Exhibit A.

Mapping a Regional Green Infrastructure Network for the Healthy Land & Water Region in NW Illinois

Mapping a Regional Green Infrastructure Network (GIN) for the Healthy Land & Water Region of NW Illinois

What is a GIN and why is mapping green infrastructure important?

Green Infrastructure Network mapping is a planning process that attempts to link natural area remnants and other natural features in a fragmented landscape to demonstrate potential for enhanced connectivity for climate resiliency and multiple biological and cultural functions for the benefit of people and wildlife. A GIN map is useful to decision-makers to facilitate stakeholder dialogue and land use actions that can lead to improving ecosystem functions like water cleansing and flood mitigation, habitat restoration and protection of biological diversity, outdoor recreation, and more.

The concept of Green Infrastructure Network mapping is illustrated in the adjacent drawing in Figure 1 (Source: greeninfrastructure.net). As always, the success of employing solutions-based concepts such as Green Infrastructure Network mapping to planning and project implementation efforts requires a broad public-private partnership of all stakeholders, particularly landowners.

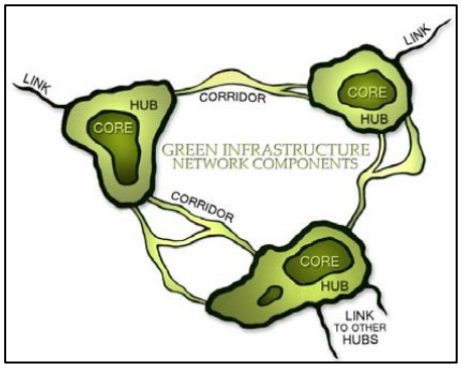


Figure 1. Green Infrastructure

The GIN mapped for the Healthy Land & Water Region (Figure 2) delineates and classifies natural landscape remnants as *cores* (larger forest, prairie, wetland, and other natural land cover remnants of a minimum size, e.g. >100 acres in size), *sites* (smaller isolated forest, prairie, wetland, and other natural land cover remnants that are not of the minimum core size, e.g. <100 acres in size), and *corridors* (linear green spaces such as drainage corridors that serve to improve landscape connectivity by linking cores and sites).

Typically, a GIN is developed at the individual HUC-12 (40-square-mile average size) watershed scale as part of an intensive watershed planning process involving detailed desktop analysis and windshield surveys. While this process works well within small watersheds, it is cost prohibitive at the regional scale and therefore must rely on systematic desktop analysis alone. In addition, GIN mapping, even at the small watershed scale, is often limited by the degree of landscape fragmentation, thus challenging efforts to identify ready linkages to create large ecological complexes without costly ecosystem restoration and collaboration with multiple landowners.

The purpose of creating a GIN for the entire 2,244-square-mile Healthy Land & Water Region is to visualize the optimal green infrastructure network of cores, sites, and potential corridors that span the collective ninety-one HUC-12 watersheds to optimize opportunities to the extent possible through collaborative partnerships to begin the process of reconnecting a highly fragmented landscape for improved ecosystem functioning and long-term climate resiliency.

The following discussion describes our method for creating the Healthy Land & Water GIN, how to interpret the results, and how to use the GIN process for further analysis at a smaller watershed scale.

Creating the GIN Map of the Healthy Land & Water Region

The following steps describe the methodology used to create the GIN for the Healthy Land & Water Region. The steps include 1) assembling publicly available national and state natural resource datasets and green infrastructure datasets from ESRI and The Nature Conservancy to identify the core, site, and corridor network features, 2) systematically analyzing how to connect network features to enhance improved ecosystem functioning, and 3) interpreting the resulting map.

Identifying Cores

Cores were identified using a variety of spatial datasets having the greatest influence on creating large ecological complexes, including:

- The Nature Conservancy Resilient and Connected Network (TNC)
- Illinois Natural Areas Inventory (INAI)
- I-View which is a database of protected public and private lands in a natural condition
- National Wetland Inventory (NWI) wetlands greater than five acres
- ESRI cores available through ESRI green mapping

Identifying Sites

Sites were identified using some of the Core datasets plus additional datasets to locate and stratify smaller yet influential ecological and biological complexes, including:

- NWI non-riverine wetlands between two and five acres in size
- Smaller TNC, INAI, and I-View parcels less than 100 acres in size
- Locations of Threatened and Endangered Species identified by the Illinois Department of Natural Resources (IDNR)

Identifying Corridors

Corridors were identified using datasets suited to optimizing connectivity among the cores and sites to achieve the greatest habitat linkages for plant and animal species enrichment, migration and gene flow, and other ecosystem functions:

- Hydric soils
- Potential restorable wetlands
- Aquatic buffered areas (a 50’ buffer was applied to each side of streams)
- Nonriverine wetlands less than five acres
- 100-year floodplains
- Frequently flooded and frequently ponded areas

Analyzing Connectivity

Much of the work necessary to create a GIN involves systematically analyzing the most ecologically meaningful and yet practical way to connect larger cores and smaller sites to optimize ecosystem functioning across a large, fragmented landscape of multiple landowners and land use practices such as the Healthy Land & Water Region. The following analyses were used to create the final GIN.

- A first analysis of corridor features determined which would best serve to connect cores and to optimize core size. For example, in some cases corridors include larger non-linear areas such as potentially restorable wetlands which provide opportunities to enlarge existing cores, if restoration can be undertaken.
- A second analysis of corridor features determined how to connect smaller sites directly to cores or to their corridors.
- A third analysis sought to connect numerous isolated larger wooded areas, not already classified as cores or sites, to the cores and sites in the first two analyses. This third analysis was an attempt to value the isolated woodland communities that are more common in highly fragmented sectors of the Healthy Land & Water Region.

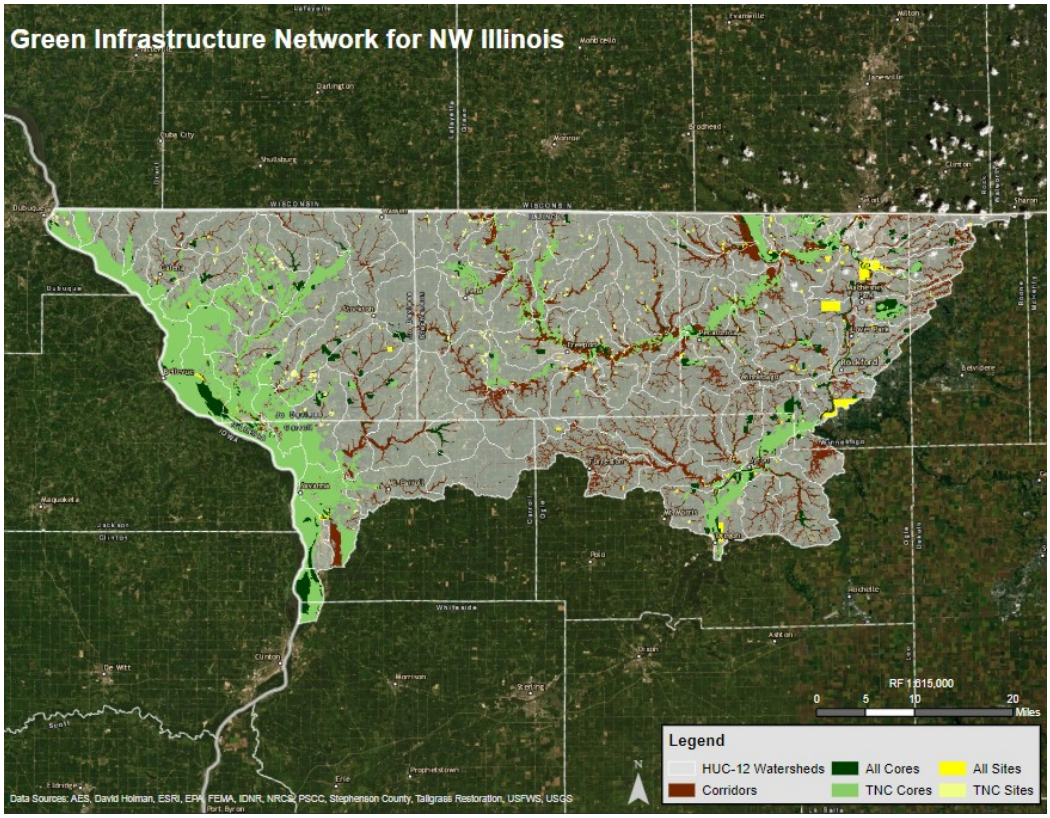


Figure 2. Green Infrastructure Network Map for the Healthy Land & Water Region

Interpreting the GIN Map of the Healthy Land & Water Region

The Healthy Land & Water Green Infrastructure Map in Figure 2 can be used in conjunction with the Comparative Watershed Assessment results to prioritize restoration, protection, and best management strategies to achieve improved biological diversity, nutrient loss reduction, and other stakeholder conservation objectives.

The following discussion interprets the GIN within the context of the Illinois Natural Divisions that characterize NW Illinois: Wisconsin Driftless, Rock River Hill Country, Northeastern Morainal, and Grand Prairie (IDNR, Illinois Natural Divisions,

https://www2.illinois.gov/dnr/publications/Documents/00000693.pdf). The Wisconsin Driftless and Rock River Hill Country Divisions occupy the greatest portion of the Healthy Land & Water Region. The easternmost extension of the Northeastern Morainal and the northernmost extension of the Grand Prairie overlap to a lesser extent along the eastern boundary of the Region.

- The western extent of the Healthy Land & Water Region (occupying much of Jo Daviess and parts of Carrol and Whiteside Counties) is characterized by very large core natural areas representing the scenic, biologically diverse, and culturally significant Mississippi River blufflands and rugged landscapes of the Wisconsin Driftless Division of Illinois. This area is known for steep forested ridges and ravines, unique geological landforms, and microclimates that support rare plant communities and species. The karst bedrock of this unglaciated region poses significant water quality challenges. The spectacular vistas and recreational opportunities support an important tourism economy. In this part of the Region expansive corridor linkages provide the greatest opportunity to connect cores and sites and create large ecological complexes to protect biodiversity.
- The largest extent of the Region occupies the Rock River Hill Country which includes the major Pecatonica, Sugar, and Rock River drainages (all of Stephenson and neighboring portions of Jo Daviess, Carrol, and Ogle Counties, and the western half of Winnebago). This once glaciated part of the Healthy Land & Water Region is dominated by working lands of primarily cropped agricultural fields. Riparian corridors of the major rivers include most of the protected core natural landscapes along the forested blufflands of the Rock River and broad forested bottomlands of the Pecatonica and Sugar River basins. The characteristic low hills of this natural division support small, scattered remnant prairie, oak savanna, woodland, and wetland natural communities. Geologic features along the Rock River include dolomite and sandstone outcrops that support unique micro habitats and plant communities with rare species. Most of the opportunities to connect natural landscape remnants to improve and protect biodiversity occur along the drainage corridors. The greatest opportunity to achieve nutrient loss reduction is in this sector of the Healthy Land & Water Region through Best Management Practices (BMPs) in working lands to improve soil heath and climate resiliency and to improve wetland functions within the larger historic floodplains and bottomlands.
- The easternmost extent of the Healthy Land & Water Region includes lands of the Northeastern Morainal Division (eastern Winnebago and part of neighboring Boone County) and Grand Prairie Division (a small northern extension into southeastern Winnebago County). The Northeastern Morainal includes much of the urbanized Rockford Area including a significant reach of the Rock River and westerly-flowing tributaries. The land is characterized by rolling topography of long ridges and mounds of fine and coarse glacial deposits. The Grand Prairie which encompasses a very small portion of the Healthy Land & Water Region is a flat glaciated topography with fine windblown loess deposits that once supported the tall grass prairie peninsula that dominated central and northern Illinois. The eastern sector of the Healthy Land & Water Region provides the greatest opportunity to address the frequent flooding and water quality issues associated with the impervious conditions of intensively developed and other working lands.

Interpreting 'Within HUC-12 Watershed Analysis'

Following the Comparative Watershed Analysis using WSIO and creation of the regional scale Green Infrastructure Network mapping, focused and intensified analysis was applied within two prioritized HUC-12 watersheds of interest: Winneshiek Creek which drains to the Rock River in the central sector of the Healthy Land & Water Region with intensive agricultural land uses (Figure 3), and the Galena River which drains to the Mississippi through the rugged driftless terrain with both increased urban and residential development and many remaining natural landscape remnants and extensive 100-year floodplain (Figure 4). This higher-level analysis, which includes more in-depth desktop analysis and in-field investigations (typically windshield surveys) increases the accuracy and extent of green infrastructure identification and of opportunities to restore connectivity and ecosystem functioning.

The following discussion describes some of key features of the *within watershed analysis* of the Winneshiek and Galena tributary basins.

Winneshiek Creek

- Areas that constitute natural land cover core and site areas with greater potential for ecosystem functioning are limited to the lower basin. They lie within the 100-year floodplain and include both TNC core and site classifications (green) and other natural classifications such as INAI, I-View, etc. (hatch overlay). Opportunities to link these scattered remnants through restoration and other practices are represented by the more significant corridor classification in red which represents the 100-year floodplain and a 50' buffer applied to each side of streams and drainageways.
- Refined mapping via *within watershed analysis* resulted in an extension of the corridor into the town of Dakota along an abandoned railroad line to the local community park, which were not identified in the regional GIN process.
- The limited number and position of the core and site areas in the lower basin suggests a need and opportunity to improve ecosystem functioning in mid and headwater reaches of the basin characterized by open agricultural fields and developed commercial and residential areas of the community. For this purpose, *within watershed analysis* identified Priority Project and

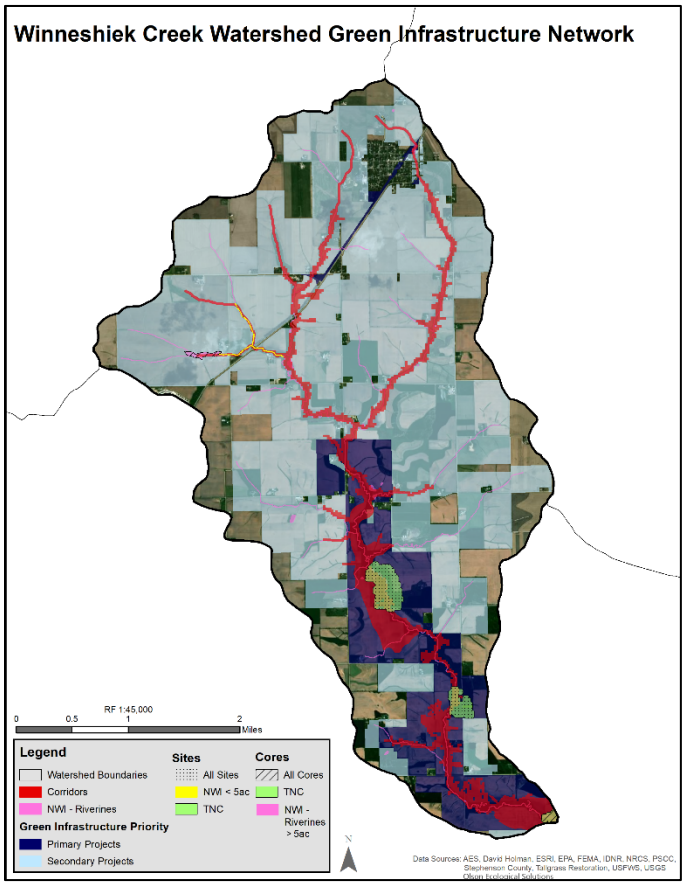


Figure 3. Green Infrastructure Network Map for Winneshiek Creek

Secondary Project areas, differing in their proximity to cores, sites, and corridors, where implementation of BMPs could be undertaken or augmented to optimize soil health, nutrient loss reduction, water quality, and other ecosystem health benefits.

Galena River

- Conditions in the Galena River watershed result in a more expansive green infrastructure network and opportunity to enhance linkages due to a greater number and broader distribution of cores and sites represented by multiple natural resource datasets (TNC, INAI, I-View, ESRI, NWI, and IDNR Threatened and Endangered Species). The 100-year floodplain provides the corridor that connects the vast majority of cores and sites both within the watershed and at the border with neighboring watersheds.
- Primary Project areas (differing in color or texture used in the Winneshiek example) are focused within the 100-year floodplain that connects the principal core natural areas across the watershed, with significant forest cover. BMPs in such areas will generally include more forestry based or woodland and savanna restoration and management practices, with stormwater runoff reduction practices within the commercial and residential neighborhoods of the City of Galena. Secondary Project areas are proposed along NWI riverine wetlands and corridors that connect small sites to the larger cores using similar BMPs.

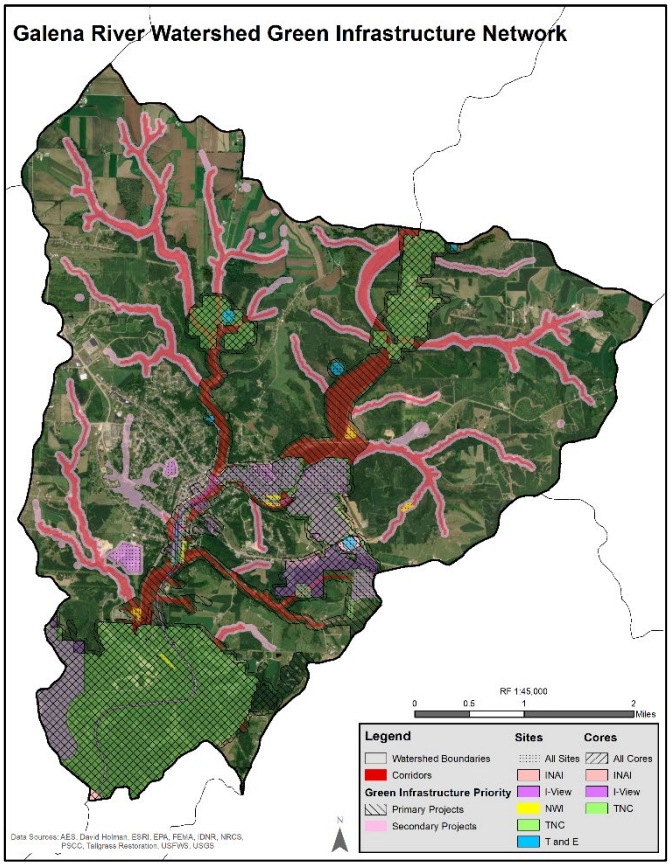


Figure 4. Green Infrastructure Network Map for the Galena River

Exhibit B.

Winneshiek Watershed Monitoring Worksheet

Monitoring Worksheet

This monitoring worksheet is available to landowners or other parties interested in recording and evaluating BMPs in the Winneshiek Creek watershed (see final page for watershed aerial map). When kept in a central location, the worksheets will form a growing aggregate that will draw an increasingly clearer picture of progress in the watershed, which provides funding agencies a quick snapshot of the watershed. Having the information at hand would mean greater chances for you to obtain funding dollars!

1. Project name or NRCS project name or code #: (there are many projects the NRCS has available which you could implement with financial and technical backing click here to check it out or go to: https://efotg.sc.egov.usda.gov/#/state/IL/documents/section=4&folder=-3)

2. When did you start or when would you like to start this project:

3. Completed (yes/no, date):

4. Approximate cost:

5. Attach before and after photos:

6. Why did you start this project?

7. Is it working?

8. What unexpected costs or frustrations came up?

9. What was the scope of the project?

10. How many feet / acres?

11. What are your expected benefits?

12. Have you seen a change in wildlife using the area after the project?

13. Did you receive any technical assistance for this project?

14. Do you have any projects you would like to be doing in the near future?

15. Would you like financial or technical backing for any of these projects?

16. Which goals of the watershed plan do you think your project applies to (circle all that you think apply):

Goal 1: Reduce total suspended solids and nutrient loading into surface waters from runoff.
Goal 2: Limit sedimentation and streambank erosion.
Goal 3: Protect the quality of ground and drinking water.
Goal 4: Improve habitat in the stream for aquatic plants and animals.
Goal 5: Adopt sustainable land use practices and policies that protect ground and surface water.
Goal 6: Protect, enhance, and manage wildlife habitat.
Goal 7: Evaluate and enhance the recreational opportunities in the watershed.
Goal 8: Promote stewardship across the community through outreach and engagement

17. Are you interested in becoming more involved in the Winneshiek Creek Watershed Committee?

18. Name:

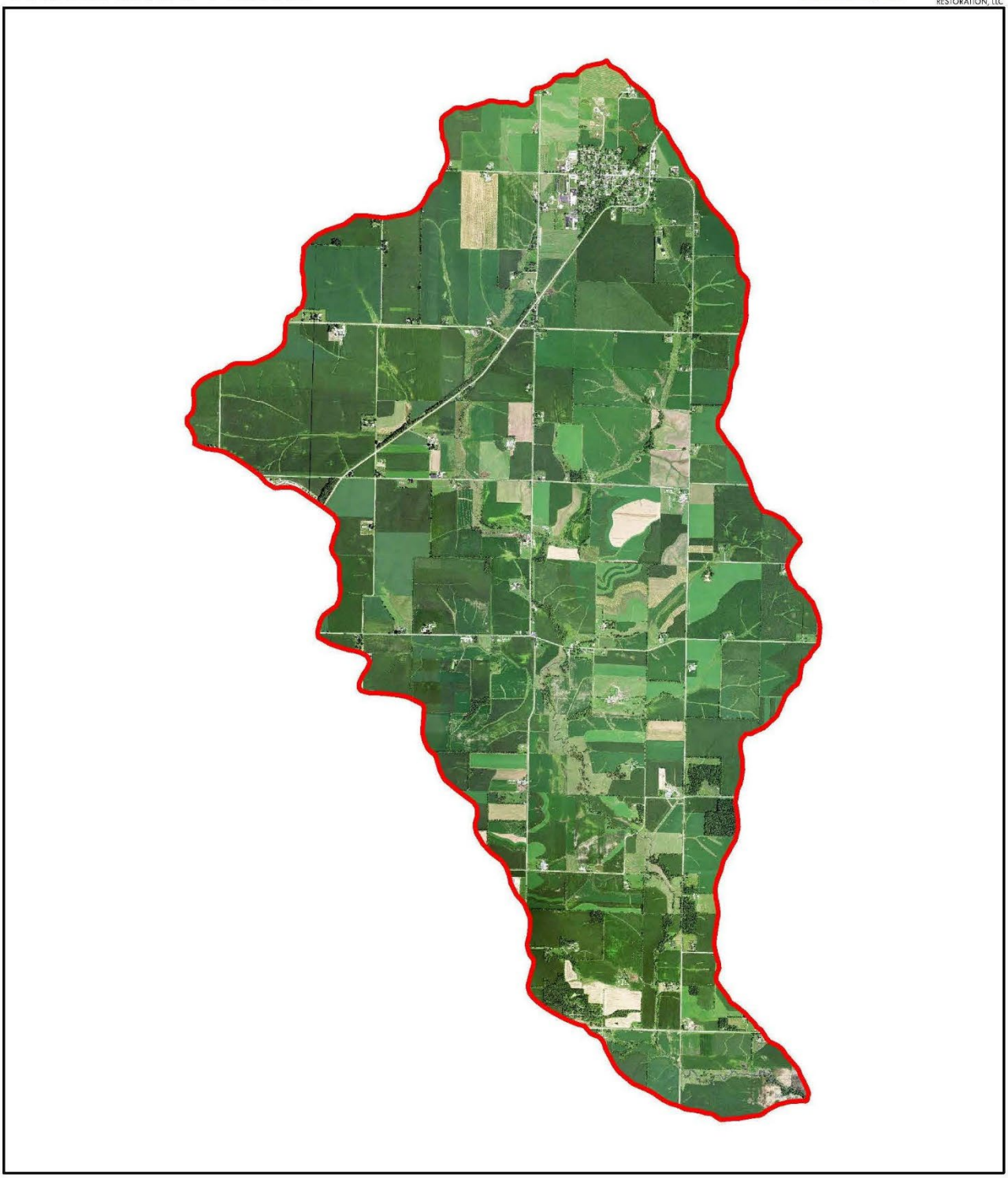
19. Return to:

20. Location of project (circle on next page):

Winneshiek Creek Watershed
Watershed Aerial

Olson Ecological Solutions, LLC

tallgrass RESTORATION, LLC



Winneshiek Boundary

0 0.5 1 1.5 2 Miles

N

Map created by Kristin Adams with Tallgrass Restoration, LLC
Data Sources: USDA/FSA/AFO, USGS
Aerial Date: August 5, 2017
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