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

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]

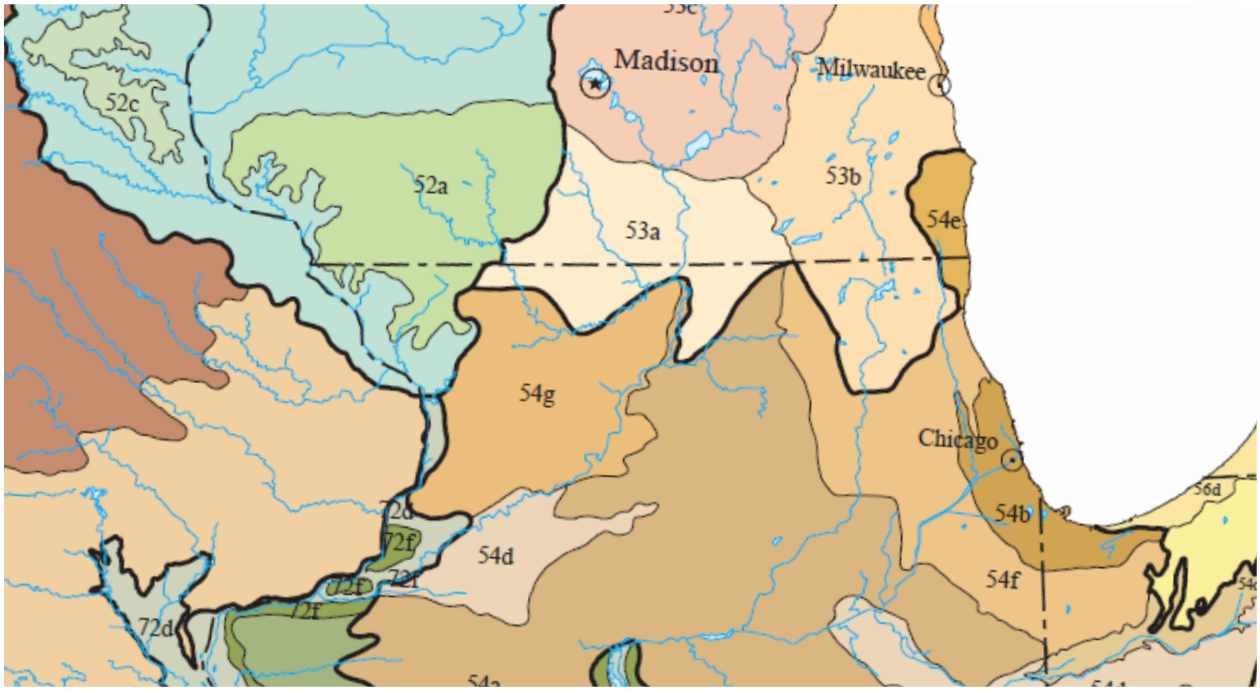
Today the Rock River Drift Plain ecoregion is principally composed of till and outwash plains. The western part of the region is hillier, and the eastern part is level or gently rolling. This region is distinct from its younger neighboring subsection of the Southeastern Wisconsin Till Plains: the Kettle 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

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

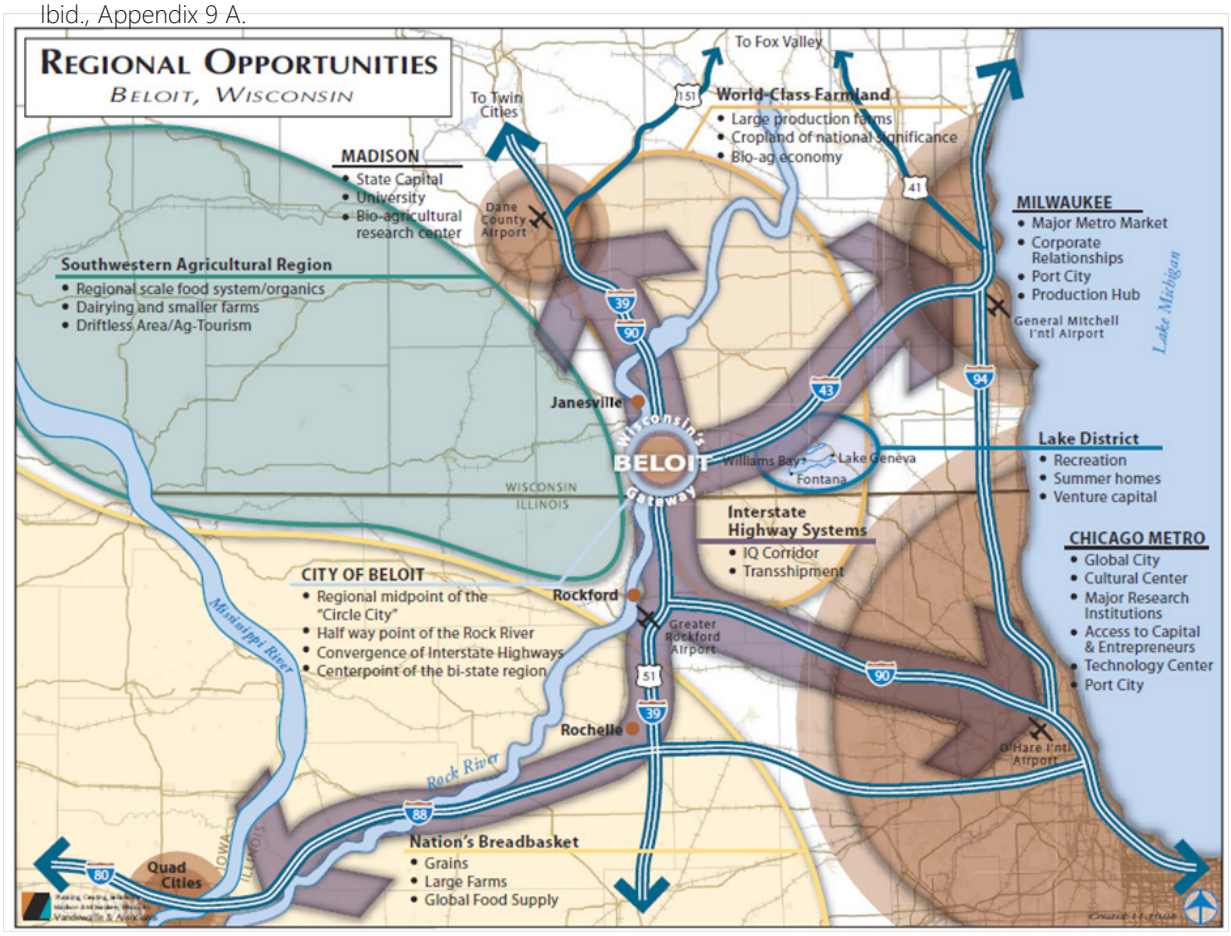
8 Rockford Metropolitan Agency for Planning. *Greenways: A Green Infrastructure Plan for Boone and Winnebago Counties*. 2015. Page 6-7 Rockford, IL. http://www.rmapil.org/assets/documents/greenways_document_2015.pdf

Sensitive areas in the Greenways Plan[9].

The Rock River region lies along critical 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.

9 Ibid., Appendix 9 A.



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

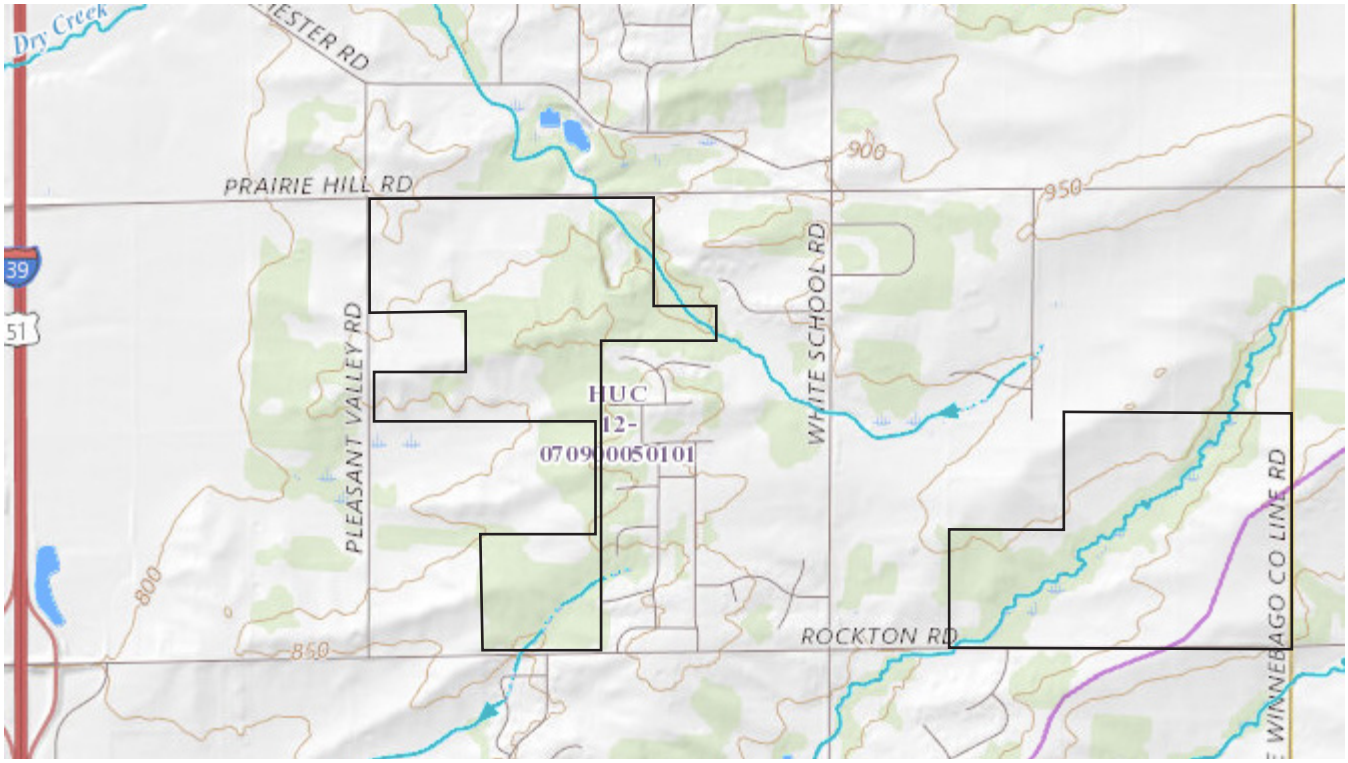
This farm is rolling, with moderate topographical changes and high potential for water erosion. A series of ridges cross the farm from east to west, creating sloping fields with clearly indicated drainage to a network of small streams.

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.

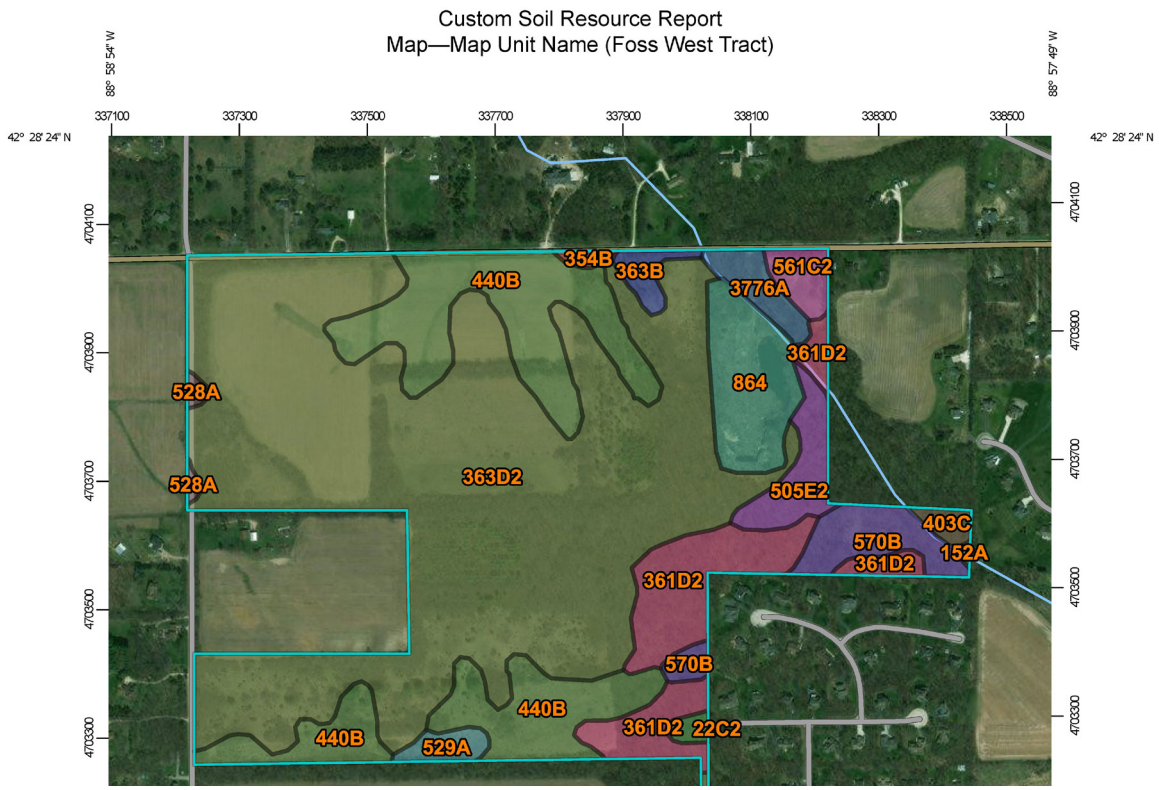
level) when erosion is taken into account. The Griswold loam estimated to make up most of the farmland on the west tracts is categorized as eroded by USGS. In a larger landscape setting already vulnerable to erosive forces, deforestation, plowing under of prairies, and continued agricultural use have 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.

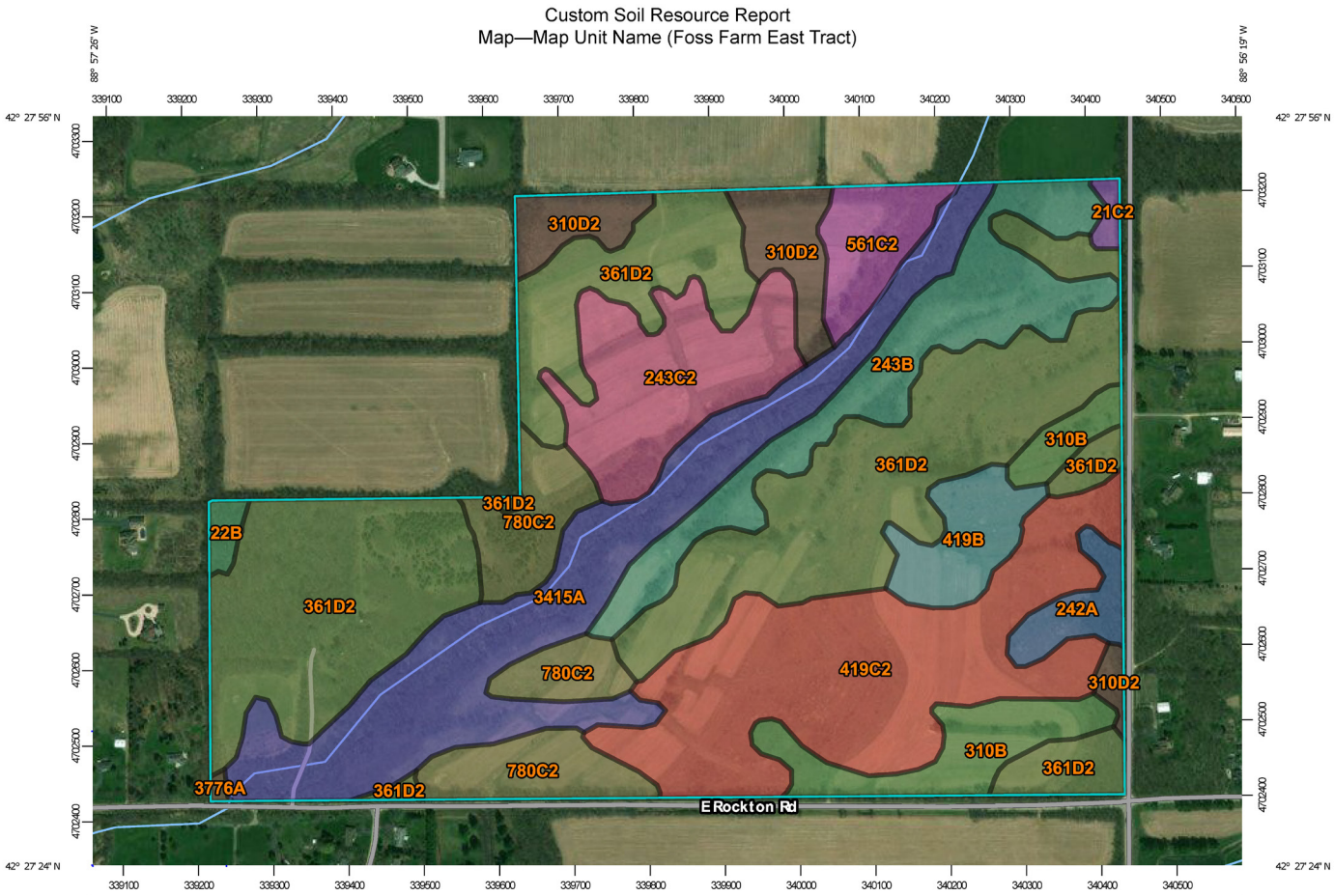


Table—Map Unit Name (Foss West Tract)

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%**

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 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. 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 loamy topsoils at the Foss Farm have likely eroded away since deforestation and tillage of prairies a century ago. 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 opportunity to adjust cropping rotations, practices and implement other practice 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 and buffers
- 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/ acres and water holding capacity worth $18/ acres.[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.

Water Quality

There is an opportunity to protect water quality in the streams in the 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

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

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

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 in 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 point primarily urban and industrial sources, and non-point sources, primarily agriculture. 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 feasible on the Foss Farm and warranting further discussion are in bold, with italicized practices already being pursued by the tenant.

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)***
- Spring/fall side dress
- Cover crops on tiled corn/soybean land
- ***Cover crops on non tiles 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

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

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

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 below.

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 on the box on the following page. 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.

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

CRP Land

There are remaining acreas of lapsed CRP land. This land will need to be restored- invasive shrubs have already begun to threaten these fields and adjoining restoration and agricultural areas. There will be a cost to 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 if the farmer has the capacity to farm extra acreage, then there is an reasonable argument that if NLI incurs the cost of restoration, it might as well generate revenue off the land through sustainable agricultural use. Restoration is currently limited by budget. Farming additional productive land will create more revenue for both the tenant and NLI, and can prevent lapsed conservation areas from being further pressured by aggressive and invasive plants.

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, 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 ind insect life cycles, and 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.

*SITL writes farm plans with 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 soil health and the agro-ecological landscape, minimize risk and protect the producer's long-term profitability. Sustainable agriculture includes providing a fair return to the producer while minimizing negative impacts to the environment, providing ecosystem services to the region and protecting the long term health and productivity of the land. The cropping opportunities in this chapter explore the various ways in which producers can be rewarded for sustainable management in the market.*

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

Grain Market Opportunities[8]

There are numerous market opportunities in addition to conventional grain spot markets in the Northern Illinois and the surrounding region. For farmers, producing for a specific market can result 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 untraditional 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, like high protein, oil content, food grade that are desirable for specific end uses and needs 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

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.

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.

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

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 or commodity markets or direct 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 opportunity for organic agriculture. Organic markets exist in the region. Many regional buyers with specialty grain programs also have organic grain programs. There are environmental incentives for organic agriculture at the Foss Farm, including the susceptibility 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 could prove a significant burden. As discussed in this section, 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.

There is not a strong tradition of organic agriculture in the Rock River Drift Plains. Discussing the possibility of organic agriculture with the tenant may also more difficult for this reason. Organic agriculture 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.

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

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 and "composted" for years in unmanaged bunker silage pits. The Foss Farm is in desperate need of a source of compost and organic matter for its soils, but ideally this organic matter comes at minimum cost to the operator or landowner.

The wood chips and manure could be hauled from Ledges 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 for 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:

- Growing 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 market research is needed
- Agricultural strategies include reducing 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.
- Evaluate restoration costs and compare cost of labor-intensive methods vs mechanical methods for restoration activities.
- Promoting practices that reduce weather-related risk, like building healthy soil and reducing nutrient and water runoff.
- Reducing future restoration burden by leveraging regenerative agriculture to generate rental income and reduce the spread of invasive species to unmanaged landscapes.

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.

Quarry

Reclamation of the quarry will certainly be a challenge at the Foss Farm. The primary concern is the understanding whether the quarry is a n environmental hazard. 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 or not, and what options there are for adaptive reuse or reclamation of this area at the Foss Farm.

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, Independence Grove in Libertyville, IL 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 a conversation and further investigation of how reclamation of the quarry can be part of the rehabilitation of the landscape at the Foss Farm.

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: A sign discovered near the quarry in the woods indicating an old well.
Below: 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. Calculate soil loss scenarios on agricultural land through RUSLE to ensure adherence to lease principles or to assess the impact of changing practices on soil loss.

2. Water quality assessment

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

3. Other Assessments

Give annual updates on the restoration progress, and record the acreage in progress or completed to assess impacts on the ecological landscape at 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 convention for all areas of the farm for easier representation the property and goals for each section.

Further Assessment ($750-1000 each) and Consulting

1. Forestry Assessment

2. Quarry/ Surface Mining Expert

3. Botanic Plant Inventory

2019-2020 SUGGESTED ACTION PLAN

Listed below are the most urgent activities and recommendations for 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.
- Establish naming convention for different landscapes and activities.
- Establish better access through mowed and gravel surfaced paths.
- Determine the soil lab of choice and begin annual soil testing protocol.
- Hire consultants for further assessments of quarry and wooded areas.
- 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.
- Encourage tenant to investigate additional grain market opportunities.
- Continued invasive species removal and containment.

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: ISU STRIPS FACT SHEET

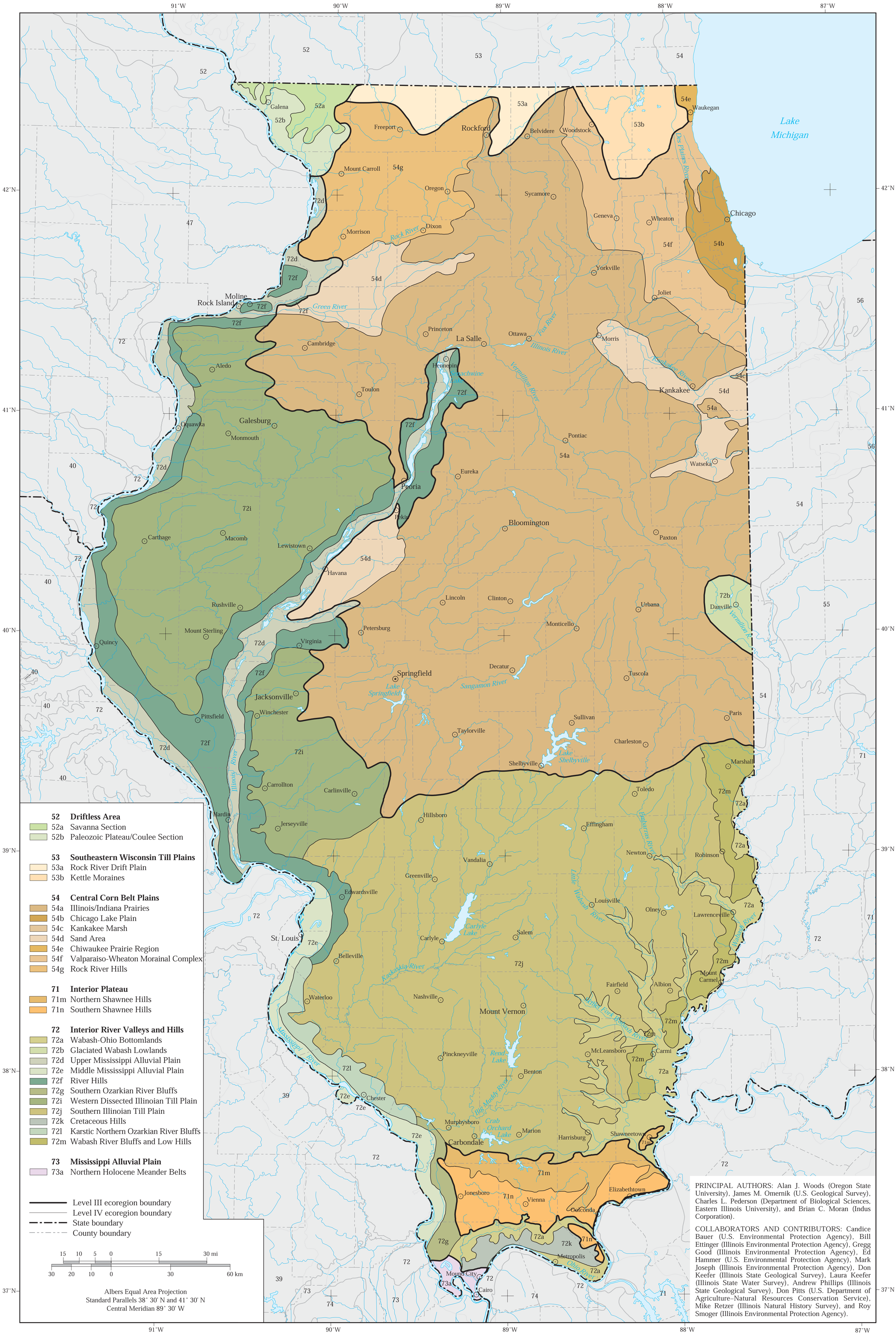
APPENDIX I: NRCS IPM PRACTICE SHEET

APPENDIX J: LEASEHOLD 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

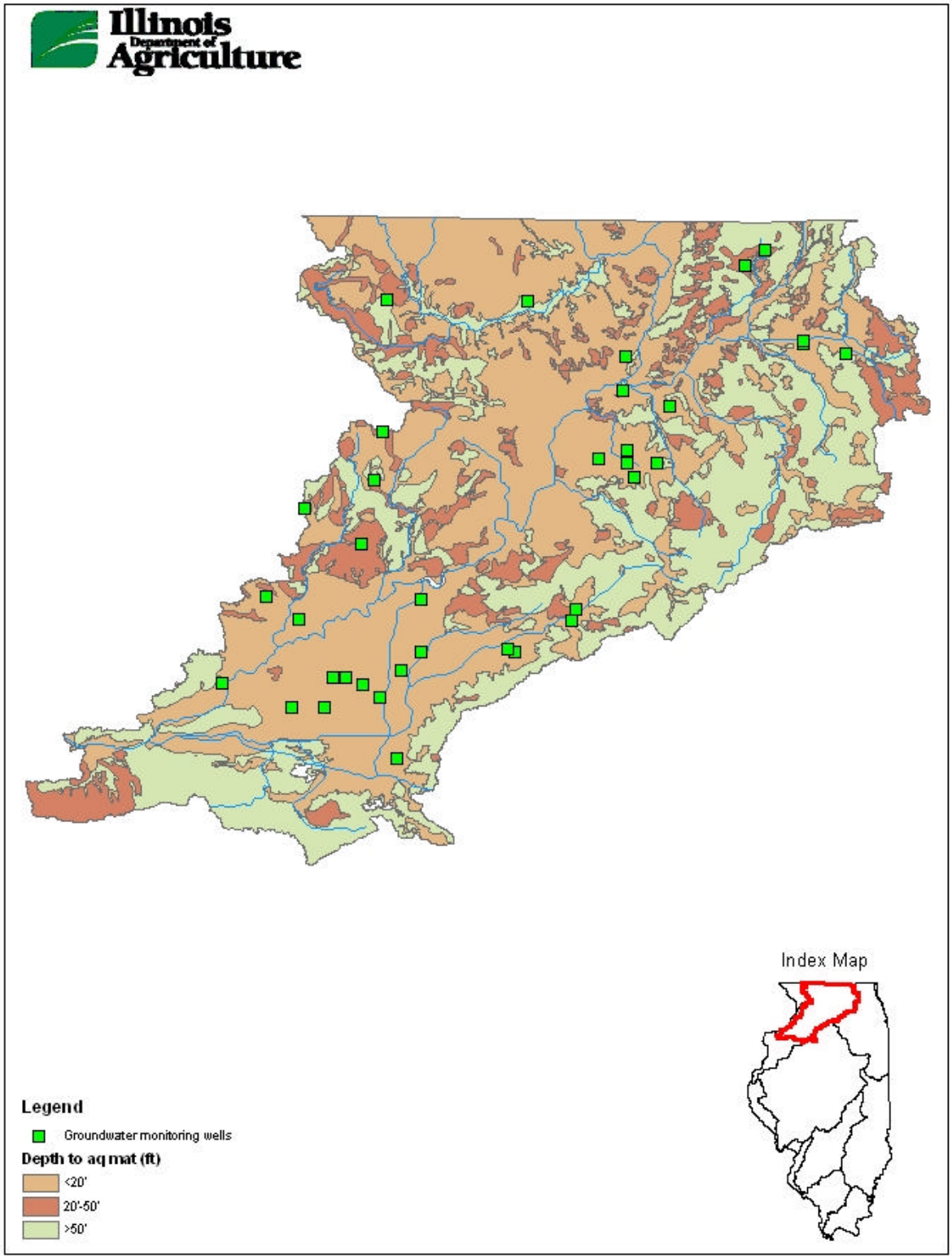
PRINCIPAL AUTHORS: Alan J. Woods (Oregon State University), James M. Omernik (U.S. Geological Survey), Charles L. Pederson (Department of Biological Sciences, Eastern Illinois University), and Brian C. Moran (Indus Corporation).

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).

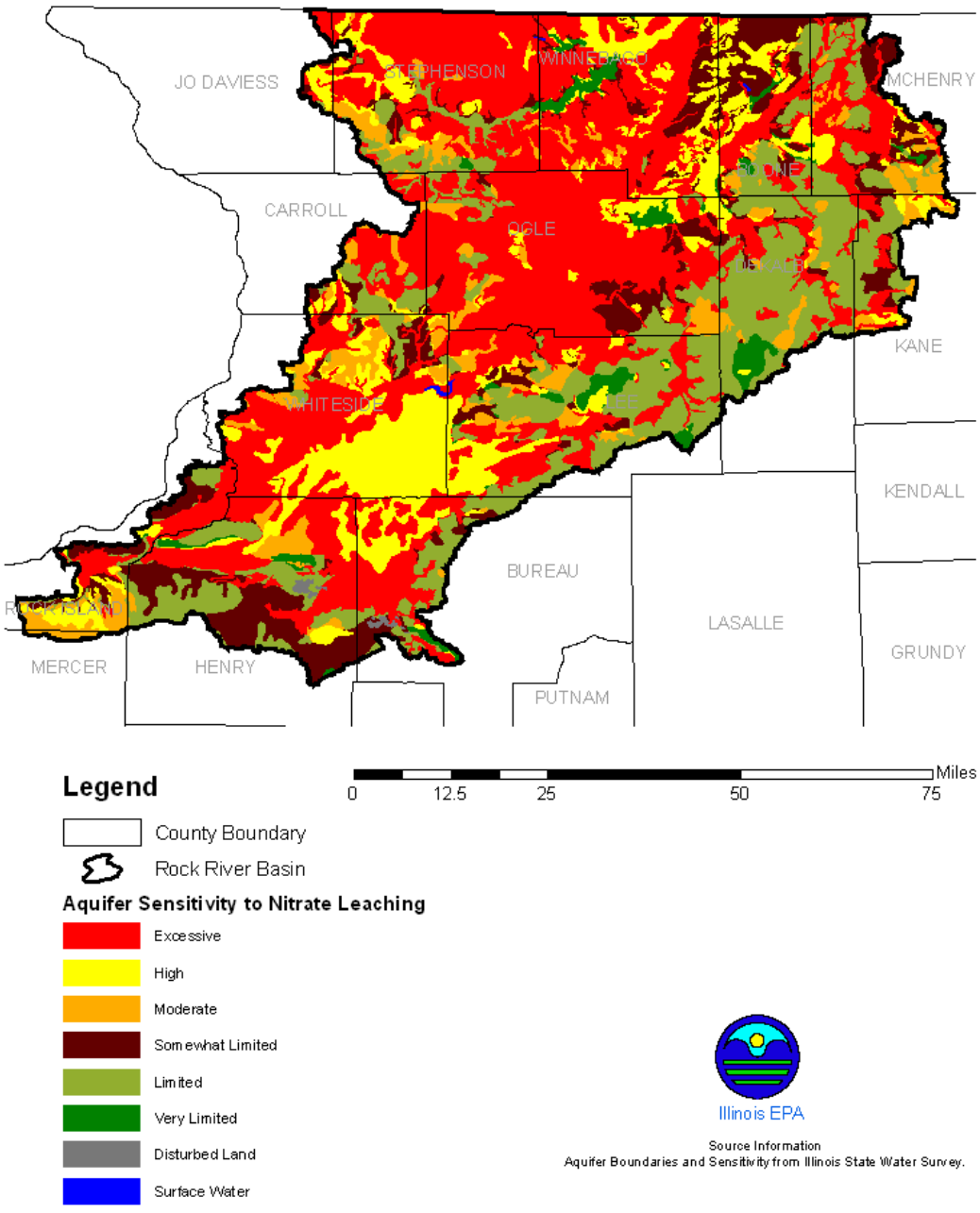
APPENDIX B

SELECTED MAPS, EPA ROCK RIVER BASIN ASSESSMENT, 2006

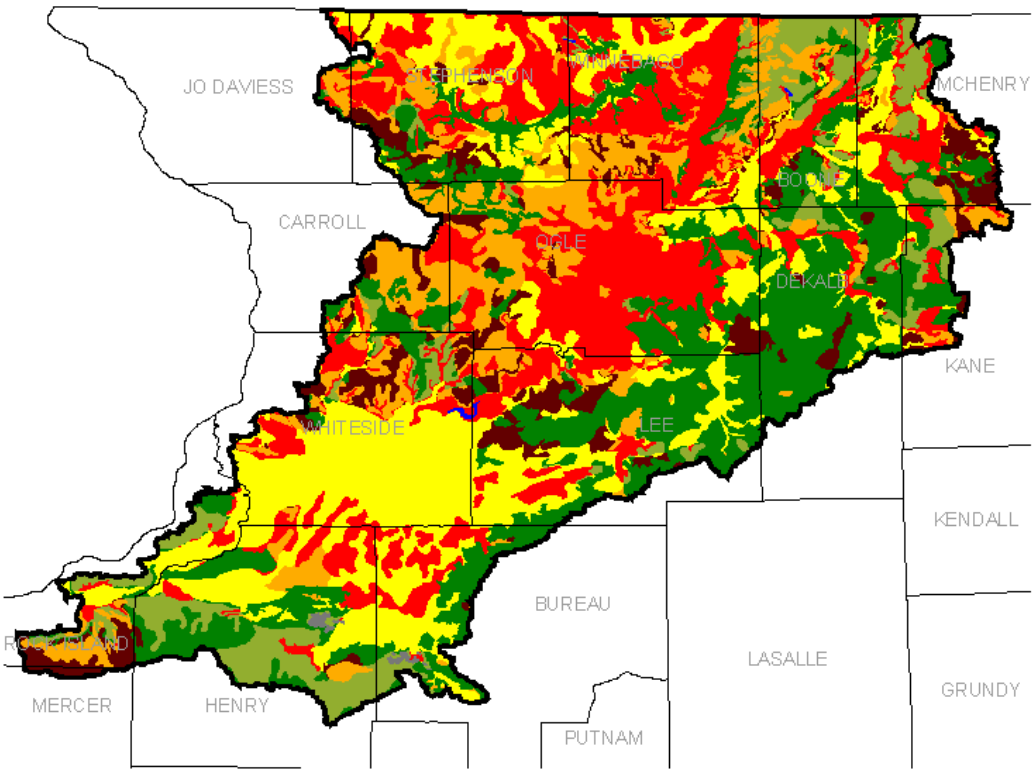
Figure 25. IDA Pesticide Monitoring Network wells and depth to uppermost aquifer in the Rock River Basin (Keefer 1995).



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



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

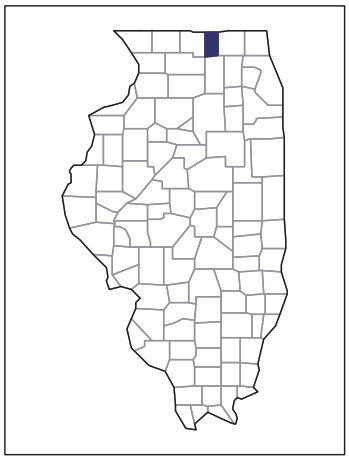


APPENDIX C

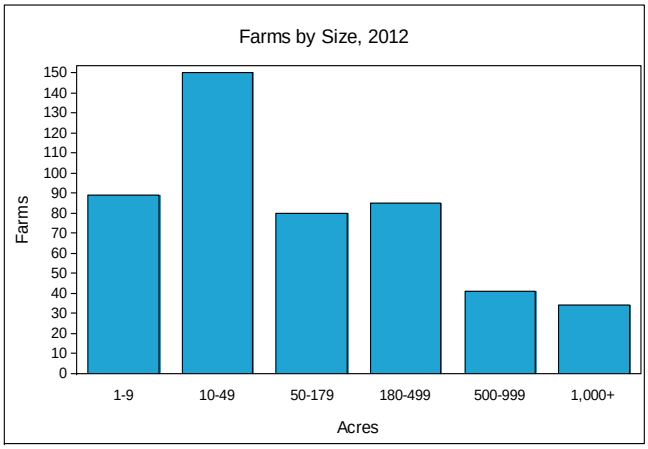
USDA NASS CENSUS OF AG
BOONE, WINNEBAGO AND STEPHENSON COUNTIES

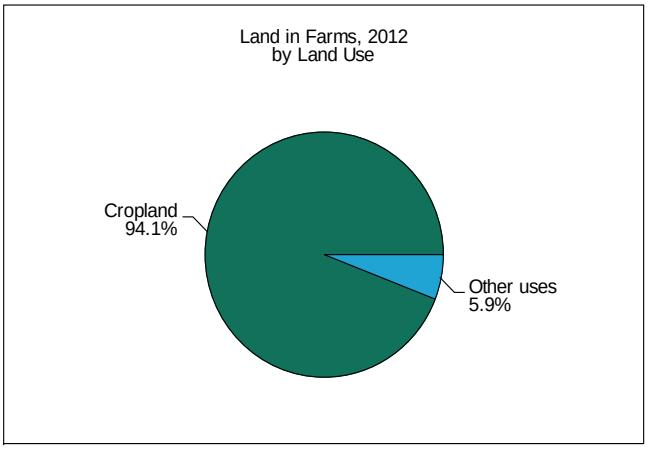
2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

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

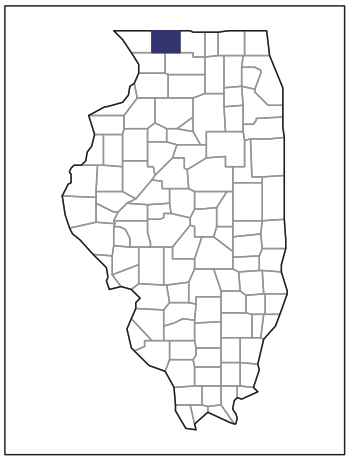
Economic Characteristics	Quantity
Farms by value of sales:	
Less than $1,000	93
$1,000 to $2,499	51
$2,500 to $4,999	23
$5,000 to $9,999	40
$10,000 to $19,999	32
$20,000 to $24,999	16
$25,000 to $39,999	12
$40,000 to $49,999	7
$50,000 to $99,999	35
$100,000 to $249,999	72
$250,000 to $499,999	44
$500,000 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

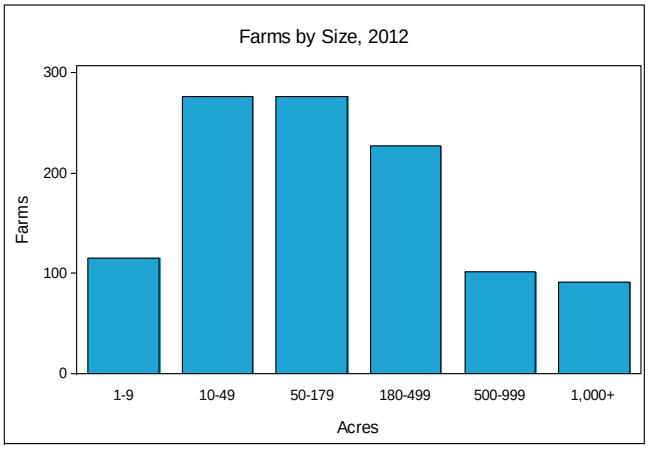
See "Census of Agriculture, Volume 1, Geographic Area Series" for complete footnotes, explanations, definitions, and methodology.
- Represents zero. (D) Withheld to avoid disclosing data for individual operations.
[1] Universe is number of counties in state or U.S. with item. [2] Data were collected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

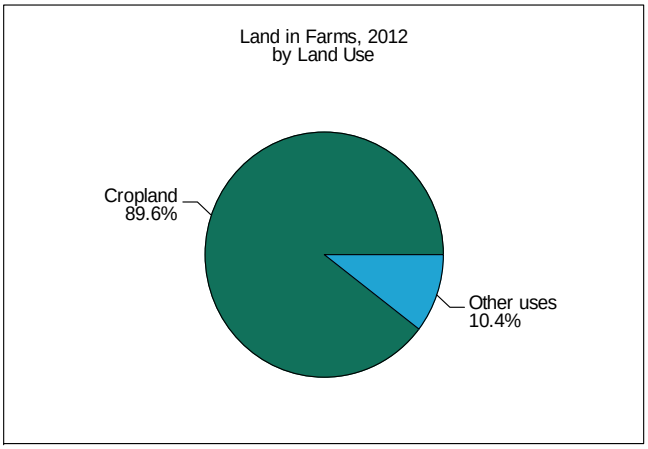
2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

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

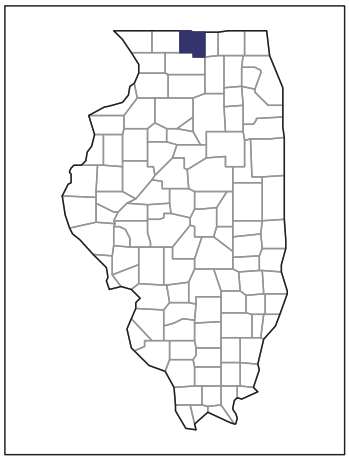
Economic Characteristics	Quantity
Farms by value of sales:	
Less than $1,000	284
$1,000 to $2,499	58
$2,500 to $4,999	48
$5,000 to $9,999	61
$10,000 to $19,999	63
$20,000 to $24,999	25
$25,000 to $39,999	30
$40,000 to $49,999	21
$50,000 to $99,999	101
$100,000 to $249,999	143
$250,000 to $499,999	98
$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

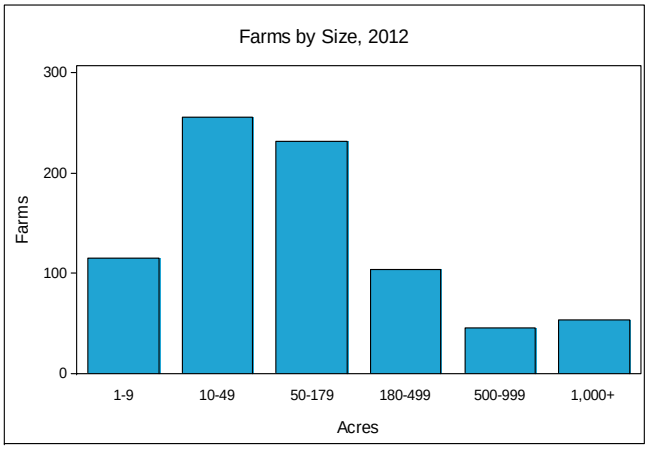
See "Census of Agriculture, Volume 1, Geographic Area Series" for complete footnotes, explanations, definitions, and methodology.
- Represents zero. (D) Withheld to avoid disclosing data for individual operations.
[1] Universe is number of counties in state or U.S. with item. [2] Data were collected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

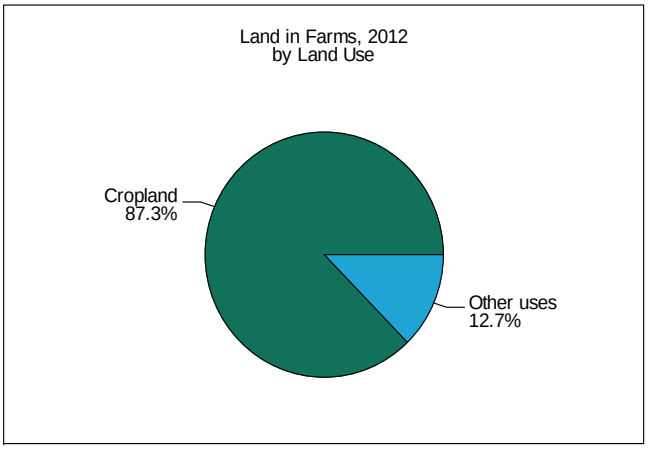
2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

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

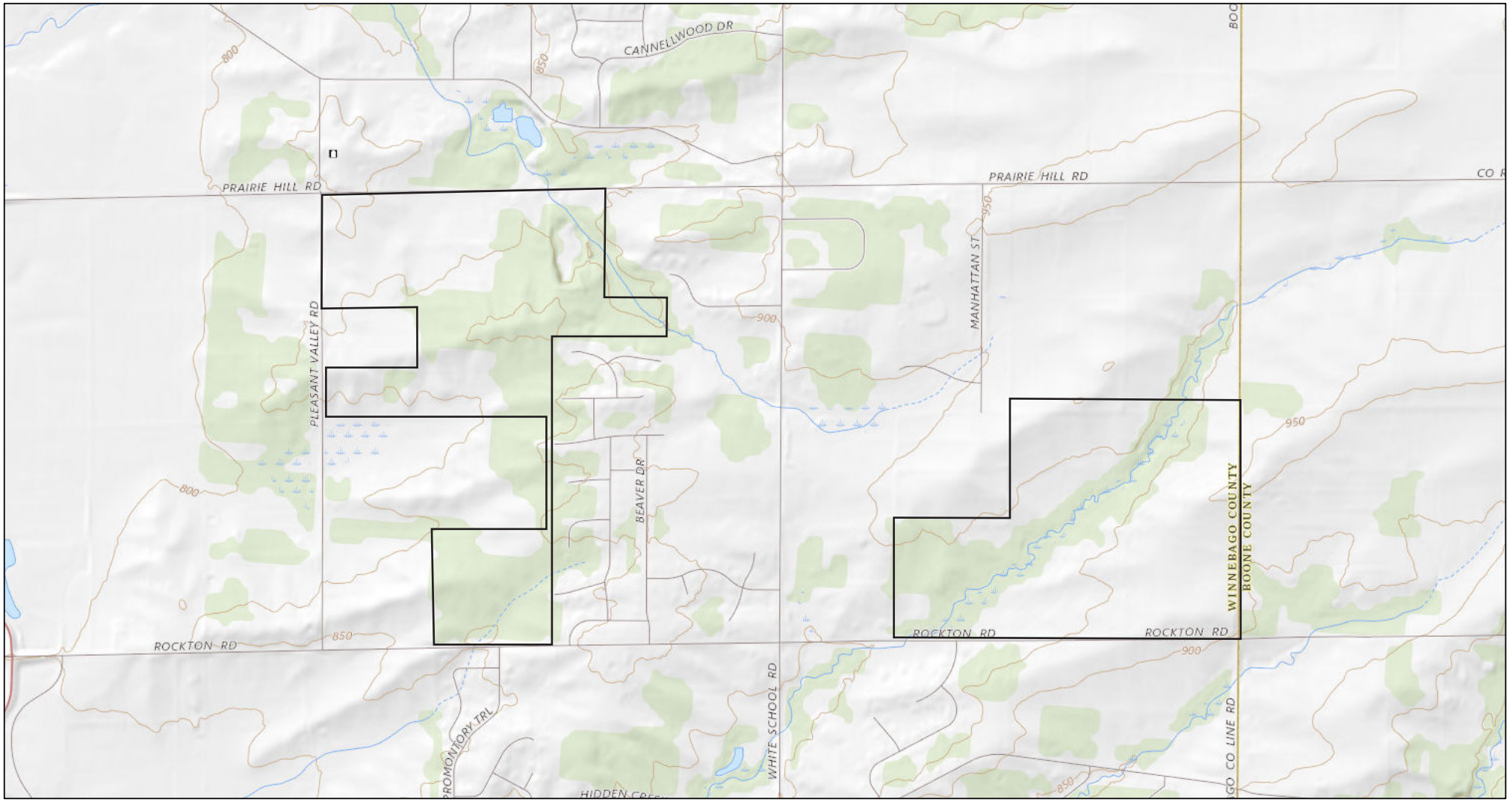
Operator Characteristics	Quantity
Principal operators by primary occupation:	
Farming	357
Other	450
Principal operators by sex:	
Male	679
Female	128
Average age of principal operator (years)	59.3
All operators by race [2]:	
American Indian or Alaska Native	3
Asian	-
Black or African American	-
Native 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 VIEWER

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

February 1, 2019

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

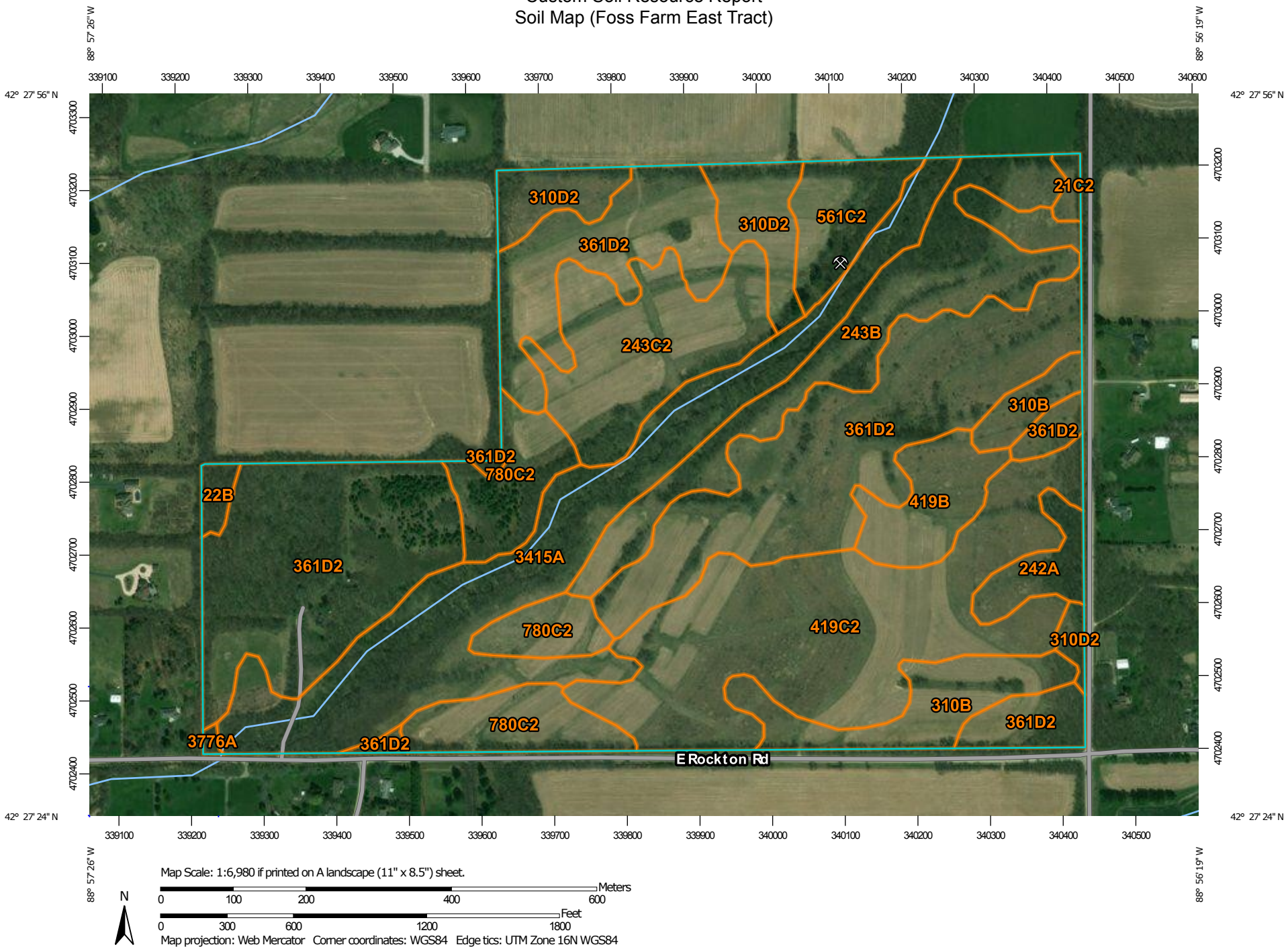
alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington,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

Contents

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.

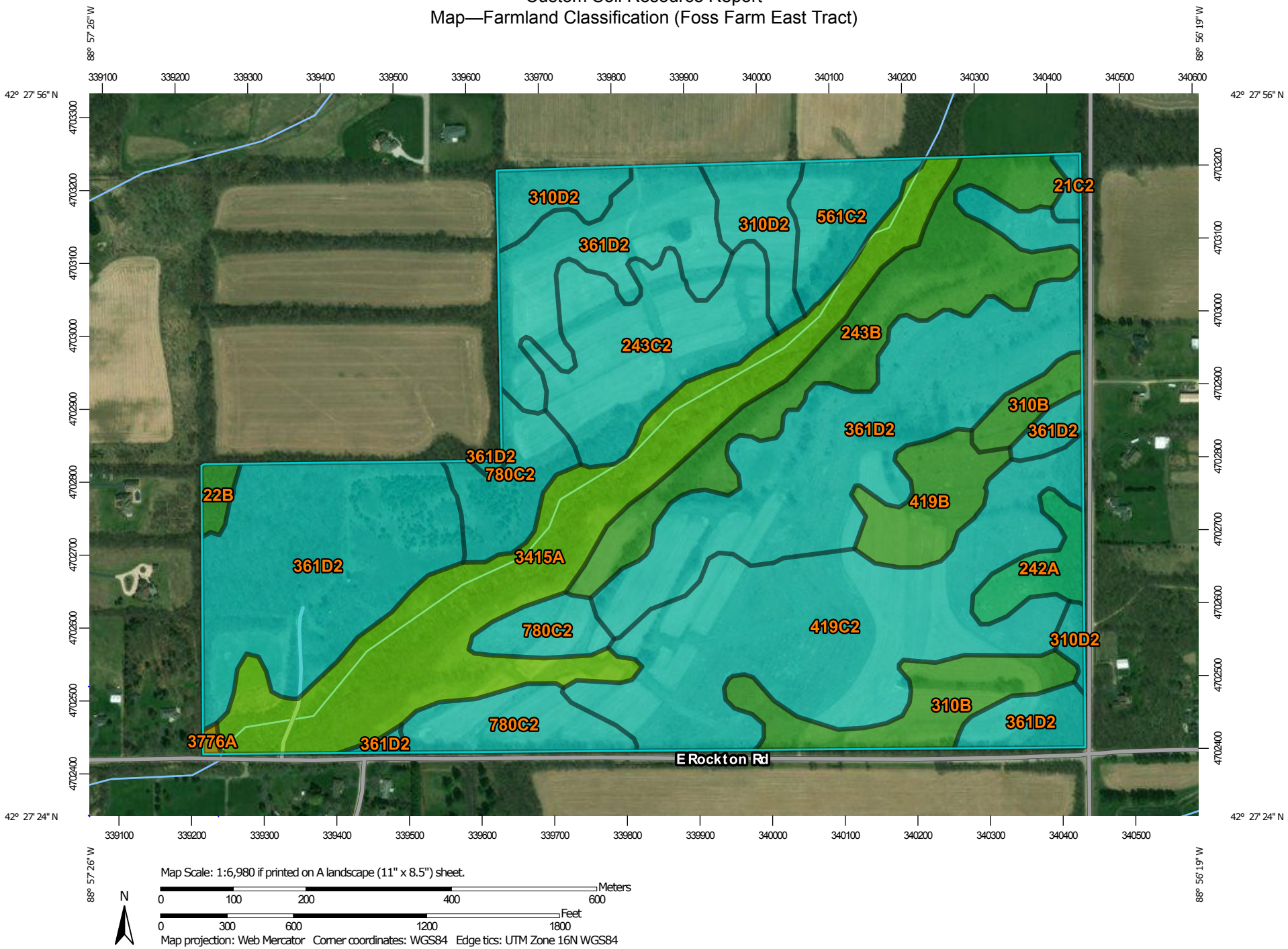
Land Classifications

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.

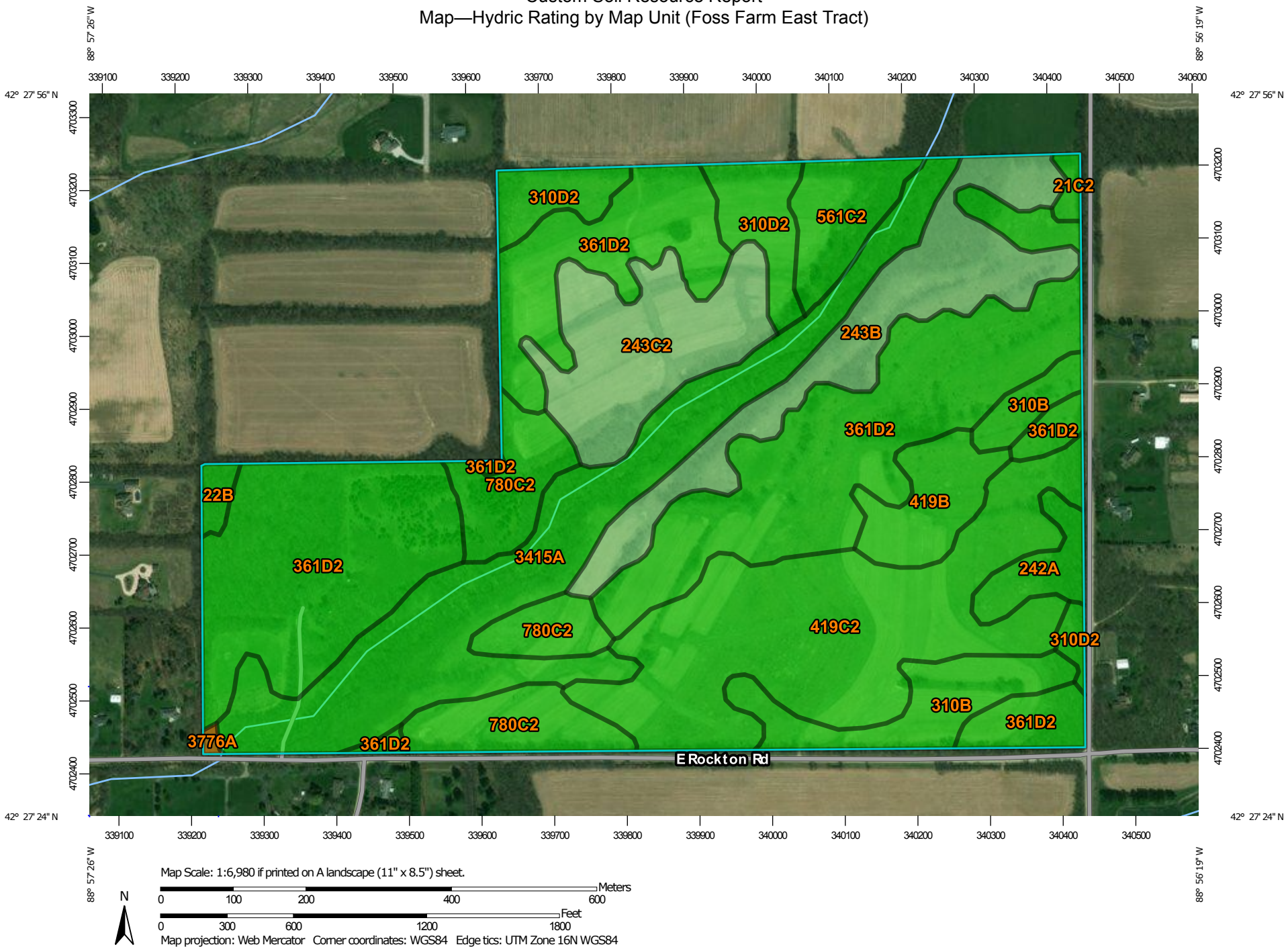
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

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.

Custom Soil Resource Report
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.

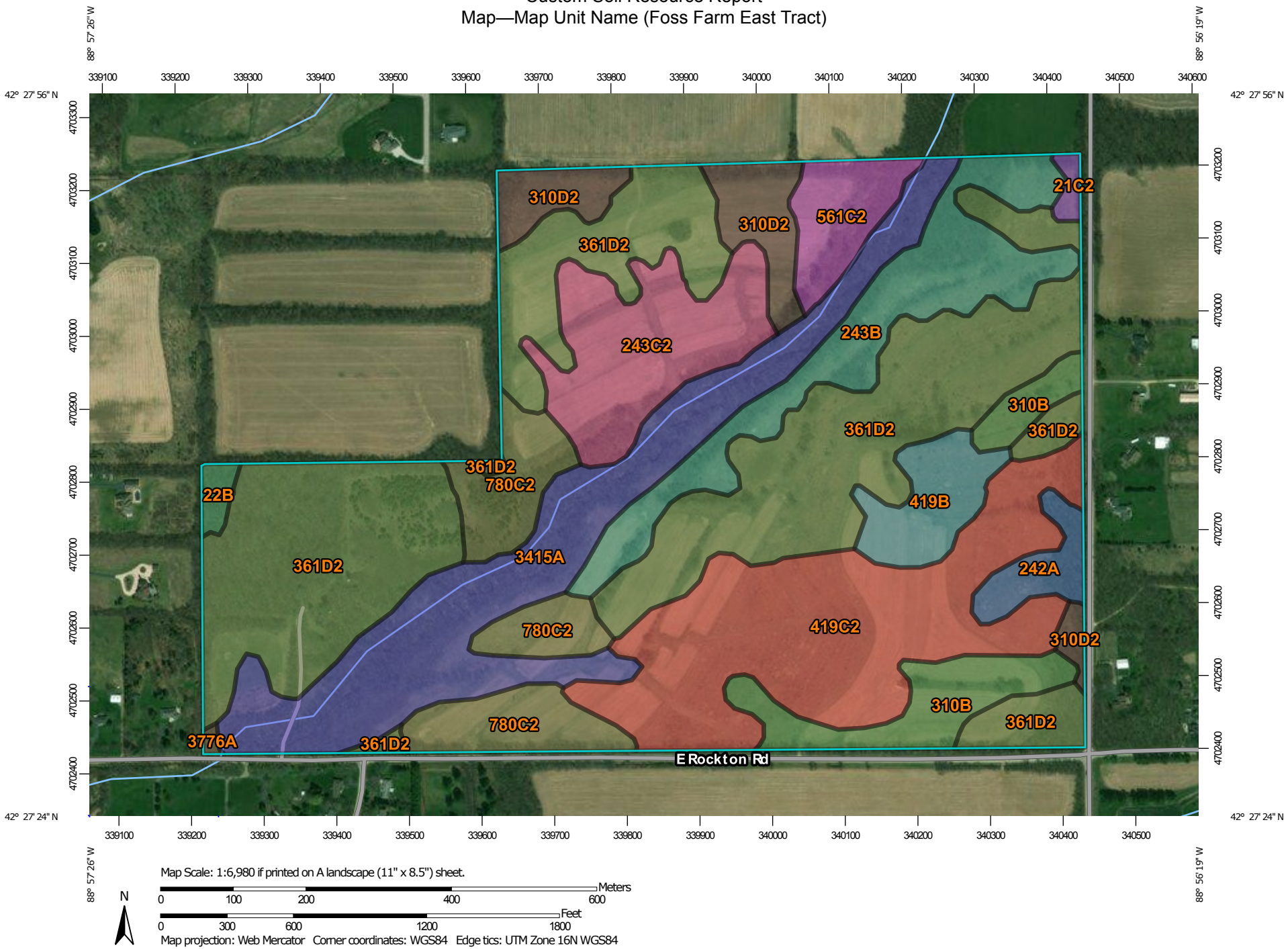
Soil Qualities and Features

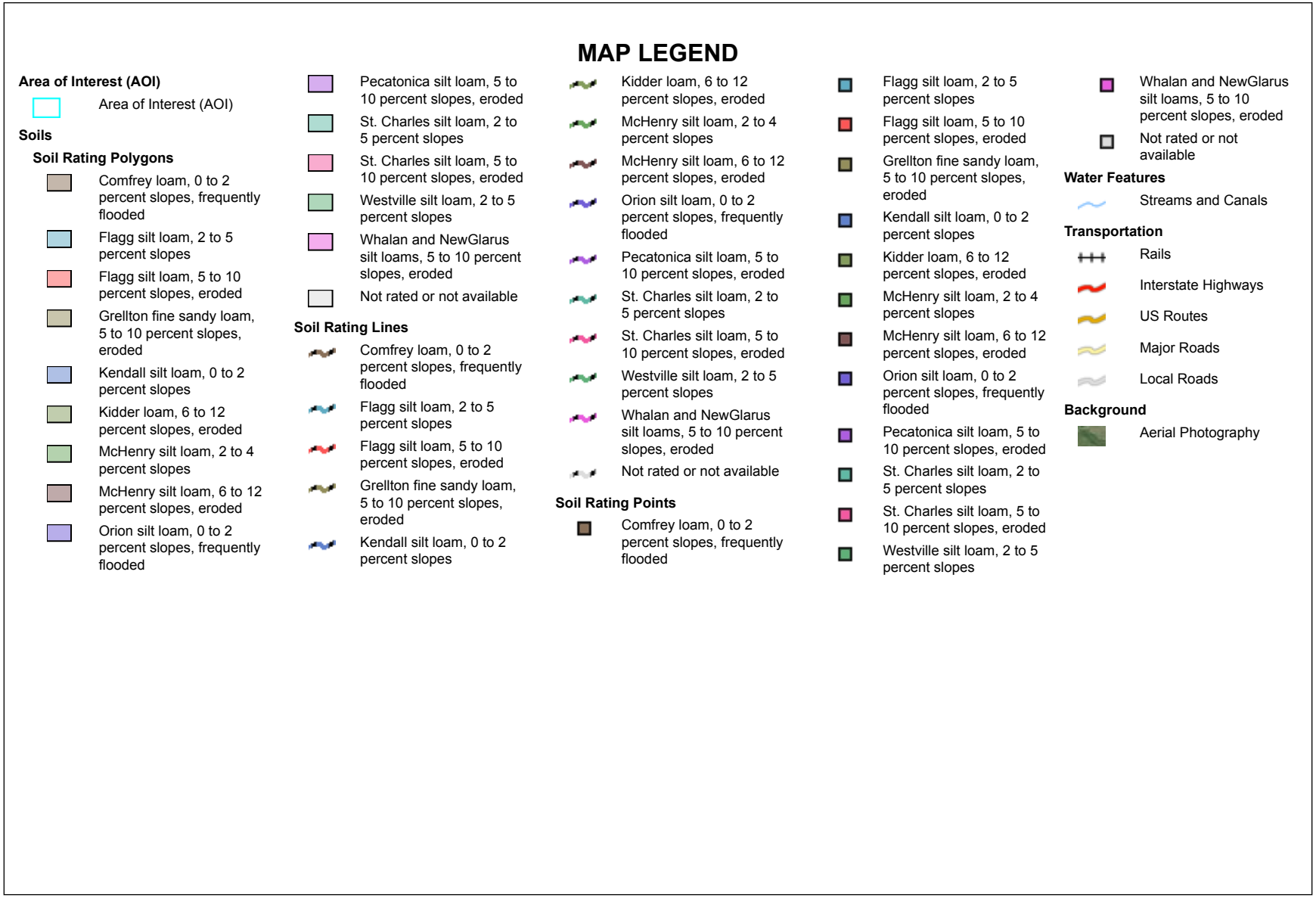
Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. 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.

Custom Soil Resource Report
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)

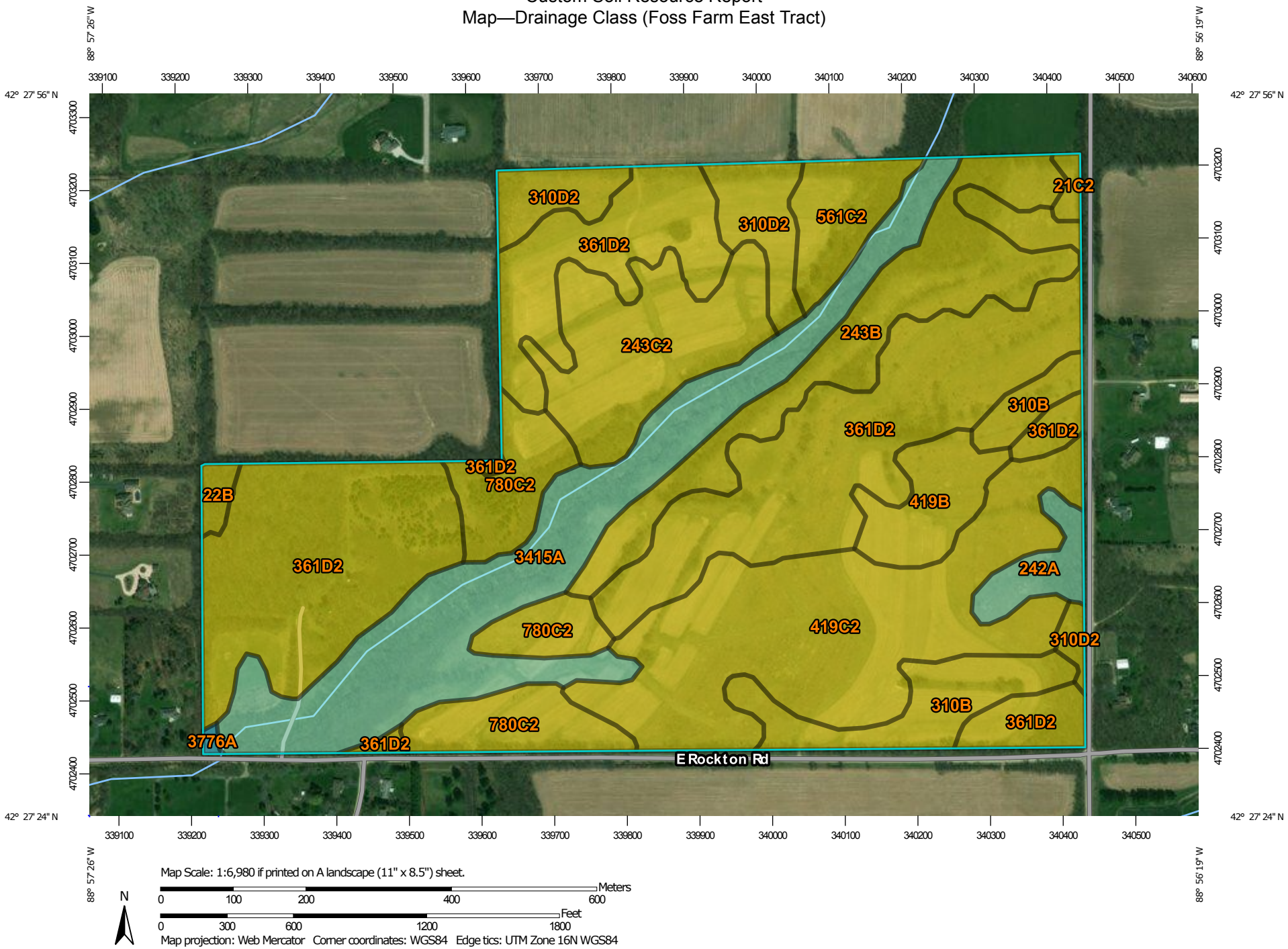
Aggregation Method: No Aggregation Necessary

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."

Custom Soil Resource Report
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

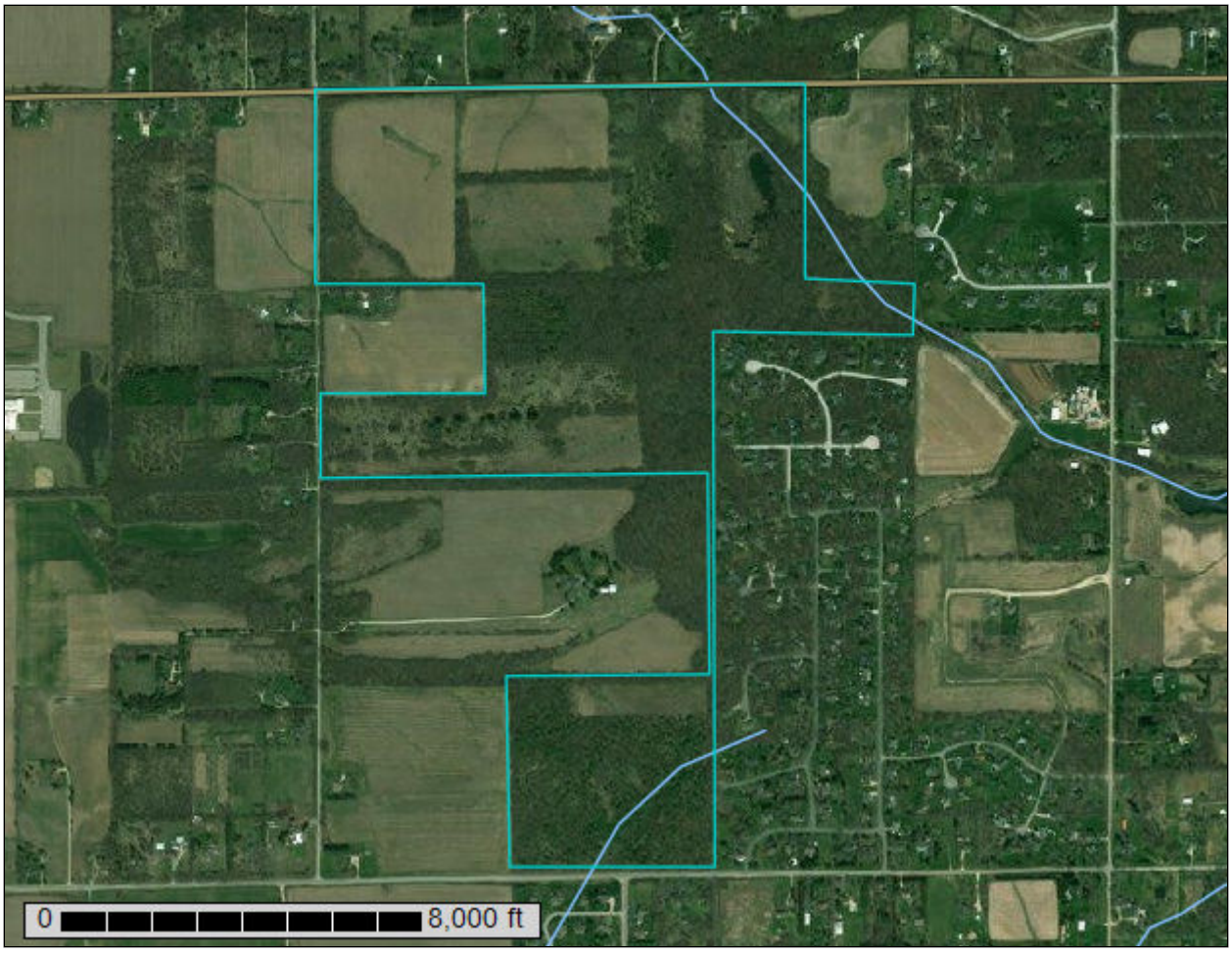
NRCS

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



February 1, 2019

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

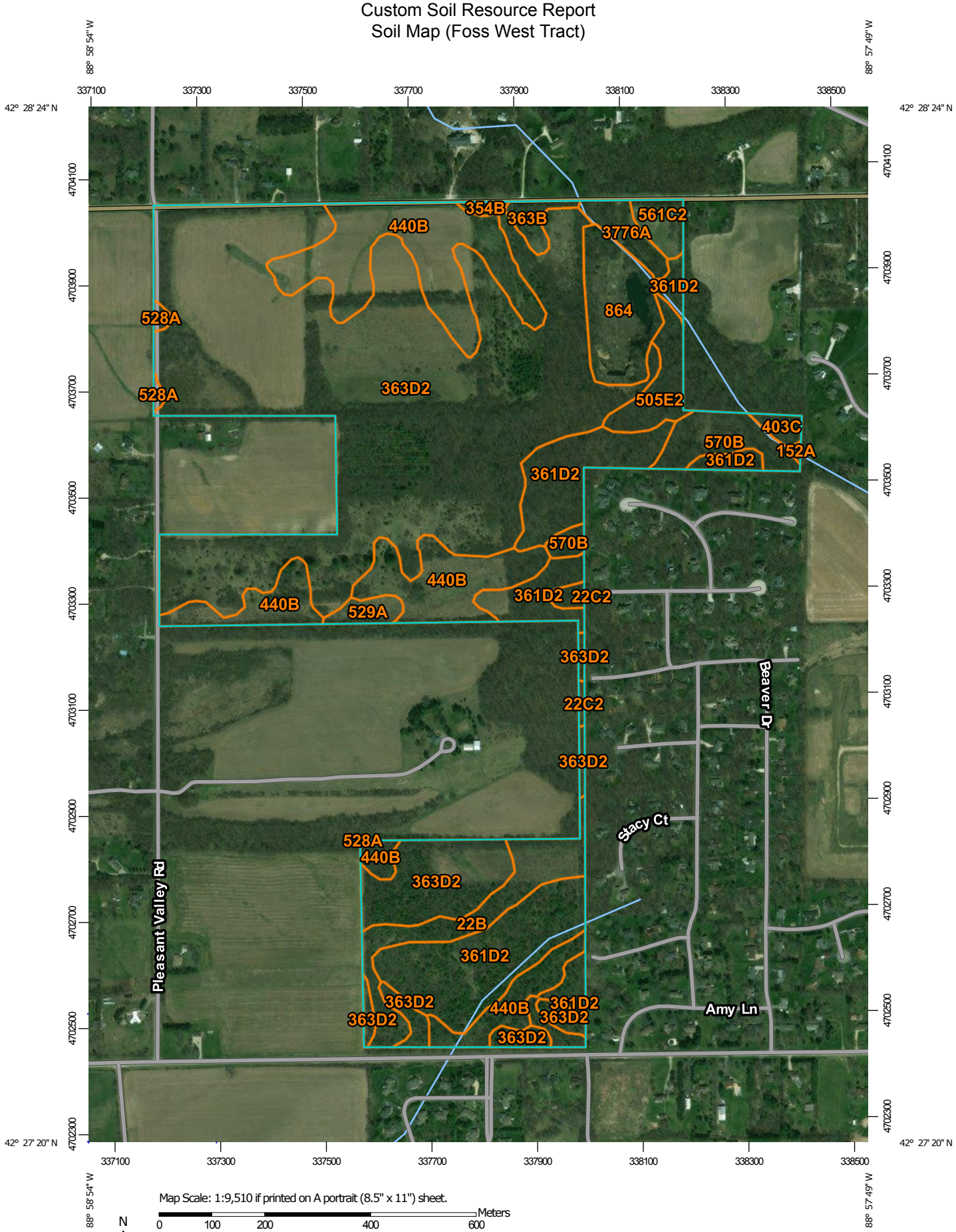
alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington,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

Contents

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

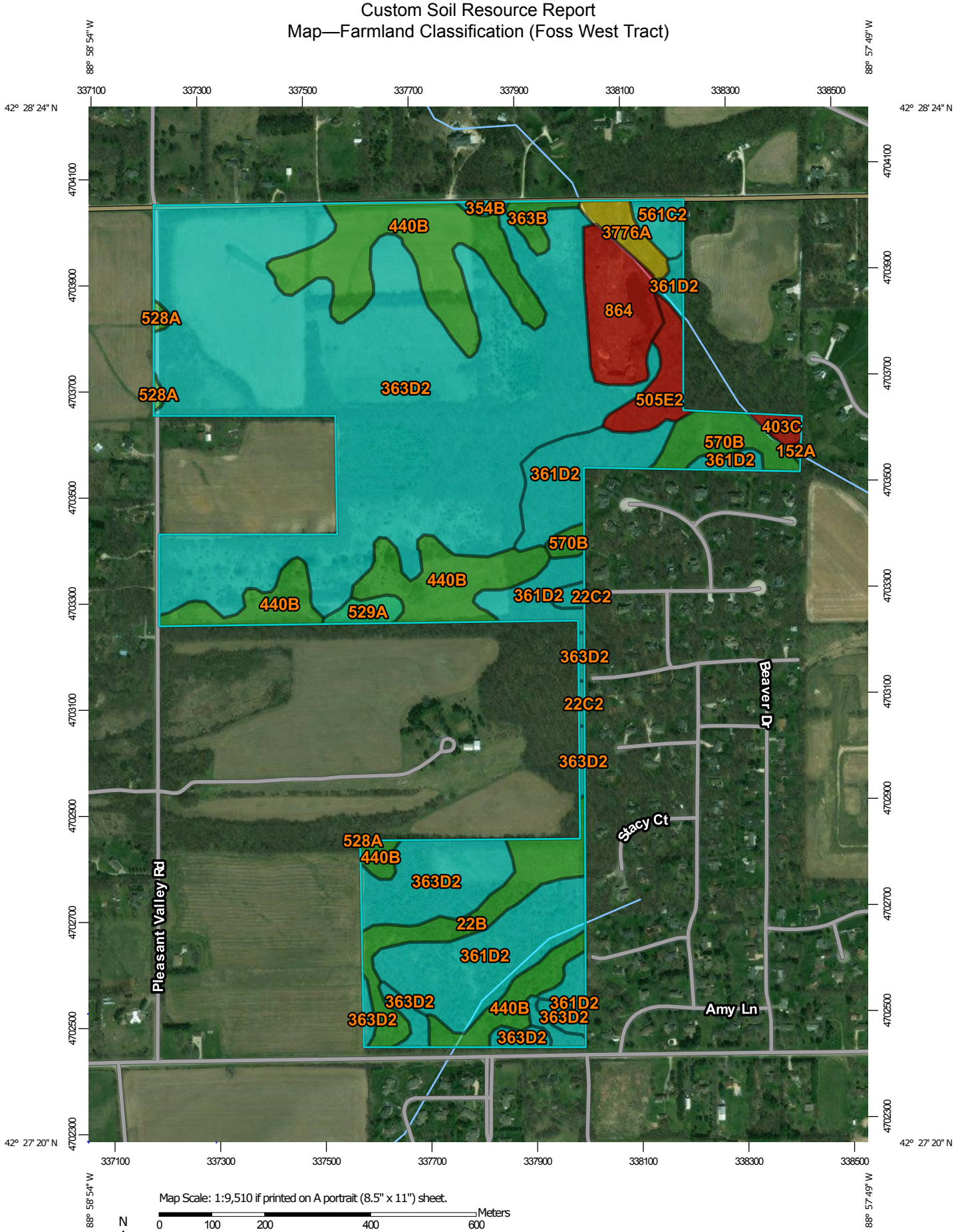
The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual 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
528A
864
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.

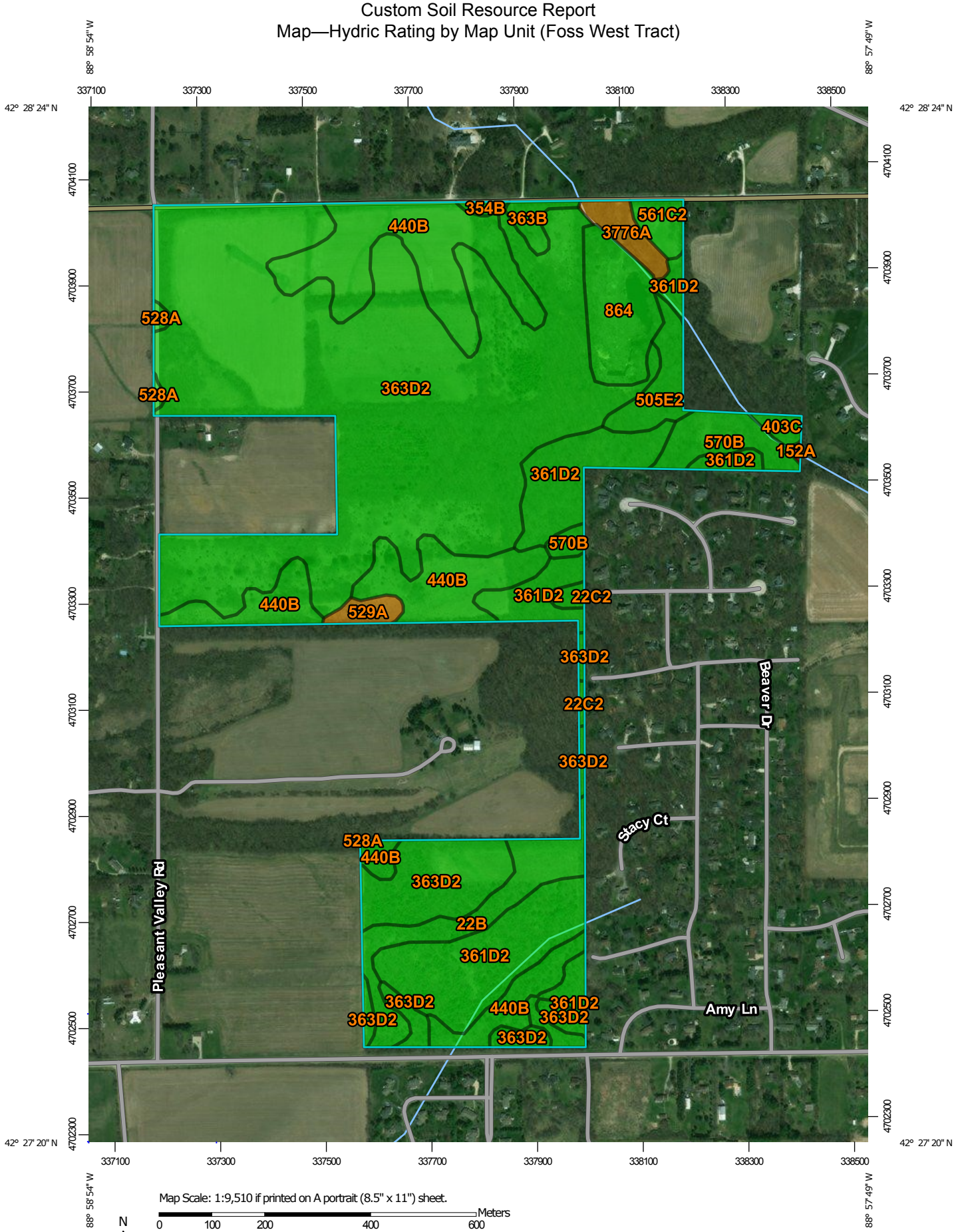
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

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.

Custom Soil Resource Report
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.

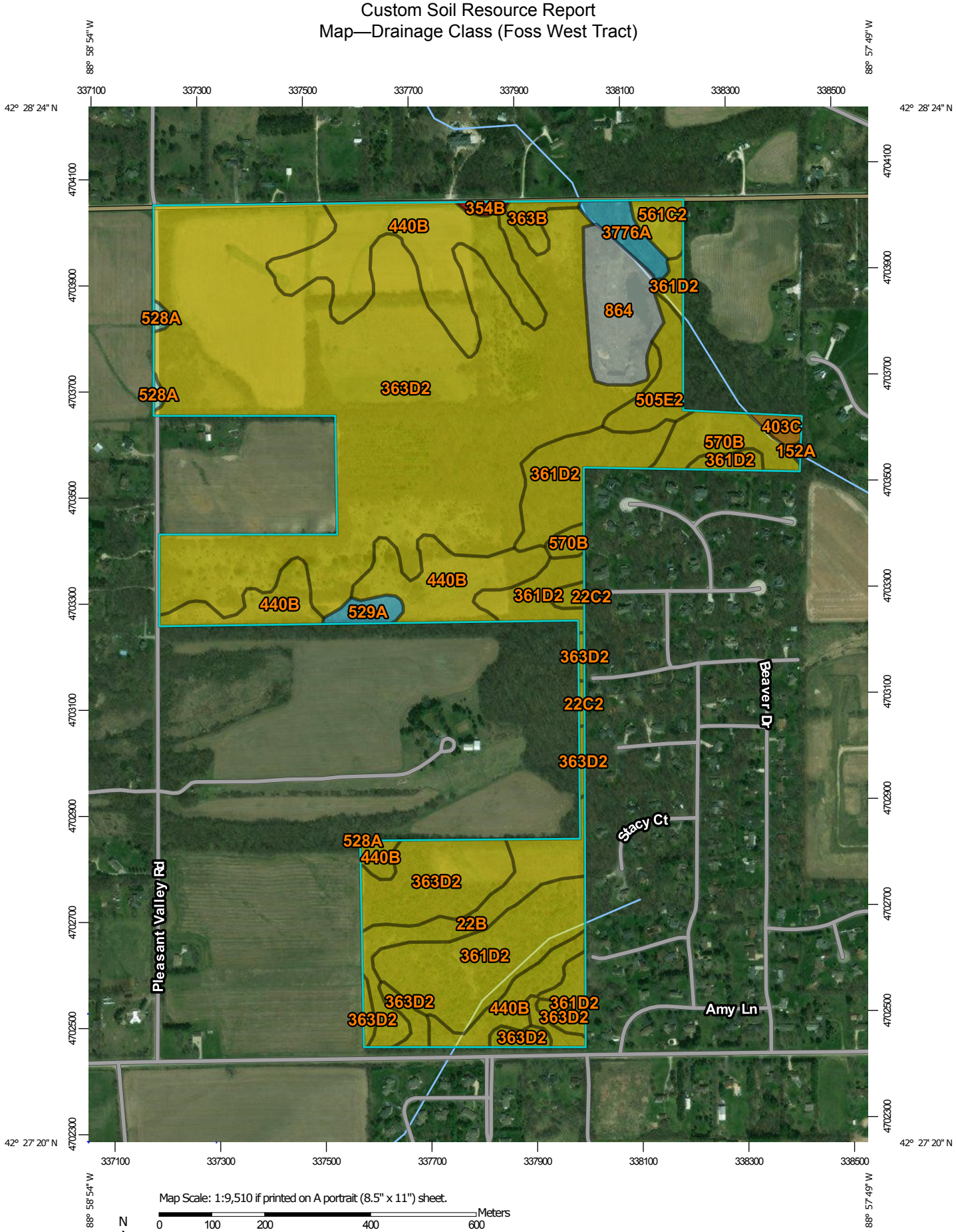
Soil Qualities and Features

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."

Custom Soil Resource Report
Map—Drainage Class (Foss West 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 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)

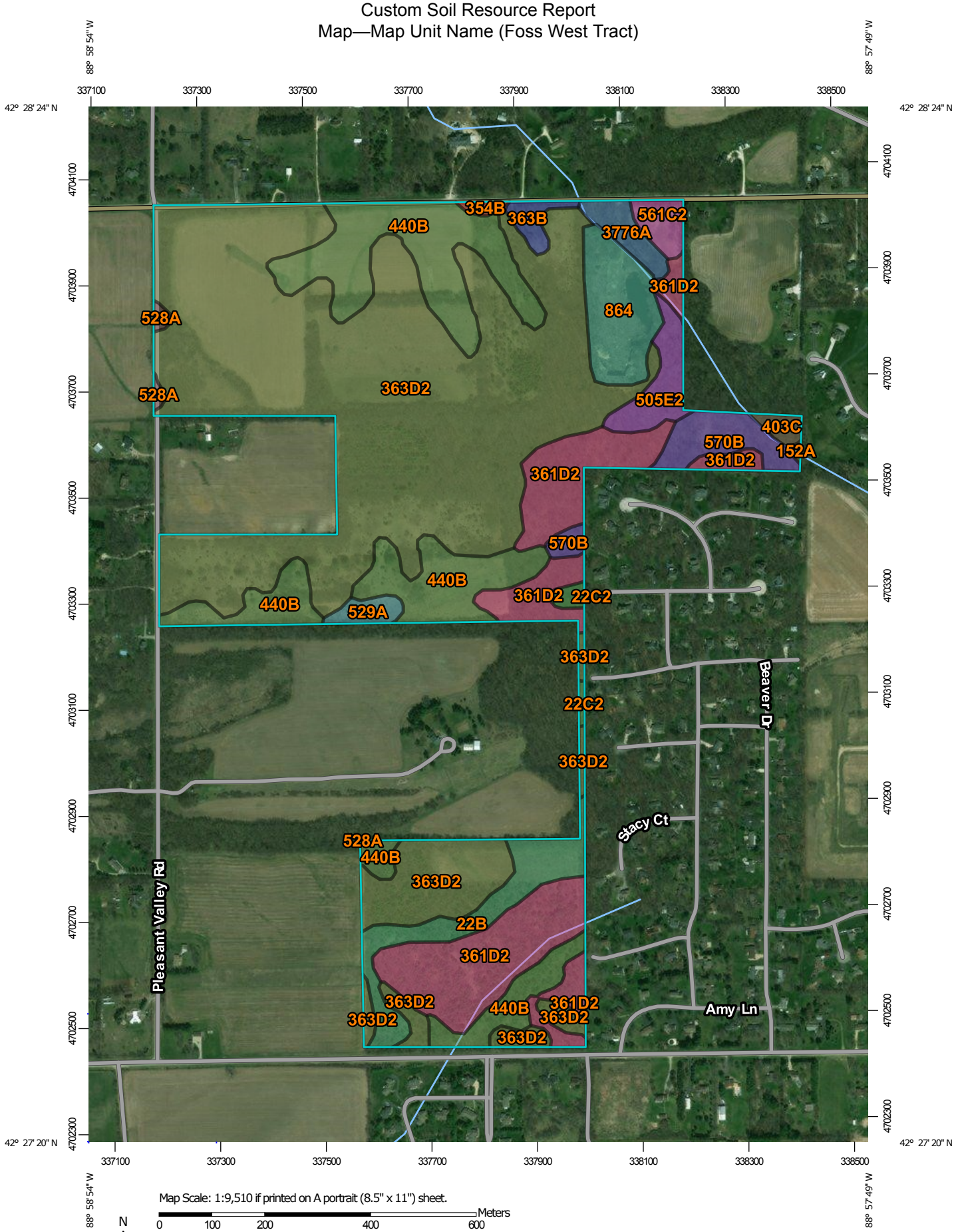
Aggregation Method: Dominant Condition

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

Score: 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

Score: 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	85	100%

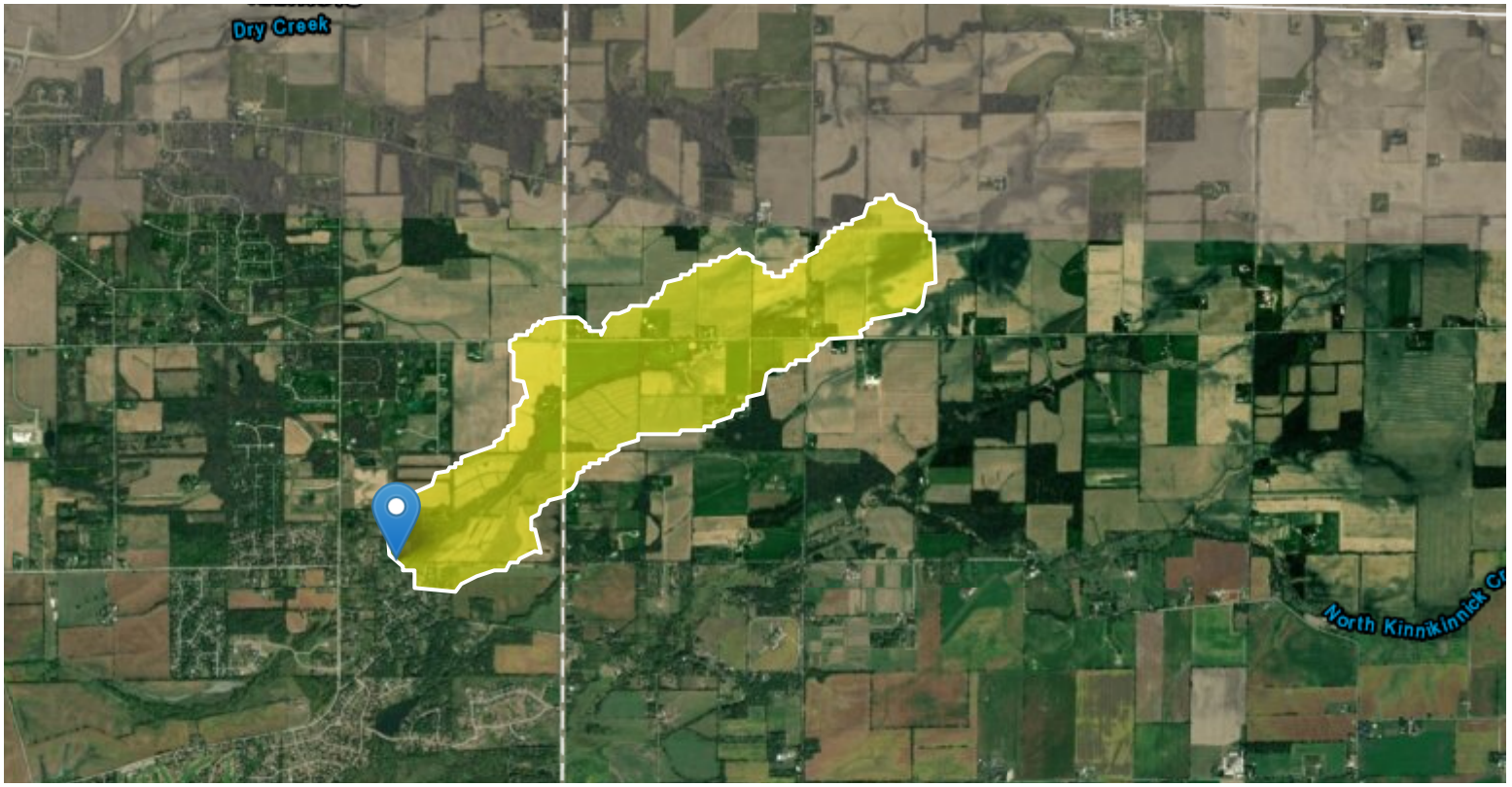
Scorecard users should examine the distribution of indicator properties within the three categories of health. Ideally, one would prefer to see all of the properties score in the *healthy* category. Even of 90% or more of the indicators you scored are *healthy*, your soil may still have serious problems 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

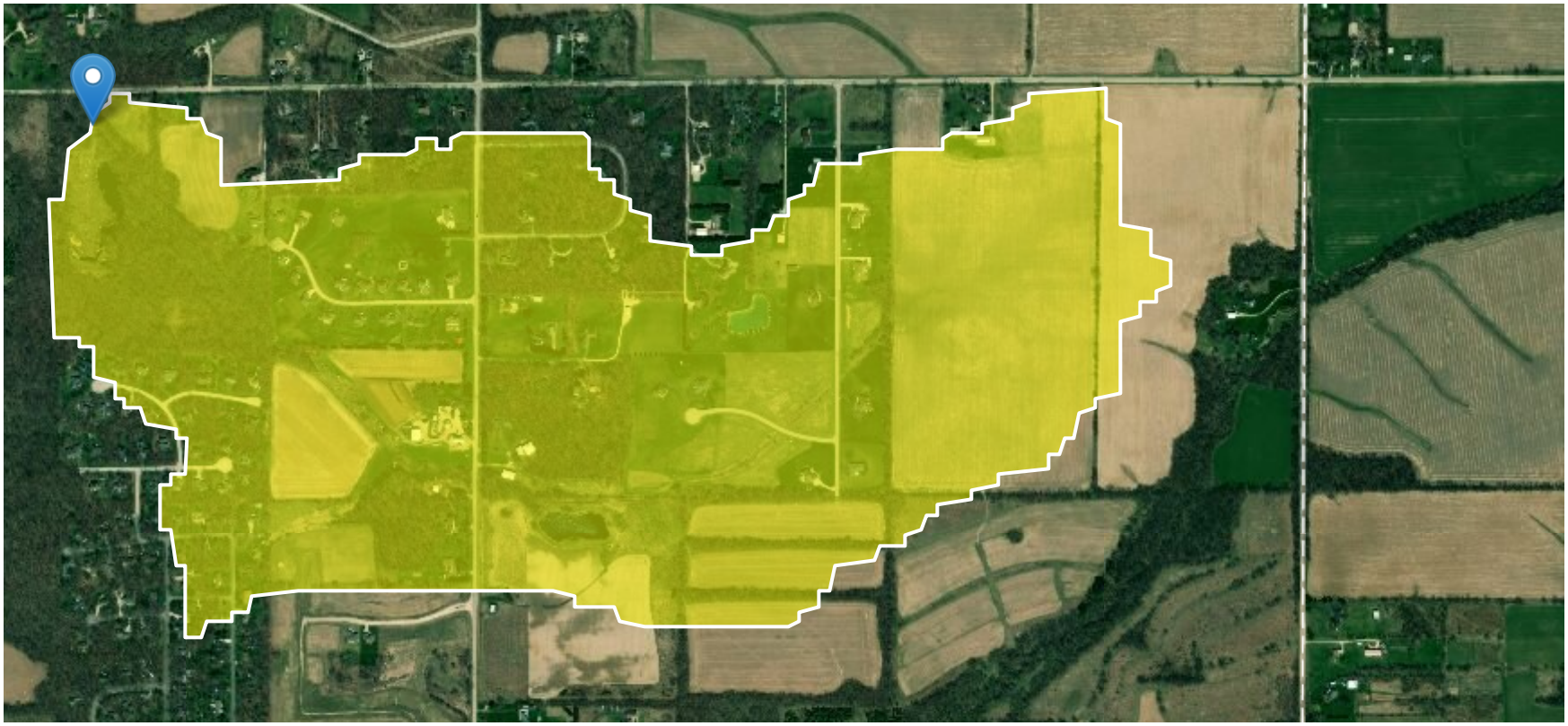
Parameter Code	Parameter Description	Value	Unit

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

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

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

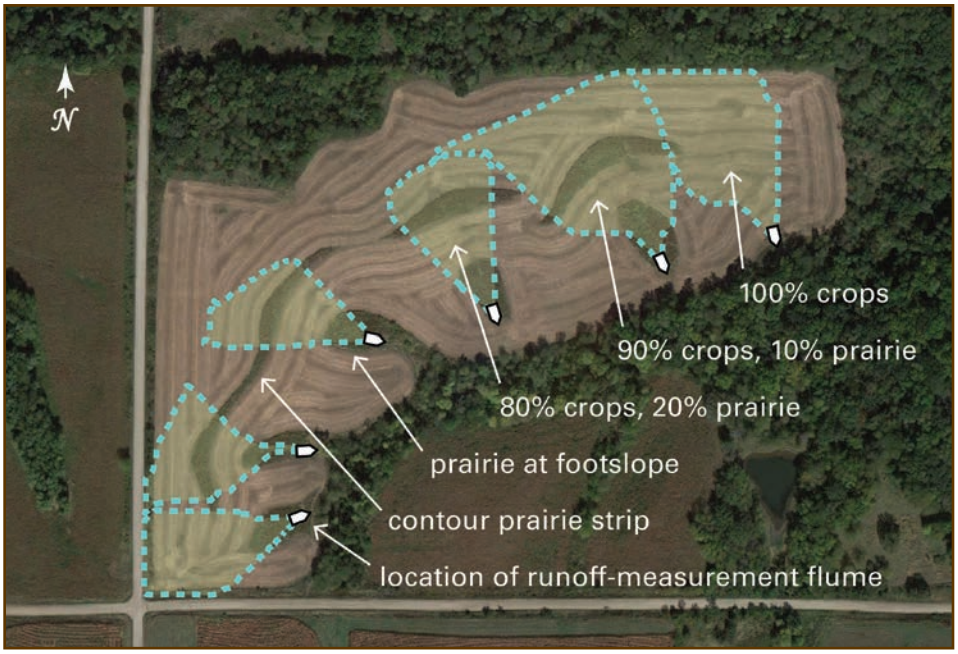
IOWA STATE UNIVERSITY
Extension and Outreach

AE 3610 June 2017

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.

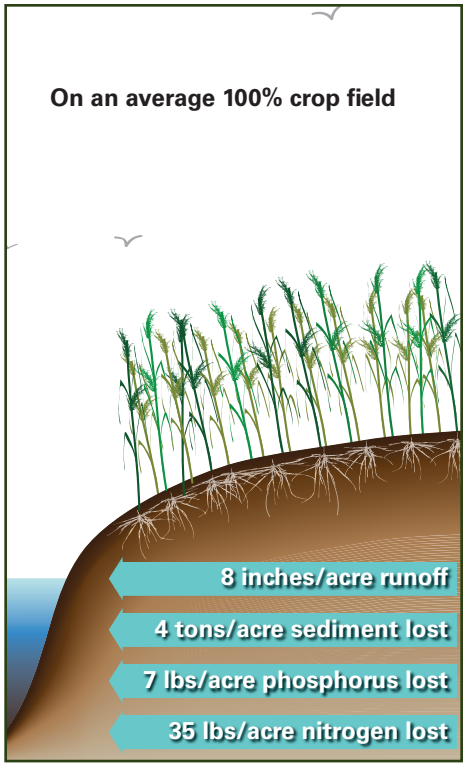
Fields with prairie strips provide habitat for twice as many birds and bird species than those with 100 percent row crops. Birds using the prairie strips included species of greatest conservation need such as the eastern meadowlark, grasshopper sparrow, field sparrow, and dickcissel.

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.

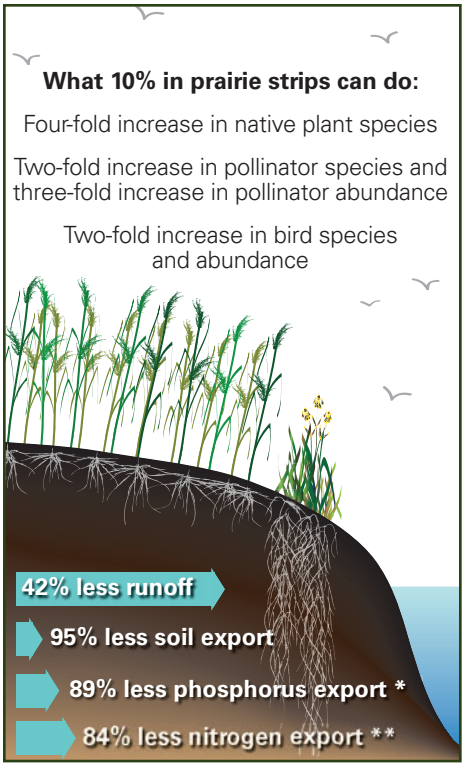


STRIPS researchers calculated average values for surface water runoff, soil and nutrient export from a field cropped entirely in corn, as well as various indicators of biodiversity. Compare this figure to its companion on page 3.

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 I

NRCS IPM PRACTICE SHEET

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

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 J

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

IOWA STATE UNIVERSITY
Extension and Outreach

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.