FREEPORT park district

OAKDALE NATURE PRESERVE MASTER PLAN

DATE: 10/02/2015

RATIO

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This Report Was Prepared By:

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Applied Ecological Services

00 INTRODUCTION

Oakdale Nature Preserve is located in some of the most beautiful country in Northern Illinois and is a true gem. It is a favorite place for a walk in the springtime when the bluebells, phlox and shooting stars are in glorious bloom. It is also a time when may apples, jack-in-the-pulpit, red trillium, and all the woodland species are in their glory.

Located three miles south of Freeport on Baileyville Road, Oakdale Nature Preserve offers 133 acres of forests, streams and restored prairies. Over four miles of trails wind through the Preserve as well as a 1/3-mile hard-packed accessible trail. Throughout the process we heard many great stories of weddings, graduation parties and events at Oakdale Nature Preserve as well as the long history of camp and school trips.

The Freeport Park District hired RATIO Architects of Chicago with Applied Ecological Services of Broadhead, Wisconsin to work with Park District and the community to complete a roadmap or a master plan for Oakdale Nature Preserve.

01 HISTORY

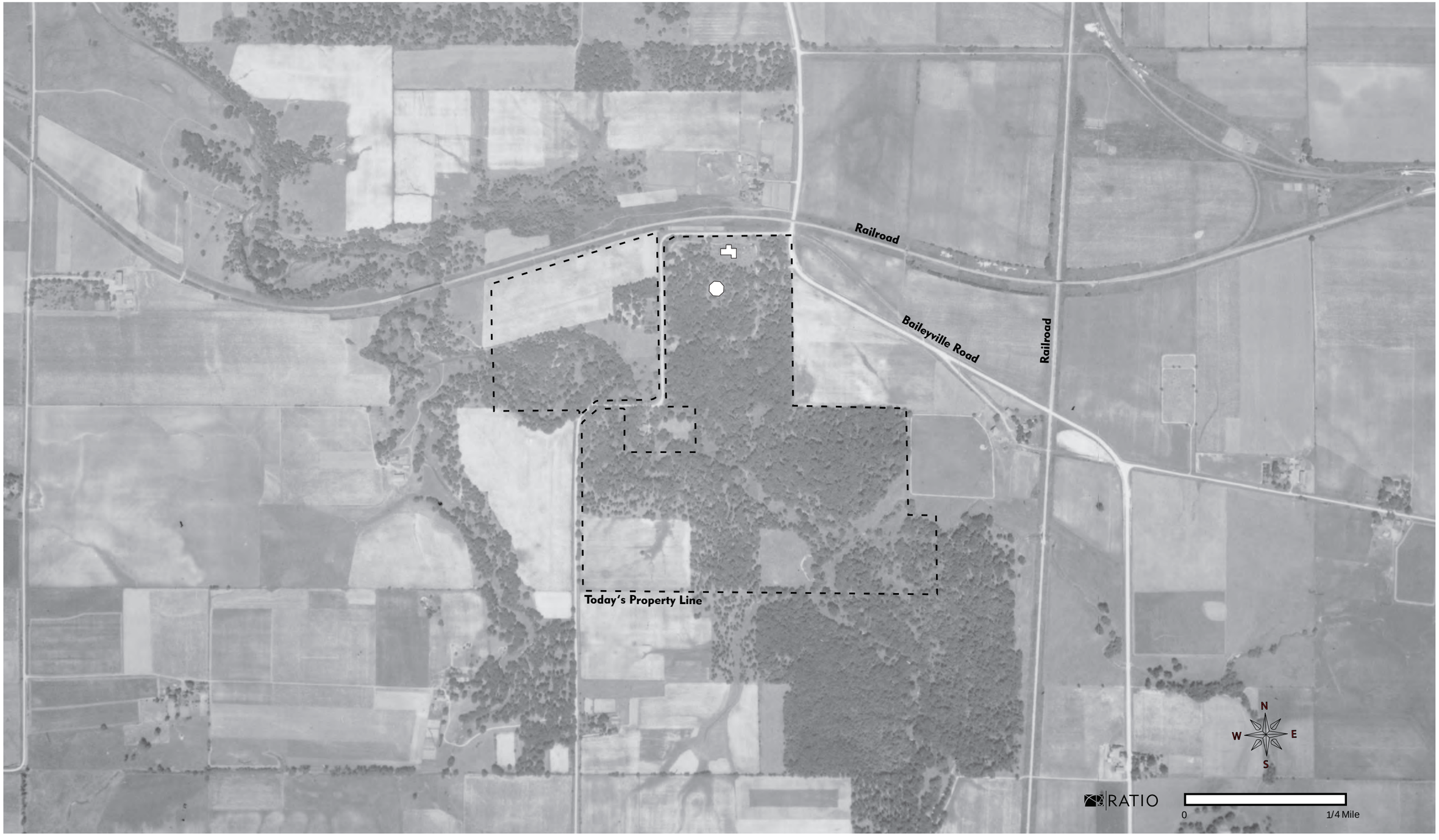
Oakdale Nature Preserve was founded in the late 1800's as a church camp. For 80 to 90 years religious groups would come to Oakdale for retreats, camps and meeting. The central area included a Chapel, Lodge or Boarding House, Tabernacle in an eight sided barn, and pool.

A railroad line ran along north of Cranes Grove Road just north of the camp which was abandoned in the 2nd half of the century. Baileyville Road has been the main access to the Oakdale from Freeport throughout its time. The area around Oakdale has been used for grazing, crops and even an area for a Christmas tree farm.

The Aerial Photo from 1939 gives us a unique look into the past. This aerial clearly shows the railroad and the site. Of note is the more savannah grasslands like nature of the site which was much more open in 1939 than today.

The Freeport Park District acquired the property in the Mid 70's and acquired several other parcels to be the area it is today.

1939 Aerial


Railroad
Baileyville Road
Railroad
Today's Property Line
N
W
E
S
RATIO
0
1/4 Mile

02 PROCESS

The Oakdale Nature Preserve Master Plan design process is Inventory and analysis, concepts and verification and final design. The inventory stage included a site visit by the consultants as a team on July 16, 2015. All of the buildings were toured and much of the site was reviewed either on foot or by cart. This led to 4 focus group meetings with stake holders and interested parties on August 14, 2015. The consultants gathered information both about the natural site and the built elements and how the community uses Oakdale. Concepts and plans were created from the information learned through staff input, site reviews, community input and the consultants experience. On August 24, 2015 the community and the Park District Board was invited to review the concepts, and provide input. Community and Park District was used to develop a draft master plan for presentation to the board on September 15, 2015 and information from this meeting will be incorporated into the final plan.

03 INVENTORY & ANALYSIS

Regional View – Oakdale Nature Preserve is located 5 miles south of Freeport in and South of US – 20 in Silver Creek Township. Oakdale Nature Preserve is located about 30 miles from the Mississippi River and 30 miles from Rockford. Two Regional Trails (The Jane Adams Trail and the Pecatonica Trail) connect in Freeport about 5 miles north of Oakdale but with no trail access to Oakdale. Cranes Grove Creek which runs through the site is part of the Pecatonica River system.

The Mogle Center – Has room for about 25 people that includes a kitchen and restroom and is heated year around. The Mogle Center has a shaded window to the woods in order to view the natural habitat without seeing in. The Mogle Center is rentable and in good condition for use. The second story of the Mogle Center is served by stairs and is currently offices.

The Auditorium (The Tabernacle; The Eight Sided Barn) – This structure is currently closed due to cost of cleaning up waste from bats and raccoons. The barn cannot be secured and these animals would have to be relocated. The Auditorium is about 8500 sf or space under one roof and doors on each side can be easily opened. In the past the Auditorium has been used for major events such as graduations and weddings and we heard many stories of grand events. The Park District still gets inquiries for its use. This structure was described as dead inside and a need to bring life to the structure.

Open Air Shelter – This is a small picnic shelter with space for about 20 people, this shelter has electricity but is in need of repair.

Lodge – This is a multipurpose building that has been closed for about 2 ½ years starting in the winter of 2013. The lodge has a banquet room, commercial kitchen, upstairs bunk house for 150 in two equally sized rooms, nature center and restrooms. The lodge has been closed because three of the 5 furnaces have failed, upgrades to bring building into code compliance are great and numerous maintenance and structural upgrades are required. Additionally a cost of maintenance versus use was not sustainable.

Restroom Building – The restrooms are currently functional but need to be upgraded to handle additional loads and to make them easier to maintain. Improvements to the restrooms should include ADA improvements

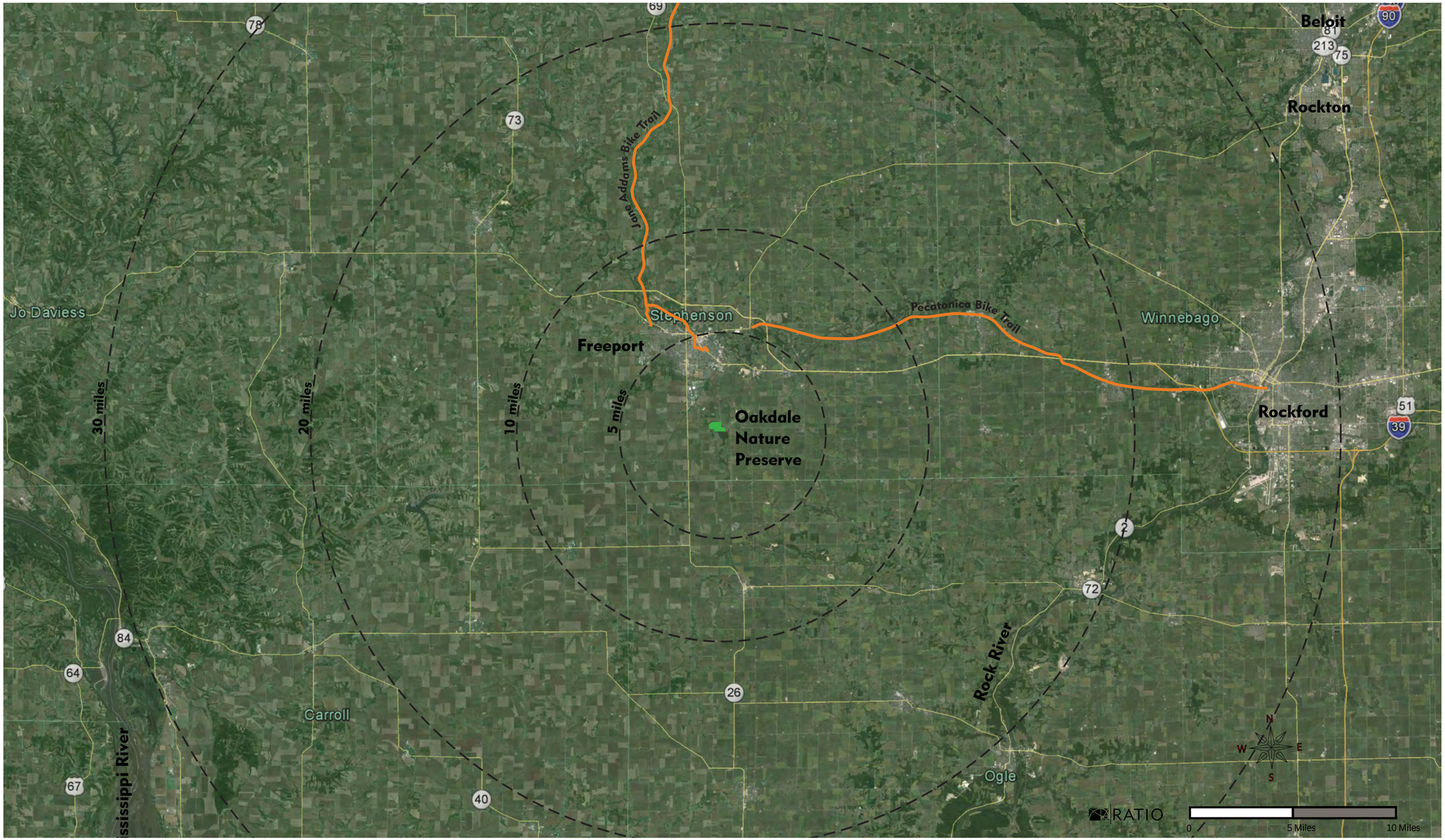
Garage/Storage – This is acceptable but the front of the garage and the Mogle Center are in the same area, this use should be separated from the Mogle Center by accessing from the opposite side door.

Parking – The main parking area has space for about 32 cars although the spacing is tight. 2 handicap parking spaces on concrete are included. Overflow is handles by parking on the grass

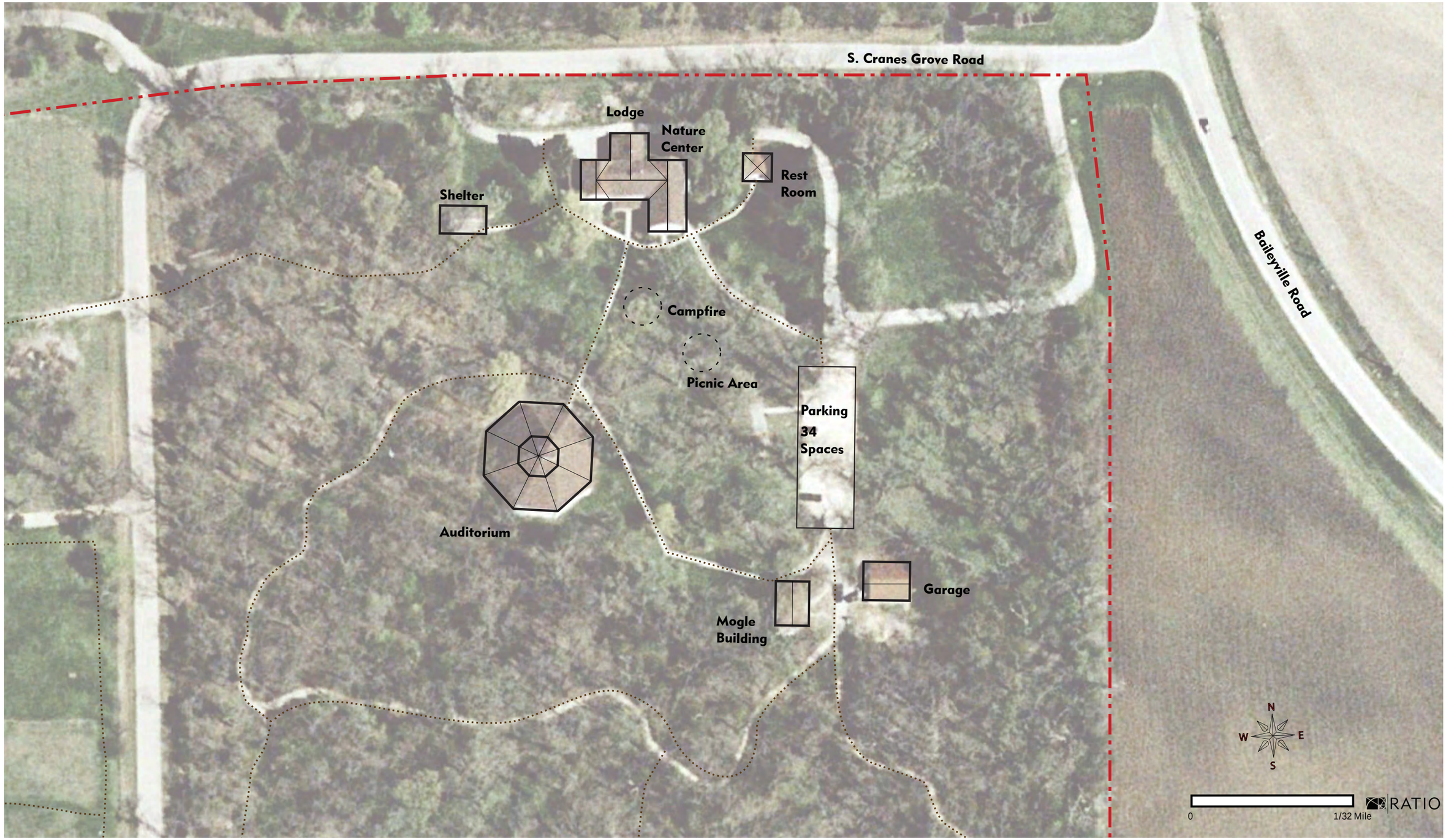
Entry – The entry is not well marked and is about 100' from the intersection of Cranes Grove Road and Baileysville Road

Newell Prairie Facilities – A 20 person Shelter, Pit Toilets (2 toilets) on concrete, informal parking and Kiosk are west of Cranes Grove Road and the Main Area about 200 yards. The structures are all functional but do need improvements, with excellent access to a restored prairie.

Regional Map



Central Area Enlargement



04 ECOLOGICAL RESTORATION PLAN

In the Natural Resources Inventory, we provide our understanding of the existing conditions of the Oakdale Nature Preserve ecological systems and how we believe they have changed over time. This knowledge of the land provides the foundation for the restoration plan contained in this section. This knowledge coupled with an economically viable plan based on sound ecological restoration principles, site-specific goals, and field tested management strategies, and most importantly with leadership that is committed to carrying-out and funding the plan, will contribute significantly to the long term success of the ecosystem restoration program. These principles, goals, and management strategies are discussed in this section.

PART 1. ECOLOGICAL RESTORATION PRINCIPLES, GOALS & OBJECTIVES

The following restoration principles, goals, and objectives are proposed for the Oakdale Nature Preserve restoration plan to systematically address the critical resource issues, threats, and stressors identified during the natural resource inventory and ecological assessment of the property. The guiding principles provide a basic approach for undertaking land management practices that are intended to improve the ecological health (Schaeffer et al. 1988) of degraded lands or to, at minimum, maintain conditions that are reasonably healthy. Restoration practices such as burning and removing undesirable elements of the plant community to achieve specific outcomes can sometimes have unexpected results from those intended or envisioned in the original stated goals and objectives (an example of this is removing invasive reed canary grass, only to have a flush of burdock and thistles take its place). Therefore, the restoration principles, goals, and objectives can help guide the decision making process when outcomes are different than expected and land managers must adapt to the new conditions.

PART 2. GUIDING RESTORATION PRINCIPLES

1. **Ecological Restoration:** The Ecological Society of America defines ecological restoration as a process of intentionally altering a site to establish a defined, indigenous, historic (presettlement-like) ecosystem. Others define it simply as a process of assisting the recovery of an impaired ecosystem (Apfelbaum & Haney 2010). In either case, the goal of restoration is to emulate as much as possible the structure, function, diversity and dynamics of the native ecosystem, and to do so with management practices that are

intended to maintain the ecological integrity and health of the system. The Erickson Wetland Ecological Restoration Plan proposes to achieve ecological restoration in this manner to the extent possible, given the limitations imposed by past and current land management practices, by the varying degrees of degradation of the native plant communities, and by program support and funding constraints.

2. **Ecosystem Health**: Assessing ecosystem health requires an understanding of what an ecosystem is and how it is "supposed" to work. Ecosystems are defined by the species that inhabit them (composition), by the structural elements that shape them—vegetation, soils, and landforms (structure), and by the processes that occur in them (function). An ecosystem is a complex and dynamic place where assessing "health" can be difficult to measure (Apfelbaum and Haney 2010; Costanza 1992). A simple assessment of ecosystem health can be made from the most visible signs or indicators, such as stable soils, clean water, and diverse plant and animal communities. Less obvious indicators are the land's ability to retain and infiltrate water to maintain aquifers and the ecosystem's capacity to change and adapt to disturbances. Ecosystem or land health can be viewed as a state of integrity and sustainability of all elements and functions of a natural community. In A Sand County Almanac, Aldo Leopold defined land health as the capacity of the land for self-renewal, and conservation as our effort to understand and preserve this capacity. Thus, attaining and maintaining healthy land also requires an enduring relationship between the land and the people that care for it. Based on an understanding of the existing ecological conditions, the Oakdale Nature Preserve plan proposes to restore the land using restoration methods and strategies to achieve a higher state of ecosystem health. As with ecological restoration, ecosystem health can be achieved only to the extent possible, given the same limitations of land use history, degree of degradation, and funding.

3. **Adaptive Management:** Just as ecosystems are complex and dynamic, responses to restoration treatments can also be surprisingly dynamic and unpredictable, particularly in highly degraded natural communities. The effects of predicted climate change in this region are expected to exacerbate such responses (Wright & Bradley 2008; WICCI2011). Therefore, a flexible management strategy is needed that allows for timely evaluation and fine-tuning of the plan, to keep the restoration moving forward toward improving the overall performance of the site. This might mean burning more frequently than anticipated to control invasive shrub seedlings, accelerating a native enhancement seeding effort because the seedbank response was slower than expected, or adjusting the burn schedule to accommodate life cycles of sensitive faunal groups. This process of evaluation, adjustment, refinement and change is adaptive management. A well designed monitoring program that regularly evaluates community responses and provides feedback to land managers is a key component of this process. Another strategy often incorporated into the adaptive management process is onsite demonstration test plots, in which experimental restoration treatments and strategies can be implemented and studied as part of improving and refining the plan and restoration outcomes. Test plots are also a valuable tool for public education and for training volunteer stewards to undertake Citizen Science monitoring activities. The Oakdale Nature Preserve plan proposes to apply the adaptive management process to achieve the highest degree of restoration benefits possible, and to explore opportunities to utilize the restoration program to advance understanding of the most effective restoration strategies through the use of test plots.

4. **Remedial and Long-term Management Phases of the Restoration Program:** The process of restoration is an evolving one, and typically starts with the hard work of repairing ecosystems in a state of advanced decline—widespread invasive species and loss of other major aspects of composition, structure, and function. This is referred to as the remedial phase of restoration. Once the system has recovered substantially and can be maintained sustainably into the future with much less effort and investment, the restoration has entered a new phase: the long-term management or maintenance phase.

Tasks undertaken during the remedial phase include slowing runoff and stabilizing eroding soils, clearing brush, controlling invasive species, and systematically reintroducing fire. Consequently, the remedial phase requires the greatest short-term financial commitment and level of effort. The period of time required to conduct the remedial restoration phase depends on the size and complexity of the property, the condition of the ecological systems, the availability of resources and labor, and other opportunities and constraints (i.e. biological responses, site access, and weather). This phase could take 15 -20 years at Oakdale Nature Preserve with current available resources and assistance from volunteers.

Once the initial ecological and biological objectives are achieved, the restoration program shifts to the long-term management phase, where more routine management practices and strategies are implemented on a rotational basis in the established management units. Long-term management tasks include conducting prescribed burns, monitoring and spot treating invasives, collecting and planting native seed to enhance biodiversity, documenting and reporting the ongoing activities and outcomes to constituents and partners, assessing budget needs, carrying out ongoing and new research projects, and training new staff and volunteers. Many of these long-term ecological management activities can then come to be viewed as part of general operations and maintenance function conducted annually at strategic times to maintain the plan's ecological goals. Nevertheless, long-term management must also remain responsive to the guiding principle of adaptive management (defined above), and be prepared to respond to catastrophic events such as storms and floods, and new infestations of invasive plants and pathogens that are already occurring more regularly with climate change.

05 GOALS

The goals for the project where created from what learned on our site visits, in focus group meetings, in project and staff discussions, information research and our experience.

1. Restore, maintain, and preserve the ecological integrity of Oakdale Nature Preserve.

   Restore, maintain, and preserve the ecological integrity of Oakdale Nature Preserve's natural resources, to benefit humans and wildlife; enhance and protect biodiversity, water and air quality, wildlife habitat, and overall ecosystem health; and to honor the environmental legacy and sense of place that is the Oakdale Nature Preserve.

2. Achieve a sustainable ecosystem health and biological diversity

   Achieve a higher level of sustainable ecosystem health and biological diversity with the most appropriate and economically cost-effective techniques and tools, and by applying a thoughtful, studied adaptive management approach that can be understood and collaboratively implemented by Park District staff, volunteers, and partners.

3. Reduce or eliminate maintenance of unused facilities

   Reduce or eliminate maintenance of unused facilities – The District heats and keeps services and maintains several unused structures. The structures should be removed or altered.

4. Provide for Educational opportunities

   Provide for Educational opportunities – The Natural Areas and the trails provide the frame work for education. Provide for high-quality, multiple-use experiences on the property that are compatible with natural resource management, recreational and environmental education goals, and that do not compromise the ecological integrity of the property. Build a science, research, and education based land management agenda for the property, in partnership with the local community, local and regional universities, schools, and conservation organizations, and with neighboring landowners. In order for Oakdale to become a classroom event location it needs to provide shelter and restrooms for about 3 bus loads (about 180 people) of students.

5. Develop a unique venue for revenue to support and enhance the other goals

Develop a unique venue for revenue to support and enhance the other goals – There were many stories of that wedding or graduation party at Oakdale. Create a unique venue that is appropriate for the market and highlights the natural habitat and surroundings

06 MASTER PLAN

NATURAL AREAS RESTORATION OBJECTIVES

The following restoration objectives are proposed to be initiated within a 10-year time period. These objectives are discussed in detail in the following section

1. **Identify and Repair Erosion Risk Areas:** Identify erosion risk areas on the site, particularly along blufflands and steep trail reaches. Prioritize repair and stabilization of existing rill erosion features along blufflands contributing to degradation of sensitive rock cliff microhabitats and stream water quality. Consider alternative trail design (location, configuration, and materials) in high risk locations, to limit impacts to ecotones (transitional areas between wetlands and uplands) and limit runoff risk.

2. **Control Exotic and Native Invasive Species:** Strategically remove, reduce, and control highly competitive invasive plant species that replace diverse native vegetation and degrade habitat quality. Prioritize control efforts to protect sensitive species habitats and highest quality areas, to facilitate volunteer steward training and participation in the control efforts, and to beautify high use areas of the property.

3. **Use Cost Effective Management Strategies:** Maximize use of cost-effective, carefully prescribed burning to reduce the need for costly mechanical and chemical control agents; rotate prescribed burning on the site, to minimize annual disturbance and to maintain sufficient refugia (areas protected from extreme disturbance) for fire-sensitive wildlife, particularly for beneficial pollinating insects, reptiles and amphibians. Establish demonstration test plots in strategic locations to study burn responses in a range of conditions and locations where closed-canopy forest settings are transitioning to more open presettlement savanna conditions, to measure increases in biodiversity and oak regeneration.

4. **Restore and Maintain Native Plant Communities:** Enhance and protect biological diversity by restoring and maintaining native oak savanna, wetlands, and prairie communities, based on an analysis of soils, topography, hydrology, historic and existing conditions, historic disturbance regimes, and restoration potential. When appropriate, enhance species diversity using available onsite or local seed sources collected using proper native seed collection protocols and re-introduced to appropriate locations on the property. Ideally, restrict seed sources to the watershed or to the physiographic region or ecoregion. Always consult with a botanist or ecologist who knows the local flora.

5. **Restore and Maintain Wildlife and Sensitive Species Habitat:** Restore and maintain wildlife habitat by managing healthy diverse native plant communities that will attract and support successful breeding and rearing, and food source opportunities for diverse wildlife species. Work with regional experts and wildlife specialists to identify habitat management

protocols for sensitive species and habitat refugia documented on the site, including bat and insect fauna refugia. Protect sensitive species and habitat by monitoring frequently and by providing regularly scheduled management, particularly removal of competing invasive woody and herbaceous species and application of appropriate prescribed burn treatments. Re-introduce rare species only under suitable conditions in cooperation with resource and agency experts following state guidelines and policies for rare species relocations and introductions.

6. **Assess and Maintain Site Hydrological Resources:** Continue to study the site hydrology to understand the source and movement of springs and ground water, surface runoff from unstable steep slopes, and flooding regimes. Evaluate the potential for hydrological impacts from offsite and from onsite to adjacent lands, and explore opportunities for adjacent landowner cooperation and support from government programs that address soil and surface and groundwater quality. Monitor channel stability in drainageways and stream corridors and consider future stream channel stabilization efforts where instability and erosion continue and efforts to mitigate runoff from adjacent properties are unsuccessful.

7. **Enhance and Maintain Habitat for Cavity Nesting Animals:** Maintain sufficient live tree and shrub cover to provide nesting habitat for birds, as well as numbers of standing dead trees and quantities of downed logs and woody debris to provide habitat and food sources for cavity nesting species and other wildlife that utilize these resources, including bats. However, remove trees that are determined to pose a hazard to site managers and visitors and that threaten important natural features, structures, and facilities on the property.

8. **Protect Cultural Resources:** Use caution when conducting restoration management activities near cultural resources on the property, including contemporary and older structures and signage; boardwalks and bridges; and educational, instructional, and recreational settings and facilities.

9. **Maintain Safe, Ecologically Sensitive Trails and Access Routes:** Maintain trails, fire breaks, and stream access points to provide sufficient and safe access to the site for multiple users and to facilitate safe and efficient management of the property. Avoid creating unnecessary trails and access points to minimize trampling of native vegetation, prevent soil erosion, reduce opportunities for exotic species invasion, and minimize disturbance to wildlife. Post permanent, attractive signage to encourage use and enjoyment of official trails and respect for the property's natural environment.

10. **Use Public Education and Outreach to Better Achieve Management Goals and to Protect Public Safety:** Regularly evaluate public safety issues and risks to natural resources. Work with site users, and approach

adjacent landowners to alert them to site management goals and activities that might be compromised by inappropriate use of the property, and to seek a collaborative relationship to address management issues, such as excess deer populations and their impacts.

11. **Establish Effective Leadership to Implement the Plan:** Identify the individuals and governing bodies who will be responsible for securing funding and directing and evaluating the plan implementation and its success. Identify the land manager responsible for overseeing the day to day restoration activities, including training and coordination of volunteer stewards and coordination with any contracting agent(s) or professionals hired to undertake restoration treatments, monitoring, reporting, or other activities. Explore partnerships with local and regional universities, schools, and conservation organizations, and with neighboring landowners to develop educational and research programming to advance the restoration of the land and to support the goals of the plan.

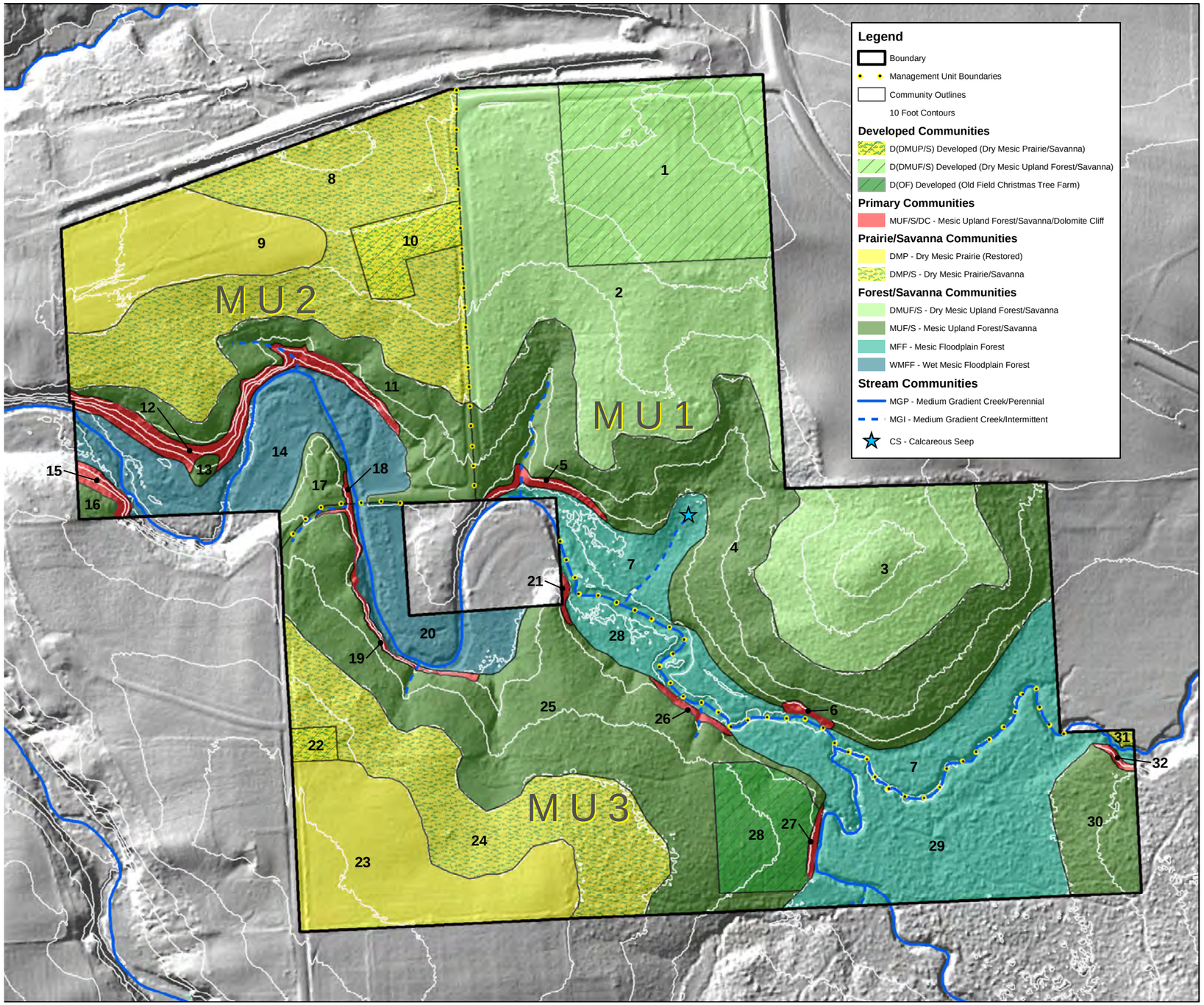
12. **Develop Programming that Supports the Ecological Restoration Management Goals:** Determine the level of research, public education, and stewardship programming desirable for the site, including public education for adjacent landowners and the Freeport Community, to build support for the restoration and maintenance and public use of the natural resources of the property.

13. **Establish a Volunteer Technical Advisory Team to Support Management Decisions:** Establish a volunteer Science & Technical Advisory Team of resource managers, restoration ecologists, foresters, and biologists to meet no less than biannually to review annual work plans and end-of-the-year monitoring reports, and to provide technical insight and recommendations for addressing problems and improving the restoration outcomes.

14. **Maximize Plan Implementation Success:** Establish well-defined management units, to facilitate systematic and cost-effective phasing and rotation of restoration and management activities (brushing, burning, weed control, seeding/planting, mowing, and monitoring).

15. **Monitor to Inform Adaptive Management Decisions:** Regularly monitor and document restoration treatment results and adjust management prescriptions as necessary to achieve the goals of the plan. Re-evaluate and update the plan as necessary every 10 years, through a process defined by the site's governing body and with input from the volunteer technical advisory team.

Communities and Management Units Map



Legend

- Boundary
- Management Unit Boundaries
- Community Outlines
- 10 Foot Contours

Developed Communities

- D(DMUP/S) Developed (Dry Mesic Prairie/Savanna)
- D(DMUF/S) Developed (Dry Mesic Upland Forest/Savanna)
- D(OF) Developed (Old Field Christmas Tree Farm)

Primary Communities

- MUF/S/DC - Mesic Upland Forest/Savanna/Dolomite Cliff

Prairie/Savanna Communities

- DMP - Dry Mesic Prairie (Restored)
- DMP/S - Dry Mesic Prairie/Savanna

Forest/Savanna Communities

- DMUF/S - Dry Mesic Upland Forest/Savanna
- MUF/S - Mesic Upland Forest/Savanna
- MFF - Mesic Floodplain Forest
- WMFF - Wet Mesic Floodplain Forest

Stream Communities

- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent
- CS - Calcareous Seep

Communities & Managment Units

Mgmt Unit / Community / Poly ID	Acres
MU1	**53.9**
Developed (Dry Mesic Upland Forest/Savanna)	**8.6**
1	8.6
Mesic Upland Forest/Savanna/Dolomite Cliff	**0.4**
5	0.3
6	0.1
Dry Mesic Upland Forest/Savanna	**22.1**
2	14.4
3	7.8
Mesic Upland Forest/Savanna	**16.1**
4	16.1
Mesic Floodplain Forest	**6.7**
7	6.7
MU2	**32.2**
Developed (Dry Mesic Prairie/Savanna)	**1.4**
10	1.4
Mesic Upland Forest/Savanna/Dolomite Cliff	**1.9**
12	1.6
15	0.3
18	0.0
Dry Mesic Prairie (Restored)	**5.0**
9	5.0
Dry Mesic Prairie/Savanna	**12.7**
8	12.7
Mesic Upland Forest/Savanna	**5.7**
11	4.5
13	0.1
16	0.2
17	0.9
Wet Mesic Floodplain Forest	**5.6**
14	5.6
MU3	**47.8**
Developed (Dry Mesic Prairie/Savanna)	**0.3**
22	0.3
Developed (Old Field Christmas Tree Farm)	**2.6**
28	2.6
Mesic Upland Forest/Savanna/Dolomite Cliff	**0.7**
19	0.3
21	0.1
26	0.1
27	0.1
32	0.1
Dry Mesic Prairie (Restored)	**6.7**
23	6.7
Dry Mesic Prairie/Savanna	**7.8**
24	7.7
31	0.1
Mesic Upland Forest/Savanna	**15.9**
25	13.4
30	2.5
Mesic Floodplain Forest	**10.9**
29	10.9
Wet Mesic Floodplain Forest	**2.9**
20	2.9
Grand Total	**134.0**

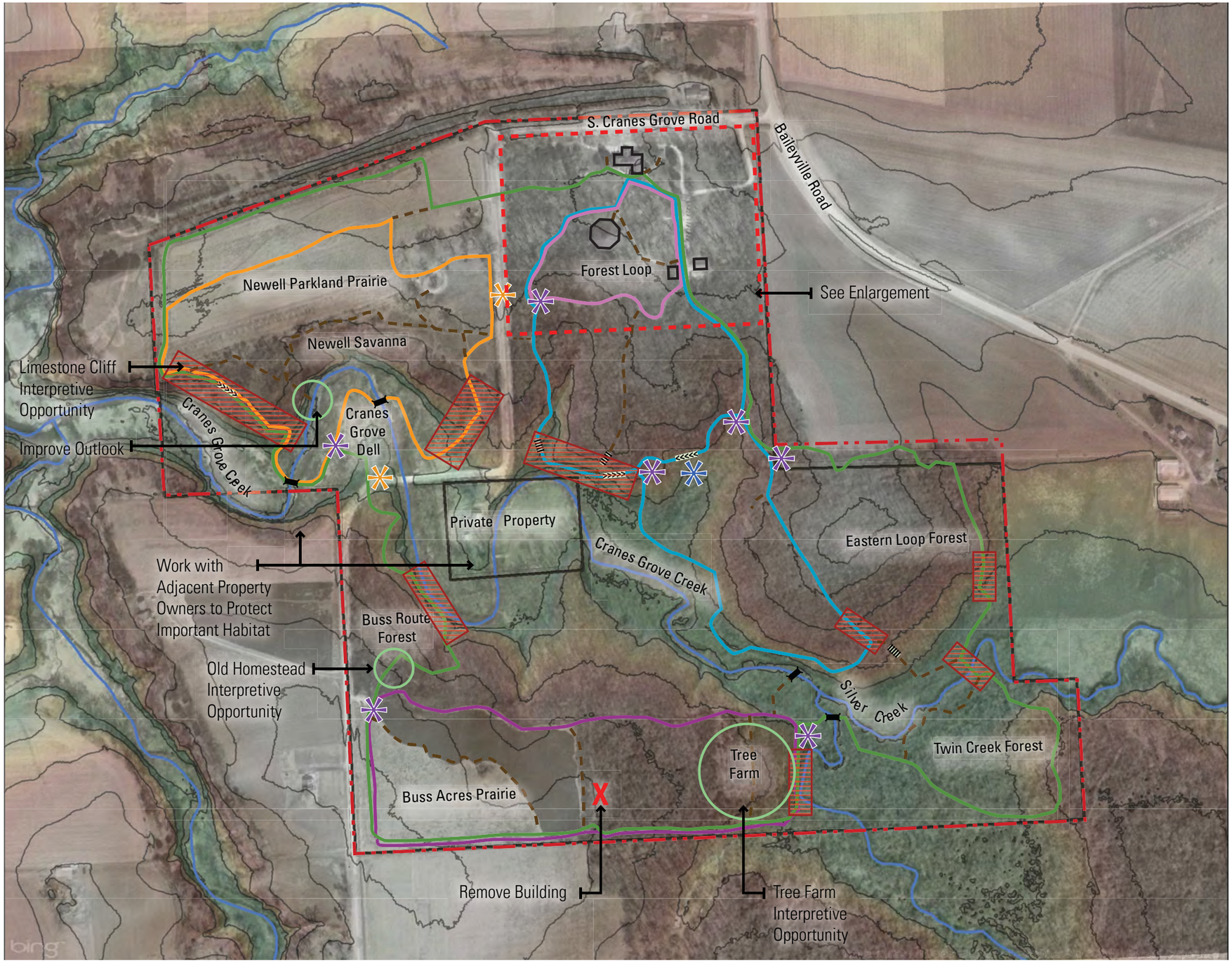
0 100 200 400 600 Feet

Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
Mapped by: dwa
Last modified: Sep 14, 2015

RATIO

Applied Ecological Services, Inc.
17921 W Smith Rd
Brodhead, WI 53520

New Trails Plan



LEGEND

- Creek
- Trail
- Slope
- Stairs
- Bridge
- Spring
- Trail Marker
- Trail Crossing
- Accessible Trail
  0.3 mile 10 min.
- Perimeter Trail
  2.7 miles 1 hr.
- Figure 8 Forest Path
  1.2 miles 25 min.
- Savanna Loop
  0.8 miles 20 min.
- Prairie Loop
  0.7 miles 20 min.
- Adjust Trails

0' 100' 200' 400'

RATIO

TRAILS PLAN AND CULTURAL AREA INTERPRETATION

The trails connect the site. The trails are important to meet the educational goals and the recreational goals of Oakdale. The trails also connect the people to the features of Oakdale including the Central Area, the Limestone Cliffs and the Tree Farm.

We propose the following action items:

- Adjust the location of several trails in order to reduce erosion or impact to significant habitat.
- Install trail markers and trail heads throughout the preserve be marked and clear – Note that these markers should be designed to withstand fire; or be removable.
- Road Crossings – The trail crosses the road in a couple of place, install signage and striping on the roadway.
- Add Interpretive Signage - Several Areas such as the restored prairie, the tree farm, the old homestead, and the limestone cliffs are opportunities for interpretive education

THE CENTRAL AREA

The center of activity; where most people go when they come to Oakdale. This is split into three phases and the phases should be developed as need arises. These are implementation scenarios and there are several different scenarios that could develop The first phase is to alter the auditorium (eight sided barn) to accommodate a minimum of 200 people in case of in climate weather. The second phase is to create an event space, with additional amenities. The third phase would be required if demand allowed. Each phase is to be designed to build upon the previous phase without removing previous work.

Phase 1 – Changes to provide a shelter for 200 people. This is a space that is meant to be rented and open.

1. Auditorium upgrades
    - Relocate bats and Raccoons / Install deterrents
    - Open up the shelter remove some roof panels, add skylights and remove doors
    - Create shelter and seating for about 200+
2. Remove lodge
3. Upgrade Parking and paths
4. Screen Maintenance and flip entry to maintenance facility
5. Improve / Remove / Replace existing shelter

Phase 2 – The addition of a 3 season shelter with fireplace, kitchen and restrooms would make Oakdale a destination. Events could use both the Auditorium and the shelter one as a place for speaker or ceremonies and the other for sit down dining or events by a fireplace.

1. Build Three Season Shelter for +/- 200 People
    - New Restrooms
    - Kitchen
    - Fire places
    - Roll Up Doors for Three Season opportunities
2. Shift Parking Entrance, welcome sign and gateway
3. Install Bus drop off and parking for 3 buses
4. Remove Restrooms
5. Improve Fire Ring / Council Ring
6. Restore Natural Areas near parking and around the central area

Phase 3 – As demand grows and the demand is clear change the shelter to be a year around facility and add a dedicated Nature Center to the Mogle Center

1. Convert three season shelter to a four season shelter
2. Add Nature Center to Mogle Center

Center Area Master Plan

07 FUNDING SOURCES, COSTS AND POLICY REVIEW

COSTS

The three components to the plan, the natural area enhancements, the paths and interpretation revisions and additions and the Central Core Area changes all require funding.

The Natural Areas enhancements is a management plan over 10 years. Some elements of the plan lend themselves to volunteer labor such as removal of garlic mustard and other elements while some task will have to be contracted out such as large tree removal. Most of the management task can be completed with Park District crews and quite a few can be completed with volunteers. Volunteers could change the price for management

The average cost of restoration $2,100 /ac x 10 acres a year is $21,000 a year

The average cost of maintenance is $250 / ac X 20 acres a year is $5,000 a year

Paths and Interpretation Areas and revisions and additions is partly maintenance and partly capital and can occur over a 10 year period. These improvements may coincide with the natural area restoration. These changes should happen hand in hand with the natural area enhancements. Some of the elements can be created with volunteers, some of the elements and changes may need to be contracted and some of the elements are changes or revisions that happen as part of regular maintenance by staff. For a budget for the changes, and capital improvements to signage and trail improvements we recommend $10,000 year for 10 years.

The Central Area enhancements we include capital costs, design and engineering and express the number as a range. This range can be narrowed by further study, detailed design, material selection, and timing.

Phase 1 $500,000 - $850,000

Phase 2 $700,000 - $1,100,000

Phase 3 $500,000- $750,000

FUNDING SOURCES

Funding is always the most challenging part of any plan. Several ideas have come from the process to assist with funding. Funding is needed for maintenance, capital projects, programs and activities.

- The use of volunteer labor and services. Volunteers and volunteer organizations can provide direct funding, run educational programs and lead discovery tours at Oakdale.
- Grants – Both public and private; federal and state grants have goals of improving the natural habitat and changes to Oakdale will fit those goals. Private grants similar to a Barn reuse grant periodically come available.
- Naming Rights – offer naming rights for capital funds, establish a policy prior to implementing the request.
- Severson Dells has a unique system – The Forest Preserve District owns the property and buildings and a separate not for profit runs and operates the programs.
- Fee for use of facilities – Fees for use for large events would be directed back into the park system.
- Partner Agencies can help with funding, provide labor for maintenance or capital or programs, these may include. Soil Conservation Service, U of I Extension Programs, Freeport Area Schools, Freeport Library, Museums, Audubon Society, Boy Scouts and Girl Scouts, Pheasants Forever and others

POLICY RECOMMENDATIONS

- Two properties adjacent to the park may have significant impact on the Oakdale Nature Preserve. We recommend the Park District work with the owners to reduce erosion, nonnative invasive plants removal and habitat degradation improvements. These areas are the property in the center of the park and the property at the far southwestern edge that encompasses some of the creek and bluffs
- Review the alcohol policy for events at Oakdale. In order to make Oakdale more competitive for group events allow alcohol, even in a limited capacity.
- Much of the improvements at Oakdale require volunteer labor and coordination of volunteers. We recommend a position for a volunteer coordinator be added to the Freeport Park District. Duties could also include grant writer, volunteer coordination, volunteer advertising and scheduling, and volunteer education. This position maybe utilized throughout the district.

08 APPENDIX

BAT INFORMATION

All bat houses are not created equal

Few box manufacturers promote their products with photographs of bats actually using their boxes. While it is a little tricky to get great shots of bats in or emerging from bat houses, more likely the problem lies with bats simply refusing to use them. Fortunately with the invention of the internet, it is now possible to compare proven products with those that are more intended for decoration.

Bat houses found in most shopping mall nature stores, mail order catalogs, nationwide hardware stores, and birdhouse websites may be from antiquated plans. Usually they are designed to be fast and inexpensive to make. For several years now we have been teaching the bat house building segment at the annual BCI Bat Conservation and Management Pennsylvania Workshop. Participants are always surprised to learn all the details that go into a successful bat house. We teach that bat houses will fail because of three reasons:

- poor design
- poor construction
- poor placement

Common bat house design and construction problems

Bad bat house designs are simply flawed from the start. They are often too small overall and contain crevices too large. Sometimes a critical detail is omitted, such as a landing plate. Usually these boxes cannot compete with a modern design, even after being upgraded by a creative hobbyist. Bad construction is a different matter, usually the box can be successful after some paint, caulk, extra screws, and extra roughening.

- A single chamber box. Bats simply prefer larger structures which offer a wider range of stable temperatures. A tightly built single chamber bat house may be good "starter" box that would be great for giveaways to the general public.
- Factory smooth interior crevices. All interior wood must be roughened for bats to readily cling to. Some commercial boxes staple screening to the inside of the box which may eventually fall off as condensation and urine rust the staples. A "bat house" seen for sale at a major hardware store has only one groove on the "landing plate"; this is totally unacceptable.
- Unprotected roof. Roofs without shingles may last only a few seasons, once the roof is compromised the box will be incapable of retaining heat and fall into disuse.

One of many experimental bat boxes built in Pennsylvania. This design is mildly successful but can get too hot internally due to the lack of overall height of the box. The bottom door must be kept closed to keep stray light from driving off bats. This same door allows guano and parasites to build up. Tall, open bottom BCM boxes give bats a temperature gradient and are self-cleaning.

- Nailed together with unsealed seams. This type of box will warp and separate at the seams allowing unwanted ventilation and disuse.
- Unpainted, unprotected exterior. Some manufacturers insist on leaving bat boxes unpainted. While in certain regions the natural wood color may be a suitable color, there is no good reason for the structure to go unprotected. While cedar is rot resistant, it will warp and separate the seams just as much as any other wood material.
- Bad design. Bat research has proceeded at a very fast rate, thanks to improved communication among many different hobbyists and biologists across the country. For example, a tall open-bottomed bat house is now preferred over smaller closed bottom designs which tend to attract more parasites.
- Old plans. Bat house plans can be found in a variety of places, which is good. Unfortunately, many posters, books, and flyers were published years ago with now antiquated plans. Frighteningly, this information is still distributed by many reputable sources. A stack of utterly horrid plans obtained from a state wildlife agency were seen distributed at a wildlife program in just a few years ago.
- "Recycled" material. Some people construct bat houses of decent design but with lumber salvaged from demolished structures in effort to cut costs. As some pesticides can leave active residues for years, approach used lumber with care.
- Unrealistic claims. For example, a seven chamber bat house was once observed with nearly 600 bats inside. However, we still only rate that box at 300. This is because 600 bats in this size bat house is overcrowded and unhealthy.

Common placement mistakes

The greatest bat house in the world will never contain a bat unless it is placed properly in the field. In cool climates it is best to avoid shady locations at all costs. Often this limits the mounting options to strategically placed new posts or sunny chimneys. Bad placement includes the following:

- A bat house that is in a shady location. It needs a minimum of seven hours of morning sunlight.
- A bat house mounted on a tree. Rarely will the box ever receive enough direct sunlight in cool climates.
- Bat house placed on a structure, directly under the eves. Again, this may be simply too shaded.
- Placed too far from permanent water. Dry, arid locations are less desirable, though bats will drink from swimming pools.
- Located over bright surfaces which reflect light into box. Shiny flashing or even pans to collect guano may deter use at certain times of the season.
- Located near burn barrels or air vents where smoke or strong wind will disturb bats. Beware of air conditioner units which may not be active when installation occurs.
- Erected where the box is prone to vandalism. Shaking the bat house to watch them fly out during the daytime- yes, your bats will abandon the roost.
- Placed in brightly lit areas. Avoid mounting where dusk-to-dawn lights shine directly onto the box.
- Erected directly along roads, where bats are vulnerable to automobile traffic during their dawn return.
- No maintenance. Some mounting solutions make a quick yearly inspection into a difficult and even dangerous ordeal. Bat houses do require minor wasp and seam inspection, otherwise bats will begin to abandon the box. Be alert for a hornet invasion as well; bats will immediately abandon a bat house until these aggressive insects are removed.

WHAT WE HEARD FROM THE FOCUS GROUP ON AUGUST 14, 2015

This is a memo to confirm what we heard at the focus group meetings

- The most important thing and the main attraction to Oakdale is the unique natural beauty of the site
- Oakdale is important for education and has hosted
    - School events for grade school
    - Special Education sessions
    - Audubon Society and other group education
    - Camp events
- 3 bus loads of kids that are able to have shelter from the weather and restroom facilities +/- 200 students
- Similar Facilities
    - Severson Dells - Rockford
    - Burpee Museum – Discovery Center - Rockford
    - Camp White Eagle
    - Mississippi River Museum
    - Lake Le-Aqua-Na - Lena
    - Torstenson Center – Pecatonica
    - Silver Creek Nature Preserve
    - Paoli Dog Park – Near Madison
- Facility Comments
    - Mogle Center
        - Perfect for meetings – of 20 or fewer
    - Auditorium/Tabernacle
        - Really Smelly – Bats and Raccoons
        - Great Facilities for events – Memorable Events
        - Did not feel alive
    - Lodge
        - Full Kitchen – great amenity
        - Wooden floor provides Character

        - Nature Center
            - Audubon Diorama
            - Events within the Nature Center
        - Restroom
    - Community Venues
    - Allow Alcohol
- Past Events that were popular
    - Luminaire Walk
    - Weddings/Graduations
    - Passenger Pigeon Presentation
    - Children's Field Trips
    - Food for Thought Workshop
    - U of I Extension programs
- New Amenities that were discussed
    - Labyrinth
    - Fireplace
    - Nature Playground
    - Off Leash Dog Facility
- Natural Area
    - Diversity across the site
    - The whole thing
    - Busse Path
    - The area along the creek Southwest of the Newell Shelter
- Funding Ideas
    - Naming Rights
    - Similar to Severson Farms – Districts owns/maintains facility – NGO runs the programs
    - Grants
    - Gifts through the Foundation
    - Shared use facility (Children's Museum, Audabon, Schools, UI Extension)
    - Pledge Campaign

A.E.S. COST WORKSHEETS

	Restoration					
year	**acres**	**brush/treat**	**burn**	**seed/plant**	**cost/ac**	**cost/yr**
1	10	$1,700	$200	$200	$2,100	$21,000
2	10	$1,700	$200	$200	$2,100	$21,000
3	10	$1,700	$200	$200	$2,100	$21,000
4	10	$1,700	$200	$200	$2,100	$21,000
5	10	$1,700	$200	$200	$2,100	$21,000
6	10	$1,700	$200	$200	$2,100	$21,000
7	10	$1,700	$200	$200	$2,100	$21,000
8	10	$1,700	$200	$200	$2,100	$21,000
9	10	$1,700	$200	$200	$2,100	$21,000
10	10	$1,700	$200	$200	$2,100	$21,000
						$210,000

Maintenance						
year	**acres**	**burn**	**weed control**	**enhance seed/plant**	**cost/ac**	**cost/yr**
1	20	$100	$100	$50	$250	$5,000
2	20	$100	$100	$50	$250	$5,000
3	20	$100	$100	$50	$250	$5,000
4	20	$100	$100	$50	$250	$5,000
5	20	$100	$100	$50	$250	$5,000
6	20	$100	$100	$50	$250	$5,000
7	20	$100	$100	$50	$250	$5,000
8	20	$100	$100	$50	$250	$5,000
9	20	$100	$100	$50	$250	$5,000
10	20	$100	$100	$50	$250	$5,000
						$50,000

ECOLOGICAL ASSESSMENT AND RESTORATION PLAN REPORT

PART 1: ECOLOGICAL ASSESSMENT

Introduction

During the growing season of 2015, Applied Ecological Services conducted a series of site visits (June 20, July 16, and August 21) to assess the natural communities of the 133-acre Oakdale Nature Preserve, in order to understand existing conditions and to make recommendations to the District for ongoing restoration and management of the natural assets of the property. Previous land management documents and District staff and volunteer stewards provided insight into the past management of the Preserve and into current critical management issues (Freeport Park District 2008; Gomolka 2003).

The objectives of the site assessment were to:

1. Understand the variability of soils, topography, vegetation, floristic quality, and habitat quality throughout the property and contextual lands.
2. Understand changes in the landcover and land management based on historic aerials and anecdotal information.
3. Evaluate the current stability of soils and vegetation and risk for erosion and loss of the native seedbanks important to preserving the plant community diversity and habitat quality.
4. Identify critical resource issues to be addressed in restoration and management goals, objectives, tasks, and strategies.

Concurrent with the field investigations, several stakeholder sessions were conducted to gather concerns and opportunities relative to the management of natural and developed areas of the Preserve. The following synthesis of comments relative to management of the natural areas was valuable to developing the goals and objectives that are presented later in this document:

1. The variety of habitat types and the sense of "wildness" that the Preserve offers is unique among other District parks, and thus protecting the ecological integrity of the natural communities is important for sustaining and preserving this valuable resource for the recreational and educational benefit of the community.
2. Past management has focused on restoring and maintaining the pre-settlement oak savanna landscape of the region, which relies heavily on the use of prescribed fire.
3. The system of trails through the Preserve is an important asset for providing public access for recreation and environmental education activities. Maintenance of the trails must balance access with ecologically sensitive trail design. Trail systems currently include mowed trails, dressed wood chip trails, and paved roadways. Several bridge crossings are located on Crane's Grove Creek, which are vulnerable to periodic flooding.
4. Limited funding and volunteer resources will require prioritization of management efforts and consideration of creative funding sources important for sustaining management of the natural communities into the future. The establishment of a volunteer technical advisory committee with knowledge of natural community management and an understanding of the goals and objectives of this plan would serve to assist District staff in developing an annual work plan and budget.

5. Currently, a complete listing and mapping of the flora and fauna that occupy the Preserve does not exist. Building such a taxonomic database will provide valuable resource information for current and future land managers of the Preserve to ensure preservation of the biological diversity and ecological integrity of the property.

6. One in-holding is located in the center of the property. Seeking opportunities to share management goals and collaborate where possible to carry-out management objectives can optimize cost-effective restoration and sustained management of the natural assets of both properties. This opportunity exists for all adjacent landowners as well.

7. Buildings occupy the north sector of the property, where mature oaks and other trees occur with a mowed understory. Trees in this high-use, intensively maintained area are vulnerable to root damage, due to soil compaction and bark damage from vehicles and maintenance equipment, which can shorten the life expectancy of the trees. Establishing attractive naturalized plantings in no-mow areas beneath the trees and within the tree's "drip line" (the outer extent of the leaf canopy) will help to maintain the valuable mature tree canopy in this high-use public area of the Preserve.

8. Three former agricultural fields are important cultural features of the property that provide unique visitor experiences. Two of the fields have been restored to native grasslands (Newell Parkland Prairie and Buss Acres Prairie). The third field was planted as a "Tree Farm" 30 or more years ago, and although trees in this location have become part of the mature canopy, they continue to exhibit the orderly rows of the original plantings. The "Tree Farm" has been a popular outdoor education area for youth in the past. A former farmstead is located on Cranes Grove Road on the west side of Buss Acres Prairie, featuring some of the former farmstead landscaping including extensive beds of non-native daylilies (Hemerocallis fulva), which may be spreading from their original planted locations.

Method

To prepare for the onsite ecological assessment investigations, an AES ecologist and geospatial technician developed a GIS base map set of resource information, including soils, elevation, topography and drainage, applying shaded relief and contours from Stephenson County LiDAR data and current and historic aerial imagery. During three separate site visits, representative areas of the property were walked or traveled by ATV with District staff or volunteer site stewards[1] to document and characterize key natural community types, along with dominant and characteristic plant species based on classification systems in Illinois (White 2009), and to identify critical resource issues such as invasive species and erosion damage or risk, as well as restoration potential for improving overall ecosystem health. General conditions and features of interest were photo documented. Extensive species lists were not developed as part of this investigation. Information gathered from these investigations was used to develop additional map layers of photo point locations, steep slope areas, a classification of tree height, and management unit boundaries.

Results

The following describes key resources of the Oakdale Nature Preserve natural landscapes that are important to understanding opportunities for restoring and managing the natural assets of the property. An appended map set is provided to illustrate elevation and topography, soils, historic land cover, natural communities, and analyses of steep slopes and tree canopy height.

1 Valuable input was provided by Superintendent of Parks Steve Ehlbeck and Jennifer and Alan Nowiki.

Setting & Significance of the Oakdale Nature Preserve

The Preserve is located in the region of the state known as the Rock River Hill Country Natural Division (Schwegman et al. 1973). This region is characterized by rolling topography and a thin mantle of glacial till drained by the Rock River and its tributaries. Two major bedrock formations—the limestone and dolomite dominated Freeport Section which underlies the greater part of the region and the sandstone dominated Oregon Section to the south—influence soil chemistries and thus floristic differences. The Preserve lies atop the Freeport Section, with its more carbonate rich and higher pH soils. Presettlement land cover of this division is characterized as having been prairie in the larger expanses of level uplands, with scattered oak openings, and with forest along water courses in more dissected uplands.

The Oakdale Nature Preserve is one of several large forested blocks that contribute to a relatively intact green corridor linking Cranes Grove Creek and Yellow River within the Pecatonica River system. This connectivity is crucial for ensuring the free movement of organisms across our fragmented landscape, in order to encourage and sustain viable wildlife and plant populations in the face of a changing climate. Access by our citizens to such natural resource assets is invaluable for maintaining a restorative connection with nature and for all of the recreational and educational benefits such a resource can provide.

Elevation, Topography & Drainage

The Preserve exhibits a highly varied topography that contributes to a rich diversity of habitats and microhabitats supportive of biological diversity not found elsewhere in the surrounding agricultural and urbanized landscapes. Level to gently sloping uplands break abruptly at blufflands with sheer rock outcroppings and steeply eroded ravines above the relatively broad bottomlands of the Cranes Grove Creek corridor that meanders dramatically across the property in a northwesterly direction (see the Topography map in the appended map set). Elevations range from 870 feet at the northeastern and southwestern sectors of the property to 790 feet at the western end of the stream valley, a difference of 80 feet. Cranes Grove Creek is joined by a smaller order tributary stream that enters the property from the east and is named Silver Creek on District site maps[2]. Less than two miles north of the Preserve, Cranes Grove Creek joins Yellow Creek, which confluences with the Pecatonica River on the east side of Freeport.

Soils

The most widely distributed soils of upland settings of the Preserve (see the NRCS Soils map in the appended map set) consist of very deep to deep, well drained silt loam soils formed variously of parent materials of loess (fine windblown silt) or other silty material, and glacial till and outwash and residuum from limestone (Fayette, Batavia, Camden, St. Charles, and Woodbine Series). All of these soils are classified as alfisols or soils that developed under a various deciduous tree canopy. Specialized soils with a more restricted distribution along the bluffland ridges of the Preserve are silt loam soils of the Elizabeth Series, shallow and very shallow, somewhat excessively drained soils formed of loamy material weathered from dolomitic limestone. Elizabeth soils are mollisols that developed under open prairie grasslands. Bottomland soils that occupy the floodplain and terraces above the stream corridor consist of very deep well drained to somewhat poorly drained water deposited fine to coarse textured alluvial and colluvial soils that washed from upland settings. These are silt loams of the Beavercreek, Dorchester, and Radford Series.

2 On other maps, the smaller order stream entering the property from the east is unnamed, and a separate stream labeled Silver Creek is mapped about three miles east of Freeport that drains directly into the Pecatonica River.

Historic Land Cover

A series of aerial images were examined to interpret land cover changes since 1939 (see Aerial Photo series in the appended map set dating from 1939, 1999, 2005, 2012, and 2013/2014). These images show that the Preserve has been more or less forested for the past 75 years, with cleared fields in three locations. The 1939 map, however, exhibits a much more open canopy likely maintained by pastured livestock since the area was settled in the first half of the nineteenth century, and which resembles to some extent, particularly in the most open settings, the early prairie – savanna landscape of the Rock River Hill Country. Removal of fire from the landscape following settlement caused the rapid expansion of forest cover in the region, except for lands cleared for agriculture. Open savanna with widely scattered oaks quickly became closed canopy forests (Swink & Wilhelm 1994; Curtis 1959). Further investigation of the early 19th century General Land Office (GLO) survey field notes and maps would provide evidence of the extent of prairie and timbered lands in the relevant sections, particularly of the distribution of trees along the section lines as they were encountered and recorded, including species and diameter.

In recent decades open agricultural fields on the Preserve were either planted with trees or to prairie grasslands to begin the process of naturalizing these areas. The 2005 aerial shows a blackened portion of the prairie in the southwest sector of the property and neighboring land where prescribed burning had taken place just prior to the time the aerial photo was captured. By the time of the 2013/2014 aerial image was taken, storm damage and the effects of oak wilt had begun to significantly alter the former oak dominated tree canopy in several locations. While this is not readily apparent in this image, an analysis of canopy tree heights using Stephenson County LiDAR imagery shows the distribution of the highest or oldest tree canopy areas in bright red and dark green, and canopy areas and areas in gold where older trees have likely been lost from the canopy (note the shorter stature trees in the "Tree Farm" area along the south property boundary).

Natural Communities

The natural communities of the Preserve consist largely of upland and bottomland forest or woodland types dominated by oaks, hickory, basswood, ash, American elm and several other hardwood trees common in the upper Midwest. One tree species that has limited distribution on the Preserve and is much less common in the region is the Kentucky coffeetree (Gymnocladus dioicus), a more southern species that is at or near the northern extent of its range in northern Illinois. Many oaks, particularly older individuals, exhibit the open grown stature of the region's savanna trees, which occupied settings that were much more open during early decades of the tree's development, before European settlement when fire was more widely used on the landscape or later with post-settlement livestock grazing. Once timbered pastures were abandoned, they quickly developed a more or less continuous tree canopy, such as in the Preserve. The reintroduction of fire as a management tool in the past decade or more has begun to recapture the savanna structure in some areas of the Preserve, accompanied by many associated benefits in the understory with increased light levels, particularly the production of new oak and hickory seedlings and reinvigoration of the native ground cover. These benefits are critical to replacing lost oaks from the mature tree canopy due to wind and insect damage and for developing a continuous diverse native herblayer of fine-rooted grasses, sedges, and wildflowers that will protect soils and stream quality and provide a defense against undesirable invasive species.

The Preserve's woodland communities (which represent 75% or more of the land cover of the Preserve) and the open restored grasslands are distributed along a moisture gradient that corresponds more or less with the elevation gradients across the property and with the soil types associated with these positions on the landscape. Following is a description of the major community types of the Preserve that includes some of the dominant and characteristic plant species associated with each, the distribution of each in the Preserve, and discusses the critical resource issues observed and learned about during the current assessment, which will be addressed in the restoration plan. As you read these descriptions, please refer to the appended Communities & Management

Units map. Each community is delineated on the map within a color-coded and numbered polygon. The map also includes a listing of the polygons and their acreages which are organized into three units of the property defined by Cranes Grove Creek Road and by the stream corridor. These Management Units (MUs 1 – 3) and their purpose are discussed further in the restoration plan section.

Forest and Savanna Communities

Dry-Mesic Upland Forest/Savanna

This community occupies the well drained soils at higher elevations of the Preserve. Characteristic species of this community that typically dominate the tree canopy include several oak species, including white (Quercus alba), red (Q. rubra), and black (Q. velutina) oaks, all of which are present in the Preserve, along with bur oak (Q. macrocarpa) a common oak of presettlement savannas and oak openings, and chinquapin oak (Q. muhlenbergii), which occurs in smaller numbers in shallow to bedrock soils at bluff edges. Other characteristic tree, shrub, and woody vine species include shagbark hickory (Carya ovata), ironwood (Ostrya virginiana), and Viburnum and Cornus shrub species, and Virginia creeper (Parthenocissus quinquefolia). This community is typically more open than the mesic upland forest, and in locations within the Preserve where oaks exhibit a more open grown growth habit and where fire has been reintroduced, presettlement savanna characteristics are being restored (as depicted in Photo 1). The understory flora has also improved in these locations. Along with frequently observed oak seedlings, many sedges, grasses, and characteristic woodland and savanna forbs are becoming more widespread, including red trillium (Trillium recurvatum), white lettuce (Prenanthes alba), shooting star (Dodecatheon media), and late horse gentian (Triosteum perfoliatum).

Importance and critical resource issues: The Dry-Mesic Forest/Savanna community represents a little over 30 acres or 23% of the landcover on the property, nearly 9 acres of which also includes the main buildings and parking facilities (Polygon 1), where the understory is maintained by mowing. Where storm and disease damage has removed many of the upper canopy oaks,

Photo 2. Dry-Mesic Forest/Savanna in the Eastern Loop Forest, where oaks removed from the canopy by storm damage are being replaced by a younger cohort of basswood

Photo 1. Dry-Mesic Forest/Savanna along the lower Figure 8 Forest Path.

basswood (Tilia americana) saplings have succeeded into the canopy in large numbers, along with other shade tolerant species (see Polygons 3 and 4, and Photo 2 taken from the Eastern Loop Forest trail). This canopy shift is largely due to low oak seedling and sapling numbers in the understory caused by lack of fire management that would otherwise favor an oak dominated system. Among the invasive woody and herbaceous species requiring management attention in this community are multiflora rose (Rosa multiflora), bush honeysuckles (Lonicera maackii, Lonicera spp), and garlic mustard (Alliaria petiolata). Trail reaches along steeper slopes, such as along the southern perimeter of the Savanna Loop trail in Photo 3, exhibit or are at risk for erosion damage. Trail edges in these settings, particularly in heavily shaded understories, often serve as refugia for native species not able to thrive, flower, and produce seed beyond the available light gap created by the trail. These are also the most heavily traveled corridors subjected to damage by deer browse, trampling by hikers, and smothering by wood chip trail dressing. Slowly increasing light levels throughout this community using fire and selective canopy thinning, while concurrently controlling invasive species and enhancing native cover with seed and plants where native seedbanks are lacking, will improve the health of this community over time.

Photo 3. Savanna Loop Trail.

Mesic Upland Forest/Savanna

This community occurs in mid to lower slope areas and in shaded ravines with increased soil moisture (Photo 4). Many of the same oaks and other canopy associates of the dry-mesic community are found here, but with increased importance of more shade tolerant species, such as red oak, basswood, maple (Acer spp), black walnut (Juglans nigra), and white ash (Fraxinus americana), along with a richer understory flora, particularly of ferns and spring ephemerals. Species more commonly found in the adjacent bottomland communities of the Preserve are also present, adding to the biological diversity of this community. Characteristic species observed in the herblayer include jack-in-the-pulpit (Arisaema triphyllum), true Solomon's seal (Polygonatum canaliculatum), woodland violets (Viola spp), and honewort (Cryptotaenia canadensis).

Photo 4. Mesic Forest/Savanna with restored understory conditions along the Buss Route Forest Trail.

Photo 5. Dolomite cliff habitat above Cranes Creek supporting extensive bulblet fern (Cystopteris bulbifera) and bryophyte populations.

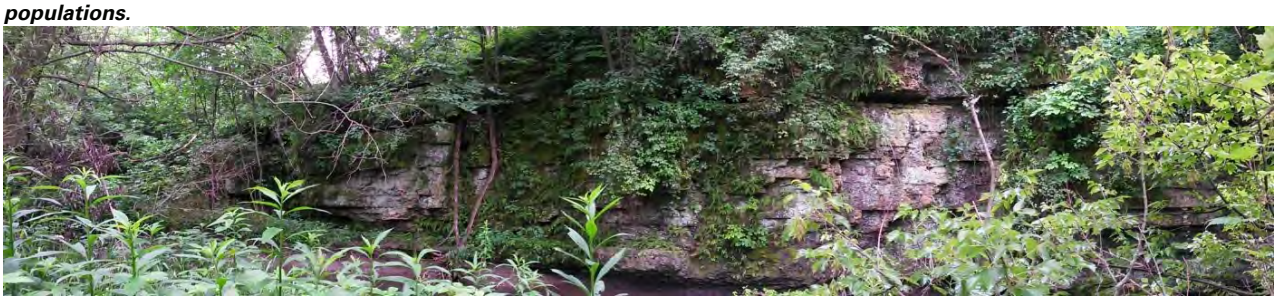


Photo 6. The "Tree Farm" at the east end of the Prairie Loop trail.

Included in this community are locations where dolomite bedrock is exposed at the base of bluffs and in some cases is contiguous with the Cranes Grove Creek stream channel (Polygon12, and as depicted in Photo 5). Such extreme settings or microclimates support a unique assemblage plants and animals, including uncommon ferns and macroinvertebrates. Shallow fracture caves are also reported in similar cliff settings just off-site that could potentially provide habitat for bats and other cave-dwelling organisms.

Importance and critical resource issues: This community represents approximately 41 acres or 30% of the landcover on the property, 3 acres of which are inclusive of 45 – 70% or greater slopes and the dolomite cliff features (see the Percent Slope & Communities map). An additional 2.6 acres includes the "Tree Farm" (Photo 6), which occupies the former open field and the elevation and soil types that support the mesic forest/savanna community. It was suggested that the planted conifers and other trees in this location have value for outdoor educational activities, although some older trees are beginning to die, and succession in the understory is occurring with species from the surrounding forest/savanna community, along with several invasive species. Erosion is occurring in some high-risk areas at the top of bluffs where off-trail incursions by hikers have removed vegetation (as pictured here in Photo 7, partially hidden by overhanging vegetation). Repair of these areas and public education will help to protect sensitive cliff and stream habitats. Similar

Photo 7. Removed vegetation.

Photo 8. Dense garlic mustard in areas of the Twin Creek Forest in the southeast corner of the Preserve.

deleterious shading effects and invasive woody and herbaceous plant species occur here as in the dry-mesic forest/savanna community. This community would benefit from the same restoration strategies as recommended for the dry-mesic forest/savanna community, however using caution in the area of sensitive cliff communities when using fire. As in the dry-mesic forest/savanna, invasive woody and herbaceous species require management attention in this community, including dame's rocket (Hesperis matronalis), multiflora rose, bush honeysuckles, and garlic mustard. Garlic mustard forms dense stands in some locations, as depicted below in Photo 8 near the trail in the area known as Twin Creek Forest.

Mesic Floodplain Forest

This community occupies the higher terraces and well to moderately well drained coarser alluvial soils of the broader floodplain in the eastern half or upstream end of the property (Photo 9). Characteristic tree species include maple (Acer spp), bur oak, black walnut, green ash (Fraxinus pennsylvanica), American elm (Ulmus americana), and hackberry (Celtis occidentalis). Kentucky coffeetree, a tree usually found on streams or on floodplains, was observed in several locations in this community. Characteristic understory species in this community include wingstem (Actinomeris alternifolia), side-flowering aster (Aster lateriflorus), cupplant (Silphium perfoliatum), and great angelica (Angelica atropurpurea). Periodic flooding creates scour and deposition features that quickly become occupied by stinging and woodland nettles (Urtica procera and Laportea canadensis).

Importance and critical resource issues: This community represents approximately 18 acres or 13% of the landcover on the property. Included within this community (see marked location in Polygon 7) is at least one calcareous seep or location where calcium-rich groundwater outcrops at the surface and maintains saturated soil conditions throughout the growing season (Nowiki 2015, Photo 10). Drainage from this wetland feature provides cool

Photo 9. Mesic Floodplain Forest from the trail in the southern extent of the Eastern Loop Forest.

Photo 10. Saturated Soils.

water surface and base flow to Cranes Grove Creek. Such specialized groundwater features with bedrock-influenced water chemistries also support some of our most uncommon and rare plant and animal species, and they are sensitive to groundwater contamination from pesticides and fertilizers. Future investigations should further study and document this feature and explore other areas of the property for similar seep and spring features. Bottomland areas have a high number of invasive woody and herbaceous plant species, including dame's rocket (Hesperis matronalis), garlic mustard, multiflora rose, bush honeysuckle, and reed canary grass (Phalaris arundinacea). These areas would benefit from burn where fire will carry.

Wet-Mesic Floodplain Forest

This community occupies somewhat poorly drained to slightly wetter soils within the more tightly constrained floodplain at the west end of the property. It supports similar canopy species as the mesic floodplain forest but perhaps with greater cover by species more common in wetter sites such as silver maple (Acer saccharinum) and willows (Salix spp), along with nettles and orange jewelweed (Impatiens capensis) in the understory.

Importance and critical resource issues: This community represents approximately 18 acres or 13% of the landcover on the property. Flooding is a reoccurring disturbance that scours and deposits fresh alluvium thus changing the subtle topographies of this community over time. Trails and bridge crossings are most at risk in these locations. As with the mesic floodplain forest invasive species control is important, and when conditions allow, fire management can assist in combating overgrowths of understory brush and stimulate native species cover.

Prairie and Savanna

Dry-Mesic Prairie (Restored)

This cultural community is located where former open agricultural fields have been converted in recent decades to grassland cover using native grass or low-diversity prairie species mixes. This community occurs in two locations in the Preserve: the Newell Parkland Prairie in the northeaster sector of the property (Polygons 8 and 9, pictured here in Photo 11) and the Buss Acres Prairie in the southwest sector (Polygon 23 and a portion of Polygon 4).

Importance and critical resource issues: This open prairie community currently represents approximately 15 acres of the landcover on the property; however, the restoration plan recommends beginning to introduce widely scattered oaks into transitional areas (see Dry-Mesic Prairie/Savanna) to begin to blend the conspicuous former field boundaries into the adjacent oak woodland and savanna communities for ecological (improved habitat) and aesthetic reasons. This change in management will reduce the total cover by open grasslands to approximately 12 acres. Opportunities to enhance biodiversity and habitat value of these grasslands can occur by overseeding with locally sourced native prairie forb mixes following spring prescribed burns.

Photo 11. Newell Parkland Prairie

Photo 12. Buss Route Forest near the old farmstead where daylilies have expanded into the forest/savanna understory.

Dry-Mesic Prairie/Savanna

This community combines a portion of the dry-mesic prairie communities with adjacent forest/savanna communities to create a more natural transition between the rectilinear restored former agricultural fields and the adjacent forest/savanna communities as described above. Pictured here in Photo 13 is the Buss Acres Prairie trail following the current north prairie-forest border, where younger trees are already beginning to move on their own into the open setting of the prairie. Management of this transitional area will use fire, selective mechanical thinning, and planting of widely scattered oaks to effect a gradual change in cover over time.

Photo 13. Buss Acres Prairie Trail.

Importance and critical resource issues: This open to semi-open prairie/savanna community will expand habitat for blue birds and other species that occupy edge communities. This community will represent approximately 22 acres or 17% of the landcover on the property, which is inclusive of two developed areas: the 1.4 acre Newell Prairie picnic shelter and parking facility (Polygon 10) and the .3 acre parking area at the location of the former farmstead (Polygon 22, pictured below in Photo 12 from the Buss Route Forest trail—note daylily beds on the left side of the photo). As with the dry-mesic prairie, opportunities to enhance biodiversity and habitat value of these grassland/savannas can occur by overseeding with locally sourced native prairie forb mixes following spring prescribed burns.

Stream Communities

Medium Gradient Creek/Perennial

Cranes Grove Creek and its tributary stream Silver Creek are perennial streams with year-round flow. The coarse rock stream substrates and minimal sediment deposits suggest this stream may be more accurately classified as a high-gradient stream, typical of other headwater streams throughout much of Illinois with gradients of 10 or more feet per mile. Water clarity and substrate

Photo 14. Cranes Creek in the western sector of the Preserve.

conditions in this stream as observed periodically during 2015 (as pictured below in Photo 14), suggest this stream likely has suitable habitat for characteristic and perhaps rare fish and aquatic organisms representative of this community type. In several locations, particularly along the western reaches of the stream within the Preserve and beyond, dolomite cliffs meet the stream and form a resistant boundary providing unique riparian habitat opportunities for plants and animals.

Medium Gradient Creek/Intermittent

Several drainage features and short ravines enter Cranes Grove Creek from surrounding blufflands. These features flow more or less intermittently, particularly during rain events and snowmelt, unless fed by perennial groundwater discharge, such as the seep in Polygon 7 and described below.

Calcareous Seep

This community, described above as occurring within the mesic floodplain forest community (see marked location in Polygon 7), may need further investigation to distinguish it from a typical seep, which is also somewhat calcareous, versus a true calcareous seep with unique features caused by much higher calcium carbonate levels (e.g. the presence of tufa or heavy calcium deposits at the surface, and location within the Wisconsinan till plain landform). The Oakdale seep is likely a typical seep based on the dominant plants, which include sedges (Carex spp), jewelweed, clearweed (Pilea pumila), and great angelica. Great blue lobelia (Lobelia siphilitica) a common plant of moist ground, but also found in calcareous fens, grows in this location, as pictured here in Photo 15 (note blue flowers).

Photo 15. Great Blue Lobelia

Importance and critical resource issues: Stream and seep communities are unique and important hydrological resources in the Oakdale Preserve. Water and habitat quality is best maintained by ensuring minimal impacts from surface water runoff containing sediment from eroded soils and nutrient and chemical contaminants from unbuffered agricultural lands and seasonally salted road surfaces. Further study of streams and groundwater along with a complete inventory of aquatic taxa will be valuable for monitoring these significant natural resource assets of the Preserve.

PART 2: ECOLOGICAL RESTORATION PLAN

Introduction

In the Part 1 Ecological Assessment, we provide our understanding of the existing conditions of the Oakdale Nature Preserve natural communities and how we believe they have changed over time. This knowledge of the land provides the foundation for the restoration plan contained in this section. This knowledge coupled with an economically viable plan based on sound ecological restoration principles, site-specific goals, and field tested management strategies, and most importantly with leadership that is committed to carrying-out and funding the plan, will contribute significantly to the long term success of the ecosystem restoration program. These principles, goals, and management strategies are discussed in this section.

Ecological Restoration Principles, Goals & Objectives

The following restoration principles, goals, and objectives are proposed for the Oakdale Nature Preserve restoration plan to systematically address the critical resource issues, threats, and stressors identified during the natural resource inventory and ecological assessment of the property. The guiding principles provide a basic approach for undertaking land management practices that are intended to improve the ecological health (Schaeffer et al. 1988) of degraded lands or to, at minimum, maintain conditions that are reasonably healthy. Restoration practices such as burning and removing undesirable elements of the plant community to achieve specific outcomes can sometimes have unexpected results from those intended or envisioned in the original stated goals and objectives (an example of this is removing invasive reed canary grass, only to have a flush of burdock and thistles take its place). Therefore, the restoration principles, goals, and objectives can help guide the decision making process when outcomes are different than expected and land managers must adapt to the new conditions.

Guiding Restoration Principles

1. *Ecological Restoration:* The Ecological Society of America defines ecological restoration as a process of intentionally altering a site to establish a defined, indigenous, historic (presettlement-like) ecosystem. Others define it simply as a process of assisting the recovery of an impaired ecosystem (Apfelbaum & Haney 2010). In either case, the goal of restoration is to emulate as much as possible the structure, function, diversity and dynamics of the native ecosystem, and to do so with management practices that are intended to maintain the ecological integrity and health of the system. The Erickson Wetland Ecological Restoration Plan proposes to achieve ecological restoration in this manner to the extent possible, given the limitations imposed by past and current land management practices, by the varying degrees of degradation of the native plant communities, and by program support and funding constraints.
2. *Ecosystem Health:* Assessing ecosystem health requires an understanding of what an ecosystem is and how it is "supposed" to work. Ecosystems are defined by the species that inhabit them (composition), by the structural elements that shape them—vegetation, soils, and landforms (structure), and by the processes that occur in them (function). An ecosystem is a complex and dynamic place where assessing "health" can be difficult to measure (Apfelbaum and Haney 2010; Costanza 1992). A simple assessment of ecosystem health can be made from the most visible signs or indicators, such as stable soils, clean water, and diverse plant and animal communities. Less obvious indicators are the land's ability to retain and infiltrate water to maintain aquifers and the ecosystem's capacity to change and adapt to disturbances. Ecosystem or land health can be viewed as a state of integrity and sustainability of all elements and functions of a natural community. In A Sand County Almanac, Aldo Leopold defined land health as the capacity of the land for self-renewal, and conservation as our effort to understand and preserve this capacity. Thus, attaining and maintaining healthy land also requires an enduring relationship between the land and the people that care for it. Based on an understanding of the existing ecological conditions, the Oakdale

Nature Preserve plan proposes to restore the land using restoration methods and strategies to achieve a higher state of ecosystem health. As with ecological restoration, ecosystem health can be achieved only to the extent possible, given the same limitations of land use history, degree of degradation, and funding.

3. *Adaptive Management:* Just as ecosystems are complex and dynamic, responses to restoration treatments can also be surprisingly dynamic and unpredictable, particularly in highly degraded natural communities. The effects of predicted climate change in this region are expected to exacerbate such responses (Wright & Bradley 2008; WICCI2011). Therefore, a flexible management strategy is needed that allows for timely evaluation and fine-tuning of the plan, to keep the restoration moving forward toward improving the overall performance of the site. This might mean burning more frequently than anticipated to control invasive shrub seedlings, accelerating a native enhancement seeding effort because the seedbank response was slower than expected, or adjusting the burn schedule to accommodate life cycles of sensitive faunal groups. This process of evaluation, adjustment, refinement and change is adaptive management. A well designed monitoring program that regularly evaluates community responses and provides feedback to land managers is a key component of this process. Another strategy often incorporated into the adaptive management process is onsite demonstration test plots, in which experimental restoration treatments and strategies can be implemented and studied as part of improving and refining the plan and restoration outcomes. Test plots are also a valuable tool for public education and for training volunteer stewards to undertake Citizen Science monitoring activities. The Oakdale Nature Preserve plan proposes to apply the adaptive management process to achieve the highest degree of restoration benefits possible, and to explore opportunities to utilize the restoration program to advance understanding of the most effective restoration strategies through the use of test plots.

4. *Remedial and Long-term Management:* Phases of the Restoration Program: The process of restoration is an evolving one, and typically starts with the hard work of repairing ecosystems in a state of advanced decline—widespread invasive species and loss of other major aspects of composition, structure, and function. This is referred to as the remedial phase of restoration. Once the system has recovered substantially and can be maintained sustainably into the future with much less effort and investment, the restoration has entered a new phase: the long-term management or maintenance phase.

   Tasks undertaken during the remedial phase include slowing runoff and stabilizing eroding soils, clearing brush, controlling invasive species, and systematically reintroducing fire. Consequently, the remedial phase requires the greatest short-term financial commitment and level of effort. The period of time required to conduct the remedial restoration phase depends on the size and complexity of the property, the condition of the ecological systems, the availability of resources and labor, and other opportunities and constraints (i.e. biological responses, site access, and weather). This phase could take 15 -20 years at Oakdale Nature Preserve with current available resources and assistance from volunteers.

   Once the initial ecological and biological objectives are achieved, the restoration program shifts to the long-term management phase, where more routine management practices and strategies are implemented on a rotational basis in the established management units. Long-term management tasks include conducting prescribed burns, monitoring and spot treating invasives, collecting and planting native seed to enhance biodiversity, documenting and reporting the ongoing activities and outcomes to constituents and partners, assessing budget needs, carrying out ongoing and new research projects, and training new staff and volunteers. Many of these long-term ecological management activities can then come to be viewed as part of general operations and maintenance function conducted annually at strategic times to maintain the plan's ecological goals. Nevertheless, long-term management must also remain responsive to the guiding principle of adaptive management (defined above), and be prepared to respond to catastrophic events such as storms and floods, and new infestations of invasive plants and pathogens that are already occurring more regularly with climate change.

Long-term Goals

1. Restore, maintain, and preserve the ecological integrity of Oakdale Nature Preserve's natural resources, to benefit humans and wildlife; enhance and protect biodiversity, water and air quality, wildlife habitat, and overall ecosystem health; and to honor the environmental legacy and sense of place that is the Oakdale Nature Preserve.
2. Achieve a higher level of sustainable ecosystem health and biological diversity with the most appropriate and economically cost-effective techniques and tools, and by applying a thoughtful, studied adaptive management approach that can be understood and collaboratively implemented by Park District staff, volunteers, and partners.
3. Build a science, research, and education based land management agenda for the property, in partnership with the local community, local and regional universities, schools, and conservation organizations, and with neighboring landowners.
4. Provide for high-quality, multiple-use experiences on the property that are compatible with natural resource management, recreational and environmental education goals, and that do not compromise the ecological integrity of the property.

Specific Objectives

The following restoration objectives are proposed to be initiated within a 10-year time period. These objectives are discussed in detail in the following section (Part 3 – Restoration Tasks & Strategies).

1. *Identify and Repair Erosion Risk Areas:* Identify erosion risk areas on the site, particularly along blufflands and steep trail reaches. Prioritize repair and stabilization of existing rill erosion features along blufflands contributing to degradation of sensitive rock cliff microhabitats and stream water quality. Consider alternative trail design (location, configuration, and materials) in high risk locations, to limit impacts to ecotones (transitional areas between wetlands and uplands) and limit runoff risk.
2. *Control Exotic and Native Invasive Species:* Strategically remove, reduce, and control highly competitive invasive plant species that replace diverse native vegetation and degrade habitat quality. Prioritize control efforts to protect sensitive species habitats and highest quality areas, to facilitate volunteer steward training and participation in the control efforts, and to beautify high use areas of the property.
3. *Use Cost Effective Management Strategies:* Maximize use of cost-effective, carefully prescribed burning to reduce the need for costly mechanical and chemical control agents; rotate prescribed burning on the site, to minimize annual disturbance and to maintain sufficient refugia (areas protected from extreme disturbance) for fire-sensitive wildlife, particularly for beneficial pollinating insects, reptiles and amphibians. Establish demonstration test plots in strategic locations to study burn responses in a range of conditions and locations where closed-canopy forest settings are transitioning to more open presettlement savanna conditions, to measure increases in biodiversity and oak regeneration.
4. *Restore and Maintain Native Plant Communities:* Enhance and protect biological diversity by restoring and maintaining native oak savanna, wetlands, and prairie communities, based on an analysis of soils, topography, hydrology, historic and existing conditions, historic disturbance regimes, and restoration potential. When appropriate, enhance species diversity using available onsite or local seed sources collected using proper native seed collection protocols and re-introduced to appropriate locations on the property. Ideally, restrict seed sources to the watershed or to the physiographic region or ecoregion. Always consult with a botanist or ecologist who knows the local flora.
5. *Restore and Maintain Wildlife and Sensitive Species Habitat:* Restore and maintain wildlife habitat by managing healthy diverse native plant communities that will attract and support successful breeding and rearing, and food source opportunities for diverse wildlife species. Work with regional experts and wildlife specialists to identify habitat management

protocols for sensitive species and habitat refugia documented on the site, including bat and insect fauna refugia. Protect sensitive species and habitat by monitoring frequently and by providing regularly scheduled management, particularly removal of competing invasive woody and herbaceous species and application of appropriate prescribed burn treatments. Re-introduce rare species only under suitable conditions in cooperation with resource and agency experts following state guidelines and policies for rare species relocations and introductions.

6. *Assess and Maintain Site Hydrological Resources*: Continue to study the site hydrology to understand the source and movement of springs and ground water, surface runoff from unstable steep slopes, and flooding regimes. Evaluate the potential for hydrological impacts from offsite and from onsite to adjacent lands, and explore opportunities for adjacent landowner cooperation and support from government programs that address soil and surface and groundwater quality. Monitor channel stability in drainageways and stream corridors and consider future stream channel stabilization efforts where instability and erosion continue and efforts to mitigate runoff from adjacent properties are unsuccessful.

7. *Enhance and Maintain Habitat for Cavity Nesting Animals:* Maintain sufficient live tree and shrub cover to provide nesting habitat for birds, as well as numbers of standing dead trees and quantities of downed logs and woody debris to provide habitat and food sources for cavity nesting species and other wildlife that utilize these resources, including bats. However, remove trees that are determined to pose a hazard to site managers and visitors and that threaten important natural features, structures, and facilities on the property.

8. *Protect Cultural Resources:* Use caution when conducting restoration management activities near cultural resources on the property, including contemporary and older structures and signage; boardwalks and bridges; and educational, instructional, and recreational settings and facilities.

9. *Maintain Safe, Ecologically Sensitive Trails and Access Routes:* Maintain trails, fire breaks, and stream access points to provide sufficient and safe access to the site for multiple users and to facilitate safe and efficient management of the property. Avoid creating unnecessary trails and access points to minimize trampling of native vegetation, prevent soil erosion, reduce opportunities for exotic species invasion, and minimize disturbance to wildlife. Post permanent, attractive signage to encourage use and enjoyment of official trails and respect for the property's natural environment.

10. *Use Public Education and Outreach to Better Achieve Management Goals and to Protect Public Safety:* Regularly evaluate public safety issues and risks to natural resources. Work with site users, and approach adjacent landowners to alert them to site management goals and activities that might be compromised by inappropriate use of the property, and to seek a collaborative relationship to address management issues, such as excess deer populations and their impacts.

11. *Establish Effective Leadership to Implement the Plan:* Identify the individuals and governing bodies who will be responsible for securing funding and directing and evaluating the plan implementation and its success. Identify the land manager responsible for overseeing the day to day restoration activities, including training and coordination of volunteer stewards and coordination with any contracting agent(s) or professionals hired to undertake restoration treatments, monitoring, reporting, or other activities. Explore partnerships with local and regional universities, schools, and conservation organizations, and with neighboring landowners to develop educational and research programming to advance the restoration of the land and to support the goals of the plan.

12. *Develop Programming that Supports the Ecological Restoration Management Goals:* Determine the level of research, public education, and stewardship programming desirable for the site, including public education for adjacent landowners and the Freeport Community, to build support for the restoration and maintenance and public use of the natural resources of the property.

13. *Establish a Volunteer Technical Advisory Team to Support Management Decisions:* Establish a volunteer Science & Technical Advisory Team of resource managers, restoration ecologists, foresters, and biologists to meet no less than biannually to review annual work plans and end-of-the-year monitoring reports, and to provide technical insight and recommendations for addressing problems and improving the restoration outcomes.
14. *Maximize Plan Implementation Success:* Establish well-defined management units, to facilitate systematic and cost-effective phasing and rotation of restoration and management activities (brushing, burning, weed control, seeding/planting, mowing, and monitoring).
15. *Monitor to Inform Adaptive Management Decisions:* Regularly monitor and document restoration treatment results and adjust management prescriptions as necessary to achieve the goals of the plan. Re-evaluate and update the plan as necessary every 10 years, through a process defined by the site's governing body and with input from the volunteer technical advisory team.

Restoration Tasks & Strategies

Identifying & Repairing Erosion Risk Areas

Moderate to severe soil erosion is occurring in the Preserve in the form of sheet erosion and gullying or rill erosion. Sheet erosion is occurring where soils are exposed on level to gently sloping surfaces, where ground cover is absent or sparse, particularly in densely shaded understories. Rill or gully erosion is occurring in high risk areas along steep bluffland edges where visitors have attempted to scale the steeper bluff faces. In these locations, vegetation is trampled and soils are exposed, creating a nick point where subsequent rains remove soil in more concentrated surface flows. Both types of erosion are also occurring along steeper trail reaches throughout the Preserve. Within the stream corridor, trails that follow the near stream bank areas or cross the stream at bridge crossings are also high risk areas for erosion and soil instability (Photo 16). In these cases, both infrastructure damage and ecological damage can occur, affecting trail safety, lost of important native seedbanks, and degradation of sensitive rock cliff microhabitats and of stream water quality, all of which add to the cost of restoration and of maintaining trails.

Photo 16. Boardwalk along Cranes Grove Creek contributing to shoreline instability in the area of the seep wetland.

The Plan proposes to:

- Repair rill erosion features along blufflands by re-establishing fine-rooted native vegetative cover of grasses, sedges, and forbs, and protect from future damage by redirecting foot traffic and public education.
- Use environmentally sensitive trail design (location, configuration, and materials) in high risk locations, to limit impacts to ecotones (transitional areas between wetlands and uplands) and to reduce runoff risk (MDCR 2014).
- Address tree fall over the boardwalk in the sensitive seep wetland area by removing and building the boardwalk uphill, using construction design that elevates the structure and uses more widely spaced slates to improve light penetration to wetland vegetation.

Controlling Exotic & Native Invasive Species

A number of invasive woody and herbaceous plant species are found in Oakdale Nature Preserve's forest, savanna, prairie, and wetland communities (see Table 1 for a listing and classification of invasive species observed during the 2015 site visits). Management of these highly competitive species is critical to control their spread and to mitigate their increasingly detrimental effects in the Preserve's native plant communities and sensitive habitats. Shading and other forms of competition by invasive species degrade the native understory vegetation and contribute significantly to the loss of floristic diversity and overall ecosystem functioning. Where they are widespread in forest and savanna settings, shading affects from invasive species populations impede the effective use of fire, because of the reduced quality of fine fuels on the ground needed to carry fire. Invasive woody growth in the understory can also cause aesthetic and safety concerns where views are obstructed, limiting wildlife viewing from the trails and awareness of other visitors sharing the trails.

Controlling invasive species is a critical part of restoring ecosystem health. Successful control efforts take time and significant investments in management funds, and should be part of an integrated strategy that combines control efforts with ecological restoration to achieve site stability over the long term. An effective invasive species control program involves 1) knowing what invasive species are present on the property and their distribution, i.e. what communities are at risk and how widespread is the invasion, 2) prioritizing species based on ecological and economic risk criteria, 3) allocating available funds and human resources appropriately to have the greatest positive impact on reducing invasive species populations over time, and 4) organizing a dedicated team to conduct an Early Detection Rapid Response (EDRR) on this and other District properties to identify and address invasions at their earliest stages, when control is most cost-effective.

Resources and information about invasive species and best methods and strategies for control are now widely available online through government, university extension, and weed management consortiums locally and across the country (see resources and links provided in the References section). Cooperative weed groups are organizing in many counties and regions to combine resources to combat invasive species in a systematic way at the landscape scale, in an effort to have the greatest impact on these damaging plants. Government grant funding is increasingly targeting these groups who are organized and have strategic plans in place to provide funding for on-the-ground control efforts. Practical guides and fact sheets based on a growing body of research and field experience are available online for many or most common invasive species, and they contain typical management strategies that have been used most successfully in ecological restorations.

Controlling woody invasives—In general, standard methods used to remove woody invasive growth employ mechanical and chemical techniques, often combined in an integrated approach with prescribed fire. By far the most costly and labor intensive is the combined strategy of mechanical removal, using chain saws and other cutting tools to remove above ground growth, followed by manual hauling and staging of cut material for burning or chipping on site, and finally an herbicide application to the cut stump

Table 1. Non-native invasive woody and herbaceous species observed during the 2015 site visits. Risk levels are generally based on the level of risk to the native plant community if left untreated and the invasive character of the species (1=low risk, low priority treatment; 2=moderate risk, moderate priority treatment; and 3=high risk, high priority treatment).

Common Name	Scientific Name	Habit	Communities	Risk Level/ Characteristics
Amur honeysuckle, and other bush honeysuckles	*Lonicera maackii*, and other *Lonicera* spp	Shrub	Upland and bottomland woodlands	High, aggressive spreader and heavy shade producer
Black locust	*Robinia pseudoacacia*	Tree	Upland and bottomland woodlands	High, forms clones, spreads aggressively when disturbed
Dame's rocket	*Hesperis matronalis*	Forb	Mesic upland and bottomland woodlands	High, heavy seed producer
Garlic mustard	*Alliaria petiolata*	Forb	Upland and bottomland woodlands	High, heavy seed producer, changes soil chemistry, risk to oak regeneration
Multiflora rose	*Rosa multiflora*	Shrub	Upland and bottomland woodlands	High
Reed canary grass	*Phalaris arundinacea*	Grass	Bottomlands	High, forms dense root mats
Sweet clover	*Melilotus* spp	Forb	Restored prairies	High, long-lived in the seedbank
Common burdock	*Arctium minus*	Forb	Bottomland woodlands	Moderate to high in disturbed areas, including recent burns
Helleborine orchid	*Epipactis helleborine*	Forb	Upland Woodlands	Moderate, considered invasive; advise monitoring closely

surface to prevent stump sprouting of new growth. This last step is critical to avoid creating multi-stemmed regrowth that is more problematic and more difficult to manage than the original infestation and requires a greater amount of herbicide to treat effectively. Follow-up monitoring to re-treat surviving stems will be necessary for several growing seasons. Such labor intensive methods are most desirable in high visibility areas near public areas, where aesthetic considerations are important. Volunteer assistance to help cut and stage woody material can help to make this treatment method more cost effective. Chemical treatments may also be applied effectively to the lower portion of the standing stems, known as a basal bark application. In this case standing stems are left to die in place, and subsequent prescribed fires will eventually consume this material as stems topple and break down on the ground to become fuel. This approach is especially desirable in larger remote areas, and where concentrations of fine fuel are sufficient to carry fire to help manage resprouts and new seedlings. In heavily shaded areas with sparse understory and bare soils, such as the wooded slopes along the south property boundary, this strategy will work if sufficient oak leaf litter is present to carry fire. If not, enhancement seeding will be necessary to increase fine fuels and to restore diverse savanna understory vegetation.

Controlling herbaceous invasives—Control methods for herbaceous invasive plants also combine mechanical, manual, and chemical strategies to achieve successful control. As an example, garlic mustard is often pulled by hand by volunteers where infestations are patchy or limited to scattered stems, versus treated chemically where infestations are more extensive and concentrated. Once treated and reduced in size, previously large infestations can then be controlled with targeted hand pulling, but caution must be used to remove the plants carefully from the soil to extract the entire root and to do so with as little soil disturbance as possible, to avoid the risk of bringing garlic mustard and other undesirable weed seeds to the surface to germinate. This is especially risky in previously pastured or cultivated lands with extensive weed soil seedbanks.

The Plan proposes to:

- Organize a District staff-led volunteer invasive species "strike team" to develop and implement an EDRR program in all District lands with natural areas, including Oakdale Nature Preserve. This team will be trained and will be responsible for identifying, mapping and prioritizing all woody and herbaceous invasive species populations in District lands for control and management by this team, other volunteers and professional contractors, as needed. The team will ideally develop a database of site data and maps, and will annually monitor and update the database to track outcomes and to identify and coordinate control and maintenance activities as part of the annual work plan development for each property.
- Prioritize and target invasive species control efforts and resources using the following criteria: 1) protection of high quality vegetation and sensitive species habitats, e.g. seep wetlands, areas with known populations of uncommon or rare species, and areas serving as buffers to bluffland habitats; 2) small invasives populations that are easy to control before they spread, 3) high visitor use areas where control of invasives will beautify and heighten visitor experience, and 4) larger invasives populations in already degraded habitat that serve as a vectors for spread.
- Annually recruit and train new volunteers from the community to provide them with the skills needed to be able to identify invasive species and to participate in appropriate control and monitoring activities. Only trained and experienced volunteers or professional contractors should be allowed to work in sensitive species habitat settings or in high-risk settings where personal safety is a concern. As part of the volunteer steward program, develop a volunteer handbook with visual and descriptive keys of both mature and seedling stages of invasive species to assist volunteers engaged in EDRR efforts.
- Establish guidelines and performance criteria for measuring treatment and restoration success, such as the following:
    - Use cost-effective mechanical and chemical control techniques and materials appropriate for the target species and the natural community setting. Chemically treat all cut stumps of woody species to prevent resprouting of multiple stems.
    - Allow only trained and certified herbicide applicators to use chemical control techniques and equipment, following label recommendations. Public safety precautions will be taken by posting all treated areas with temporary signage.
    - Reduce cover and seed sources of invasive species as much as possible (70 – 90%), with concurrent increase in native species diversity and cover in all settings. In forest and savanna settings, increase understory light necessary to reinvigorate native groundcover vegetation and stimulate native seed banks, as well as encourage new oak seedlings and sapling development (suggested 30 – 50% ambient light levels); where seedbanks have been lost, re-introduce native plant species via seed and live plants, using appropriately sourced native seed (from onsite collections or from commercial sources providing native seed and plant stock from the region).
    - Monitor all treatment areas annually and conduct follow-up treatments as necessary to ensure treatment success and to maintain population control over time, due to re-invasion from long-lived seedbanks or to new introductions. Concurrently conduct other restoration management activities, such as prescribed burning and enhancement seeding and planting (where needed), to fully restore ecosystem functioning. Where fine fuels are available, such as oak leaf litter, fire should be used immediately following brushing to help combat resprouting and growth of new seedlings.

- Be prepared to exercise adaptive management to adjust treatment methods to improve outcomes.
- Provide ongoing public education about the ecological and economic impact of invasive species, and how the public can help reduce the damage and risk to our environment by landscaping with native plants where possible.
- Engage landowners adjacent to the Preserve and throughout the Cranes Grove Creek corridor to work cooperatively in controlling invasive species to protect natural assets and ecosystem functioning in the watershed.

Prescribed Burning & Establishing Test Plots

Fire disturbance is a natural and anthropogenic process that has shaped regional landscapes for millennia. In present-day, fire continues to be used as an essential tool in the recovery and maintenance of the fire adapted systems of the region, including the oak forest and savanna, floodplain forest, prairie, and wetland communities found at Oakdale Nature Preserve. Burning is used to control woody vegetation, reduce litter build-up, and stimulate herbaceous ground cover productivity and diversity. Prescribed burning has been previously used successfully in the Preserve to open the forest understory, stimulate oak regeneration and invigorate a lush diverse cover of native grasses, sedges, and wildflowers. Continued, carefully planned use of fire will be necessary to maintain the improved plant community and habitat conditions gained in several areas of the Preserve, and to begin the restoration process in other areas where prescribed fire has not yet been applied.

Appropriate use of fire—Prescribed burning is the least costly restoration and long-term management tool. Carefully planned prescribed fires can be conducted with the assistance of well-trained volunteers under the direction of professional burn specialists and well-equipped burn crews, with the proper annual permits and approvals. The coverage and effects of burning will depend in part on the distribution of fine fuels, particularly of grasses and persistent oak leaf litter. Many areas of the Preserve have a substantial fine fuel for carrying prescribed fire into most areas of the property that are not inundated or perennially saturated in floodplain settings and in upland spring seep areas. Some densely shaded areas with poor fine fuels will require a brushing treatment and possibly seeding and planting to stimulate ground cover vegetation and fuel production. Repeated annual fires may be important in some locations during the early years of restoration for controlling exotic shrub seedlings, following initial brushing. Variable fuel loads and wet conditions will result in spotty fires, which will allow for a more patchy vegetation structure to develop. Spotty fires are actually preferred for this reason over complete coverage, as they limit the impact to small populations of insects and other fauna.

Designing burn prescriptions—The frequency and intensity of burns can dramatically shift plant community structure and composition. Generally, more frequent and hotter fires will favor grasses and remove woody cover in grassland communities, and shift closed forest to more open woodland and savanna over time. In restored prairie communities, short burn rotations of 1-3 years will minimize woody growth, whereas 4-5 year rotations and longer will allow more shrubs and tree saplings to develop. Late spring burns tend to suppress cool season grasses, and favor warm season grasses. Fall burns tend to favor more forbs, but remove winter cover for wildlife.

The timing and rotation of burn regimes in the Preserve should aim to protect habitat refugia for sensitive species, such as reptiles, amphibians, and insect fauna including butterflies and moths. A recommended approach for scheduling and managing prescribed burning to ensure such protections is to vary the burn schedule between spring and fall, vary the length of time between burns (annual to multi-year rotations), and vary the environmental conditions under which burning is conducted (cool/moist to warm/dry conditions). The desired outcome is to leave a mosaic of burned and unburned areas within each management unit or community type, allowing sensitive species to repopulate burned areas where they may be lost or reduced in number. This can be a natural outcome when burning occurs during the early part of the day before fuels dry out completely, or when ignition occurs later in the day and temperatures cool down and humidity rises in the evening. Monitoring is important to understand fire affects and is helpful to determine appropriate burn schedules and prescriptions, particularly in sensitive habitats. This can occur most effectively in

permanent test plots in representative areas, where the public can observe the before and after effects of fire, and where scientists can say with more certainty what changes are occurring as a result of burn management and other restoration activities (e.g. reduction of invasive species and increases in native species diversity and cover).

Annual burns in the Preserve (in different locations each year) will be necessary to insure that the effects of fire will eventually be applied to most areas of the property during the 10-year remedial restoration phase. Once fire is introduced into an area, the results should be monitored to determine the appropriate burn rotation schedule to achieve the stated goals in each management unit. During the long-term management phase, fires will be used more exclusively to maintain prairies and savannas.

Risks of using fire—Prescribed burning at Oakdale will have an overall positive effect on native wildlife communities, and the impact on most mammals will be minimal. Larger mammals and mature birds can safely move away from fire. Small ground mammals, such as mice can out-run a slow-moving fire line or find shelter in the ground or under large logs. However, spring burning can negatively impact reptiles and ground nesting birds or those that build their nests in low-branching shrubs such as exotic honeysuckle. To avoid potentially burning eggs and newborn of nesting species, spring fires should be scheduled for mid to early April or earlier in areas serving as habitat for reptiles, many of which become active in April. Migrant and resident butterflies will benefit from carefully prescribed burning by increasing the native plant diversity and the number of plants that may serve as larval hosts and nectar sources for adults, however great care should be taken to maintain key refugia for repopulating the areas burned.

The Plan proposes to:

- Conduct prescribed burns annually during the 10-year remedial restoration phase according to the prioritized management unit objectives and an annual work plan that identifies the target burn zones on a map.
- Monitor previously burned areas to assess need for follow-up invasive species control and need for enhancement seeding treatments. Continue to apply fire in areas that have been previously burned as needed, to maintain gains initiated in previous burns, following the adaptive management strategy.
- Conduct brushing and burning treatments in selected areas that can serve as a permanent demonstration and test plot of burn effects in representative habitats.
- Prepare burn prescriptions that minimize the hazard of smoke on public roadways and adjacent facilities, as necessary.
- Conduct grassland and savanna burning outside the breeding season for grassland birds and reptiles, before late-April and after late August, to avoid harming eggs and young (some bird species will produce a second clutch, if their first is destroyed).
- After the remedial phase, monitor and document the effects of prescribed burn treatments, and adjust the burn prescription and management strategy according to established adaptive management protocols.
- Train volunteer stewards to safely assist in prescribed burns, and interpret the ecological benefits of fire in environmental education programming.

Restoring & Maintaining Native Plant Communities

The plan proposes to restore the existing savanna, prairie, and forested wetland (floodplain forest) communities that are present at the Oakdale Nature Preserve, based on the knowledge of existing and historic conditions and restoration potential gained during the ecological assessment. Significant improvements are anticipated through prescribed burning alone in many areas of the property due to well preserved native soil seedbanks. Areas with greater concentrations of invasive species, such as those with

dense garlic mustard populations, will require additional work to enhance the positive benefits of fire. Appropriate seeding and planting rates will need to be developed as part of the design process for these areas, if native seedbanks have declined.

Tall, shrubby native vegetation is part of the natural shrub carr community structure and provides important bird habitat for migrant and resident songbirds in the spring. Early on, more intense prescribed burning regimes will initially reduce shrub stem numbers and understory cover of both native and non-native woody species. Once remedial restoration goals are achieved, long-term rotational burning can be planned to allow an understory native shrub component to re-develop in balance with ground cover vegetation. Plantation plantings can be allowed to remain to be restructured by prescribed fire regimes or otherwise removed to advance a more natural savanna-like canopy structure.

The plan proposes to:

- Use carefully prescribed fire principally, along with other restoration techniques to reduce competition from exotic tree, shrub and herbaceous species, to enhance native biodiversity, increase native plant cover, stabilize soils, and improve habitat quality in all management units.
- Where floristic enhancement is needed or desired, re-introduce native plant species appropriate for the mapped plant community and region according to site, regional and state floras and with guidance from the science and technical advisory team and using well established seeding and planting techniques for native species.
- Enlist volunteers to collect native seed preferably from onsite sources, or other approved local sources. For species or quantities not locally available, apply a reasonable geographic limit for the collection of wild and commercially-grown native seed. We propose this geographic limit be the watershed or the physiographic province in which the site is located (Rock River Hill Country and neighboring SW Savanna in Wisconsin).
- Maintain sufficient existing native shrub cover and diversity to support breeding bird habitat. Most native shrubs will reinvade or resprout following fire, and thus will not be removed permanently from the system. Cutting and treating of native shrub species should be avoided.
- Monitor the response of the native soil seedbank following restoration treatments in each management unit to determine if costly enhancement seeding or planting will be necessary. It can sometimes take more than a single growing season to determine the full extent of the soil seedbank response. In the meantime, where bare soils are vulnerable to erosion, a simple temporary cover seeding will protect soils from erosion until native cover is re-established.

Restoring & Maintaining Wildlife & Sensitive Species Habitat

Unique habitats—Like other nature preserves and wildlife areas of the region, Oakdale Nature Preserve is a small remnant of a once larger and continuous landscape of diverse plant communities; however, remnant patches such as this continue to provide important habitat for wildlife and to provide outstanding outdoor educational and recreational opportunities for the community. The Preserve contains unique habitat settings due to the property's dramatic topographic relief and the presence of converging stream corridors bordered by bottomland forests and sheer rocky cliffs and bluffland forests and savannas, featuring groundwater outcroppings that form seep wetlands at the base of bluffs. Unique habitats and microhabitats such as these typically support some of our rarest and most sensitive terrestrial and aquatic plant and animal species. These areas in the Preserve should be inventoried more thoroughly to document the presence of rare species and to develop specific management protocols to enhance and protect their populations, as well as that of their more common associates.

Deer population impacts—Some wildlife species, such as white-tailed deer that have become over-abundant, can pose management problems due to the browse damage they can cause to some plant populations such as orchids and lilies. Generally,

improved habitat conditions with restoration and management will also render these resources more resilient to such wildlife impacts. Trail users and other visitors should be directed to understand where sensitive habitats and species are at risk due to disturbances, and trails should be reviewed to consider reducing risks posed by increasing traffic in these area.

Long term benefits to wildlife—Wildlife in general and sensitive species are a critical focus of the restoration plan. Most wildlife populations are expected to thrive and increase as a result of the restoration activities, particularly those species that benefit from natural disturbance such as periodic fire. Although the property is located near an urban setting surrounded by agricultural lands, the natural movement of species from other habitat remnants in the watershed and in the region will occur more or less spontaneously, aided by the connectivity of the Crane's Grove Creek and Silver Creek corridors, and neighboring woodland and grassland properties. Nevertheless, it may be desirable to consider reintroducing both common and rarer species that may have been lost, as the restored habitats become more stable and can sustain such re-introductions.

Habitat size—Restoration of small-sized habitat fragments may be less effective for conserving grassland and forest birds, due to increased nest predation and brood parasitism in edge dominated stands (Heske et al. 2000). Research in the Midwest, however, indicates that bird species breeding in disturbance dependent shrub lands and oak savannas may be far less sensitive to tract size than forest or grassland breeding birds (Brawn et al. 2002). This is encouraging for the habitat goals for the Oakdale Nature Preserve.

The Plan proposes to:

- Evaluate and establish long-term habitat goals for the site, in collaboration with regional wildlife specialists, the science and technical team, research and conservation partners, and site users. This includes identifying habitat management protocols for sensitive species and important habitat refugia to protect from over-use of fire, and for understanding the needs of the Preserve's bat populations that currently occupy built structures on the property in significant numbers.
- Restore and maintain wildlife habitat by managing healthy diverse native plant communities that will provide abundant natural food sources and enhance breeding and rearing success of birds and other wildlife.
- Increase the area of disturbance dependant habitat (fire adapted communities), to shift appropriate areas of the property toward the structure and composition of the pre-settlement open to semi-open savanna and open grassland conditions, to increase nesting opportunities for birds and other wildlife that are less area-sensitive.
- Monitor the populations of rare species following restoration treatments, to measure population responses and to identify ongoing management needs.
- Manage threats to sensitive species and habitats, such as invasive species, trampling by on- and of-trail foot traffic, lack of (or over exposure to) natural disturbances, altered hydrology, and loss of specific growing requirements.
- Coordinate volunteers, students, and area wildlife biologists to conduct annual bioblitzes to monitor the effects of restoration on key wildlife populations and to raise awareness of and appreciation for the habitat value and rich biodiversity of the Preserve.
- Use trail closures, barriers and signage to reduce trampling and discourage the collection of wildflowers. Consider adjusting trail location and materials to reduce erosion risk.
- If and when appropriate, propagate native species from locally collected seed, and introduce to suitable locations on the property to improve habitat diversity and suitability. Introduction of rare and protected species should be conducted in cooperation with the Illinois Department of Natural Resources, to ensure appropriate introductions and approved and/or permitted propagule collection sources.

Assessing & Maintaining Site Hydrological Resources

In addition to the stream and forested wetland complex that is the central feature of the Preserve, at least one significant groundwater seep is located on the property that supports an uncommon wetland community. Additional study to understand the groundwater chemistry and source and movement of ground water on the site would offer an opportunity to locate additional springs and seep resources in and near the Preserve. At the same time, further evaluation of surface runoff from on- and off-site locations, such as adjacent agricultural lands, impervious surfaces of structures and roadways, and internal trails would help to plan for and seek collaborative partnerships to reduce erosion, flood damage, and stream water quality impairment.

The Plan proposes to:

- In collaboration with interested university partners and adjacent landowners, continue to study the site hydrology and that of the Cranes Grove Creek watershed to understand the source and movement of ground water and to better understand the character and nature of the onsite seep and associated wetland community and similar resources on the property and in the area.
- In collaboration with interested university partners and adjacent landowners, model surface runoff, stream hydraulics and flooding regimes, in order to design best practices to reduce damage from excess surface runoff and floodwaters. Explore opportunities for adjacent landowner cooperation and funding support from government programs that address soil and surface and groundwater quality.
- Monitor channel stability in drainageways and stream corridors and consider future stream channel stabilization efforts where instability and erosion continue and efforts to mitigate runoff from adjacent properties are unsuccessful.
- Learn about and support efforts in the Pecatonica River watershed and tributaries to improve water quality.

Enhancing & Maintaining Habitat for Cavity Nesting Animals

Maintaining sufficient live tree and shrub cover will be important to provide nesting habitat for birds, but it will also be important to maintain a sufficient number of standing dead trees and quantities of downed logs and woody debris to provide habitat and food sources for cavity nesting bird species and other wildlife that utilize these resources—insect-feeding wildlife and wood decomposers, terrestrial snails, and salamanders. An exception would be the need to remove dead trees that pose a significant tree fall hazard to site managers, volunteers, and visitors, and that may threaten important natural or cultural features on the property.

Downed woody debris also provides an important carbon source for building soils. Forest managers with an ecosystem management perspective recommend leaving at least five to ten dead standing trees (snags) per acre in forested systems for wildlife habitat (McEvoy 2004).

The Plan proposes to:

- Maintain mature canopy oaks in savannas, and other trees in riparian settings to provide habitat structure for nesting birds and other wildlife.
- Leave all dead standing trees for wildlife habitat, except those identified as hazard or diseased trees and trees that are removed as part of habitat improvement.
- Leave all downed woody debris to the extent possible, unless removal is necessary to conduct controlled burns or other management activities safely and efficiently.

- Convey the importance of cavity trees to wildlife in environmental education programming.

Protecting Cultural Resources

Use caution when conducting restoration management activities near cultural resources on the property, including contemporary and older structures and signage; boardwalks and bridges; and educational, instructional, and recreational settings and facilities.

The Plan proposes to:

- Evaluate and protect all historic and contemporary cultural resources important to the Preserve and community.
- Evaluate and investigate cultural resources for which little information is known or available to determine their value and need for protection, and opportunities for interpretation.

Maintaining Safe, Ecologically Sensitive Trails & Access Routes

A carefully designed and maintained trail and access road system can serve to provide controlled public access to natural resources for recreational and educational purposes, while at the same time exhibit sensitivity to the ecological systems the public seeks to enjoy. Several ecological principles can be applied in the trail and road design process to ensure sustainable, healthy natural resources over the long term. These principles address trail and human use impacts to soil, vegetation, wildlife, and water resources.

The Plan proposes to:

- Review all trails and access roads to identify and map where use and maintenance may be damaging the underlying soils or vegetation resulting or contributing to the deterioration of site ecological conditions and serving as a vector for invasive plant species. Trails and roads that have high impact (such as increased incidence of reptile kills by vehicles) should be evaluated for modification or alternate use and maintenance strategies.
- Avoid fragmentation of high quality ecological resources and transitional or ecotonal corridors, where the greatest biological diversity is concentrated, such as at the border between streams and wetlands, and between wetlands and uplands.
- Use signage to discourage off-trail access and minimize trampling in sensitive areas.
- Identify appropriate stream access locations for outdoor education activities. Ensure that these locations do not conflict with sensitive species habitats and rare species populations.

Using Public Education & Outreach to Better Achieve Management Goals & to Protect Public Safety

Both natural resource management goals and public safety can be compromised by lack of understanding and awareness of the sensitive landscapes and natural communities of the Preserve and the purpose and objectives of the restoration program. Inappropriate use of the trails and off-trail hiking and climbing can damage sensitive resources. Likewise, use of herbicides and prescribed burning can pose risks to site users who are unaware of these activities. Public enjoyment and appreciation of the Preserve is enhanced with opportunities to learn about the efforts and investments being made to restore and enhance the natural assets of the Preserve for the benefit of the public.

The plan proposes to:

- Establish a public safety protocol and signage that alerts the public to safety considerations when using the site, such as posting notices for prescribed burning and marking herbicide treatment areas, identifying access points are for emergency vehicles, and knowing how to identify poisonous plants.
- Regularly evaluate public safety issues and risks to natural resources.
- Work with site users and adjacent landowners to alert them to site management goals.
- Use public education and signage to alert trail users to high risk sensitive areas that are vulnerable to off-trail foot traffic, such as bluff and cliff faces.

Establishing Effective Leadership to Implement the Plan

The District and its staff are in charge of securing funding, developing work plans, and approving and overseeing, and evaluating the implementation of the Oakdale Nature Preserve Restoration Plan. The District will identify the land manager responsible for overseeing the day to day restoration activities, including training and coordination of volunteer stewards and coordination with any contracting agent(s) or professionals hired to undertake restoration treatments, monitoring, reporting, or other activities. The District may choose to explore partnerships with local and regional universities, schools, other conservation organizations, professional services, and with neighboring landowners to undertake various aspects of the restoration work and to develop educational and research programming to advance the restoration of the land and other goals and objectives of the plan.

The Plan proposes to:

- Identify the individuals and governing bodies who will be responsible for securing funding and directing and evaluating the plan implementation and its success.
- Identify the land manager responsible for overseeing the day to day restoration activities, including training and coordination of volunteer stewards and coordination with any contracting agent(s) or professionals hired to undertake restoration treatments, monitoring, reporting, or other activities.
- Explore partnerships with local and regional universities, schools, and conservation organizations, and with neighboring landowners to develop educational and research programming to advance the restoration of the land and to support the goals of the plan.

Developing Programming that Supports the Ecological Restoration Management Goals

The District will determine the level of research, public education, and stewardship programming desirable for the site. Public education for adjacent landowners and the community will be valuable to build support and advocacy for the restoration and maintenance of the natural resources of the Preserve.

The Plan proposes to:

- Invite neighbors and the community to an informal meeting to present the restoration goals, objectives, strategies, and schedules for the proposed restoration plan.
- Develop interpretive materials and interpretive signage for the site to explain the restoration activities and objectives to the public and to site visitors, and to showcase the conservation efforts by the District and volunteers.
- Explore opportunities to develop research partnerships with universities, schools, and conservation organizations.

Establishing a Volunteer Technical Advisory Team

Many private and public landowners undertaking land restoration have benefited from establishing a Technical Science Advisory Team, which is a voluntary group of regional experienced experts that can be assembled one or more times annually to meet with the District land management team to review the annual work plans and end of season outcomes, and provide recommendations for the upcoming management season. The nature of the meetings will involve both field visits and roundtable discussions to address questions, concerns, and issues expressed and outlined by the District team. The scientific/technical advisory team can serve the Oakdale Nature Preserve team by supporting the goals and objectives of the plan to ensure ecologically thoughtful and cost effective implementation of the plan over time.

The Plan proposes to:

- Establish a volunteer Science & Technical Advisory Team of resource managers, restoration ecologists, foresters, and biologists to meet no less than biannually to review annual work plans and end-of-the-year monitoring reports, and to provide technical insight and recommendations for addressing problems and improving the restoration outcomes.

Maximizing Plan Implementation Success

Implementing the plan within clearly defined management units (MUs), will help to facilitate systematic and cost-effective phasing and rotation of restoration and management activities (burning, brushing, weed control, seeding/planting, mowing, and monitoring).

The Plan proposes to:

- Organize the site into logical, manageable units to facilitate access and to help focus management activities in a systematic and cost-effective way across the site.

Monitoring to Inform Adaptive Management Decisions

A clearly defined annual monitoring program and set of performance goals are vital to the successful restoration and long-term management of the property. Simple monitoring techniques such as documenting conditions from permanent photo points and conducting periodic quantitative vegetation sampling and floristic inventories can be undertaken by volunteers with guidance from professionals. This information is useful to measure progress toward meeting the goals and objectives of the plan, and the results provide a basis for determining appropriate adjustments to restoration treatments and to the schedule and budget. Annual monitoring data should include a narrative summary and map of locations, dates, site conditions, methods, personnel, and costs of all restoration and management efforts undertaken, as well as treatment results and recommendations for continued or adjusted management strategies.

The Plan proposes to:

- Regularly monitor and document restoration treatment results and adjust management prescriptions as necessary to achieve the goals of the plan.
- Conduct simple baseline vegetation monitoring investigations to measure relative plant species cover, frequency, and importance, as well as species richness and floristic quality using standard techniques and methods, in representative areas of the property (this task is optional depending upon available budget).

- Utilize the permanent photo point locations established in representative areas of the property during the natural resources inventory and ecological assessment and document pre-and post-treatment conditions. The goal is to document major trends in the recovery of the target plant community structure and composition.
- Conduct periodic repeat data collection of the baseline sampling parameters. At minimum, conduct simple species inventories to measure species diversity trends.
- Conduct annual site inspections to provide a qualitative assessment of responses to restoration treatments and to provide recommendations for adjusting treatments.
- Consider the following general performance guidelines for the Remedial Restoration program:
    - Reduce cover by exotic invasive woody species by a minimum of 70% in all areas of the site.
    - Increase light at the ground story to a minimum 30 - 50% of full sunlight levels in target savanna communities to favor oak regeneration. A reasonable estimate can be made based on degree of canopy closure or measure using a simple light meter.
    - Increase the frequency of oak seedlings from baseline conditions in all target savanna areas.
    - Increase native plant diversity and cover from baseline conditions in all target plant communities.
    - Achieve sustainable re-vegetation of all remedial treatment areas
    - Maintain, at minimum, and increase where possible, sensitive species populations and habitats.
    - Prepare an annual summary of treatments, treatment responses, and recommended adjustments in a written report with photo documentation for review by the governing body and technical advisory team.
    - Monitor and assess the condition of the site at the end of the first 10 years of the Remedial Restoration period and prepare an assessment and recommendations for approval by the governing body, and for use in reviewing and updating the plan.
- Re-evaluate and update the plan as necessary every 10 years, through a process defined by the site's governing body and with input from the volunteer technical advisory team.

Implementing the Plan

With guiding restoration principles, goals, and objectives, and specific tasks and strategies identified, this section describes where and when the restoration plan will be executed, provides guidance on preparing annual work plans and securing funding sources and strategies, and provides a process for applying the adaptive management principle and establishing and benefiting from a technical support team and research partners. All of these components of the restoration plan are a starting point to provide a framework and process for implementing the plan and to guide the land manager's short-term and long-term decision making.

Ensuring Plan Success

A common lament of many land managers with a plan in hand is that such documents have limited use and often end up on the shelf to gather dust, rarely to be opened again after the work has begun. There are many reasons for this problem having to do

with leadership, commitment of resources, and practical application of the plan elements. Following is a discussion of some of the key guidelines for successful on-going implementation of the plan.

1. Adoption of the plan and acknowledgement and support of the plan by the community and other stakeholders—careful and broad review of the plan by key land managers, partners, resource experts, and community stakeholders is necessary to ensure the soundness of the plan. Adoption of the plan following this review process ensures acknowledgement of the guiding principles, goals and objectives, and task and strategies detailed in the plan. Adoption and support of the plan can help to ensure the plan remains viable and provides a reset button should the project face challenges in the future.

2. Commitment of leadership and funding—the plan will not be implemented without dedicated leadership and the sustained commitment of financial and human resources. The work of successfully restoring ecosystems requires such sustained investments, because of the time required to repair damaged ecosystems and maintain them in a more fully-functioning state. Once initiated, the work of restoration must continue on a regular basis to ensure that objectives are met and to avoid costly setbacks due to lag times in treatments and management. Once objectives are achieved, ongoing management will be necessary because natural landscapes today exist as small patches that are limited in their resilience to chronic disturbances in our industrialized and agricultural landscapes, and in their ability to recover from catastrophic events such as storm damage and floods.

3. Preparation of an annual work plan and budget, and following an annual monitoring protocol—a plan document in and of itself is not meant to be the operational manual for a restoration project. A more practical approach and tool is needed to execute the plan on a regular basis, and in a systematic and cost-effective way that addresses the prioritized critical resource issues of the property and the limited resources available for the project. Such an approach is an annual work plan and budget, which identifies the tasks to be undertaken in the coming season, where those tasks will be implemented, responsible parties doing and overseeing the work, and resources needed to complete the work. The plan provides a scheduling tool for preparing an annual work plan and budget. Instituting a periodic monitoring protocol is also important for measuring and assessing the success and unanticipated outcomes of the annual work activities, and for identifying actions to be undertaken immediately and as part of the next year's work plan.

4. Technical support through volunteer technical advisory team and other technical support from partners and professionals—periodic review and input from a technical advisory team of resource experts knowledgeable of ecological restoration approaches, methods, and techniques, will ensure appropriate management actions are undertaken in a timely fashion. This will help to avoid costly mistakes and setbacks, which can jeopardize success and long-term support of the plan. Technical advisors can also provide input when unanticipated outcomes do occur, thus providing a supportive role in adaptive management—a key guiding principle of the plan. An important role of the technical advisory team is the review of the annual work plan at the beginning of the season and the assessment of on-the-ground outcomes at the end of the year and recommendations for the following season.

5. Volunteer stewardship education and Citizen Science training—passionate and dedicated volunteer stewards can play a pivotal role in the long-term success of a restoration project, through their physical presence and effort in undertaking the hard work of restoration and monitoring, and through their support and championing of the project in the community. The value of this experience for the volunteer steward is the exchange of knowledge, information, and experience, and the gratification of knowing they played an important role in accomplishing the goals and objectives of the plan and contributed to the wellbeing of their community. Regular acknowledgement and reward of community volunteer contributions will ensure a long and gratifying relationship with these important partners.

6. Periodic review and update of the plan—the plan is designed to be relevant for the life of the project, however, it is important to conduct a critical review of the key elements of the plan from time to time to be responsible to and to demonstrate the plan's relevance to future leaders and stakeholders. At minimum, the plan should be reviewed and updated every ten

years. The product of a plan review and update does not have to be a complete rewriting of the existing plan, but rather a supplemental document that comments on the relevance of the key elements of the plan, provides an overview of restoration outcomes (both successes and challenges), and makes recommendations for adjusting management priorities and methods to address new or changing conditions on the property.

Undertaken with dedicated leadership and a commitment of financial and human resources, successful implementation of this plan and its principles at Oakdale Nature Preserve will have enormous consequences for the Freeport community and citizens of the region, by contributing to cultural, educational, economic, and scientific research opportunities that spring from healthy ecosystems that people love and enjoy and want to protect. Hundreds of visitors over the years will discover a strong personal connection with Oakdale Nature Preserve and will no doubt return again and again to enjoy the land's natural beauty. New and renewed partnerships will grow from this connection with nature and with the land to support ongoing management and nature programming at the site, as well as contribute to the thriving economies and wellbeing of the communities of the region that depend on healthy functioning ecosystems and the many important services they provide—clean water and air, a place to connect with nature personal renewal, and more. Such a plan must not gather dust.

Defining Management Units

Land managers typically find that dividing a natural landscape into Management Units (MUs) is an effective way to organize work efficiently and to achieve both ecological and budgetary goals. The first step in defining MUs is to consider the size of the property and the natural and cultural features such as streams and roads or trails that can be used to practically divide up the property into logical areas to facilitate or constrain management activities cost-effectively and safely on the landscape, particularly fire. Within an MU, individual natural community or landcover types are considered sub-management units when planning, for example, appropriate burn rotations and planting lists or any number of other remedial management activities depending on disturbance history and restoration potential. Ideally, an MU will contain a number of natural communities and conditions that allow fire to assist in creating a more natural continuum across the landscape, such as across a moisture gradient from upland prairie and savanna to a wetter bottomland forest, where a former abrupt field edge boundary persists, such as on the Preserve.

The plan delineates and identifies three management units (MUs) within the Preserve using major human-made land breaks and natural features: South Cranes Grove Road to define the east and south boundaries of MU1, and the stream corridor following Cranes Grove Creek and Silver Creek to separate MU2 and MU3 (see the appended Communities & Management Unit map). Each MU includes a number of delineated natural community types or polygons representing the natural moisture and topographic gradients across the site (Table 2). While the entire site represents a fire-adapted system capable of burning in its entirety at any time, the objectives of the plan are to more systematically apply such treatments within the specific community polygons or across more than one polygon, to maximize burn benefits, create patch diversity, and to minimize burn impacts to sensitive species populations and key habitat refugia. Nevertheless, the major burn breaks (the road, stream, and internal trails) will provide some assurance that if fire exceeds the boundary of a prescribed burn, the major burn break will allow control of the burn beyond those limits.

Table 2. Summary of the natural community types and their acreages within each MU (see also the polygon and acreage listing in the Communities & Management Unit map).

	MU1					
	Developed Dry-Mesic Upland Forest/Savanna (D/DMUF/S)	Dry-Mesic Upland Forest/Savanna (DMUF/S)	Mesic Upland Forest/Savanna (MUF/S)	Mesic Upland Forest/Savanna/ Dolomite Cliff (MUF/S/DC)	Mesic Floodplain Forest (MFF)	
Polygons						Total
1	8.6					
2		14.4				
3		7.8				
4			16.1			
5				0.3		
6				0.1		
7					6.7	
	8.6	22.2	16.1	0.4	6.7	**54**

	MU2						
	Dry-Mesic Prairie/Savanna (DMP/S)	Dry-Mesic Prairie Restored (DMP)	Developed Dry-Mesic Prairie/Savanna (D/DMP/S)	Mesic Upland Forest/Savanna (MUF/S)	Mesic Upland Forest/Savanna/ Dolomite Cliff (MUF/S/DC)	Wet-Mesic Floodplain Forest (WMFF)	
Polygons							Total
8	12.7						
9		5.0					
10			1.4				
11				4.5			
12					1.6		
13				0.1			
14						5.6	
15					0.3		
16				0.2			
17				0.9			
18					0.04		
	12.7	5.0	1.4	5.7	1.9	5.6	**32.2**

	MU3								
	Mesic Upland Forest/Savanna/ Dolomite Cliff (MUF/S/DC)	Wet-Mesic Floodplain Forest (WMFF)	Developed Dry-Mesic Prairie/Savanna (D/DMP/S)	Dry-Mesic Prairie Restored (DMP)	Dry-Mesic Prairie/ Savanna (DMP/S)	Mesic Upland Forest/Savanna (MUF/S)	Developed Oldfield Tree Farm (D/OF)	Mesic Floodplain Forest	
Polygons									Total
19	0.3								
20		2.9							
21	0.1								
22			0.3						
23				6.7					
24					7.7				
25						13.4			
26	0.1								
27	0.1								
28							2.6		
29								10.9	
30						2.5			
31					0.1				
32	0.1								
	0.7	2.9	0.3	6.7	7.8	15.9	2.6	10.9	**47.8**

Phasing & Prioritizing Management

One way to make decisions about how to prioritize the restoration and management work recommended in the plan is to rank each mapped community type or problem area within each MU as being either high, medium, or low priority based on existing conditions of the community (high quality versus degraded), restoration potential (the level of effort and cost to improve conditions), and ecological risk (what valuable resources could be lost in the near term if management is not undertaken). A high priority area could be a higher quality area or unique habitat such as the blufflands and dolomite cliffs that are being negatively impacted by steep unstable and eroding soils from off-trail foot traffic in MU2, where immediate repair and remediation work is needed to prevent further damage, or it could be small populations of highly invasive species that are currently relatively easy to control but which would cost more to remove and cause more damage if left to spread. A moderate priority area might be addressing the widespread presence of garlic mustard in Twin Creek Forest in MU2, which will be a long-term effort, but will offer substantial payback by reducing this seed source that can be easily moved by deer and other animals and humans throughout the Preserve. A low priority area might be the overabundance of basswood in the canopy in the Eastern Loop Forest in MU1 that will require more time and further planning to prepare understory conditions before any canopy thinning is undertaken.

Each MU will have potential range of high, medium, and low priority management needs, which means work could proceed in any of the three MUs simultaneously, depending on available resources and decisions made about what the District can commit to once the work begins. All decisions made in initiating restoration work need to consider the long term commitment necessary to sustain the desired trajectory of recovery. This is particularly important in areas of the Preserve where burning and invasive species removal has already been underway. Following is a proposed prioritization of management activities for each MU based on the key critical resource issues of soil erosion, invasive species, shading effects, biodiversity, and water quality.

It should be stressed that MUs and the proposed prioritization framework is the best assessment based on the knowledge gained during the ecological assessment of the property over a relatively short period of time. Prioritization guidelines should therefore be reassessed on an annual basis with knowledge gathered from on-the-ground restoration activities as work is completed and evaluated.

MU1

High Priority Management Activities

- Repair and stabilize eroding trail reaches on steep slopes in MU1 (GPS locations for follow-up monitoring).
- Evaluate erosion problems in off-trail steep slope areas, especially in vicinity of Polygons 5 and 6. Evaluate seep wetland in Polygon 7, GPS estimated boundary, conduct floristic inventory and assess invasive species and other risk management needs such as trail and foot traffic impacts; initiate invasives control in the seep wetland cautiously using aquatic approved herbicide only, and only if needed. Explore ravine at Polygon 5 for potential seep wetland conditions.
- Form invasive species “strike team” and begin to inventory and map zones of invasive species populations in all MUs.
- Re-locate the boardwalk in Polygon 7 to a position upslope of the fallen tree (leave tree in place as a natural tree-fall providing habitat structure, but monitor during flood events for obstruction problems and stream bank scouring); redesign boardwalk to allow more light to growing vegetation beneath by increasing height above ground and allowing more space between decking planks.
- Reach out to adjacent landowners to discuss management goals and opportunities for collaboration on shared goals.

Moderate Priority Management Activities

- Continue brushing along trails in Polygons 3 and 4 during winter months, expanding the area with increased light levels from the trails into the interior of the forest.
- Conduct follow-up spring burns (early to mid-April) in all brushed areas with adequate fine fuels (oak leaf litter).
- Naturalize ground cover to drip line under oaks in Polygon 1.
- Inventory Crane Grove and Silver Creeks for faunal diversity and stream habitat quality.

Low Priority Management Activities

- Begin to thin young basswood from the canopy in Polygon 3 to increase light levels gradually by 10 - 20% increments to encourage herbaceous cover, but avoid stimulating excessive brambles in the understory.
- Initiate brushing, burning, and invasive species control in Polygon 7.
- Conduct prescribed burning in 30 – 50% of Polygon 2.

MU2

High Priority Management Activities

- Repair and stabilize eroding trail reaches on steep slopes in MU2 (GPS locations for follow-up monitoring).
- Evaluate erosion problems in off-trail steep slope areas, especially in vicinity of the overlook and Polygons 12, 15 and 17.
- Explore ravine and drainage in Polygon 12 for potential seep wetland conditions; if located, delineate, inventory, and evaluate for management needs as in MU1.
- Conduct prescribed burn in previously burned area in Polygon 11 and southern sectors of Polygon 8; extend burn north into adjacent tree plantation; prior to burn, evaluate the feasibility of transplanting selected trees from the plantation into open areas of Polygon 8, to begin to create the Dry-Mesic Prairie/Savanna conditions as mapped.
- Conduct invasive species follow-up control in burned areas, e.g. hand pulling and spot herbicide treatment of noxious weeds, based on the inventory of the Invasive Species Strike Team.
- Reach out to adjacent landowners to discuss management goals and opportunities for collaboration on shared goals.

Moderate Priority Management Activities

- Conduct brushing along trails in Polygons 8, 11, 14, and 17 during winter months, expanding the area with increased light levels from the trails into the interior of the forest.
- Conduct follow-up spring burns (early to mid-April) in all brushed areas with adequate fine fuels (oak leaf litter).
- Naturalize ground cover to drip line under oaks in Polygon 10, if needed.
- Inventory Crane Grove and Silver Creeks for faunal diversity and stream habitat quality.

Low Priority Management Activities

- Initiate brushing, burning, and invasive species control in Polygons 14 and 17.

- Enhance species diversity in restored prairie grassland settings of Polygons 8 and 9 with locally and regionally sourced seed and plants, following prescribed burns in early to mid spring; maintain unburned patchiness as habitat refugia with appropriate burn prescriptions.

MU3

High Priority Management Activities

- Repair and stabilize eroding trail reaches in MU3 (GPS locations for follow-up monitoring).
- Evaluate erosion problems in off-trail steep slope areas, especially in vicinity of Polygons 19, 21, 26 27, and 32.
- Explore ravine and drainage in Polygon 19, 21, 26 27, and 32 for potential seep wetland conditions; if located, delineate, inventory, and evaluate for management needs as in MU1.
- Conduct prescribed burn in previously burned areas in Polygons 24 and 25; extend burn south into adjacent prairie to begin to create the Dry-Mesic Prairie/Savanna transition as mapped; evaluate the feasibility of transplanting trees from the plantation in Polygon 8 into this area.
- Conduct invasive species follow-up control in burned areas, e.g. hand pulling and spot herbicide treatment of noxious weeds, based on the inventory of the Invasive Species Strike Team.
- Reach out to adjacent landowners to discuss management goals and opportunities for collaboration on shared goals.

Moderate Priority Management Activities

- Conduct brushing along trails in Polygons 25, 28 (Tree Farm) during winter months, expanding the area with increased light levels from the trails into the interior of the forest.
- Conduct follow-up spring burns (early to mid-April) in all brushed areas with adequate fine fuels (oak leaf litter).
- Inventory Crane Grove and Silver Creeks for faunal diversity and stream habitat quality.

Low Priority Management Activities

- Initiate brushing, burning, and invasive species control in Polygons 20, 29 and 30.
- Enhance species diversity in restored prairie grassland settings of Polygons 23 and 24 with locally and regionally sourced seed and plants, following prescribed burns in early to mid spring; maintain unburned patchiness as habitat refugia with appropriate burn prescriptions.
- Evaluate invasive species threat of daylily beds and consider reducing the extent of the beds, at least along the perimeter contiguous with the Dry-Mesic Savanna to restore the savanna understory.

Annual Work Plan, Schedule & Budget

A schedule for conducting the first 10 years of remedial restoration treatments at Oakdale Nature Preserve is provided separately in an Excel spreadsheet format. The schedule identifies the principle management units and organizes key treatment strategies (described previously in this chapter) on an annual basis. The schedule is organized vertically by year and by key tasks: burning,

brush removal, invasives control, timber management, seed collection, seeding/planting, and monitoring/reporting. The spreadsheet is setup with separate sheets representing each year of the 10-year remedial restoration schedule to allow annual budgets to be developed from real or estimated unit costs for each treatment. A summary table generates the total annual budget costs and total cost per restoration treatment.

A restoration budget should be developed annually as part of developing the annual work plan and work schedule, based on the prioritized restoration treatments targeted for that season, as determined by the site management and supporting technical advisory team. The schedule and budget will need to be adjusted based on review by the governing body and the available funding and volunteer and partner support. Enhancement seeding and planting activities should be considered to some degree as optional and will depend on the response of the site to brushing and burning treatments and the level of diversity desired by land managers. The total cost of the remedial restoration program will vary significantly depending on the need or desire to introduce seed and plant materials to the existing degraded natural communities, the level of effort required to control noxious weeds and exotic invasive species, and the contracting with professional services.

The plan's goals, objectives, and funding should be re-examined on an annual basis and adjusted as necessary based upon knowledge gained from monitoring the results of restoration treatments in the previous period. At the completion of the initial 10-Year remedial restoration period, the entire site should be monitored and assessed in a review process with the governing body and stakeholders to evaluate and refine the restoration treatment program and goals.

Funding Strategies

Funding and support for the restoration effort can be derived from grants, donations, volunteer steward training and participation, university student research, visitor participation, and from dedicated funds associated with the District's annual budget commitments. It is important that land restoration and management of the Preserve's natural communities be considered and included as a line item in the budget for the Oakdale Nature Preserve as this is by far the best way to ensure that the restoration, which has been initiated in several locations in the Preserve, can be sustained into the future.

Having a detailed restoration plan in hand significantly increases standing as a reliable recipient of grant funding, donations, and participation in national volunteer programs such as AmeriCorps; however, it is not advisable to rely solely on such funding and support for keeping the restoration on track. For example, grants typically have a 6-12 month lead time from the date you prepare and submit a proposal until the notification that you did or did not receive the grant. Relying on grants alone can leave you in the lurch with critical next steps in the restoration process, particularly where restoration has been initiated and lack of follow-up could cause serious and costly setbacks. It is best to pursue and use grants to accelerate the schedule for higher and medium priority restoration activities or if necessary to reduce the draw on the allocated funds. Either way, grants can reduce the long term costs for restoration.

Adaptive Management Protocol

A tested adaptive management protocol for effectively evaluating restoration success and responding to problems and issues is to prepare a simple annual work plan and schedule, defining specific tasks to be undertaken and by whom. The restoration schedule and budget spreadsheet tool will be helpful in preparing this annual work plan (see Table 2). Keeping good notes, map and photo records throughout the year on where actions were taken and details about the outcomes and adjustments made

due to impediments or opportunities as part of the annual monitoring effort will help to document and track the progress of the restoration. Work plans and monitoring reports are essential for making informed adjustments to the management prescriptions to achieve the goals of the plan. At the end of the initial ten-year remedial restoration phase and every ten years thereafter, the overall plan should be re-evaluated and revised as necessary, through a process defined by the site's governing body and with input from the technical advisory team. The adaptive management protocol should also be applied whenever budget shortfalls or receipt of new funds require adjustments to the program.

Science & Technical Advisory Team Review

A volunteer Science & Technical Advisory Team of resource managers, restoration ecologists, foresters, botanists, and wildlife biologists can provide critical overview support on a periodic and ongoing basis, and help to advance and improve restoration outcomes. Participants are typically invited to review annual work plans and end-of-year annual monitoring reports, and to gather onsite during the growing season to observe and evaluate treatment activities and results. Formal meetings can be scheduled to bring the advisory team together with District staff and volunteers to discuss monitoring data and reports and to provide scientific and technical insight and recommendations for addressing problems on adaptive management needs commensurate with the field performance of the restoration in each management unit. These gatherings can occur as infrequently as twice a year or more often depending on the need, level of activity, and availability and interest level of volunteer advisors.

Research Partnerships

An excellent way to advance the restoration program is to engage local and regional universities, schools, and conservation organizations interested in opportunities to participate in long-term ecological restoration. Collaborating partners could sponsor and support student research projects focused on conducting, demonstrating, and monitoring the short term and long term effectiveness of restoration strategies and techniques prescribed in the restoration plan. A simple framework for coordinating such an ongoing collaboration would be a series of permanent demonstration and test plots strategically placed in locations representing critical management areas of the property. Such test and demonstration plots would serve as an important public education tool as well as a research and adaptive management tool. Population studies of bats and other sensitive species would provide an excellent opportunity to engage and collaborate with university research partners.

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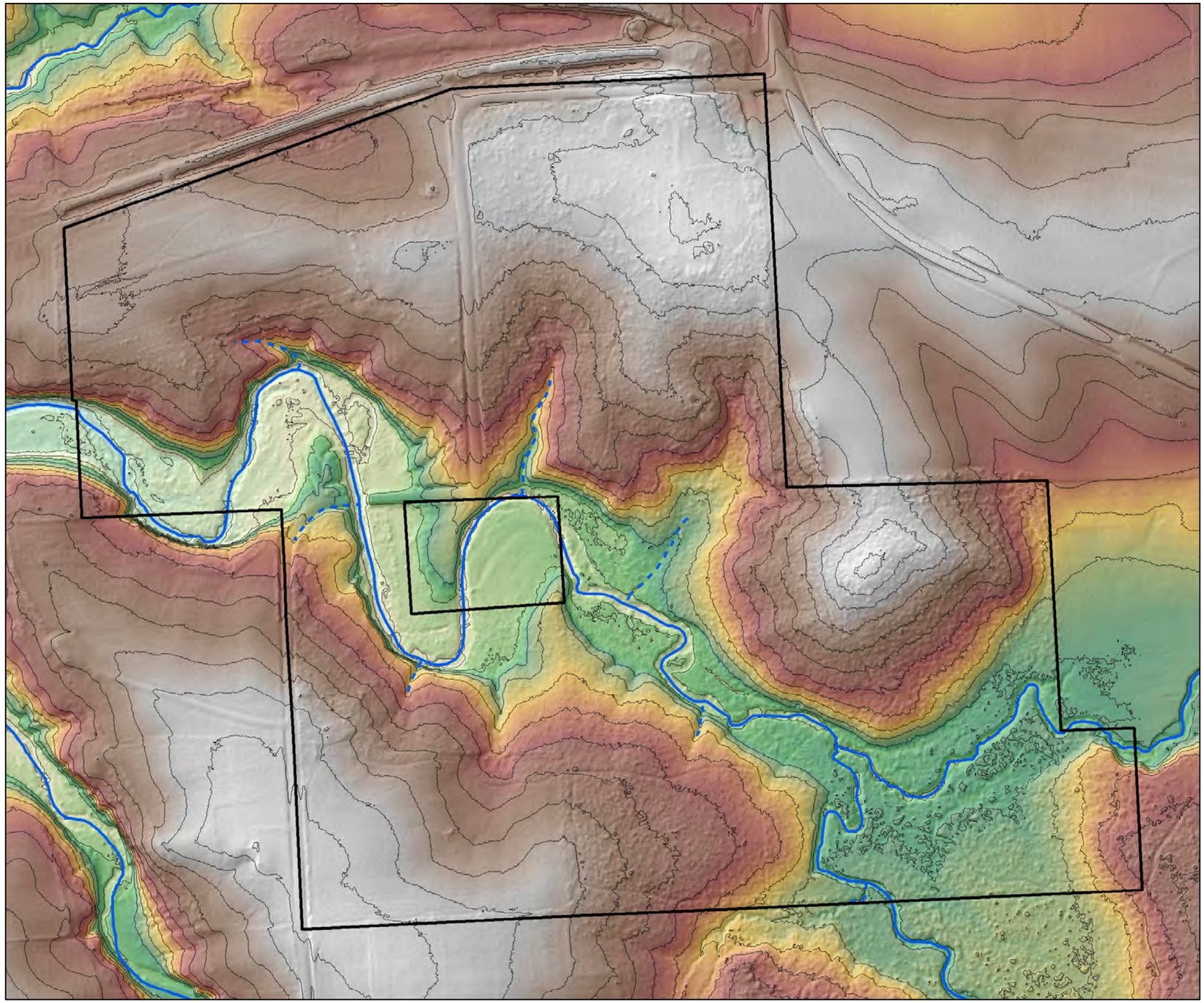
Map Set

1. Topography
2. NRCS Soils
3. 1939 Aerial Photo
4. 1999 Aerial Photo
5. 2005 Aerial Photo
6. 2012 Aerial Photo
7. 2013/2014 Aerial Photo
8. Canopy Heights
9. Communities & Management Units
10. Percent Slope & Communities

Map 1. Topography



Topography

Legend

- Boundary
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent
- 5 Foot Contours

Elevation Above MSL

High : 870 ft

Low : 790 ft

Shaded Relief, Elevation and Contours
From Stephenson Co LiDAR

0 100 200 400 600 Feet

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Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
Mapped by: dwa
Last modified: Sep 15, 2015 RATIO

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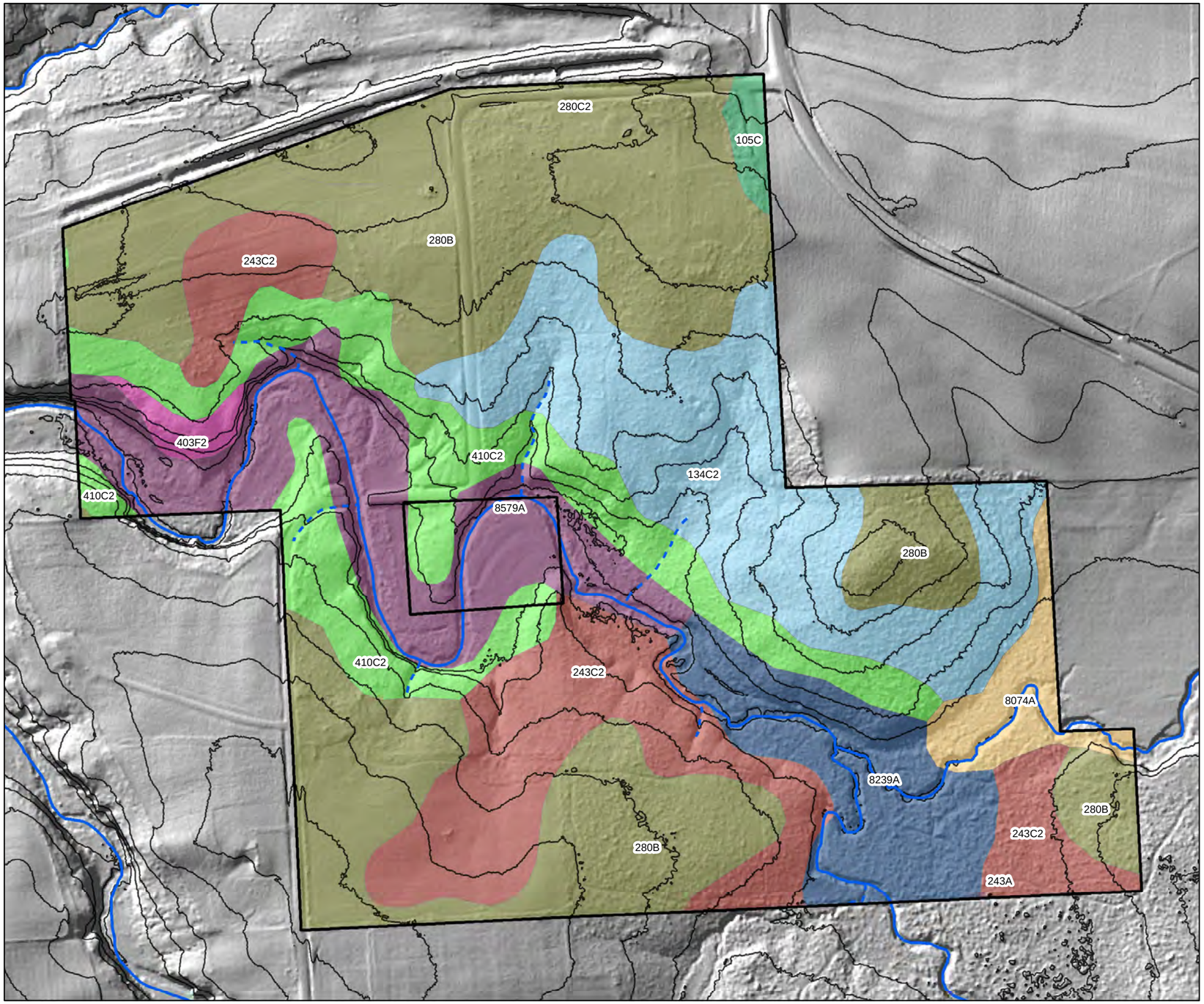
Map 2. NRCS Soils



NRCS Soils

Legend

- Boundary
- 10 Foot Contours
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent

Stephenson Soils

Soil Series (With Labels)

- Batavia silt loam (105C)
- Beavercreek silt loam (8579A)
- Camden silt loam(134C2)
- Dorchester silt loam (8239A)
- Elizabeth silt loam(403F2)
- Fayette silt loam(280B, 280C2)
- Radford silt loam (8074A)
- St Charles silt loam(243, 243C2)
- Woodbine silt loam(410C2)

0 100 200 400 600 Feet

N W E S

Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
Mapped by: dwa
Last modified: Sep 15, 2015

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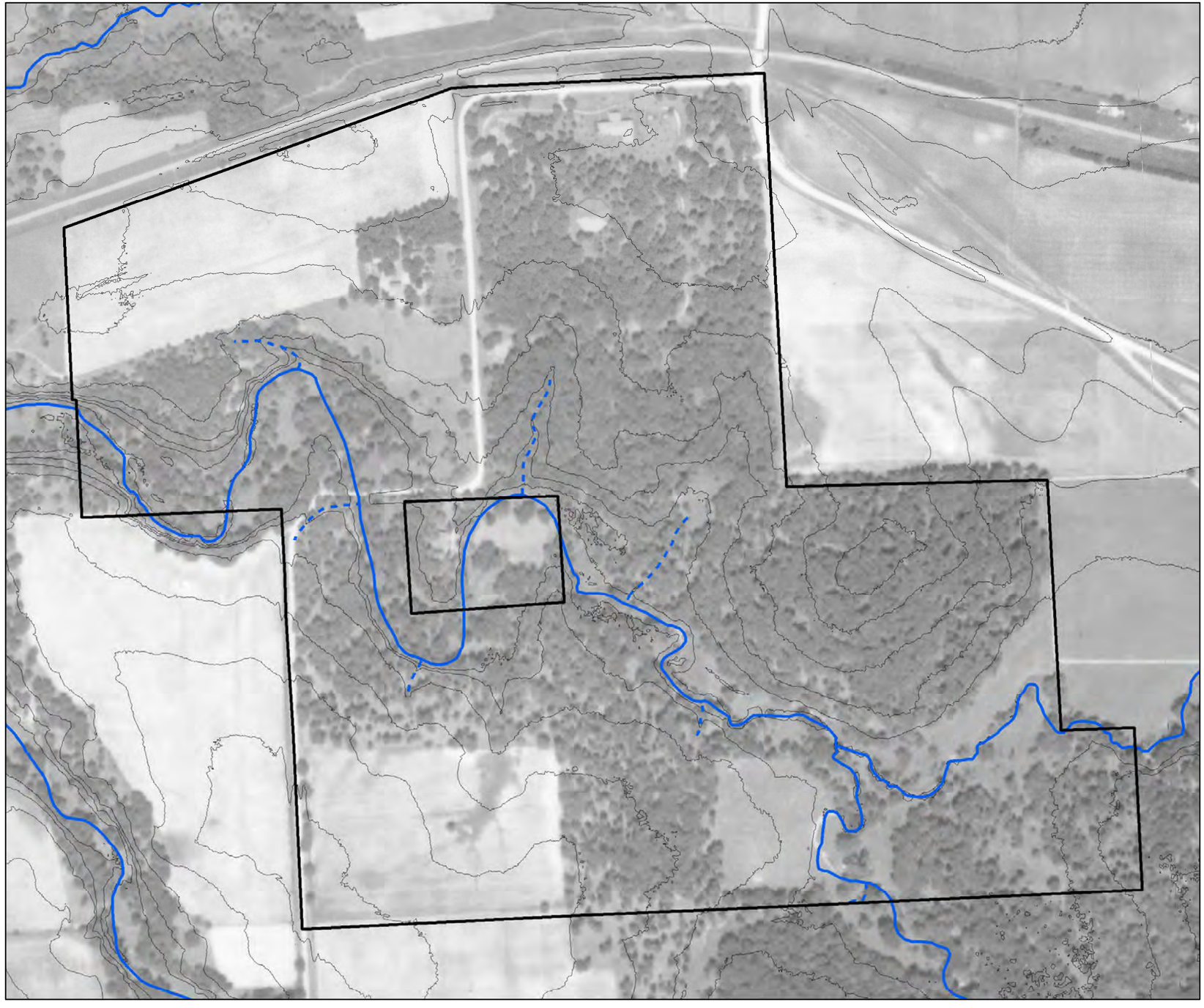
Map 3. 1939 Aerial Photo



1939 Aerial Photo

Legend

- Boundary
- 10 Foot Contours
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent

Shaded Relief, Elevation, Contours and Canopy Height
From Stephenson Co LiDAR

0 100 200 400 600
Feet

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Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
Mapped by: dwa
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Map 4. 1999 Aerial Photo

1999 Aerial Photo

Legend

- Boundary
- 10 Foot Contours
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent

Shaded Relief, Elevation, Contours and Canopy Height
From Stephenson Co LiDAR

0 100 200 400 600
Feet

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Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
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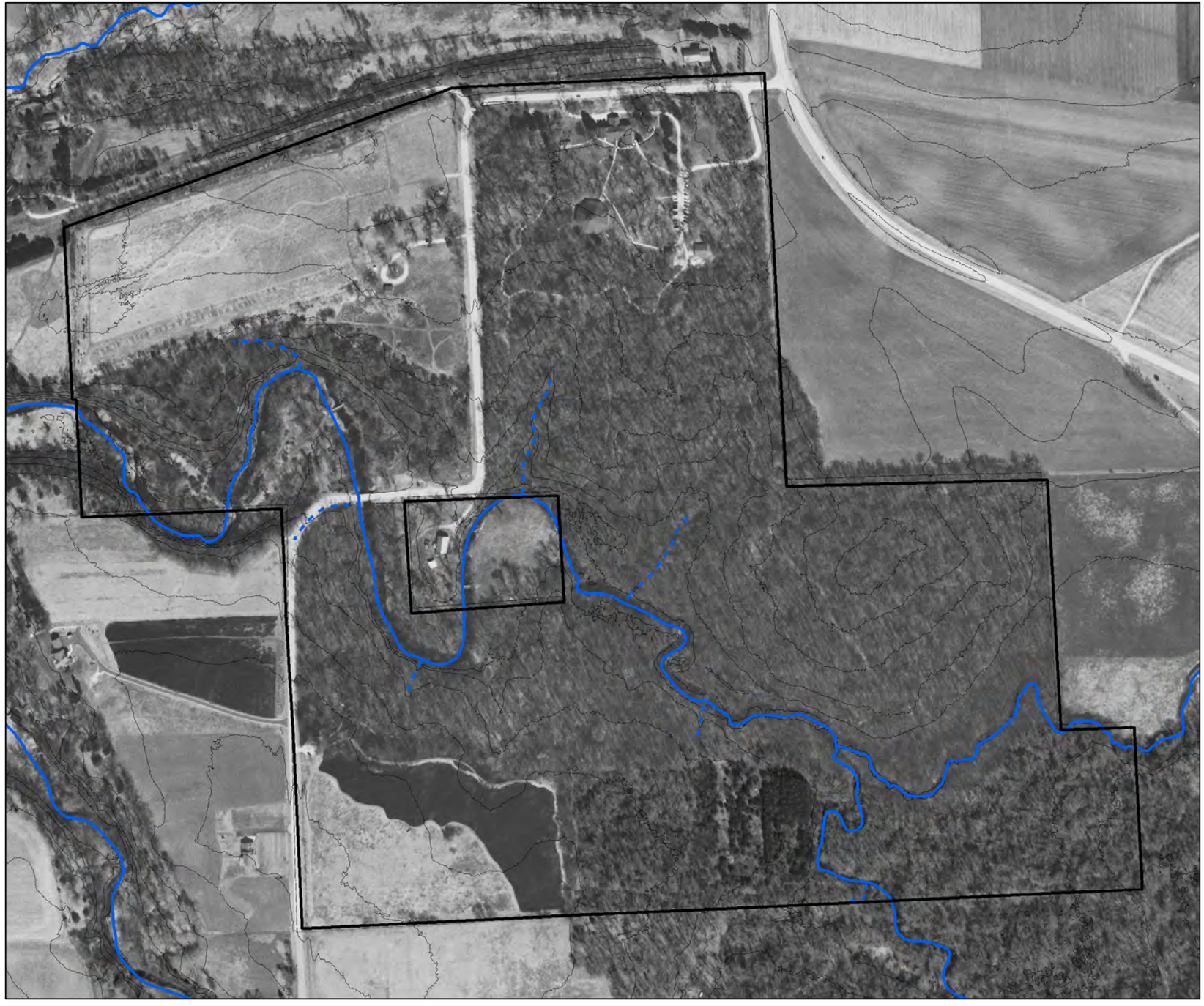
Map 5. 2005 Aerial Photo



2005 Aerial Photo

Legend

- Boundary
- 10 Foot Contours
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent

Shaded Relief, Elevation, Contours and Canopy Height
From Stephenson Co LiDAR

0 100 200 400 600 Feet

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Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
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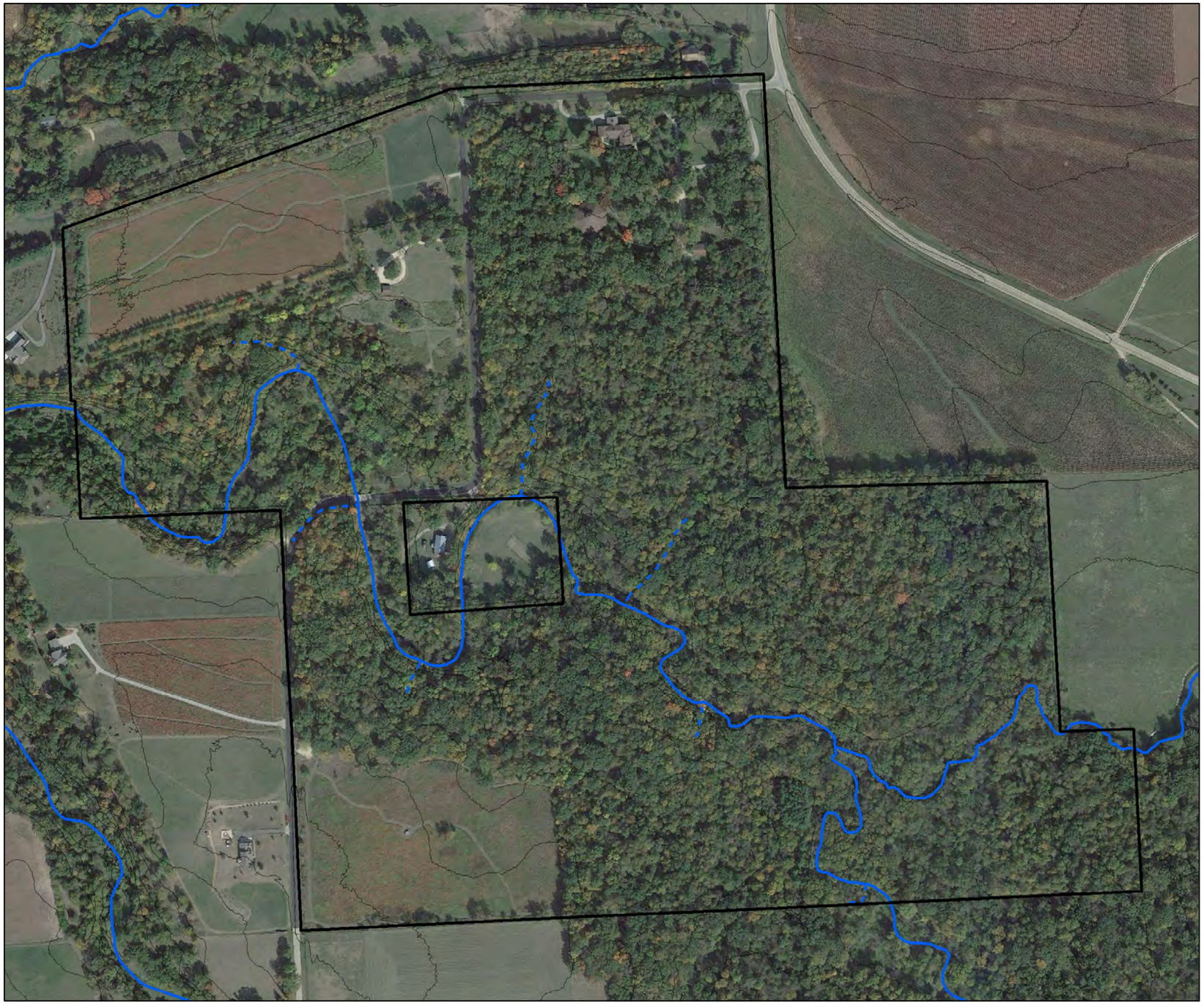
Map 6. 2012 Aerial Photo



2012 Aerial Photo

Legend

- Boundary
- 10 Foot Contours
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent

Shaded Relief, Elevation, Contours and Canopy Height
From Stephenson Co LiDAR

0 100 200 400 600 Feet

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Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
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Map 7. 2013/2014 Aerial Photo

Recent Aerial Photo (2013 or 2014)

Legend

- Boundary
- 10 Foot Contours
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent

Shaded Relief, Elevation, Contours and Canopy Height
From Stephenson Co LiDAR

0 100 200 400 600 Feet

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Project Location: Freeport, IL
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Map 8. Canopy Height

Canopy Heights

Legend

- Boundary
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent

Canopy Height (Feet)

- Less than 1 Ft
- 1 to 10 Ft
- 10 to 20 Ft
- 20 to 30 Ft
- 30 to 40 Ft
- 40 to 50 Ft
- 50 to 60 Ft
- 60 to 95 Ft

Shaded Relief, Elevation, Contours and Canopy Height
From Stephenson Co LiDAR

0 100 200 400 600 Feet

N W E S

Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
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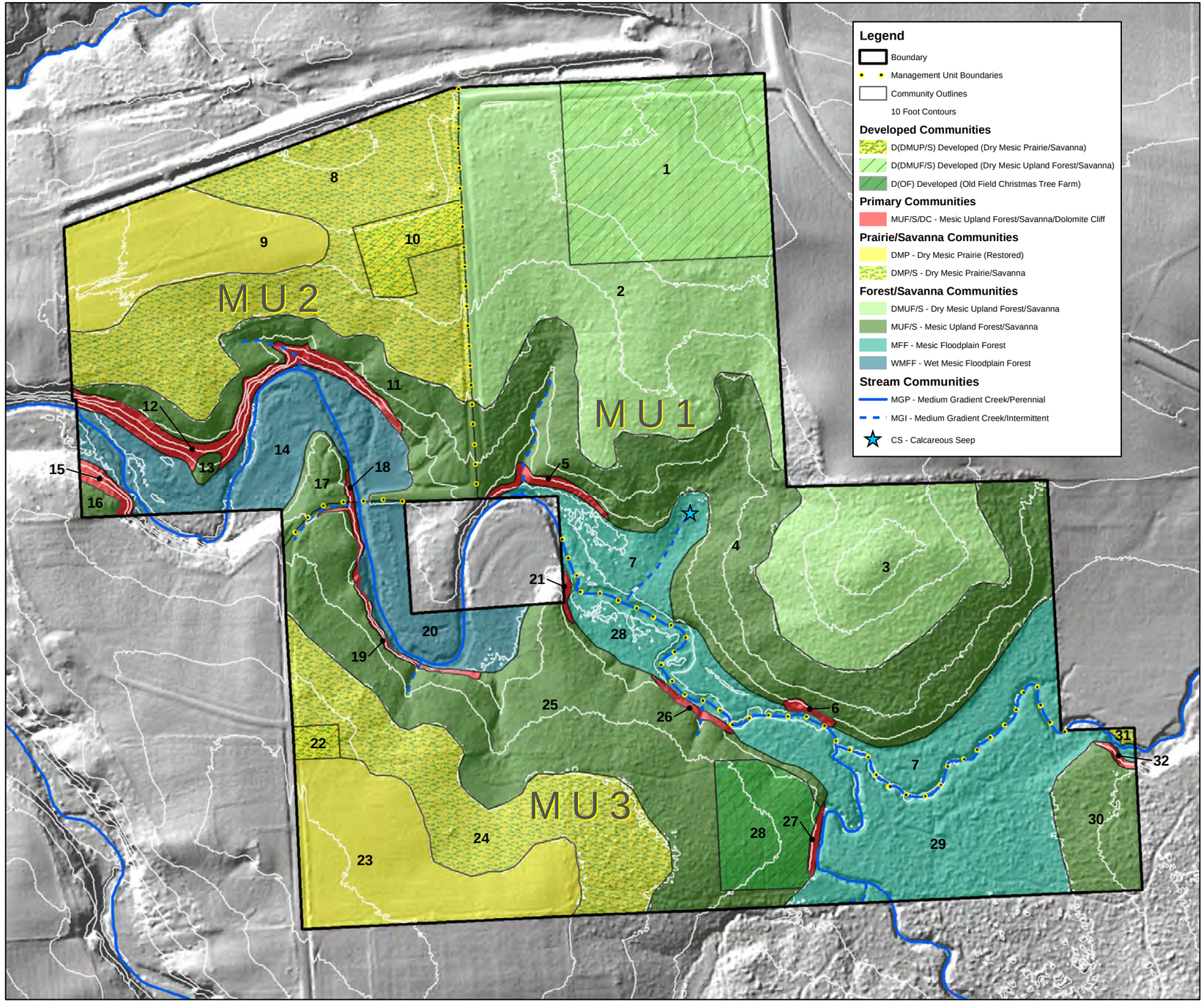
Map 9. Communities & Management Units



Legend

- Boundary
- Management Unit Boundaries
- Community Outlines
- 10 Foot Contours

Developed Communities

- D(DMUP/S) Developed (Dry Mesic Prairie/Savanna)
- D(DMUF/S) Developed (Dry Mesic Upland Forest/Savanna)
- D(OF) Developed (Old Field Christmas Tree Farm)

Primary Communities

- MUF/S/DC - Mesic Upland Forest/Savanna/Dolomite Cliff

Prairie/Savanna Communities

- DMP - Dry Mesic Prairie (Restored)
- DMP/S - Dry Mesic Prairie/Savanna

Forest/Savanna Communities

- DMUF/S - Dry Mesic Upland Forest/Savanna
- MUF/S - Mesic Upland Forest/Savanna
- MFF - Mesic Floodplain Forest
- WMFF - Wet Mesic Floodplain Forest

Stream Communities

- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent
- CS - Calcareous Seep

Communities & Managment Units

Mgmt Unit / Community / Poly ID	Acres
MU1	**53.9**
Developed (Dry Mesic Upland Forest/Savanna)	**8.6**
1	8.6
Mesic Upland Forest/Savanna/Dolomite Cliff	**0.4**
5	0.3
6	0.1
Dry Mesic Upland Forest/Savanna	**22.1**
2	14.4
3	7.8
Mesic Upland Forest/Savanna	**16.1**
4	16.1
Mesic Floodplain Forest	**6.7**
7	6.7
MU2	**32.2**
Developed (Dry Mesic Prairie/Savanna)	**1.4**
10	1.4
Mesic Upland Forest/Savanna/Dolomite Cliff	**1.9**
12	1.6
15	0.3
18	0.0
Dry Mesic Prairie (Restored)	**5.0**
9	5.0
Dry Mesic Prairie/Savanna	**12.7**
8	12.7
Mesic Upland Forest/Savanna	**5.7**
11	4.5
13	0.1
16	0.2
17	0.9
Wet Mesic Floodplain Forest	**5.6**
14	5.6
MU3	**47.8**
Developed (Dry Mesic Prairie/Savanna)	**0.3**
22	0.3
Developed (Old Field Christmas Tree Farm)	**2.6**
28	2.6
Mesic Upland Forest/Savanna/Dolomite Cliff	**0.7**
19	0.3
21	0.1
26	0.1
27	0.1
32	0.1
Dry Mesic Prairie (Restored)	**6.7**
23	6.7
Dry Mesic Prairie/Savanna	**7.8**
24	7.7
31	0.1
Mesic Upland Forest/Savanna	**15.9**
25	13.4
30	2.5
Mesic Floodplain Forest	**10.9**
29	10.9
Wet Mesic Floodplain Forest	**2.9**
20	2.9
Grand Total	**134.0**

0 100 200 400 600 Feet

N W E S

Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
Mapped by: dwa
Last modified: Sep 14, 2015 RATIO

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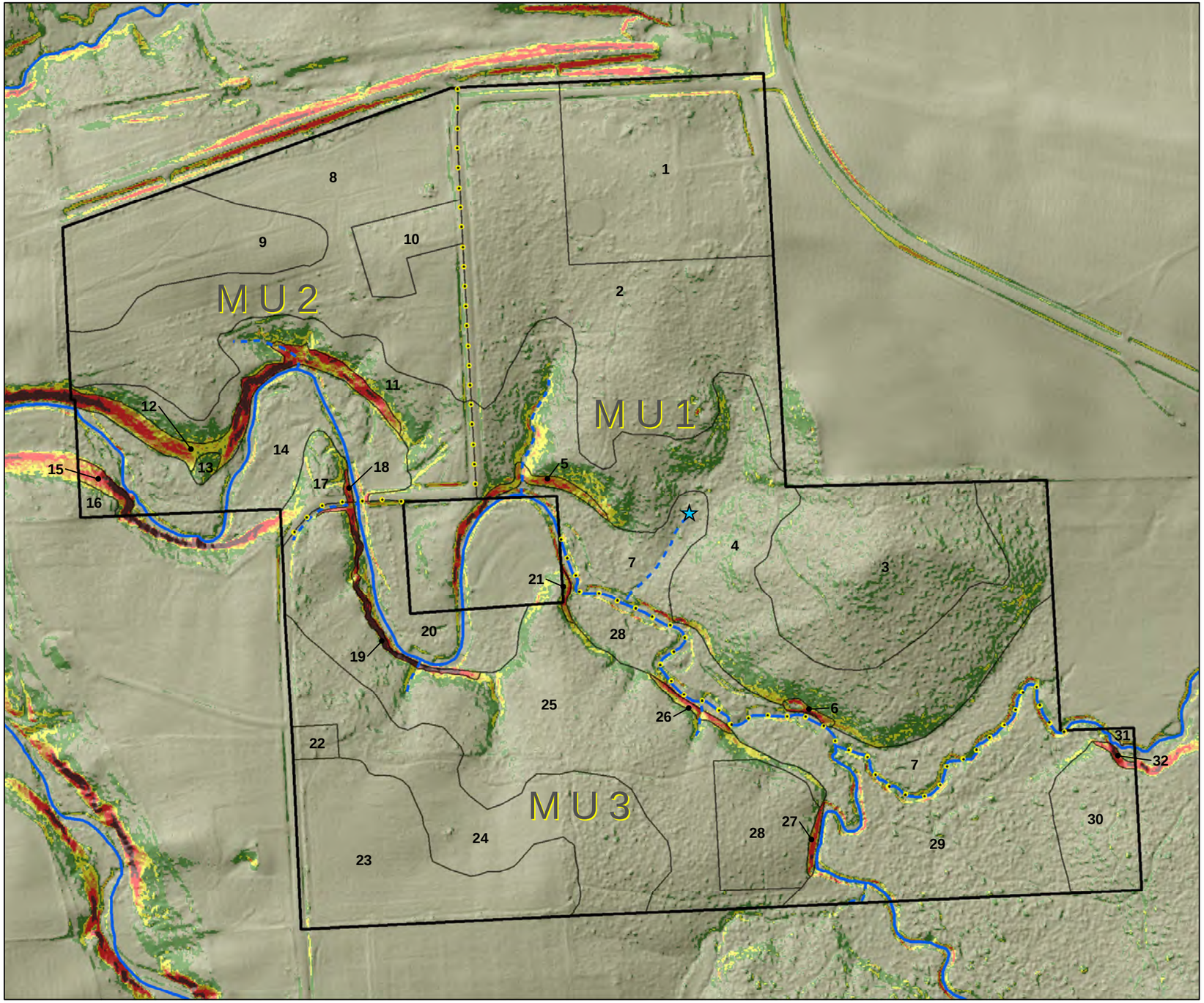
Map 10. Percent Slope & Communities



Percent Slope & Communities

Legend

- Boundary
- Management Unit Boundaries
- Community Outlines
- MGP - Medium Gradient Creek/Perennial
- MGI - Medium Gradient Creek/Intermittent
- CS - Calcareous Seep

Percent Slope

- 0 - 15
- 15 - 25
- 25 - 35
- 35 - 45
- 45 - 70
- 70 plus

0 100 200 400 600 Feet

N W E S

Project Location: Freeport, IL
Project Type: NRI
AES Project #: 15-0540
Mapped by: dwa
Last modified: Sep 14, 2015

RATIO

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