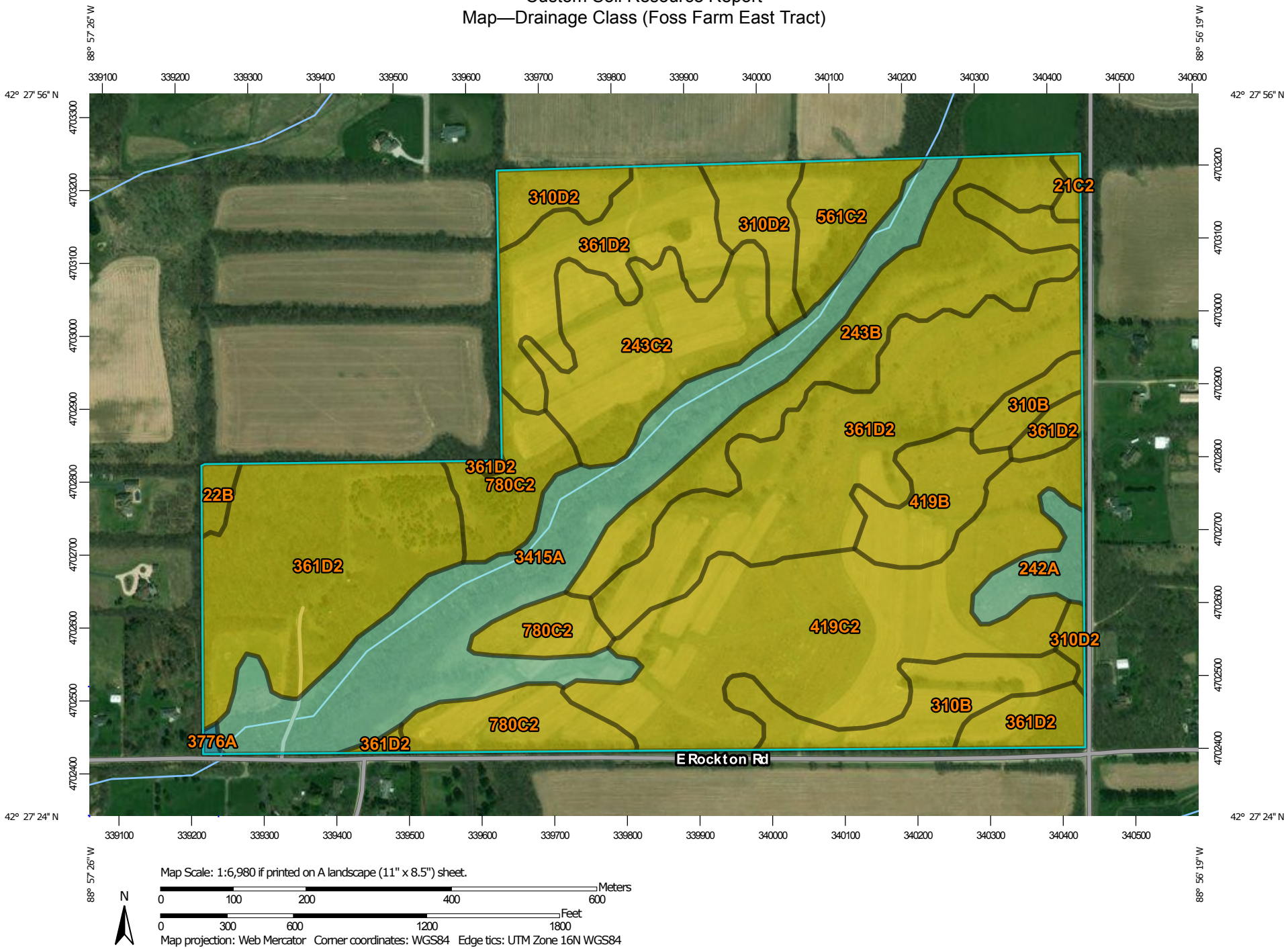
Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Drainage Class (Foss Farm East Tract)

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Map—Drainage Class (Foss Farm East Tract)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Drainage Class (Foss Farm East Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
21C2	Pecatonica silt loam, 5 to 10 percent slopes, eroded	Well drained	0.7	0.4%
22B	Westville silt loam, 2 to 5 percent slopes	Well drained	1.0	0.5%
242A	Kendall silt loam, 0 to 2 percent slopes	Somewhat poorly drained	3.1	1.6%
243B	St. Charles silt loam, 2 to 5 percent slopes	Well drained	16.2	8.1%
243C2	St. Charles silt loam, 5 to 10 percent slopes, eroded	Well drained	13.9	6.9%
310B	McHenry silt loam, 2 to 4 percent slopes	Well drained	9.4	4.7%
310D2	McHenry silt loam, 6 to 12 percent slopes, eroded	Well drained	8.2	4.1%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Well drained	64.2	31.9%
419B	Flagg silt loam, 2 to 5 percent slopes	Well drained	5.7	2.8%
419C2	Flagg silt loam, 5 to 10 percent slopes, eroded	Well drained	31.3	15.6%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Well drained	5.3	2.6%
780C2	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	Well drained	13.6	6.8%
3415A	Orion silt loam, 0 to 2 percent slopes, frequently flooded	Somewhat poorly drained	28.2	14.0%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Poorly drained	0.2	0.1%
Totals for Area of Interest			**201.1**	**100.0%**

Rating Options—Drainage Class (Foss Farm East Tract)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

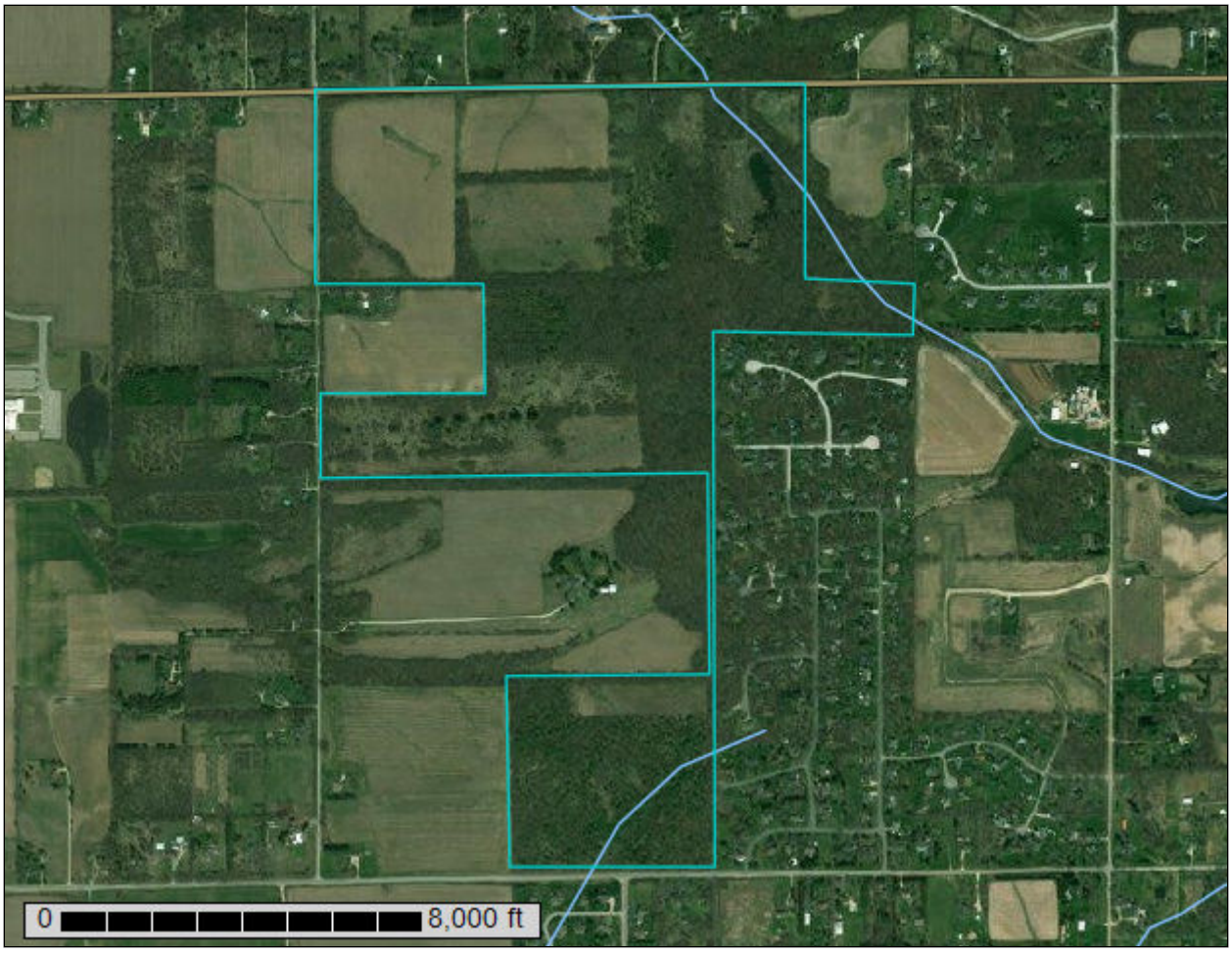
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Winnebago County, Illinois

Foss West Tract



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

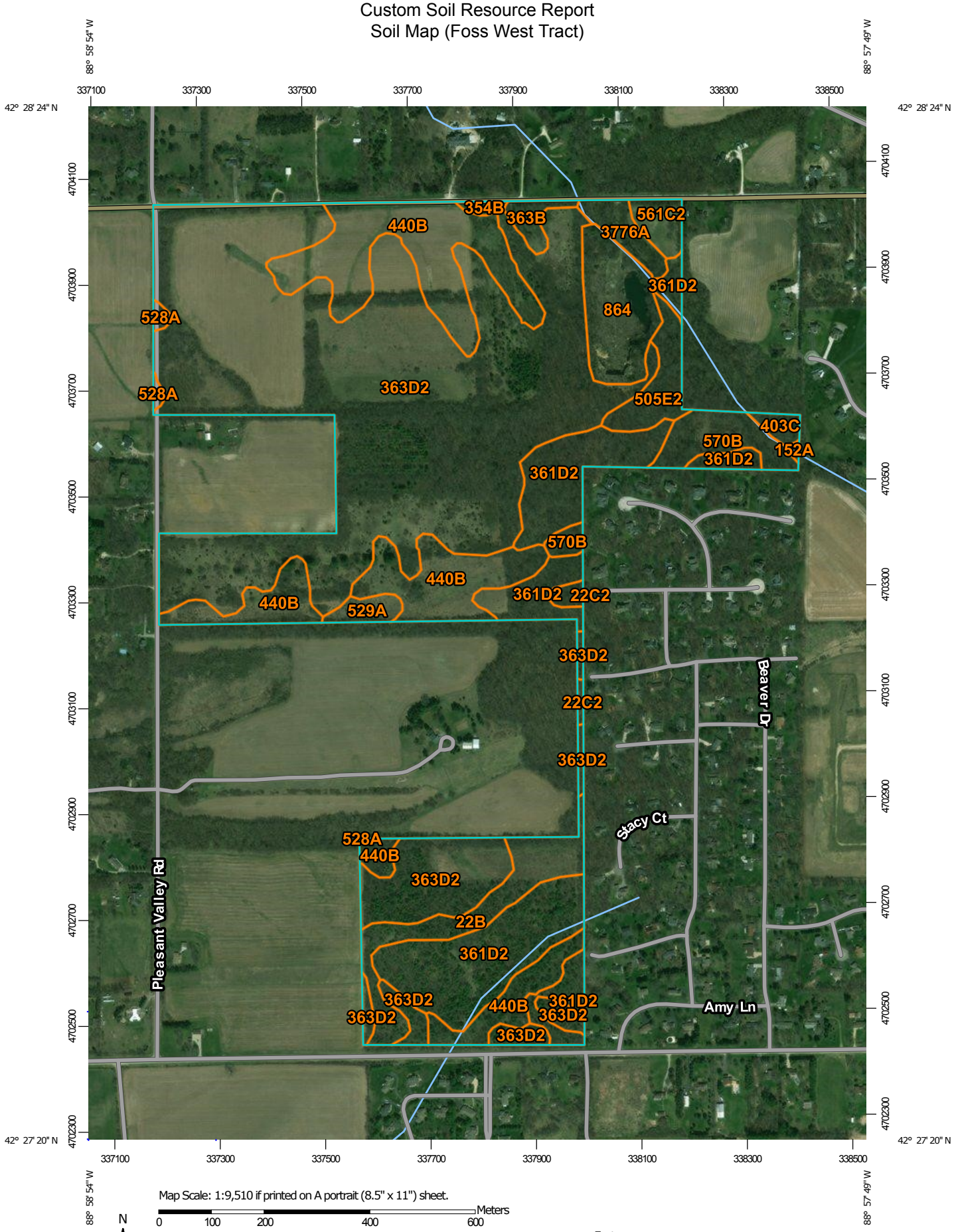
Contents

Preface.....2
Soil Map.....5
Soil Map (Foss West Tract).....6
Legend.....7
Map Unit Legend (Foss West Tract).....8
Soil Information for All Uses.....9
Suitabilities and Limitations for Use.....9
Land Classifications.....9
Farmland Classification (Foss West Tract).....9
Hydric Rating by Map Unit (Foss West Tract).....14
Soil Properties and Qualities.....19
Soil Qualities and Features.....19
Drainage Class (Foss West Tract).....19
Map Unit Name (Foss West Tract).....23
References.....28

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Foss West Tract)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Foss West Tract)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
22B	Westville silt loam, 2 to 5 percent slopes	8.0	3.8%
22C2	Westville silt loam, 5 to 10 percent slopes, eroded	0.9	0.4%
152A	Drummer silty clay loam, 0 to 2 percent slopes	0.2	0.1%
354B	Hononegah loamy coarse sand, 2 to 6 percent slopes	0.5	0.2%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	29.0	13.7%
363B	Griswold loam, 2 to 4 percent slopes	1.5	0.7%
363D2	Griswold loam, 6 to 12 percent slopes, eroded	113.1	53.3%
403C	Elizabeth silt loam, 5 to 10 percent slopes	1.0	0.5%
440B	Jasper silt loam, 2 to 5 percent slopes	33.9	16.0%
505E2	Dunbarton silt loam, 12 to 20 percent slopes, eroded	4.0	1.9%
528A	Lahoguess loam, 0 to 2 percent slopes	0.6	0.3%
529A	Selmass loam, 0 to 2 percent slopes	1.5	0.7%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	2.0	1.0%
570B	Martinsville silt loam, 2 to 4 percent slopes	5.4	2.6%
864	Pits, quarries	8.2	3.9%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	2.5	1.2%
Totals for Area of Interest		**212.2**	**100.0%**

Soil Information for All Uses

Suitabilities and Limitations for Use

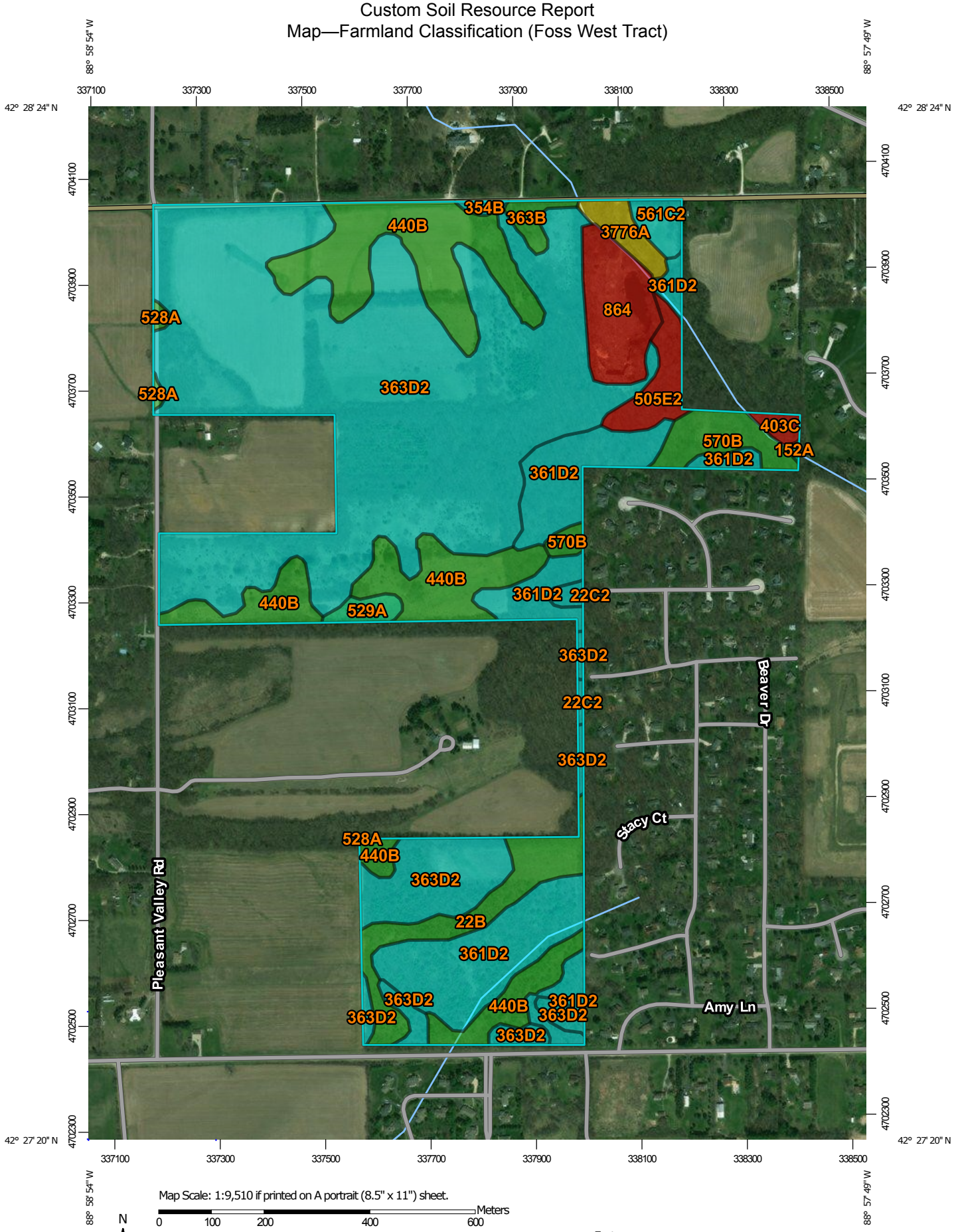
The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification (Foss West Tract)

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.


88° 58' 54" W
88° 57' 49" W
337100
337300
337500
337700
337900
338100
338300
338500
42° 28' 24" N
42° 27' 20" N
4704100
4703900
4703700
4703500
4703300
4703100
4702900
4702700
4702500
4702300
354B
363B
561C2
440B
3776A
361D2
864
528A
363D2
505E2
403C
570B
152A
361D2
570B
440B
361D2
22C2
529A
363D2
Beaver Dr
22C2
363D2
Stacy Ct
528A
440B
363D2
Pleasant Valley Rd
22B
361D2
363D2
440B
361D2
363D2
Amy Ln
363D2
Map Scale: 1:9,510 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 100 200 400 600
Feet
0 450 900 1800 2700
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation


Rails


Interstate Highways


US Routes

Major Roads

Local Roads

Background


Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification (Foss West Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
22B	Westville silt loam, 2 to 5 percent slopes	All areas are prime farmland	8.0	3.8%
22C2	Westville silt loam, 5 to 10 percent slopes, eroded	Farmland of statewide importance	0.9	0.4%
152A	Drummer silty clay loam, 0 to 2 percent slopes	Prime farmland if drained	0.2	0.1%
354B	Hononegah loamy coarse sand, 2 to 6 percent slopes	Farmland of statewide importance	0.5	0.2%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Farmland of statewide importance	29.0	13.7%
363B	Griswold loam, 2 to 4 percent slopes	All areas are prime farmland	1.5	0.7%
363D2	Griswold loam, 6 to 12 percent slopes, eroded	Farmland of statewide importance	113.1	53.3%
403C	Elizabeth silt loam, 5 to 10 percent slopes	Not prime farmland	1.0	0.5%
440B	Jasper silt loam, 2 to 5 percent slopes	All areas are prime farmland	33.9	16.0%
505E2	Dunbarton silt loam, 12 to 20 percent slopes, eroded	Not prime farmland	4.0	1.9%
528A	Lahoguess loam, 0 to 2 percent slopes	All areas are prime farmland	0.6	0.3%
529A	Selmass loam, 0 to 2 percent slopes	Prime farmland if drained	1.5	0.7%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Farmland of statewide importance	2.0	1.0%
570B	Martinsville silt loam, 2 to 4 percent slopes	All areas are prime farmland	5.4	2.6%
864	Pits, quarries	Not prime farmland	8.2	3.9%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	2.5	1.2%
Totals for Area of Interest			**212.2**	**100.0%**

Rating Options—Farmland Classification (Foss West Tract)

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Hydric Rating by Map Unit (Foss West Tract)

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

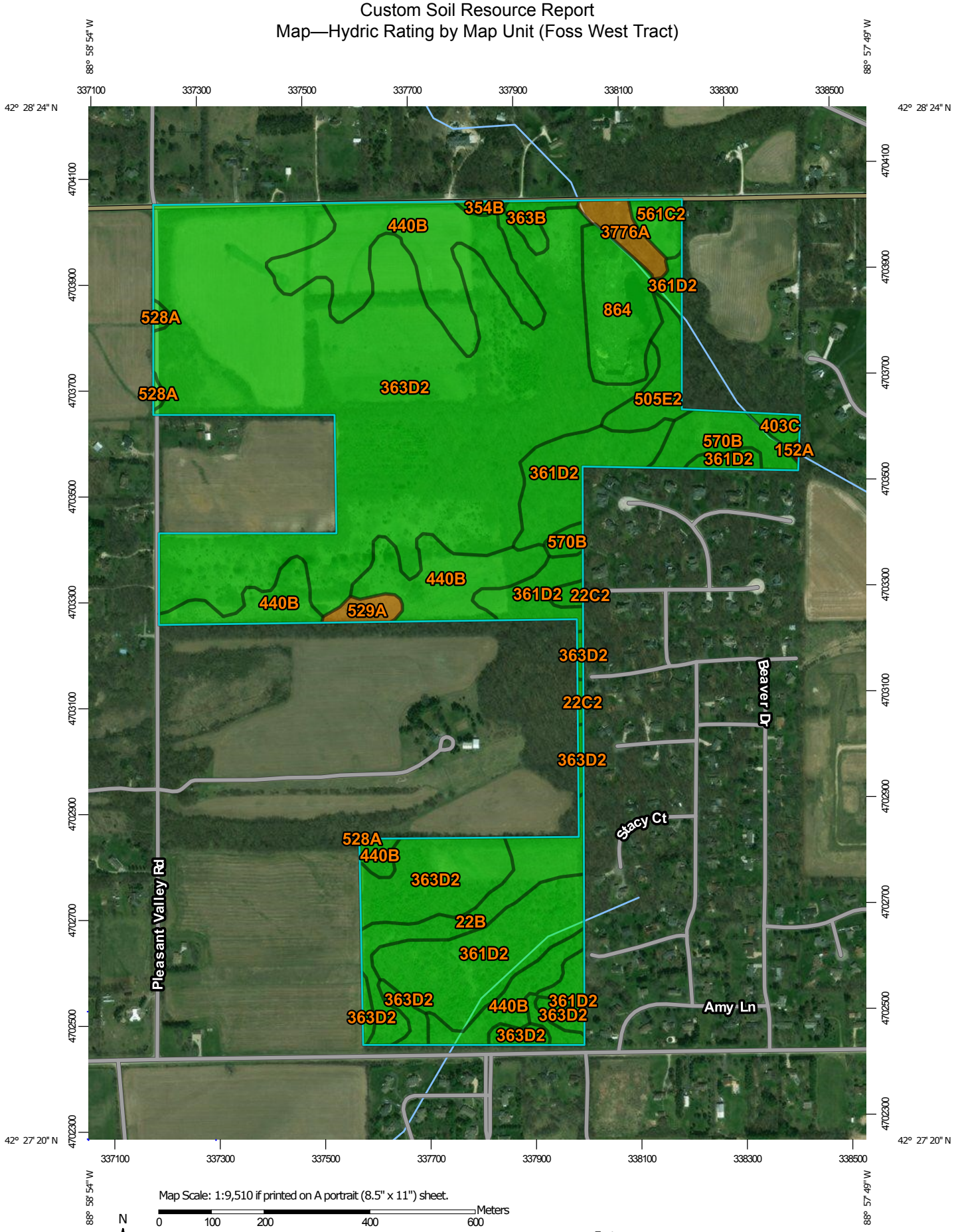
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Map—Hydric Rating by Map Unit (Foss West Tract)



Map Scale: 1:9,510 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydric Rating by Map Unit (Foss West Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
22B	Westville silt loam, 2 to 5 percent slopes	0	8.0	3.8%
22C2	Westville silt loam, 5 to 10 percent slopes, eroded	0	0.9	0.4%
152A	Drummer silty clay loam, 0 to 2 percent slopes	100	0.2	0.1%
354B	Hononegah loamy coarse sand, 2 to 6 percent slopes	0	0.5	0.2%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	0	29.0	13.7%
363B	Griswold loam, 2 to 4 percent slopes	0	1.5	0.7%
363D2	Griswold loam, 6 to 12 percent slopes, eroded	0	113.1	53.3%
403C	Elizabeth silt loam, 5 to 10 percent slopes	0	1.0	0.5%
440B	Jasper silt loam, 2 to 5 percent slopes	0	33.9	16.0%
505E2	Dunbarton silt loam, 12 to 20 percent slopes, eroded	0	4.0	1.9%
528A	Lahoguess loam, 0 to 2 percent slopes	0	0.6	0.3%
529A	Selmass loam, 0 to 2 percent slopes	90	1.5	0.7%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	0	2.0	1.0%
570B	Martinsville silt loam, 2 to 4 percent slopes	0	5.4	2.6%
864	Pits, quarries	0	8.2	3.9%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	90	2.5	1.2%
Totals for Area of Interest			**212.2**	**100.0%**

Rating Options—Hydric Rating by Map Unit (Foss West Tract)

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Soil Properties and Qualities

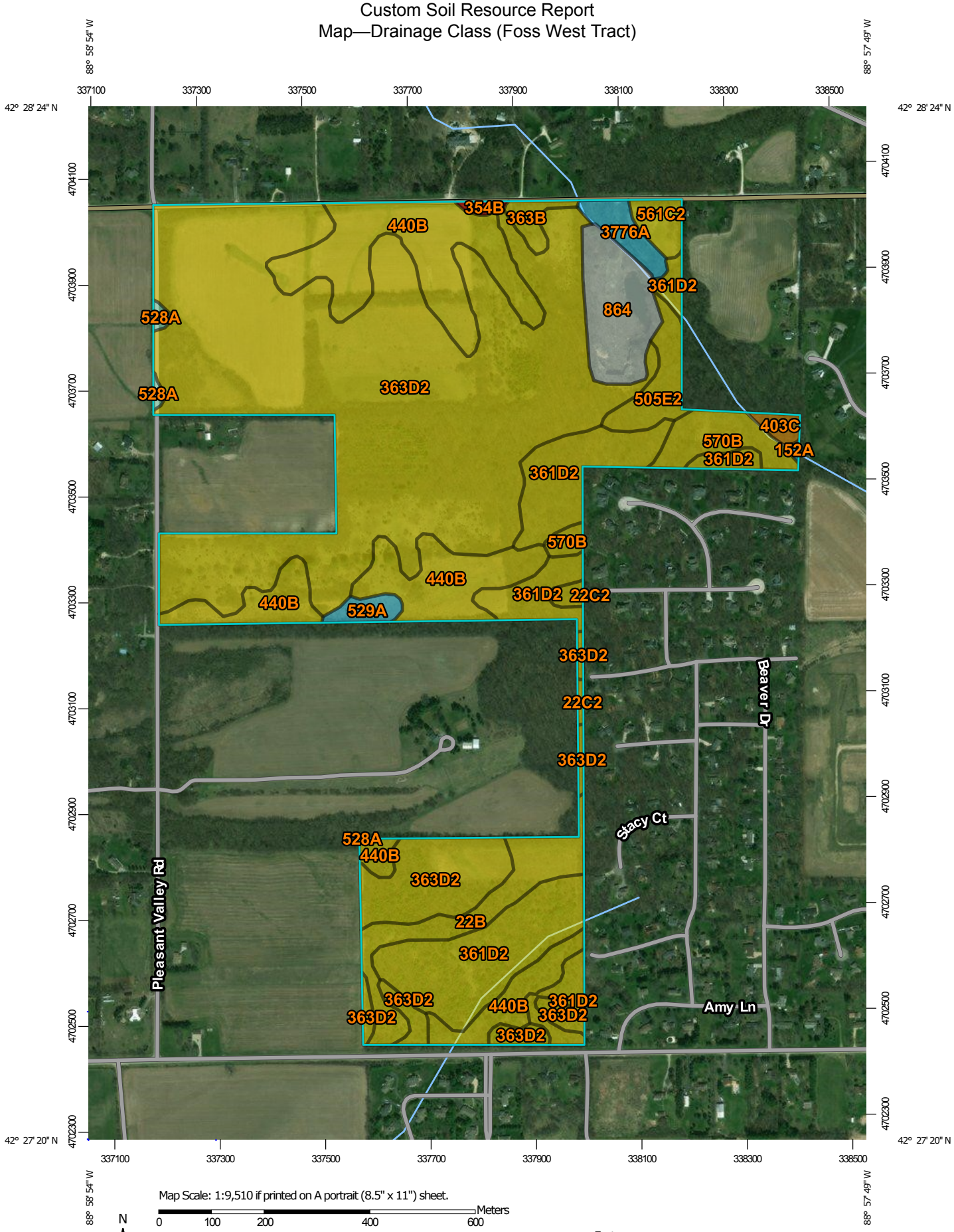
The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Drainage Class (Foss West Tract)

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."


88° 58' 54" W
88° 57' 49" W
337100
337300
337500
337700
337900
338100
338300
338500
42° 28' 24" N
42° 27' 20" N
4704100
4703900
4703700
4703500
4703300
4703100
4702900
4702700
4702500
4702300
354B
363B
561C2
440B
3776A
361D2
528A
864
363D2
505E2
403C
570B
152A
361D2
570B
440B
361D2
22C2
529A
363D2
22C2
363D2
528A
440B
363D2
22B
361D2
363D2
440B
361D2
363D2
363D2
Pleasant Valley Rd
Beaver Dr
Stacy Ct
Amy Ln
Map Scale: 1:9,510 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 100 200 400 600
Feet
0 450 900 1800 2700
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Drainage Class (Foss West Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
22B	Westville silt loam, 2 to 5 percent slopes	Well drained	8.0	3.8%
22C2	Westville silt loam, 5 to 10 percent slopes, eroded	Well drained	0.9	0.4%
152A	Drummer silty clay loam, 0 to 2 percent slopes	Poorly drained	0.2	0.1%
354B	Hononegah loamy coarse sand, 2 to 6 percent slopes	Excessively drained	0.5	0.2%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Well drained	29.0	13.7%
363B	Griswold loam, 2 to 4 percent slopes	Well drained	1.5	0.7%
363D2	Griswold loam, 6 to 12 percent slopes, eroded	Well drained	113.1	53.3%
403C	Elizabeth silt loam, 5 to 10 percent slopes	Somewhat excessively drained	1.0	0.5%
440B	Jasper silt loam, 2 to 5 percent slopes	Well drained	33.9	16.0%
505E2	Dunbarton silt loam, 12 to 20 percent slopes, eroded	Well drained	4.0	1.9%
528A	Lahoguess loam, 0 to 2 percent slopes	Somewhat poorly drained	0.6	0.3%
529A	Selmass loam, 0 to 2 percent slopes	Poorly drained	1.5	0.7%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Well drained	2.0	1.0%
570B	Martinsville silt loam, 2 to 4 percent slopes	Well drained	5.4	2.6%
864	Pits, quarries		8.2	3.9%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Poorly drained	2.5	1.2%
Totals for Area of Interest			**212.2**	**100.0%**

Rating Options—Drainage Class (Foss West Tract)

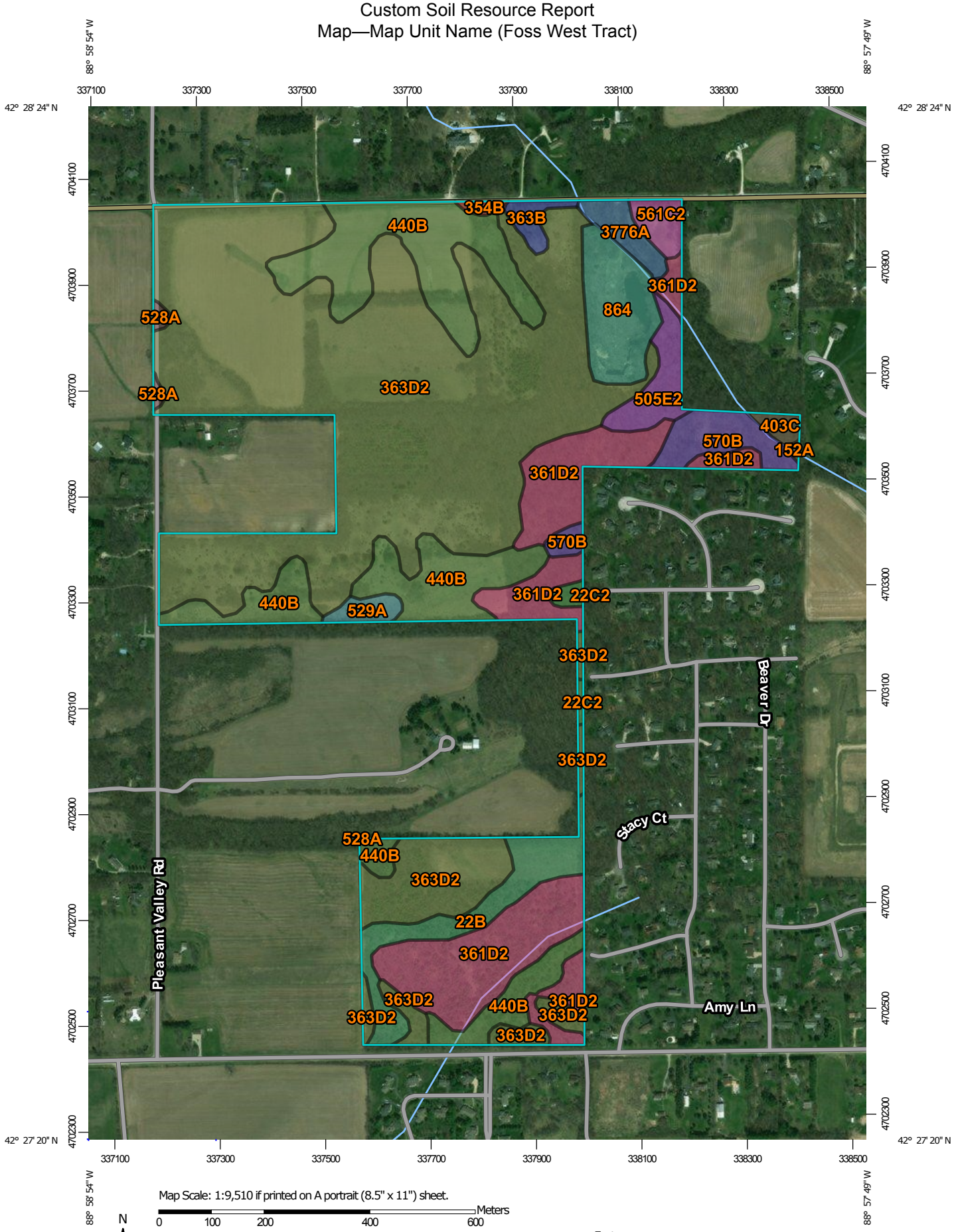
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Map Unit Name (Foss West Tract)

A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.


88° 58' 54" W
88° 57' 49" W
337100
337300
337500
337700
337900
338100
338300
338500
42° 28' 24" N
42° 27' 20" N
4704100
4703900
4703700
4703500
4703300
4703100
4702900
4702700
4702500
4702300
354B
363B
561C2
440B
3776A
361D2
864
528A
363D2
505E2
403C
570B
152A
361D2
570B
440B
361D2
22C2
529A
363D2
Beaver Dr
22C2
363D2
Stacy Ct
528A
440B
363D2
Pleasant Valley Rd
22B
361D2
363D2
440B
361D2
363D2
363D2
Amy Ln
Map Scale: 1:9,510 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 100 200 400 600
Feet
0 450 900 1800 2700
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Comfrey loam, 0 to 2 percent slopes, frequently flooded
- Drummer silty clay loam, 0 to 2 percent slopes
- Dunbarton silt loam, 12 to 20 percent slopes, eroded
- Elizabeth silt loam, 5 to 10 percent slopes
- Griswold loam, 2 to 4 percent slopes
- Griswold loam, 6 to 12 percent slopes, eroded
- Hononegah loamy coarse sand, 2 to 6 percent slopes
- Jasper silt loam, 2 to 5 percent slopes
- Kidder loam, 6 to 12 percent slopes, eroded
- Lahoguess loam, 0 to 2 percent slopes
- Martinsville silt loam, 2 to 4 percent slopes
- Pits, quarries
- Selmass loam, 0 to 2 percent slopes
- Westville silt loam, 2 to 5 percent slopes
- Westville silt loam, 5 to 10 percent slopes, eroded
- Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded
- Not rated or not available

Soil Rating Lines

- Comfrey loam, 0 to 2 percent slopes, frequently flooded
- Drummer silty clay loam, 0 to 2 percent slopes
- Dunbarton silt loam, 12 to 20 percent slopes, eroded
- Elizabeth silt loam, 5 to 10 percent slopes
- Griswold loam, 2 to 4 percent slopes
- Griswold loam, 6 to 12 percent slopes, eroded
- Hononegah loamy coarse sand, 2 to 6 percent slopes
- Jasper silt loam, 2 to 5 percent slopes
- Kidder loam, 6 to 12 percent slopes, eroded
- Lahoguess loam, 0 to 2 percent slopes
- Martinsville silt loam, 2 to 4 percent slopes
- Pits, quarries
- Selmass loam, 0 to 2 percent slopes
- Westville silt loam, 2 to 5 percent slopes
- Westville silt loam, 5 to 10 percent slopes, eroded
- Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded
- Not rated or not available

Soil Rating Points

- Comfrey loam, 0 to 2 percent slopes, frequently flooded
- Drummer silty clay loam, 0 to 2 percent slopes
- Dunbarton silt loam, 12 to 20 percent slopes, eroded
- Elizabeth silt loam, 5 to 10 percent slopes
- Griswold loam, 2 to 4 percent slopes
- Griswold loam, 6 to 12 percent slopes, eroded
- Hononegah loamy coarse sand, 2 to 6 percent slopes
- Jasper silt loam, 2 to 5 percent slopes
- Kidder loam, 6 to 12 percent slopes, eroded
- Lahoguess loam, 0 to 2 percent slopes
- Martinsville silt loam, 2 to 4 percent slopes
- Pits, quarries
- Selmass loam, 0 to 2 percent slopes
- Westville silt loam, 2 to 5 percent slopes
- Westville silt loam, 5 to 10 percent slopes, eroded
- Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Winnebago County, Illinois
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2010—Jul 24, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Map Unit Name (Foss West Tract)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
22B	Westville silt loam, 2 to 5 percent slopes	Westville silt loam, 2 to 5 percent slopes	8.0	3.8%
22C2	Westville silt loam, 5 to 10 percent slopes, eroded	Westville silt loam, 5 to 10 percent slopes, eroded	0.9	0.4%
152A	Drummer silty clay loam, 0 to 2 percent slopes	Drummer silty clay loam, 0 to 2 percent slopes	0.2	0.1%
354B	Hononegah loamy coarse sand, 2 to 6 percent slopes	Hononegah loamy coarse sand, 2 to 6 percent slopes	0.5	0.2%
361D2	Kidder loam, 6 to 12 percent slopes, eroded	Kidder loam, 6 to 12 percent slopes, eroded	29.0	13.7%
363B	Griswold loam, 2 to 4 percent slopes	Griswold loam, 2 to 4 percent slopes	1.5	0.7%
363D2	Griswold loam, 6 to 12 percent slopes, eroded	Griswold loam, 6 to 12 percent slopes, eroded	113.1	53.3%
403C	Elizabeth silt loam, 5 to 10 percent slopes	Elizabeth silt loam, 5 to 10 percent slopes	1.0	0.5%
440B	Jasper silt loam, 2 to 5 percent slopes	Jasper silt loam, 2 to 5 percent slopes	33.9	16.0%
505E2	Dunbarton silt loam, 12 to 20 percent slopes, eroded	Dunbarton silt loam, 12 to 20 percent slopes, eroded	4.0	1.9%
528A	Lahoguess loam, 0 to 2 percent slopes	Lahoguess loam, 0 to 2 percent slopes	0.6	0.3%
529A	Selmass loam, 0 to 2 percent slopes	Selmass loam, 0 to 2 percent slopes	1.5	0.7%
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	2.0	1.0%
570B	Martinsville silt loam, 2 to 4 percent slopes	Martinsville silt loam, 2 to 4 percent slopes	5.4	2.6%
864	Pits, quarries	Pits, quarries	8.2	3.9%
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	Comfrey loam, 0 to 2 percent slopes, frequently flooded	2.5	1.2%
Totals for Area of Interest			**212.2**	**100.0%**

Rating Options—Map Unit Name (Foss West Tract)

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX F

SOIL HEALTH SCORECARD, COMPLETED BY FOSS FARM TENANT

Scorecard Instructions

The Wisconsin Soil Health Scorecard assesses a soil's health as a function of soil, plant, animal and water properties identified by farmers. The scorecard is a field tool to monitor and improve soil health based on field experience and a working knowledge of a soil.

The scorecard is best completed near or just following harvest. Periodic and seasonally expressed properties (soil smell, seed germination, infiltration, etc.) should be recorded during the growing season to increase its effectiveness. When scoring you soil's health, please:

1. **Read each question completely. Focus only on the property being graded.**
2. **Choose the answer that best describes the property and enter score between 0 and 4 in the box provided. The scale corresponds to healthy (3-4 pts.), impaired (1.5-2.5), and unhealthy (0-1).**
3. **Answer as many questions as possible to ensure an accurate evaluation of your soil's health.**
4. **Enter NA (not answered) if a question does not apply to your farm, and go to the next question.**

The scorecard was developed by the University of Wisconsin's Soil Health Program from structured interviews with 28 farmers in conjunction with the Wisconsin Integrated Cropping Systems Trial [1]. Superscript numbers indicate the relative importance and rank of the property. Farmers who were interviewed operated conventional and low-input cash grain and dairy farms typical of southeast Wisconsin. Typical soils are formed in silt over glacial till or outwash. Applying this scorecard to other locations should be done with caution. Modifications of this scorecard for other cropping systems and other regions requires structured input from additional farmers.

[1] D.E. Romig, M.J. Garlynd, and R.F. Harris. 1994. Farmer-based soil health scorecard. p.288. Agronomy abstracts. ASA, Madison, WI.

Please go to next page ⇨⇨⇨⇨

SOIL—Questions refer primarily to the plow layer

Descriptive Properties — Score

1. EARTHWORMS[3]
- 0 Little sign of worm activity
- 2 Few worm holes or castings
- 4 Worm holes and castings numerous

Score: 3

2. EROSION[4]
- 0 Severe erosion, considerable topsoil moved, gullies formed
- 2 Moderate erosion, signs of sheet and rill erosion, some topsoil blows
- 4 Little erosion evident, topsoil resists erosion by water or wind

Score: 3

3. TILLAGE EASE[5]
- 0 Plow scours hard, soil never works down
- 2 Soil grabs plow, difficult to work, needs extra passes
- 4 Plow field in higher gear, soil flows, & falls apart, mellow

Score: NA

4. SOIL STRUCTURE[7]
- 0 Soil is cloddy with big chunks, or dusty and powdery
- 2 Soil is lumpy or does not hold together
- 4 Soil is crumbly, granular

Score: 3

5. COLOR (moist)[13]
- 0 Soil color is tan, light yellow, orange, or light gray
- 2 Soil color is brown, gray, or reddish
- 4 Soil color is black, dark brown, or dark gray

Score: 3

6. COMPACTION[11]
- 0 Soil is tight & compacted, cannot get into it, thick hardpan
- 2 Soil packs down, thin hardpan or plow layers
- 4 Soil stays loose, does not pack, no hardpan

Score: 3

7. INFILTRATION[12]
- 0 Water does not soak in, sits on top or runs off
- 2 Water soaks in slowly, some runoff or puddling after a heavy rain
- 4 Water soaks right in, soil is spongy, no ponding

Score: 3

Please go to next page ⇨⇨⇨⇨

SOIL—Questions refer primarily to the plow layer

Descriptive Properties — Score

8. DRAINAGE[6]
- 0 Poor drainage, soil is often waterlogged or oversaturated
- 2 Soil drains slowly, slow to dry out
- 4 Soil drains at good rate for crops, water moves through

Score: 3

9. WATER RETENTION[14]
- 0 Soil dries out too fast, droughty
- 2 Soil is drought prone in dry weather
- 4 Soils holds moisture well, gives and takes water easily

Score: 3

10. DECOMPOSITION[16]
- 0 Residues and manures do not break down in soil
- 2 Slow rotting of residues and manures
- 4 Rapid rotting of residue and manures

Score: 3

11. SOIL FERTILITY[20]
- 0 Poor fertility, nutrients do not move, potential is very low
- 2 Fertility not balanced, needs help
- 4 Fertility is balanced, nutrients available, potential is high

Score: 3

12. FEEL[21]
- 0 Soil is mucky, greasy, or sticky
- 2 Soil is smooth or grainy, compresses when squeezed
- 4 Soil is loose, fluffy, opens up after being squeezed

Score: 2

13. SURFACE CRUST[24]
- 0 Soil surface is hard, cracked when dry, compacted
- 2 Surface is smooth with few holes, thin crust
- 4 Surface does not crust, porous, digs easily with hand

Score: 3

14. SURFACE COVER[23]
- 0 Soil surface is clean, bare, residue removed or buried following harvest
- 2 Surface has little residue, mostly buried
- 4 Surface is trashy, lots of mulch left on top or cover crop used

Score: 3

Please go to next page ⇨⇨⇨⇨

SOIL—Questions refer primarily to the plow layer

Descriptive Properties — Score

15. HARDNESS[28]
- 0 Soil is hard, dense or solid, will not break between two fingers
- 2 Soil is firm, breaks up between fingers under moderate pressure
- 4 Soil is soft, crumbles easily under light pressure

Score: 3

16. SMELL[25]
- 0 Soil has a sour, putrid or chemical smell
- 2 Soil has no odor or a mineral smell
- 4 Soils has an earthy, sweet, fresh smell

Score: 3

17. SOIL TEXTURE[31]
- 0 Texture is a problem, extremely sandy, clayey or rocky
- 2 Texture is too heavy or too light, but presents no problem
- 4 Texture is loamy

Score: 2

18. AERATION[35]
- 0 Soil is tight, closed, almost no pores
- 2 Soil is dense, has a few pores
- 4 Soil is open, porous, breaths

Score: 3

19. BIOLOGICAL ACTIVITY[36]
- 0 Soil shows little biological activity, no signs of soil microbes
- 2 Moderate biological activity, some wormlike threads, moss, algae
- 4 Biological activity high, white wormlike threads, moss, algae plentiful

Score: 3

20. TOPSOIL DEPTH[38]
- 0 Subsoil is exposed or near surface
- 2 Topsoil is shallow
- 4 Topsoil is deep

Score: 3

Please go to next page ⇨⇨⇨⇨

SOIL—Questions refer primarily to the plow layer

Analytical Properties — Score

Values are for typical soils of southeast Wisconsin

21. ORGANIC MATTER[1]
- 0 Organic matter less than 2% or greater than 8%
- 2 Organic matter 2 to 4% or 6 to 8%
- 4 Organic matter between 4 and 6%

Score: 2

22. pH[8]
- 0 Soil pH less than 6.4 or greater than 7.2
- 2 Soil pH 6.4 to 6.7 or 7.0 to 7.2
- 4 Soil pH between 6.7 and 7.0

Score: 2

23. SOIL TEST – N, P, & K[9]
- 0 Two or more nutrient levels very low, law of minimum at work
- 2 Soil test values are below recommended levels, need extra inputs
- 4 All nutrient levels at recommended levels

Score: 2-3

24. MICRONUTRIENTS[30]
- 0 Severe shortages of trace minerals (magnesium, zinc, sulfur, boron, etc.)
- 2 Micronutrients at a minimal level or not balanced
- 4 Levels of micronutrients high and balanced

Score: 2-3

Please go to next page ⇨⇨⇨⇨

PLANTS—Questions concern typical years with adequate rainfall and temperatures

Descriptive Properties — Score

25. CROP APPEARANCE[2]
- 0 Overall crop is poor, stunted, discolored, in an uneven stand
- 2 Overall crop is light green, small, in a thin stand
- 4 Overall crop is dark green, large, tall, in a dense stand

Score: 3

26. NUTRIENT DEFICIENCY[15]
- 0 Crop shows signs of severe deficiencies (blighted, streaky, spotty, discolored, leaves dry up)
- 2 Crop falls off or discolors as season progresses
- 4 Crop has what it needs, shows little signs of deficiencies

Score: 3

27. SEED GERMINATION[34]
- 0 Seed germination is poor, hard for crop to come out of ground
- 2 Germination is uneven, seed must be planted deeper
- 4 Seed comes up right away, good emergence

Score: 3

28. GROWTH RATE[19]
- 0 Crop slow to get started, never seems to mature
- 2 Uneven growth, late to mature
- 4 Rapid, even growth, matures on time

Score: 3

29. ROOTS[17]
- 0 Plant roots appear unhealthy (brown, diseased, spotted), poorly developed, balled up
- 2 Plant roots are shallow, at hard angles, development limited, few fine roots
- 4 Plant roots are deep, fully developed with lots of fine root hairs

Score: 3

30. STEMS[40]
- 0 Stems are short, spindly, lodging often a problem
- 2 Stems are thin, leaning to one side
- 4 Stems are thick, tall, standing, straight

Score: 3

Please go to next page ⇨⇨⇨⇨

PLANTS—Questions concern typical years with adequate rainfall and temperatures

Descriptive Properties — Score

31. LEAVES[33]
- 0 Leaves are yellow, discolored, few in number
- 2 Leaves are small, narrow, light green
- 4 Leaves are full, lush, dark green

Score: 3

32. RESISTS DROUGHT[27]
- 0 Plants dry out quickly, never completely recover
- 2 Plants suffer in dry weather, slow to recover
- 4 Plants withstand dry weather, fast to recover

Score: 2

33. RESISTS PESTS AND DISEASE[29]
- 0 Plants damaged severely by diseases & insects
- 2 Plants stressed by diseases & insects
- 4 Plants tolerate pests & disease well

Score: 2

34. MATURE CROP[18]
- 0 Seedhead or pod misshapened, grain is not ripe, shriveled, poor color
- 2 Seedhead small, unfilled, grain slow to ripen
- 4 Seedhead large, grain fill, ripe, with food color

Score: 3

Analytical Properties — Score

Values are typical for soils of southeast Wisconsin

35. YIELD[10]
- 0 Corn: less than 85 bushel/acre, Alfalfa: 2 to 6 ton/acre
- 2 Corn: 85 to 130 bushel/acre, Alfalfa: 2 to 6 ton/acre
- 4 Corn: greater than 130 bushel/acre, Alfalfa: greater than 6 ton/acre

Score: 4

36. FEED VALUE[41]
- 0 Feed has poor nutritional value (energy, protein, minerals), supplements must be used
- 2 Feed is unbalanced in energy, protein, or minerals, may require supplements
- 4 Feed is balanced, high in nutritional value, supplements used infrequently

Score: NA

Please go to next page ⇨⇨⇨⇨

PLANTS—Questions concern typical years with adequate rainfall and temperatures

Analytical Properties — Score

37. TEST WEIGHT[32]
- 0 Grain test weight is low, takes a deduction
- 2 Grain test weight is average
- 4 Grain test weight is high

Score: 3

38. COST OF PRODUCTION AND PROFIT[26]
- 0 Production and input costs high yet profit is low
- 2 Profits are variable, yields maintained with high input costs
- 4 Profits are dependable, high, yields maintained with low input costs

Score: 2

ANIMALS—Questions should not relate to improper housing, poor water or inclement weather

Descriptive Properties — Score

39. HUMAN HEALTH[37]
- 0 Human health is poor, recurrent health problems, recovery is difficult and long
- 2 Occasional health problems, slow recovery time
- 4 Human health is excellent, resists diseases, long life, quick recovery time

Score: NA

40. ANIMAL HEALTH[42]
- 0 Continuous animal health problems, poor performance and production
- 2 Occasional animal health problems, performance average
- 4 Animal health excellent, exceptional performance and production

Score: NA

41. WILDLIFE[43]
- 0 Signs of wildlife rare, animals do not appear healthy
- 2 Infrequent signs of wildlife; songbirds, deer, turkey etc. uncommon
- 4 Wildlife is abundant; gulls behind plow, songbirds, deer, turkey, etc. are common

Score: 3

Please go to next page ⇨⇨⇨⇨

WATER

Analytical Properties	Score
42. CHEMICALS IN GROUNDWATER[22]	
0 Chemicals found in groundwater above allowable levels 2 Chemicals found in groundwater below allowable levels 4 No chemicals present in groundwater	NA

Descriptive Properties	Score
43. SURFACE WATER[39] (open water flowing from fields – lakes, marshes, streams, etc.) 0 Surface water is very muddy or slimy 2 Surface water is brownish with dirt and silt 4 Surface water is clear and clean	2

Please go to next page ⇨⇨⇨⇨

Interpreting the Soil Health Scorecard's Results

Review the scorecard and tally the number of indicator properties that reside within the three categories of health listed below. Divide the number in each health category by the total number of questions answered (a maximum of 43) and multiply by 100% for the percentage within each category.

Health Category	Number	%
Healthy (score of 3 - 4)	30	69
Impaired (score of 1.5 – 2.5)	7	16
Unhealthy (score of 0 - 1)	0	0
Total	35	100%

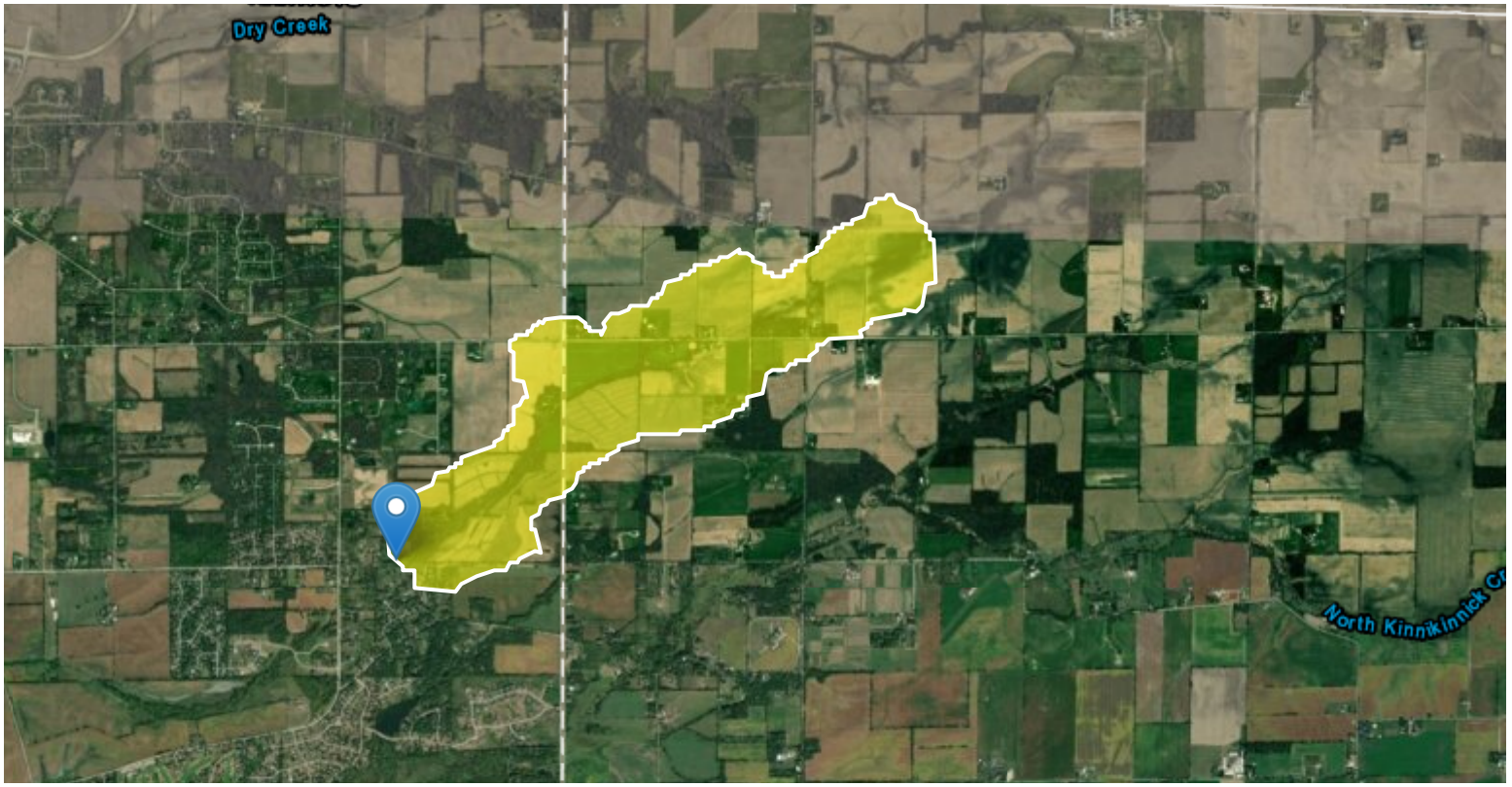
Scorecard users should examine the distribution of indicator properties within the three categories of health. Ideally, one would prefer to see all of the properties score in the *healthy* category. Even of 90% or more of the indicators you scored are *healthy*, your soil may still have serious problems with the remaining properties. For indicators either in the *impaired* and *unhealthy* categories, careful consideration is necessary to identify what caused the property to be in a less-than-optimum condition. *Impaired* indicator properties should be closely monitored over time to determine whether they are deteriorating or improving. *Unhealthy* properties need immediate attention and corrective action. You may also wish to give higher priority to those properties farmers considered more important as indicated by their relative rank in superscript.

APPENDIX G

STREAMSTATS DRAINAGE BASINS FOR PERENNIAL STREAMS AT THE FOSS FARM

StreamStats Report

Region ID: IL
Workspace ID: IL20190131200003673000
Clicked Point (Latitude, Longitude): 42.45769, -88.95527
Time: 2019-01-31 14:00:21 -0600



Basin Characteristics

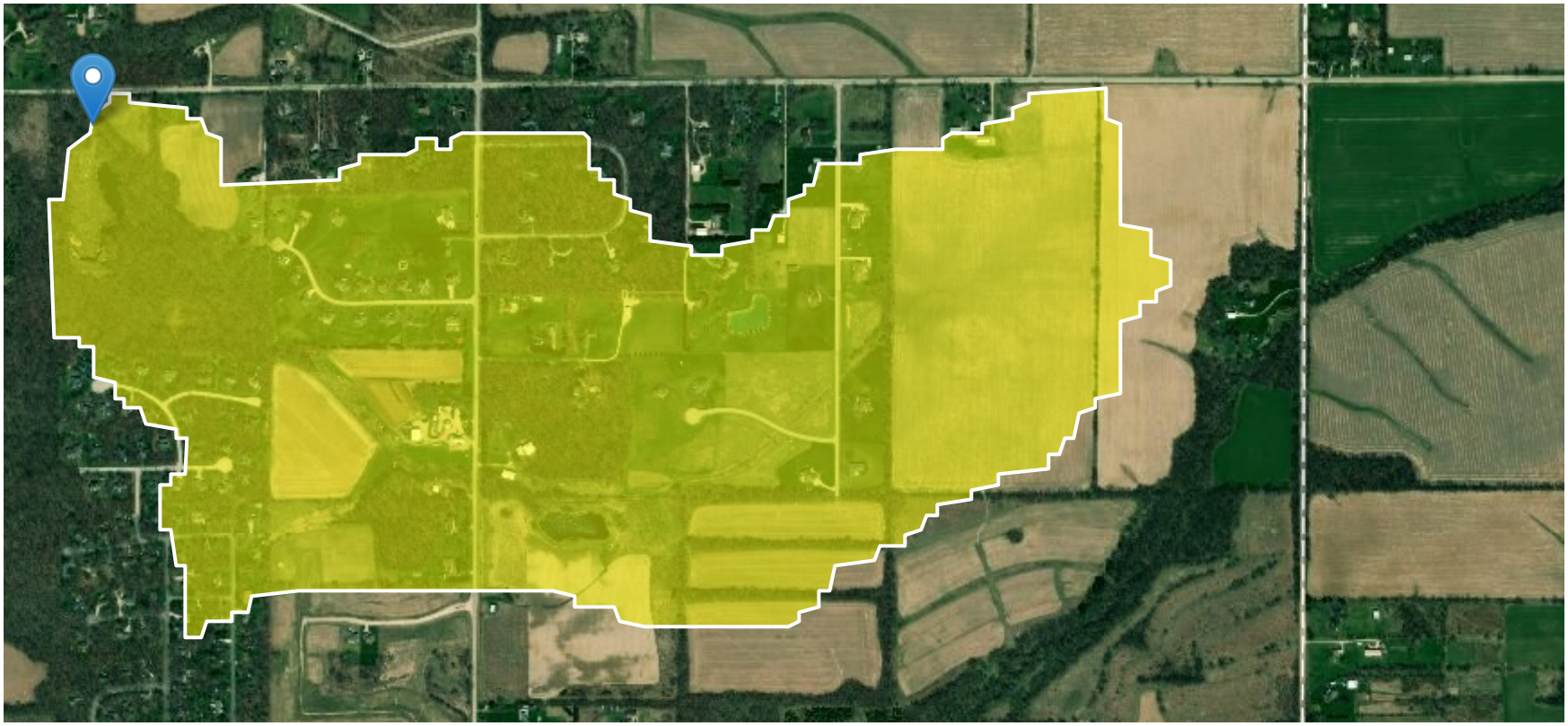
Parameter Code	Parameter Description	Value	Unit
200			

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.43	square miles

Application Version: 4.3.0

StreamStats Report

Region ID: IL
Workspace ID: IL20190131201610445000
Clicked Point (Latitude, Longitude): 42.47112, -88.96956
Time: 2019-01-31 14:16:25 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
202			

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.63	square miles

Application Version: 4.3.0

APPENDIX H

NRCS IOWA VALUE OF SOIL HEALTH

IOWA

VALUE OF soil health

unlock the SECRETS IN THE SOIL

What is the value of healthy soil?

Soil health is a combination of physical, chemical and biological properties impacting the function and productivity of the soil. Several of these properties directly affect your farm's net return.

Soil organic matter directly impacts water infiltration rates, soil aggregate stability and soil structure. It can also impact compaction, which can affect your farm's net return.

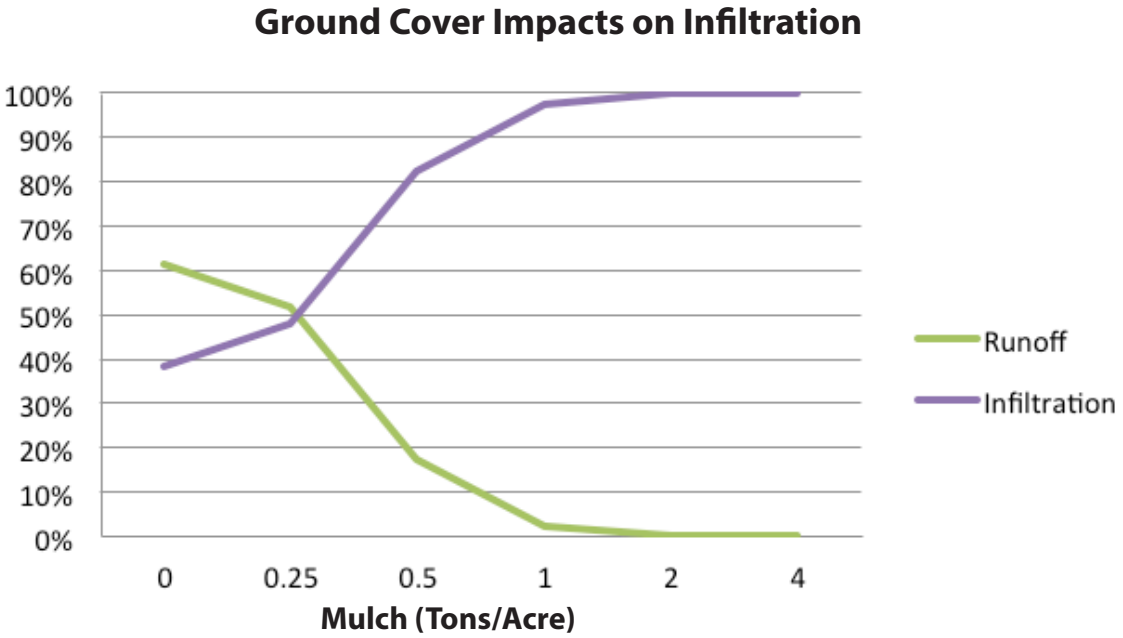
While it is difficult to place a monetary value on any one of these properties, it may be possible to provide an estimate of the economic value of two by-products of healthy soil: the availability of water and maintenance of soil nutrients.

More water for plant growth

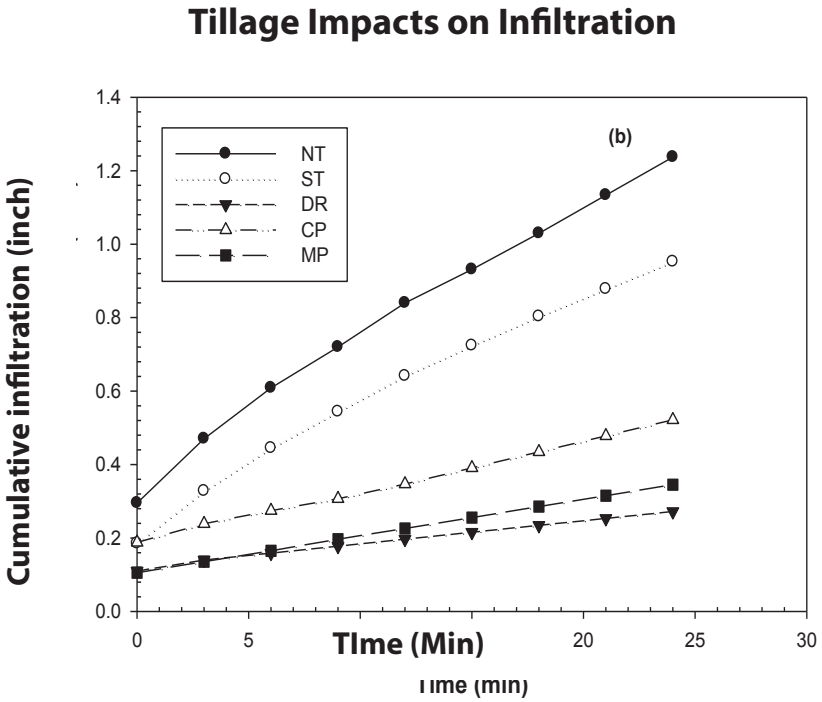
Healthy soils impact the amount of water available for plant growth by improving infiltration of precipitation and the ability of the soil to store precipitation; in other words, the soil available water holding capacity. In the short-term, water infiltration (water entering the soil) can be effectively influenced by managing residue and reducing tillage. Studies have shown that the amount of water entering the soil can be increased up to 2.5 inches per hour by maintaining crop residues on the soil surface.

Conservation planning with NRCS can help you decide which adjustments are best for your operation to improve soil health .

The residue shields the soil from rain drop impact which can seal the soil surface preventing infiltration.A majority of the benefit is gained by maintaining at least 1,000 pounds of residue on the soil surface at all times. This equates to approximately 30 percent ground cover of corn residue or 40 percent soybean residue.



Tillage is disruptive to the soil structure and reduces water infiltration by breaking large pores and fills the small pores by dislocating the soil particles. Additionally, incorporating residue can cause a significant loss of soil moisture. .



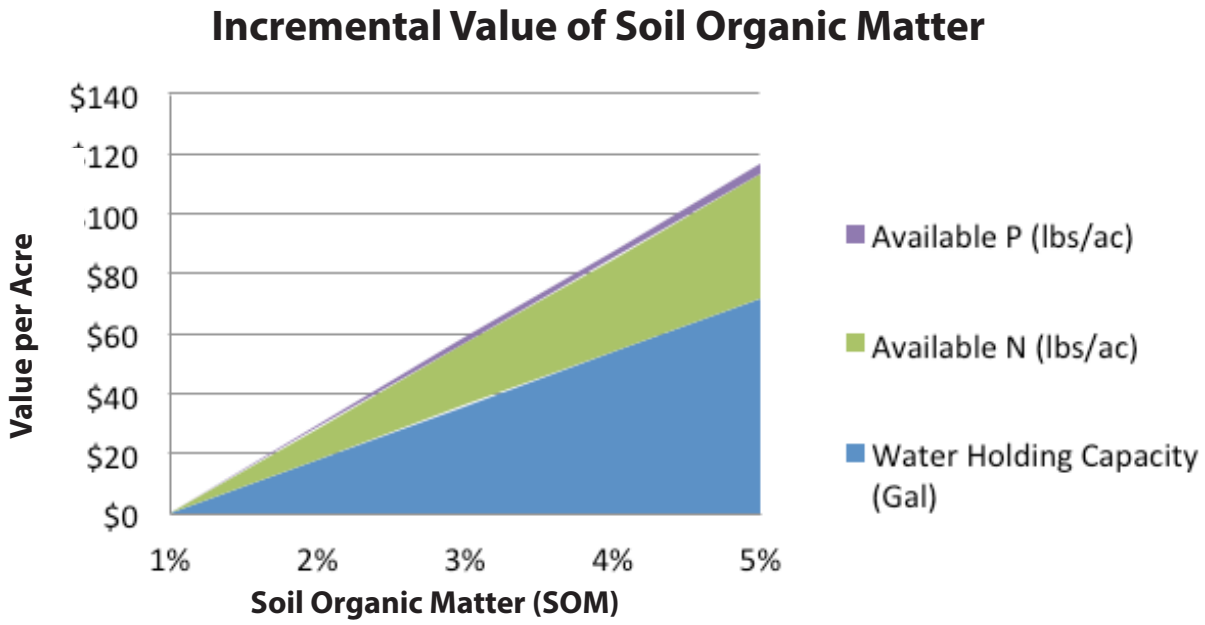
Cumulative water infiltration under five tillage systems. NT=No-till, ST=Strip-tillage, DR=Deep Rip, CP=Chisel Plow and MP=Moldboard Plow. (Al-Kaisi, 2013). NT and ST increased water recharge by 50 to 70% over conventional tillage systems.

The exact economic return of improved water infiltration is determined by many factors including: precipitation, growing season conditions, yields and commodity prices. So the net return from each additional inch of available plant water will vary from year to year.

Value of soil organic matter

The long-term impacts of increasing soil organic matter (SOM) can be significant. A typical acre of soil, six inches in depth, weighs about 1,000 tons. One percent organic matter equates to 10 tons of organic material.

Since it takes at least 10 pounds of residue to decompose to 1 pound of organic material, SOM levels under the right management conditions will typically increase at a fairly slow rate. Studies have shown that for every percent increase in SOM, an additional 16,500 gallons of water is available in the soil. Using an average commodity price from 2009 through 2013 for corn and soybeans this would equate to $18 per acre income, per 1 percent increase in organic matter.



Maintenance of Soil Nutrients

Soil organic matter is also a significant source of nutrients. An acre of a medium textured soil profile, approximately six inches deep, will weigh approximately two million pounds. At an average mineralization rate of 1.5 percent, this could account for up to **17 pounds of nitrogen and 1.75 pounds of phosphorus per percent of organic matter**. At current prices of commercial fertilizer, this would amount to approximately **$11 per percent of organic matter.** Using 1 percent SOM as a baseline level, the total long-term value of a 1 percent increase is an estimated $29 per acre for the nutrient value and available water holding capacity. These estimates are based on Iowa's average of 34 inches of precipitation annually. Actual results will vary based on precipitation amounts and intensity, starting soil health conditions, crop rotation, and tillage methods selected.

How do you improve soil health and its value?

There are many things you can do to improve soil health and increase productivity and profitability.

No-till planting in between terraces in Southwest Iowa.

Manage More by Disturbing Soil Less

Eliminating or reducing tillage minimizes the loss of organic matter, reduces the impact of compaction, and protects the soil surface with plant residue.

More Crop Diversity

Increasing the diversity of a crop rotation and cover crops increases soil health and soil function, reduces input costs, and increases profitability.

A diverse cover crop mix including oats and radishes.

Keep a Living Root Growing Throughout the Year

Cover crops keep living roots throughout the year and provide a food source for soil microbes, which helps them cycle nutrients.

Add Livestock to Your Operation

Livestock will add nutrient rich manure to your soil, improve profitability of cover crops, increase soil organic matter and reduce input costs, as well as diversify your operation.

Keep the Soil Covered as Much as Possible

Residue management and cover crops provide a variety of benefits including erosion control, weed suppression, supplemental forage, reducing compaction, as well as fertility and other soil health benefits.

Questions?

For more information, conservation technical assistance, or to learn about Soil Health Management Systems, contact your local NRCS or conservation district staff or visit http://soils.usda.gov/ or www.ia.nrcs.usda.gov.

References

Licht, Mark and Al-Kaisi, Mahdi, 2012. Less Tillage for More Water in 2013.

Mannering, J.V. and L.D. Meyer, 1963. The Effects of Various Rates of Surface Mulch on Infiltration and Erosion.

Hudson, B.E., 1994. Soil Organic Matter and Available Water Capacity. Journal of Soil and Water Conservation, Vol. 49, No. 2. p. 189-194

USDA-NRCS. Soil Organic Matter Soil Quality Kit — Guides for Educators.

Want to unlock the secrets in YOUR soil?

Go to: www.nrcs.usda.gov

USDA NRCS

United States Department of Agriculture

Natural Resources Conservation Service

APPENDIX I

ISU STRIPS FACT SHEET

Prairie Strips: Small Changes, Big Impacts

"Want to stem soil and biodiversity loss, enhance fresh water supplies, curtail climate change, *and* improve people's lives? Then enhance agriculture with perennials and partnerships."

– Lisa Schulte Moore, STRIPS team scientist

"This is the kind of agriculture I love—to talk about the soil, about sustainability, about production. Will I be able to say that I left the land better than I found it? Hopefully. That's what matters to me."

– Seth Watkins, farmer and STRIPS practitioner

Researchers have found that converting as little as 10 percent of a row-cropped field to prairie can help reduce soil erosion, retain nutrients, and provide habitat for wildlife without impacting per-acre crop yield. Research has demonstrated that sowing native prairie species in narrow bands along contours and at the base of slopes on corn and soybean farmland is a relatively low cost way to garner multiple agricultural conservation benefits. Small changes can have big impacts.

Science findings

In 2007, researchers at Iowa State University and its partners tested the impacts of integrating native prairie vegetation within cropland at the Neal Smith National Wildlife Refuge in Jasper County, Iowa. The prairie species were strategically sown to slow the movement of water within 12 small watersheds, 1 to 8 acres in size with slope inclines between 6 and 11 percent. The cropland produced corn and soybeans using no-till management. The scientists monitored each watershed for crop yields, sediment, water, nitrogen, and phosphorus movement off the fields, greenhouse gas emissions, and plant, insect, and bird biodiversity. The work eventually became known as Science-based Trials of Row crops Integrated with Prairie Strips, or STRIPS.

Some of the watersheds were planted with tallgrass prairie vegetation in one or two contour strips among row crops, with separate prairie plantings at the base of the slope. The total land planted with prairie vegetation in a row-cropped watershed was either 20, 10, or zero percent. The entire land area (100 percent) was planted to corn or soybean in the zero percent watershed.

From 2007 to 2014, the STRIPS team found that the watersheds with only 10 percent prairie reduced sediment export by 95 percent, phosphorus export by 90 percent, and nitrogen export by nearly 85 percent in surface runoff water when compared to losses from the 100 percent row crop watersheds. On some fields, nitrogen loss through groundwater also was reduced by 70 percent.

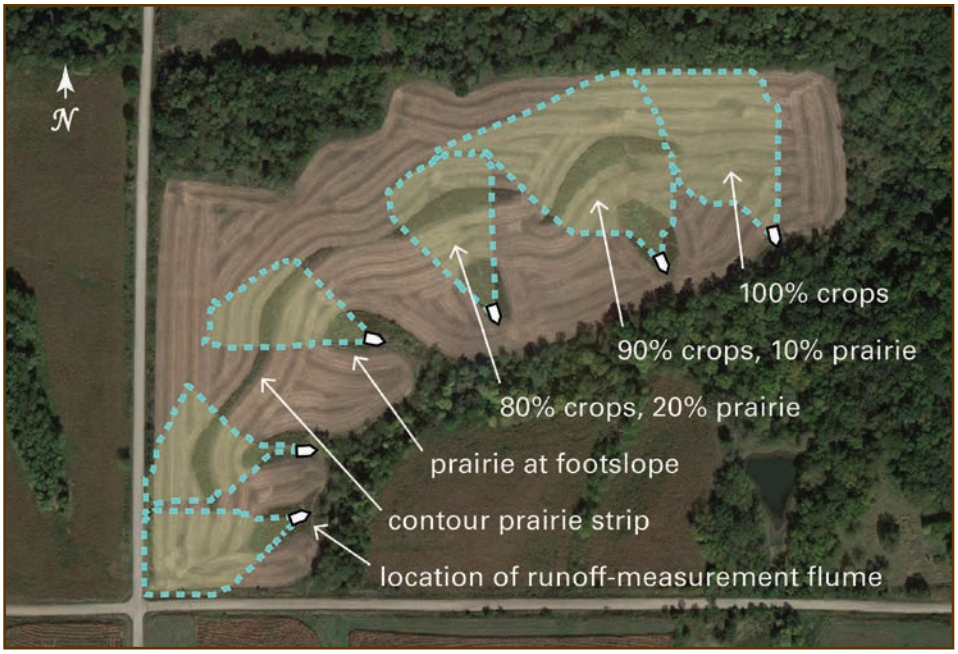
STRIPS research also demonstrated increased biodiversity. Within the surveyed prairie strips, an average of 51 native plant species were found, compared to 13 species found within the row crop areas. This plant diversity provides habitat that fosters conservation of native communities for plants, birds, pollinators, and other beneficial insects.

Prairie strips support several species of insect predators, such as lady beetles, that help control corn and soybean insect pests. The many flowers that grow in prairie strips support a diverse community of pollinators including 70 species

of native bees along with the European honeybee. Research also suggests prairie strips can reduce the negative impacts of neonicotinoids, an important class of pesticides, on non-target insect species.

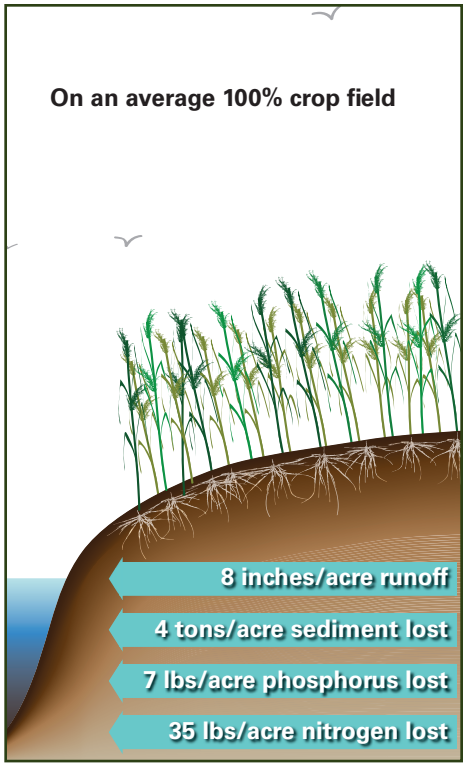
Fields with prairie strips provide habitat for twice as many birds and bird species than those with 100 percent row crops. Birds using the prairie strips included species of greatest conservation need such as the eastern meadowlark, grasshopper sparrow, field sparrow, and dickcissel.

Researchers found no impact on crop yield beyond the land area converted to prairie strips. Furthermore, the native plants established in prairie strips are unlikely to pose weed problems in farm fields. Financial assessments show that prairie strips is one of the most affordable conservation practices available to landowners.



This diagram shows the watershed boundaries of six STRIPS study sites after crop harvest. Dashed lines denote the watershed boundaries and the flumes are denoted by the white boat-shaped markers.

These flumes measure surface water runoff from the STRIPS watersheds. Note the amount of sediment displaced from a 100 percent no-till crop field (left) compared to a field enhanced with 10 percent prairie (center) and a field of 100 percent prairie, which has little sediment loss.

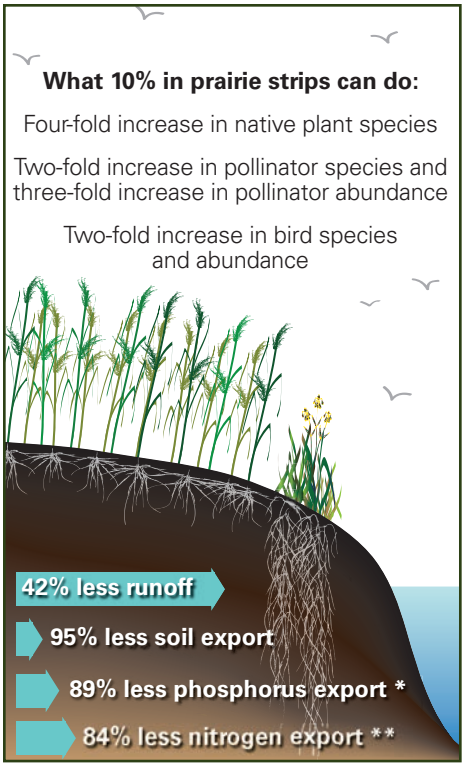


STRIPS researchers calculated average values for surface water runoff, soil and nutrient export from a field cropped entirely in corn, as well as various indicators of biodiversity. Compare this figure to its companion on page 3.

Tallgrass prairie benefits

Tallgrass prairie is a diverse mixture of native grasses and flowering plants uniquely adapted to the climate and soils of the central United States.

Prairie strips keep vital soil resources in crop fields. Deep-rooted prairie plants increase soil organic matter and improve water infiltration. The plants' stiff, upright stems slow surface runoff and help hold soil in place during heavy rains.



On a 10% strips field, all of the above-measured biological and environmental indicators show improvement. There is no appreciable loss of yield on land that remains in annual crops.
*** Phosphorus moving with surface water runoff.**
**** Nitrogen moving with surface water runoff.**

Diversity: More than just "more"

Prairie strips, with multiple plant species, have an advantage over similar conservation practices, such as contour buffer strips or filter strips, which are often a single grass species. Plant diversity lets a prairie flourish under a variety of climatic conditions. Even if an individual species performs poorly because of yearly nutrient or water fluctuations, the ecosystem as a whole thrives, reducing vulnerability to climate extremes.

A mixture of plants also supports an array of animals, insects, and birds that are found only in the central United States. A diverse ecosystem supports multiple land uses. For example, haying, grazing, hunting, honey production, bird watching and photography.

From experiment to practice

Farmers are showing interest in implementing this practice on their own farm fields based on the scientific findings. Working with several partners, the STRIPS team established demonstration sites on farms throughout Iowa. In addition to private land locations, prairie strips demonstration sites can be found at several Iowa State University Research and Demonstration Farms. Field days are periodically held at these sites during which farmers, landowners, consultants, and others can view prairie strips and talk with the landowners and land managers.

The cost of installing prairie strips

The STRIPS team calculated the average annual cost for one acre of prairie strips ranges between $280 and $390. Using the "10 percent solution," the cost of protecting a farm field ranges $28-$39 per acre per year. Costs include land costs, potential tillage and herbicides to facilitate prairie plant establishment, prairie seed, and annual and periodic mowing to encourage the prairie plants to take hold.

Land costs include property taxes and potentially either foregone rent or net revenue loss associated with taking land out of crops. These costs represent more than 75 percent of the total, but in some cases can be relieved through Conservation Reserve Program (CRP) contracts offered by the USDA Farm Service Agency. Overall, prairie strips are one of the least costly conservation practices available to landowners and farmers, similar to cover crops and less expensive than terraces.

The STRIPS team continues to conduct financial assessments of prairie strips. Up-to-date information can be found on the project website: http://www.prairiestrips.org.

Restoring balance

Iowa owes the immense agricultural productivity it reaps to the prairie. Historically, perennial prairie covered 85 percent of Iowa, and its deep root network built and held together a fertile topsoil layer that was many feet deep.

Now, that same land is in agricultural production, with the majority in row crops. However, shallow rooted annual crops such as corn and soybeans cannot reproduce the soil-retaining and building capacity of a perennial prairie system. The large-scale conversion to row crops has drastically reduced native habitat and biodiversity. Conservation practices need to be implemented to keep soil, moisture and nutrients on the field. Without such practices in place, more than half of the prairie-built topsoil of Iowa has been lost in the past 50 years, and nutrient runoff and waterway pollution have become common. Climatic extremes continue to put pressure on the productivity of monoculture cropping systems.

The public as well as local and federal governments increasingly urge the adoption of measures that reduce the impacts of agricultural production on soil health, water quality from the Mississippi River Basin down to the Gulf of Mexico, and grassland biodiversity. Programs such as the USDA Natural Resources Conservation Service (NRCS) Soil Health Initiative, the Iowa Nutrient Reduction Strategy, and Iowa's Wildlife Action Plan encourage farmers and landowners to voluntarily adopt practices that improve soil, ecosystem, and watershed health.

Agriculture in Iowa can balance production with conservation. The STRIPS research team has shown that this conservation practice can sustain agricultural production while also providing diverse and extensive benefits across a broad range of ecological and economic criteria. Landscape diversity in the form of prairie strips creates a natural buffer against soil erosion and nutrient loading of streams, and helps water infiltrate soil so it can later be used by crops. It also preserves important habitat for wildlife, including pollinators and natural predators of crop pests.

Planting prairie strips is a feasible and effective conservation practice with real benefits for farmers, landowners and society. Prairie strips provide big impacts through these small changes in farmland.

For more information

- STRIPS project website: http://www.prairiestrips.org
- Tallgrass Prairie Center website: https://tallgrassprairiecenter.org
- This and other publications can be found on the ISU Extension Store: https://store.extension.iastate.edu

See prairie strips at work:

- Fields with prairie strips are located at the Iowa State University Research and Demonstration farms across the state: http://farms.ag.iastate.edu/farms
- Prairie strips research fields are located at the Neal Smith National Wildlife Refuge, Prairie City, Iowa: https://www.fws.gov/refuge/neal_smith

Top ten priorities for agricultural policies and programs

Data from the STRIPS team

Priority	Addressed by prairie strips
1. Drinking water quality	✓
2. Water quality for aquatic life	✓
3. Rural job opportunities	✓
4. Flood control	✓
5. Water quality for recreation	✓
6. Game wildlife habitat	✓
7. Reducing greenhouse gases	✓
8. Tourism opportunities	✓
9. Crop production	✓
10. Non-game wildlife habitat	✓

The STRIPS team asked more than 1,000 Iowans to rank a list of benefits that could be derived from agriculture, and thus be promoted by policies and programs. Drinking water quality topped the list. More than just crop production, respondents valued agricultural practices that improved water quality, rural livelihood, and wildlife habitat, and also reduced greenhouse gas emissions and flood risk. Agriculture enhanced by prairie strips addresses all 10 top priorities for Iowans.

Acknowledgements

This publication was developed by the STRIPS project in conjunction with Iowa State University Extension and Outreach. A full list of STRIPS partners can be found at www.prairiestrips.org. Funding provided by Iowa State University, Iowa Department of Agriculture and Land Stewardship, Iowa Department of Natural Resources, Leopold Center for Sustainable Agriculture, National Science Foundation, The McKnight Foundation, U.S. Department of Agriculture, U.S. Fish and Wildlife Service, U.S. Forest Service, and Walton Family Foundation.

Prepared by the STRIPS team. Contact Lisa Schulte Moore, Natural Resource Ecology and Management, Tim Youngquist, Agronomy, and Matt Helmers, Agricultural and Biosystems Engineering, Iowa State University for more information.

Photos by Christopher Gannon, Jose Gutierrez-Lopez, Sarah Hirsh, Lisa Schulte Moore, Tatum Watkins, and Tim Youngquist.

APPENDIX J

NRCS IPM PRACTICE SHEET

Conservation Practice Standard Overview

Integrated Pest Management (595)

Integrated pest management (IPM) is a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies.

Practice Information

IPM is used to prevent or mitigate pest management risks for identified natural resource concerns. Strategies that keep pest populations below economically damaging levels and minimize pest resistance should be utilized because they also help prevent unnecessary pest management risks to natural resources and humans.

IPM is crop and/or land use specific and adheres to applicable elements and guidelines accepted by the local land grant university or extension.

Common Associated Practices

Integrated Pest Management (595) is commonly associated with conservation practices such as Conservation Crop Rotation (328), Nutrient Management (590), Conservation Cover, and Cover Crop (340).

For further information, contact your local NRCS field office.

APPENDIX K

LEASEHOLD IMPROVEMENTS

Lease Supplement for Investing in Improvements on a Rented Farm

Ag Decision Maker

File C2-07

The purpose of this lease supplement is to encourage cooperation between tenants and landowners who wish to obtain needed improvements, facilities, and buildings on a rented farm. Often rented farms are in need of additional buildings, facilities, major repairs, or soil improvements. Many of the additions and improvements that are needed on a rented farm will not be made unless the tenant pays for part or all of the cost. But tenants are not likely to make important contributions toward farm improvements unless they are sure of repayment for any unexhausted value of their investments in case they have to discontinue farming the property.

Procedure

First step: Agree on the improvements to be made: what each party will furnish, rate of depreciation, and estimated value of tenant's investment in each major improvement or addition.

Second step: Record and sign the agreements on the lease supplement. Fill out one copy each for landowner and tenant.

Suggested Rates of Depreciation

The initial cost of each improvement should be depreciated over a reasonable length of time. Straight-line depreciation is suggested because it is simple and it is commonly used for accounting purposes. For major improvements such as a livestock building, machine shed, or livestock production facility, a depreciation period of 15 to 25 years is suggested. For minor improvements such as fences or corrals, a shorter depreciation period may be used. However, the two parties may use any rate of depreciation they can agree upon. Farm income tax depreciation schedules are not particularly useful, though, because they often allow assets to be depreciated more rapidly than their actual market value decreases.

Spreading Limestone

The rate of depreciation and value of limestone varies with the type of soil, cropping system, the amount of limestone applied, and other factors. Under average conditions, the value of limestone may be assumed to last three to five years.

Commercial Fertilizers

The residual value beyond the year of application of fertilizers depends on a number of factors, including nutrients applied, rate of application, soil, crops to which applied, and seasonal weather conditions. The level of these nutrients in the soil at the time of the fertilizer application should also be considered. On farms where the rate is designed to maintain the present level of fertility, no allowance is usually made for fertilizer residual. On farms where the fertility level is low and the application rates are high relative to anticipated annual use, it may be desirable to specify a carry-over value of fertilizers.

Farm Structures and Repairs

A tenant on a cash or crop-share lease sometimes wants special improvements beyond what the landowner will furnish for machinery storage, grain storage, or livestock production. The landowner may receive little, if any, direct return from such an investment. If the landowner will not provide such a structure, then the tenant may offer to make

the improvement provided the landowner will guarantee payment for any unused value in case the tenant has to move before fully realizing the value of the investment. If it is a structure that fits in with the landowner's improvement plan, the landowner may provide a portion of the investment and safeguard the tenant for a period of years on the part the tenant provides.

Farm Drainage and Terraces

Farm drainage and terraces usually are the entire responsibility of the landowner. If the tenant bears all or part of the expense of tiling or ditching for drainage or constructing terraces, a suitable depreciation period for the tenant's investment should be used. In some cases, the tenant may provide labor and/or machinery for making such improvements. The Iowa Farm Custom Rate Survey (AgDM File A3-10) can be used to value the tenant's contribution in such a case. More information about tiling can be found in *AgDM Information File C2-90*, **Understanding the Economics of Tile Drainage**.

Suggestion depreciation rates	Years	Annual Rate
Livestock production facilities	10-20	5-10%
Machinery storage, grain bins	15-20	5-7%
Tile lines	10-15	7-10%
Terraces	10-15	7-10%
Fences	15-20	5-7%
Lime	3-5	20-33%

Prepared by William Edwards,
emeritus economics professor
wedwards@iastate.edu

www.extension.iastate.edu/agdm
store.extension.iastate.edu

Lease Supplement for Investing in Improvements on a Rented Farm

Description of Farm: County _____ Township _____ Section (s) _____ Acres _____

1. In consideration of the agreements herein contained, the signers agree that the improvements listed in Section A (below) have been completed on the above-described farm.

2. It is agreed that the signers will share contributions and costs necessary to the completion of these improvements as set forth in Section B.

3. It is agreed that the estimated value or cost of the tenant's contributions will be listed in Section C.

4. It is further agreed that the estimated value or cost of the tenant's contributions will be depreciated at the uniform annual percentage rate listed in Section D. The year of first depreciation is to be listed in Section E.

5. If for any reason the tenant leaves the farm before the tenant's estimated value or cost (Section C) is fully recovered through annual use and deprecation (Section D), then the landowner will pay the tenant for the remaining undepreciated value of the tenant's investment.

6. It is agreed that each item as set forth opposite the signatures of the landowner and tenant will be viewed as a separate contract supplemental to the lease. New items may be agreed upon at any time during the term of the lease and recorded in the spaces below.

Section A Type and location of improvement	**Section B** Cost of contributions by landowner (L) or by tenant (T)						**Section C** Total cost of tenant's contribution	**Section D** Annual rate of depreciation (percent)	**Section E** Lease year when depreciation begins	**Section F** Date signed	**Section G** – Signatures I hereby accept my indicated share of the responsibility for the improvements recorded in Section A, which I have approved.
	Materials		Labor		Machinery						
	L	T	L	T	L	T					
											L. T.
											L. T.
											L. T.
											L. T.
											L. T.
											L. T.
											L. T.
											L. T.

Appendix G

Resources

**__Regenerative agriculture__ is an approach to food and farming systems that regenerates topsoil and increases biodiversity now and long into the future.*
http://regenerationinternational.org/2017/02/24/what-is-regenerative-agriculture/

"**ReGenerate IL**" aims to restore farm, soil, water quality, wildlife and community health. https://www.regenerateillinois.org/

The Wild Farm Alliance protects biological diversity on working lands. Wild Farm Alliance works to empower farmers, connect consumers, and protect wild nature. http://www.wildfarmalliance.org/

"The Farm as Natural Habitat, Reconnecting Food Systems with Ecosystems" 2002. Edited by Dana L. Jackson and Laura L. Jackson. Island Press
http://www.internationalsoilinstitute.com/ description of Cornell Soil Health Assessment Protocol. Link: https://soilhealth.cals.cornell.edu/ (A comprehensive manual of Soil health)

Flex Leasing, A Solution for Growers and Landowners. 2014. Family Farms Group LLC, Brighton Il. pdf document

Adaptation Resources for Agriculture: Responding to Climate Variability and Change in the Midwest and Northeast. A product of the USDA Midwest, Northeast, and Northern Forests Climate Hubs. USDA. October 2016.

Managing Farmland Holdings for Sustainability. Profiles of Organizations Undertaking the Challenge. July 2018. Liberty Prairie; Foresight Design Initiative; Food: Land: Opportunity, Localizing the Chicago Foodshed; Delta Institute

Understanding Soil Health and Watershed Function, A Teachers Manual. Didi Pershouse. *A joint project of:* The USDA Natural Resources Conservation Service, The USDA Southern Plains Climate Hub, The Soil Carbon Coalition, Redlands Community College, The Dixon Water Foundation. September 2017.