A Level 1 Survey for the Karner Blue Butterfly, Wild Lupine and Other Species of Interest For The City of Black River Falls, Wisconsin

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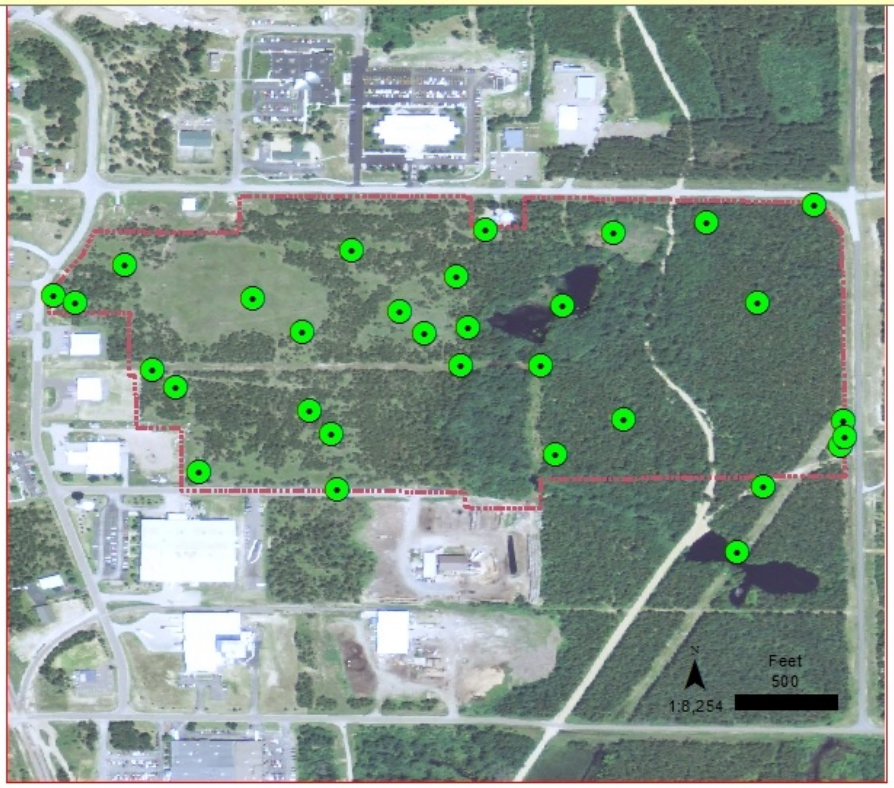
Wildlands Ecological Services

Certified Site Area - Proposed Industrial Park City of Black River Falls, Jackson County, WI - a Karner Blue Butterfly HCP Partner -

Karner Blue Butterfly - Habitat Conservation Plan
Level 1 Survey Wild Lupine Survey
And Search For Other Species of Interest

Dates May 25-28, 2016.



Map Created by Scott C. Zager, Plant Ecologist
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Map Date: May 31, 2016

Legend

Waypoint Observation
(within approximate area searched)

Industrial Park - Proposed Certified Area
(Note: Boundaries are Approximate)

A Level 1 Survey for the Karner Blue Butterfly, Wild Lupine and Other Species of Interest For The City of Black River Falls, Wisconsin

A Survey For Rare Butterflies, Plants, and Their Habitats

June 5, 2016

Submitted To:

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SUMMARY

A recent land acquisition has made approximately 80 acres available for expansion of the Industrial Park in Black River Falls, Jackson County Wisconsin (Fig. 1a). The existing Industrial Park is already home to more than 15 businesses. It has its own water supply, fire hydrants, sanitary/sewer system, high-speed internet cable, and paved roads. Natural gas and Electricity are available. In addition, a rail spur is located within the Industrial Park. The new addition available for development is called the "Certified Site Area" for purposes of this report (Figs. 1a, 4-7).

A survey for populations of wild lupine (*Lupinus perennis*) and other species of interest was conducted during May 25-28, 2016. This period was considered optimal based upon past peak appearance of lupine blooms, recorded butterfly phenology, and predicted weather patterns for Spring of 2016 (see Figs A1-A3 in Appendix 1). This survey was intended to locate possible occurrences of Federal and State Listed species, their host plants and/or suitable habitats within the Certified Site Area. Should wild lupine have been found within the proposed site, additional studies would have been required prior to development to ascertain the presence and abundance of these rare butterflies and/or other rare species.

No rare butterflies were located on the Certified Site Area, despite the presence of suitable habitats of Dry Oak-Pine Barrens/Woodlands and Dry Barrens Prairie. These natural communities were present; however, they expressed degraded ecological quality with a scarcity of nectar plant species required for adult butterflies. Furthermore, no plants of wild lupine were observed on the Certified Site Area even the though the bright, showy flowers of this legume expressed peak display at other nearby locations. However, a Wisconsin State Endangered plant was found in a road ditch adjacent to the Southeast corner of the "Site" (Fig. 7). Eight plants of arrowleaf violet (*Viola sagittata var. ovata = Viola fimbriata*, a synonym) were found in disturbed sand covered by reindeer lichen on the back shoulder of a road ditch. This was near a high-voltage powerline right-of-way and an abandoned railroad bed.

INTRODUCTION

The Study Area.
The proposed Certified Site Area (Fig. 1b) is located on a level plain of well-drained sand within the City of Black River Falls, Wisconsin. The site is on a broad ecological landscape designated by the Wisconsin Department of Natural Resources (WI DNR 2009) as the Central Sand Plains Ecological Landscape[1] (Fig. 2). The Central Sand Plains is located in central Wisconsin, on a relatively level, sandy, glacial lake plain. Historically, the uplands were extensive areas of pine and oak forests. These areas burned frequently and were vegetated with open-canopied woodland natural communities described as pine barrens, oak barrens, and sand prairie.

The Central Sand Plains is one of only three ecological landscapes where contemporary large-scale management is feasible for Oak and Pine Barrens communities. Important populations of several rare species are strongly associated with pine and oak barrens habitats. Many disjunct species occur in the Central Sand Plains, including some with ranges centered on the Atlantic Coastal Plain of the eastern United States and in the western Great Plains.

The Certified Site Area may be potentially inhabited by several species of interest, many of which have

[1]Central Sand Plains Ecological Landscape - Wisconsin DNR
http://dnr.wi.gov/topic/landscapes/index.asp?mode=detail&Landscape=5

or had historical populations in the vicinity (Appendix 2). The Karner Blue Butterfly[2] (KBB or Karner Blue), is a Federal Endangered Species with large populations located in Jackson County (Figs. 3a & 3b)[3], [4]. In fact the proposed site is within an area designated by WI DNR as a "High Potential Range"[5] and is within a 5-mile buffer of known populations of Karner Blue. Furthermore, the Certified Site is within 2 miles of two separate "Recovery" properties with important Karner Blue populations (e.g., the Bauer-Brockway Barrens, Fig. 8).

The Karner Blue is solely dependent on wild lupine, *Lupinus perennis* L. (Fabaceae), because this legume is its only known food plant for developing larva. In addition, the adult butterflies of the Karner Blue require several species of flowering plants as nectar food sources[6]. These native plants occur in dry prairies, savanna and oak-pine barren habitats with well-drained, sandy soils. Many of these natural communities have been lost or overgrown by woody succession. KBB, and other rare species, now occur in remnants of these habitats, as well as other suitable locations that occur in roadsides, military bases, and on some forest lands. The Certified Area is itself supports vegetation and soils that comprise the natural communities where Karner Blue and other species of interest are potentially found. While wild lupine has no state or federal protection, it is an indicator plant of natural community habitats where several rare species are found. (See Appendix 2, Tables B1 & B2). It is important to find and map possible occurrences of rare species that may exist on-site, so that planned development can avoid or minimize impact to rare species populations.

Wild lupine (*Lupinus perennis*) is an considered an important indicator species for identifying areas with significant biodiversity. Lupine is the primary larval host plant for Karner Blue and other butterfly species, such as the Frosted Elfin. Lupine grows best in sandy soils and full sun where competition from shrubs and tall grasses is minimal. It spreads quickly in areas recently cleared by fire, logging, grazing, or other disturbance. They grow on sandy soils under canopy in dry oak/pine woodlands. Most often, lupine patches occur on the edges of the woodlands or within the open to semi-open canopies of jackpine/oak

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[2] USFWS (United States Fish and Wildlife Service). 2003. Final Recovery Plan for the Karner Blue Butterfly (Lycaeides melissa samuelis). U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 273 pp. http://www.fws.gov/midwest/endangered/insects/kbb/kbbRecPlan.html (downloaded May 1, 2016)

[3] Wisconsin's Karner blue butterfly Habitat Conservation Plan is the document that accompanies the incidental take permit from the U.S. Fish and Wildlife Service to the DNR. The permit and the plan are designed to protect and conserve Karner blues while allowing activities to occur that could impact Karner blues or their habitat. The first 10-year plan was approved in 1999 and the second 10-year plan was approved in 2009. http://dnr.wi.gov/topic/ForestPlanning/karner/karnerHCP.html (downloaded May 1, 2016)

[4] Wisconsin's Rare Butterflies and moths - Wisconsin DNR: http://dnr.wi.gov/topic/endangeredresources/Animals.asp?mode=list&Grp=9/ (download May 1, 2016)

[5] High Potential Range (Figs 3a & 3b): The high potential range is the region of the state containing all documented occurrences of the Karner blue butterfly, and extending 5 miles beyond documented Kbb occurrences to include areas with similar habitat, soils, and climate where the Karner blue butterfly is most likely to occur based on the Kbb probability model developed in 2006-2007. Karner Blue High Potential Range Map in Wisconsin "Karner Blue Butterfly Habitat Conservation Plan High Potential Range - Regulatory Range" map http://dnr.wi.gov/topic/ForestPlanning/documents/rangemap.pdf

[6] Common Nectar Species for the Karner blue butterfly: A color photo guide from the WI DNR Karner Blue Butterfly Program color photo guide from the WDNR Karner Blue Butterfly Program. http://dnr.wi.gov/topic/forestplanning/documents/commonnectarspecieskbb.pdf

barrens habitat. Frosted elfins are most often found in habitat where the lupine is common to abundant and the patch size is very large (at least 2 to 2.5 acres).

Rare Species of the Central Sand Plains

Within the Central Sand Plains there are documented occurrences of 116 rare animal species including 6 mammals, 29 birds, 11 herptiles (e.g., snakes, turtles), 11 fishes, and 59 invertebrates. Fifty-five species of rare vascular plants inhabit the Central Sand Plains (WI DNR 2009). Six of these species are listed as Wisconsin Endangered, 8 are listed as Wisconsin Threatened, and 41 are listed as Wisconsin Special Concern (See Appendix 2, Tables B1, B2). Furthermore, there are forty-one species directly associated with sand barren communities (Kirk 1996)[7] (Appendix 2). The U.S. Endangered, Karner blue butterfly and the Wisconsin Threatened, Frosted Elfin are two of these characteristic species highly dependent upon oak and pine barrens. For example, the frosted elfin (*Callophrys irus*), a butterfly, uses the same larval host plant as the Karner blue butterfly, wild lupine, and is actually much rarer species in Wisconsin than the Karner blue. The frosted elfin is now recognized as globally rare. The Central Sand Plains is an important place to manage for these butterflies because there are several existing populations within large areas of suitable habitat. These are found within extensive public land holdings with significant restoration opportunities possibilities.

METHODS

Wisconsin's Karner Blue Butterfly Habitat Conservation Plan (HCP)

The ecology of the KBB is closely tied to its habitat which provides food resources and key subhabitats for the butterfly. The larvae feed only on one plant, wild lupine (*Lupinus perennis*). Adults require nectar source to survive and lay sufficient eggs. Because these habitat components can be lost to succession, Karner blue butterfly persistence is dependent on disturbance and/or management to renew existing habitat or to create new habitats. The distribution and dynamics of these habitats in the establishment of viable metapopulation of this species forms the ecological basis for recovery planning.

The Karner Blue Butterfly Habitat Conservation Plan guides management of this U.S. Endangered species on both public and private lands in the state of Wisconsin. HCP Partners agree to follow specific protocols to avoid and minimize impacts to Karners during the course of their work. In return, the HCP extends permit coverage allowing the partners to conduct activities that may inadvertently "take" (harass, harm or kill) the federally endangered KBB provided that the level of take does not threaten the long-term survival and recovery of KBB in the state.

Municipal Utilities of the City of Black River Falls, which manages the Industrial Park, is a HCP Partner.

Lupine Presence or Absence Monitoring Protocol (Level 1 Survey)

A Level 1 survey is intended to determine the viable presence or absence of wild lupine on land managed by HCP Partners under the federal Incidental Take Permit TE 010064-5. The following protocol is taken from the Wisconsin Statewide Habitat Conservation Plan for the Karner Blue Butterfly, May, 1998 Revision. This protocol has been reformatted from "A Guide to Conducting Monitoring for the Wisconsin Karner Blue Butterfly Habitat Conservation Plan"

Scott Zager, Ecologist for Wildlands Ecological Services (WILDLANDS) conducted a four-day botanical

[7] WI DNR (Wisconsin Department of Natural Resources). 2010. Wisconsin Statewide Karner Blue Butterfly Habitat Conservation Plan. Appendix B. Species Associated with the Karner Blue Butterfly and its Habitat Updated for Application to Renew Federal Fish and Wildlife Permit TE010064-5 May 27, 2010. PUBL-SS-947 2010 Rev. http://dnr.wi.gov/topic/forestplanning/karner/karnerhcp.html

and butterfly survey of the 80 acre site delineated in Figures 1, 4 and 5. During May 25-28, 2016[8], populations of wild lupine and other significant species were searched for using protocols developed by Wisconsin's Habitat Conservation Plan for the Karner Blue[9]. WILDLANDS followed WI DNR protocol and conducted a Level 1 search for wild lupine to locate potential sites for Karner Blue (Federally Endangered) and other species of regulatory concern. The survey was conducted during the peak bloom of wild lupine and mid-way during the first flight of adult Karner Blues (Appendix 1).

Air photos and soils maps (Fig. 6) were consulted so that the following criteria were met:

- Wetlands or other areas flooded for most of the growing season were visited but surveyed intensely.
- Forests with dense canopy (>75%) were searched by a random walk method. Canopy cover was determined by aerial photo interpretation of forest stands with a continuous canopy >75%. These were areas were confirmed by site visit to be comprised of pole or saw timber sized stands (lupine was determined to be absent)
- Sites on non-sandy soils (all soils were determined to be sand or sand loam).
- Cultivated or otherwise developed areas supporting no native vegetation
- In places where lupine flowers (no lupine was observed on site).

During the Level 1 survey, WILDLANDS used one of two methods depending upon canopy cover:

- In open areas with less than 75% woody plant cover, I used "OPTION 2": WILDLANDS walked each opening in the site in strip transects marked by end flags set pre-determined distance apart (e.g. 50 feet, 100 feet, etc). The exact distance was determined in the field based on the limits of sight, which depended upon the distance between surveyors and density of vegetation.

- In closed canopy woodlands, I chose "OPTION 3": a "Random Walk Survey" for a specified time (e.g. 5 minutes) that produces a description of what was found and an estimated % coverage of habitat.

GPS Waypoints
Observations and field notes on general areas were recorded by waypoint sample number using a Garmin 62s GPS. Since no lupine populations were observed, no population boundaries were recorded with GPS. Observation of significant species of interest were recorded with GPS waypoints.

RESULTS

Natural Community types where the Karner Blue Butterfly are known to inhabit are found within the Certified Site Area. These are mostly Pine Barrens of Oak-Pine Barrens dominated by jack pine (*Pinus banksiana*) with some northern pin oak (*Quercus ellipsoidalis*) and bur oak (*Quercus macrocarpa*). There were several openings or canopy gaps with relic dry prairie or barrens prairie. These communities were severely degraded and largely dominated by Kentucky Bluegrass (*Poa pratense*) with a significant percent cover of Little Bluestem (*Schizachyrium scoparium*). Over 100 species of vascular plants were

[8] Appendix 1: Karner Blue Butterfly Emergence Model: View flight predictions using current weather data through May 25, 2016: http://dnr.wi.gov/topic/ForestPlanning/karner/documents/kbb_flights_05252016.pdf

[9] Karner Blue Habitat Conservation Plan User's Guide: http://dnr.wi.gov/topic/forestplanning/karner/hcpguide.html

observed; however, most forbs were infrequently scattered and in low abundance. Brief notes detailing canopy cover and crown heights are given for many waypoint locations and characterize the polygons where they occur. Approximately 20% of the Certified Site Area had dense canopies (>75% cover) of jack pine with crown heights of 10-15 meters (30-45 feet). Wet-mesic habitats with poorly drained soils were dominated by large oaks with dense shrub layers dominated by the invasive glossy buckthorn (Rhamnus frangula). These form a dense thicket on moist soil.

No wild lupine was observed within the Certified Site Area during the Level 1 survey on Dates May 25-28, 2016. Data on important nectar plants were recorded for several habitats within the Certified Site Area. Observations about species presence, abundance and phenology (blooms, seed, etc.) were recorded at 32 waypoint sample locations collected to represent the habitats where they occur[10]. A map of these 32 waypoints are provided in Figure 6. Location data and brief habitat notes are provide in Results Table 1. Despite the present of potential habitat on the Certified Site, no rare species of Butterflies were observed (see Appendix 2, Table B1). However, several common, non-listed butterflies were present at several waypoints. These are recorded in the "Comment" attribute field of Results Table 1. Data concerning sub-populations of plant species observed at waypoint samples are provided in Results Table 2. Attribute fields include scientific name, common name, alternative names (synonyms), phenology and abundance (Percent cover). Results Table 3 lists the names of plant species observed within the Certified Area during the survey. There were over 100 species of plants observed. Frequency of occurrence can be estimated from the waypoint count where species occurred (Results Table 3). A Wisconsin State Endangered plant was observed at two waypoints within approximately 10-15 meters apart. A total of eight plants of arrowleaf violet (*Viola sagittata var. ovata* - formerly *Viola fimbriatula*) was observed at waypoints #978 & #981 (see Figs. 06 & 07 and Results Tables 1 & 2).

Wild Lupine
No wild lupine plants were observed.

Rare Plant Observations
Waypoint 978: Viola sagittata ovata[11]: One cespitose plants; one in bloom, several with developing fruit. On upper shoulder of Road R.O.W. approximately 5 m due east of fire hydrant. On loose sand covered by reindeer lichen with scattered plants of Festuca rubra. Railroad R.O.W. & Road ROW. Also, with Earth Star Fungus. Butterflies: Pearl crescent; Juvenil's Dustywing; American Copper; Silvery Checkerspot, Spring Azure (see Table 1 for location data).

Waypoint 981: Viola sagittata ovata: Seven cespitose plants with fruiting capsules. one plant with developed fruit with 3 scapes with capsules. amid scattered saplings of jack pine with 5-25% cover on back shoulder of road R.O.W. Dense lichen cover with scattered red fescue. EARTH STAR FUNGUS

Butterflies Observations
No populations of Karner Blue Butterfly or any state listed butterflies were observed. (However, Karner Blue Butterflies and wild lupine were observed nearby at the Bauer-Brockman Recovery Site (Fig. 8)[12].

[10] Hyperlink to view photos of some of the waypoints sampled

[11] Hyperlink to view photos of State Endangered, Viola sagittata ovata

[12] Hyperlink to view photos of Karner Blue Butterflies and Lupine at Bauer-Brockman

Common Species of Butterflies Recorded at Various Waypoints
American Copper
Juvenil's Dustywing
Cabbage Sulfur
Spring Azure
Silvery Checkerspot

Natural Communities Observed
Oak-Pine Barrens
Dry Prairie
Barrens Prairie

LITERATURE CITED

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USFWS 2003 (United States Fish and Wildlife Service). Final Recovery Plan for the Karner Blue Butterfly (Lycaeides melissa samuelis). U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 273 pp.

WI DNR 2009 (Wisconsin Department of Natural Resources). Appendix 10.C. The Natural Heritage Inventory (NHI) table of rare species and natural community occurrences (plus a few miscellaneous features tracked by the NHI program) for the Central Sand Plains (CSP) Ecological Landscape in November 2009. See the Wisconsin Natural Heritage Working List online for the most current status.

WI DNR 2010 (Wisconsin Department of Natural Resources). Wisconsin Statewide Karner Blue Butterfly Habitat Conservation Plan. Appendix B. Species Associated with the Karner Blue Butterfly and its HabitatUpdated for Application to Renew Federal Fish and Wildlife Permit TE010064-5 May 27, 2010. PUBL-SS-947 2010 Rev.

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WI DNR 2014b (Wisconsin Department of Natural Resources). Chapter 10, Central Sand Plains Ecological Landscape. 108 pp. Wisconsin Department of Natural Resources, PUB-SS-1131L 2014, Madison. In: The ecological landscapes of Wisconsin: an assessment of ecological resources and a guide to planning sustainable management. Central Sand Plains Ecological Landscape - Wisconsin DNR http://dnr.wi.gov/topic/landscapes/index.asp?mode=detail&Landscape=5

RESULTS TABLE 1: Waypoint Observations with habitat notes (see Figs. 6 and 7)

ID	Wypt ID	Comments	Cadastral	Latitude	Longitude	x_proj*	y_proj	time
1	958	Open Jack Pine woodlands with prairie species. Jack Pine crowns 2-10 m tall; canopy 25-75% cover. Butterflies: American Copper; Juvenile's Dustywing.	SE1/4, NE1/4, Sec 13 T21N R4E	44.3020	-90.8036	455901.97	425731.27	5/25/2016
2	959		SE1/4, NE1/4, Sec 13 T21N R4E	44.3023	-90.8054	455752.75	425759.50	5/25/2016
3	960	Canopy 80% cover with small openings dominated by reindeer lichen. Annual blue flower with spur. EARTH STAR FUNGUS	NE1/4, NE1/4, Sec 13 T21N R4E	44.3034	-90.8058	455728.95	425886.48	5/25/2016
4	961		NE1/4, NE1/4, Sec 13 T21N R4E	44.3036	-90.8061	455703.76	425912.39	5/25/2016
5	962	Small canopy openings with abundant little bluestem.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3031	-90.8040	455872.09	425848.09	5/25/2016
6	963	Medium-sized gap by little bluestem.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3028	-90.8037	455895.53	425814.87	5/25/2016
7	964	Cleared R.O.W.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3037	-90.8019	456037.08	425915.79	5/25/2016
8	965	Edge of wet-mesic swale within oak woodlands. Glossy buckthorn thickly dominates shrub layer beneath oak canopy.	NW1/4, NW1/4, Sec 18 T21N R3E	44.3037	-90.8008	456122.02	425914.18	5/25/2016
9	966	Butterflies: American Copper	NE1/4, NE1/4, Sec 13 T21N R4E	44.3044	-90.8027	455971.02	425996.64	5/25/2016
10	967	Butterflies: American Copper; Juvenile's Dustywing; Opening in pine-oak woodlands near water tower.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3055	-90.8016	456064.51	426118.36	5/26/2016
11	968	Bluegrass meadow opening bordered by Glossy buckthorn, bur oak and jack pine. Large clonal patches of Rubus spp. Forb diversity is few and pooring dispersed.	NW1/4, NW1/4, Sec 18 T21N R3E	44.3055	-90.7998	456203.17	426113.01	5/26/2016
12	969	Wet-Mesic, poorly drained, basin opening bordered by glossy buckthorn and bur oak.	NW1/4, NW1/4, Sec 18 T21N R3E	44.3045	-90.8005	456146.91	426004.25	5/26/2016
13	970	Pine border. Butterflies: American Copper.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3042	-90.8018	456044.82	425972.81	5/26/2016
14	971	Dry, open field in jack pine opening about 10 to 20 m from glossy buckthorn thicket. Butterflies: Cabbage Sulphur, Juvenile's Dustywing, American Copper.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3041	-90.8024	455997.02	425963.17	5/26/2016
15	971B		NE1/4, NE1/4, Sec 13 T21N R4E	44.3049	-90.8020	456033.58	426047.57	5/26/2016
16	972	Large open field. Butterflies: American Copper; Juvenile's Duskywing.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3041	-90.8040	455866.54	425966.22	5/26/2016
17	973	Open grassland. Forbs scattered and infrequent. most rarely occur. Butterflies: Spring Azure; Earth Star Fungus.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3050	-90.8064	455676.10	426068.63	5/26/2016

RESULTS TABLE 1: Waypoint Observations with habitat notes (see Figs. 6 and 7)

ID	Wypt ID	Comments	Cadastral	Latitude	Longitude	x_proj*	y_proj	time
18	974		NE1/4, SW1/4, Sec 16 T21N R3E	44.2974	-90.7558	459709.78	425183.53	5/27/2016
19	973B	Roadside	NW1/4, NE1/4, Sec 13 T21N R4E	44.3046	-90.8074	455597.89	426024.41	5/27/2016
20	975	Crowns 5-10 m tall. Butterfly: Juvenile's Duskywing; Cabbage Sulfur.	NW1/4, NE1/4, Sec 13 T21N R4E	44.3045	-90.8071	455622.52	426014.17	5/27/2016
21	976	Grassy / sedge corridor with jack pine. Linear swath dominated by Pennsylvania sedge, bluegrass and scattered little bluestem. Few forbs which are rare and poorly dispersed to absent.	NE1/4, NE1/4, Sec 13 T21N R4E	44.3052	-90.8034	455921.20	426089.99	5/27/2016
22	977	Powerline ROW and old RR bed.	NW1/4, NW1/4, Sec 18 T21N R3E	44.3029	-90.7967	456448.34	425829.25	5/28/2016
23	978	RR R.O.W. & Road ROW. Viola sagittata ovata: One cespitose plants; one in bloom, several with developing fruit. On upper shoulder of Road R.O.W. approximately 5 m due east of fire hydrant. On loose sand covered by reindeer lichen with scattered plants of Festuca rubra. Also, with Earth Star Fungus. Butterflies: Pearl crescent; Juvenile's Dustywing; American Copper; Silvery Checkerspot, Spring Azure.	NW1/4, NW1/4, Sec 18 T21N R3E	44.3026	-90.7968	456445.41	425790.73	5/28/2016
24	979	Wet soil near pon on sandy marsh. open flats within powerline R.O.W.	SW1/4, NW1/4, Sec 18 T21N R3E	44.3012	-90.7982	456331.56	425632.87	5/28/2016
25	980	Butterflies: Silvery Checkerspot on old R.O.W. on gravel rail bed.	SW1/4, NW1/4, Sec 18 T21N R3E	44.3021	-90.7978	456361.32	425731.78	5/28/2016
26	981	Viola sagittata ovata: Seven cespitose plants with fruiting capsules. one plant with developed fruit with 3 scapes with capsules. amid scattered saplings of jack pine with 5-25% cover on back shoulder of road R.O.W. Dense lichen cover with scattered red fescue. EARTH STAR FUNGUS	NW1/4, NW1/4, Sec 18 T21N R3E	44.3027	-90.7967	456448.98	425804.25	5/28/2016
27	982	R.O.W., ROAD & POWERLINE. Dense fescue grass with scattered prairie forbs. Butterflies: Blue azure; American Copper.	NW1/4, NW1/4, Sec 18 T21N R3E	44.3058	-90.7971	456420.12	426151.55	5/28/2016
28	983	Jack Pine Forest crowns 15-20m tall; canopy 85% cover; DBH 4-8 inches. Shrub layer thickly covered by Glossy buckthorn. Mesic substrate. DBH 6-8"	NW1/4, NW1/4, Sec 18 T21N R3E	44.3056	-90.7986	456304.14	426127.47	5/28/2016

RESULTS TABLE 1: Waypoint Observations with habitat notes (see Figs. 6 and 7)

ID	Wypt ID	Comments	Cadastral	Latitude	Longitude	x_proj*	y_proj	time
29	984	Dry-Mesic jack pine forests; canopy 50-75% cover; crowns 10-15 m tall; DBH 4-6 inches. Hill's oak dbh 4-6"; crowns 5-10 m tall.	NW1/4, NW1/4, Sec 18 T21N R3E	44.3045	-90.7979	456356.97	426006.87	5/28/2016
30	972B		NE1/4, NE1/4, Sec 13 T21N R4E	44.3046	-90.8047	455812.60	426016.89	2016/05/28
31	985		NW1/4, NW1/4, Sec 18 T21N R3E	44.3025	-90.8006	456137.56	425780.08	2016/05/28
32	986		NW1/4, NW1/4, Sec 18 T21N R3E	44.3029	-90.7997	456211.12	425831.77	2016/05/28
		***GIS Projection:** NAD83 (HARN) Transverse Mercader						

RESULTS TABLE 2: Species Observed at Waypoint Sample Points (see Results Table 1).

Wypt ID	UNIQCODE	HERBNAME	Latin_Name	COMMON NAME	Synonym	Certainty	PHENDESC	Veg_Layer	AbunDesc	State List	Date
958	PINU15BA	Pinus banksiana Lamb.	Pinus banksiana	Jack pine, U	Pinus banksiana Lamb.	Species		2	>25-50%		5/25/16 8:52 PM
958	CEANHERB	Ceanothus herbaceus Raf.	Ceanothus herbaceus	Oval-leaved New Jersey tea	Ceanothus herbaceus Raf.	Species Certain	03 = Flowering	3 Shrub	<1% (few 2-20)		5/25/16 8:52 PM
958	HEDYLONG	Hedyotis longifolia (Gaertn.) Hook.	Hedyotis longifolia	Bluets	Hedyotis longifolia (Gaertn.) Hook.	Species Certain	03 = Flowering	6 Herb			5/25/16 8:52 PM
958	CENTSSMI	Centaurea stoebe L. subsp. micranthos (S.G. Gmelin ex Gugler) Hayek [= Centaurea biebersteinii = Centaurea maculosa]	Centaurea stoebe subsp. micranthos	spotted knapweed	[Centaurea maculosa auct. non Lam. (=Centaurea biebersteinii DC.) see Centaurea stoebe subsp. micranthos]	Species Certain	01= Immature	6 Herb	1-5% (many >20)		5/25/16 8:52 PM
958	LITHVACR	Lithospermum caroliniense (Walter ex J.F. Gmel.) MacMill. var. croceum (Fernald) Cusick	Lithospermum caroliniense var. croceum	Carolina pucoon	Lithospermum caroliniense (Walter ex J.F. Gmel.) MacMill.	Species Certain	03 = Flowering	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	CAREPENS	Carex pensylvanica Lam.	Carex pensylvanica	Pennsylvania sedge	Carex pensylvanica Lam.	Species	04 = Fruit	7 Graminoid			5/25/16 8:52 PM
958	SISYCAMP	Sisyrinchium campestre E.P. Bicknell	Sisyrinchium campestre	Field blue-eyed grass	Sisyrinchium campestre E.P. Bicknell	Species Certain	03 = Flowering	6 Herb	1-5% (many >20)		5/25/16 8:52 PM
958	PRUN_SPP	Prunus	Prunus	Plum; Cherry	Prunus	Genus Certain	01= Immature	3 Shrub	Single (r)		5/25/16 8:52 PM
958	RHAMFRAN	Rhamnus frangula L. [= Frangula alnus Mill.]	Rhamnus frangula	Alder buckthorn	Rhamnus frangula L. [= Frangula alnus Mill.]	Species Certain	03 = Flowering	3 Shrub	1-5% (many >20)		5/25/16 8:52 PM
958	Brassicaceae	Brassicaceae Unknown	Brassicaceae Unknown	Unknown mustard	Brassicaceae Unknown	Unknown	03 = Flowering	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	CARESICC	Carex siccata Dewey	Carex siccata	dry-spike or hay sedge	Carex siccata Dewey	Species	04 = Fruit	7 Graminoid	Present		5/25/16 8:52 PM
958	LONIXXBE	Lonicera x bella Zabel (Lonicera morrowii x tatarica)	Lonicera xbella	Pretty honeysuckle	Lonicera x bella Zabel (Lonicera morrowii x tatarica)	Species Certain	03 = Flowering	3 Shrub	<1% (few 2-20)		5/25/16 8:52 PM
958	ROSA_SPP	Rosa	Rosa	Wild Rose	Rosa	Genus Certain	01= Immature	3 Shrub	1-5% (many >20)		5/25/16 8:52 PM
958	FRAGVIRG	Fragaria virginiana Duchesne	Fragaria virginiana	Common strawberry	Fragaria virginiana Duchesne	Species Certain	03 = Flowering	6 Herb	1-5% (many >20)		5/25/16 8:52 PM
958	SYMPSERI	Symphyotrichum sericeum (Vent.) G.L.	Symphyotrichum sericeum	western silky aster	Symphyotrichum sericeum (Vent.) G.L.	cf. Species	01= Immature	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	MAIASTEL	Maianthemum stellatum (L.) Link	Maianthemum stellatum	starry false lily-of-the-valley	Maianthemum stellatum (L.) Link	Species Certain	02 = Pre-Bloom (Bud)	6 Herb	1-5% (many >20)		5/25/16 8:52 PM
958	LESPCAPI	Lespedeza capitata Michx.	Lespedeza capitata	Round-headed bush-clover	Lespedeza capitata Michx.	Species Certain	01= Immature	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	OENOCLEL	Oenothera clelandii W. Dietr., P.H. Raven & W.L. Wagner	Oenothera clelandii	Cleland's evening-primrose	Oenothera clelandii W. Dietr., P.H. Raven & W.L. Wagner	cf. Species	01= Immature	6 Herb	Single (r)		5/25/16 8:52 PM
958	VERBTHAP	Verbascum thapsus L.	Verbascum thapsus	Common mullein	Verbascum thapsus L.	Species Certain	01= Immature	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	SCHISCOP	Schizachyrium scoparium (Michx.) Nash [var. Unknown; MN see var. scoparium]	Schizachyrium scoparium	Little bluestem	Schizachyrium scoparium (Michx.) Nash [var. Unknown; MN see var. scoparium]	Species Certain	01= Immature	7 Graminoid	>5-25%		5/25/16 8:52 PM

RESULTS TABLE 2: Species Observed at Waypoint Sample Points (see Results Table 1).

Wypt ID	UNIQCODE	HERBNAME	Latin_Name	COMMON NAME	Synonym	Certainty	PHENDESC	Veg_Layer	AbunDesc	State List	Date
958	SOLIRIGI	Solidago rigida L. [subsp. unknown]	Solidago rigida	Stiff goldenrod	Solidago rigida L. [subsp. unknown]	Species Certain	01= Immature	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	TRAD_SPP	Tradescantia	Tradescantia	Spiderwort	Tradescantia	Genus Certain	01= Immature	6 Herb	Single (r)		5/25/16 8:52 PM
958	LECH_SPP	Lechea	Lechea	Pinweed	Lechea	Genus Certain	01= Immature	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	HELIPAUC	Helianthus pauciflorus Nutt. [subspecies unknown]	Helianthus pauciflorus	stiff sunflower	Helianthus pauciflorus Nutt. [subspecies unknown]	cf. Species	01= Immature	6 Herb	>5-25%		5/25/16 8:52 PM
958	POA_PRAT	Poa pratensis L. [subspecies unknown]	Poa pratensis	Kentucky bluegrass	Poa pratensis L. [subspecies unknown]	Species Certain	02 = Pre-Bloom (Bud)	7 Graminoid	>25-50%		5/25/16 8:52 PM
958	RHUS_SPP	Rhus	Rhus	Sumac; Poison-Ivy	Rhus	Genus Certain	01= Immature	3 Shrub	<1% (few 2-20)		5/25/16 8:52 PM
958	CORY12AM	Corylus americana Walter	Corylus americana	American hazelnut	Corylus americana Walter	Species Certain	01= Immature	4 Seedling	<1% (few 2-20)		5/25/16 8:52 PM
958	PRUN15SE	Prunus serotina Ehrh.	Prunus serotina	Black cherry, U	Prunus serotina Ehrh.	Species	03 = Flowering	2	Single (r)		5/25/16 8:52 PM
958	RANURHOM	Ranunculus rhomboideus Goldie	Ranunculus rhomboideus	Prairie buttercup	Ranunculus rhomboideus Goldie	Species Certain	06 = Ripe Seed	6 Herb	Single (r)		5/25/16 8:52 PM
958	LIAT_SPP	Liatris	Liatris	Blazing star; Gayfeather	Liatris	cf. Genus	01= Immature	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	POTESIMP	Potentilla simplex Michx. [varieties not recognized]	Potentilla simplex	Old-field cinquefoil	Potentilla simplex Michx. [varieties not recognized]	Species Certain	02 = Pre-Bloom (Bud)	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	ROSABLAN	Rosa blanda Aiton	Rosa blanda	Smooth wild rose	Rosa blanda Aiton	Genus Certain	01= Immature	4 Subshrub	Single (r)		5/25/16 8:52 PM
958	CROCBICK	Crocanthemum bicknellii (Fernald) Janchen	Crocanthemum bicknellii	hoary frostweed	[Helianthemum bicknellii Fernald SEE Crocanthemum bicknellii]	Species Certain	01= Immature		<1% (few 2-20)		5/25/16 8:52 PM
958	ACHIMILL	Achillea millefolium L.	Achillea millefolium	Yarrow	Achillea millefolium L.	Species Certain	01= Immature	6 Herb	<1% (few 2-20)		5/25/16 8:52 PM
958	EUPHVACO	Euphorbia corollata L. var. corollata	Euphorbia corollata var. corollata	Flowering spurge		Species Certain	01= Immature	6 Herb	Present		5/25/16 8:52 PM
958	VEROVAXA	Veronica peregrina L. var. xalapensis (Kunth) Pennell	Veronica peregrina var. xalapensis	Purslane speedwell	Veronica peregrina L. var. xalapensis (Kunth) Pennell	Species Certain	04 = Fruit Developing	6 Herb	Present		5/25/16 8:52 PM
958	MAIACANA	Maianthemum canadense Desf. [varieties not recognized]	Maianthemum canadense	Canada mayflower	Maianthemum canadense Desf. [varieties not recognized]	Species Certain	03 = Flowering	6 Herb	Present		5/25/16 8:52 PM
960	UNKNFORB	Unknown Forb	Unknown Forb	Unknown Forb	Unknown Forb	Unknown	03 = Flowering	6 Herb	<1% (few 2-20)		5/25/16 10:02 PM
960	KOELMACR	Koeleria macrantha (Ledeb.) Schult.	Koeleria macrantha	June-grass	Koeleria macrantha (Ledeb.) Schult.	cf. Genus		7 Graminoid	Present		5/25/16 10:02 PM
960	PINU12BA	Pinus banksiana Lamb.	Pinus banksiana	Jack pine	Pinus banksiana Lamb.	Species Certain		4 Seedling	<1% (few 2-20)		5/25/16 10:02 PM
960	ANDRGERA	Andropogon gerardii Vitman	Andropogon gerardii	Big bluestem	Andropogon gerardii Vitman	Species Certain		7 Graminoid	Single (r)		5/25/16 10:02 PM
961	DICH_SPP	Dichanthelium species	Dichanthelium	Panic Grass	Dichanthelium species	Genus Certain		7 Graminoid	<1% (few 2-20)		5/25/16 10:48 PM
961	RUMEACE2	Rumex acetosella L.	Rumex acetosella	Red sorrel	Rumex acetosella L.	Species		6 Herb	>5-25%		5/25/16 10:48 PM

RESULTS TABLE 2: Species Observed at Waypoint Sample Points (see Results Table 1).

Wypt ID	UNIQCODE	HERBNAME	Latin_Name	COMMON NAME	Synonym	Certainty	PHENDESC	Veg_Layer	AbunDesc	State List	Date
961	DICHLEIB	Dichanthelium leibergii (Vasey) Freckmann	Dichanthelium leibergii	Leiberg's panicgrass	Dichanthelium leibergii (Vasey) Freckmann	cf. Species		7 Graminoid	<1% (few 2-20)		5/25/16 10:48 PM
961	HIERUMBE	Hieracium umbellatum L.	Hieracium umbellatum	narrow-leaf hawkweed	[Hieracium canadense Michx. see Hieracium umbellatum]	cf. Species		6 Herb	Present		5/25/16 10:48 PM
961	PANIVIRG	Panicum virgatum L.	Panicum virgatum	Switchgrass	Panicum virgatum L.	Species		7 Graminoid	Present		5/25/16 10:48 PM
961	VIOLVAP3	Viola pedata L. var. pedata	Viola pedata var. pedata	birdfoot violet	Viola pedata L. var. pedata	Species Certain		6 Herb	1-5% (many >20)		5/25/16 10:48 PM
961	ANTENEGL	Antennaria neglecta Greene	Antennaria neglecta	Field pussytoes	Antennaria neglecta Greene	Species Certain		6 Herb	1-5% (many >20)		5/25/16 10:48 PM
963	RUDBHIRT	Rudbeckia hirta L. [MN see var. pulcherrima	Rudbeckia hirta	Black-eyed Susan	Rudbeckia hirta L. [MN see var. pulcherrima	Species Certain		6 Herb	Present		5/25/16 11:08 PM
966	SELARUPE	Selaginella rupestris (L.) Spring	Selaginella rupestris	Rock spikemoss	Selaginella rupestris (L.) Spring	cf. Species		6 Herb	Present		5/25/16 11:39 PM
967	QUERMACR	Quercus macrocarpa Michx.	Quercus macrocarpa	Bur oak	Quercus macrocarpa Michx.	Species Certain		3 Shrub	Present		5/26/16 5:37 PM
967	ARTESSCA	Artemisia campestris L. subsp. caudata (Michx.) H.M. Hall & Clem.	Artemisia campestris subsp. caudata	Tall wormwood	Artemisia campestris L. subsp. caudata (Michx.) H.M. Hall & Clem.	Species Certain		6 Herb	Present		5/26/16 5:37 PM
968	QUER15MA	Quercus macrocarpa Michx.	Quercus macrocarpa	Bur oak, U	Quercus macrocarpa Michx.	Species Certain		2 Understory	Present		5/26/16 7:50 PM
968	QUER12MA	Quercus macrocarpa Michx.	Quercus macrocarpa	Bur oak	Quercus macrocarpa Michx.	Species Certain		4 Seedling	Present		5/26/16 7:50 PM
968	CORYAMER	Corylus americana Walter	Corylus americana	American hazelnut	Corylus americana Walter	Species		3 Shrub	Present		5/26/16 7:50 PM
968	QUER15EL	Quercus ellipsoidalis E.J. Hill	Quercus ellipsoidalis	Northern pin oak, U	Quercus ellipsoidalis E.J. Hill	Species Certain		2 Understory	Present		5/26/16 7:50 PM
968	PRUNPUMI	Prunus pumila L. [variety unknown]	Prunus pumila	Sand cherry	Prunus pumila L. [variety unknown]	cf. Genus	03 = Flowering	3 Shrub	Present		5/26/16 7:50 PM
968	EUTHGRAM	Euthamia graminifolia (L.) Nutt. [varieties not recognized]	Euthamia graminifolia	Grass-leaved goldenrod	Euthamia graminifolia (L.) Nutt. [varieties not recognized]	cf. Genus		6 Herb	Present		5/26/16 7:50 PM
969	QUER69MA	Quercus macrocarpa Michx.	Quercus macrocarpa	Bur oak, T	Quercus macrocarpa Michx.	Species Certain		1 Canopy	Present		5/26/16 8:17 PM
969	CAREVESI	Carex vesicaria L. [no varieties recognized]	Carex vesicaria	Inflated sedge	Carex vesicaria L. [no varieties recognized]	Species Certain		7 Graminoid	Present		5/26/16 8:17 PM
969	LYSICILI	Lysimachia ciliata L.	Lysimachia ciliata	Fringed loosestrife	Lysimachia ciliata L.	Genus Certain		6 Herb	Present		5/26/16 8:17 PM
969	SPIR12AL	Spiraea alba Du Roi [variety unknown]	Spiraea alba	Meadowsweet	Spiraea alba Du Roi [variety unknown]	Species Certain		4 Seedling	Present		5/26/16 8:17 PM
969	IRISVERS	Iris versicolor L.	Iris versicolor	Northern blue Flag	Iris versicolor L.	Species	01= Immature	6 Herb	Single (r)		5/26/16 8:17 PM
970	COREPALM	Coreopsis palmata Nutt.	Coreopsis palmata	Stiff tickseed	Coreopsis palmata Nutt.	Species		6 Herb	Present		5/26/16 8:36 PM
970	HIERLONG	Hieracium longipilum Torr. ex Hook.	Hieracium longipilum	Long-bearded hawkweed	Hieracium longipilum Torr. ex Hook.	cf. Species		6 Herb	Present		5/26/16 8:36 PM
971	ANEMCYLI	Anemone cylindrica A. Gray	Anemone cylindrica	Long-headed thimbleweed	Anemone cylindrica A. Gray	Species Certain	01= Immature	6 Herb	Present		5/26/16 8:49 PM
972	OENO_SPP	Oenothera	Oenothera	evening-primrose	Oenothera	Genus Certain		6 Herb	Present		5/26/16 10:19 PM
972	PRUN12SE	Prunus serotina Ehrh.	Prunus serotina	Black cherry	Prunus serotina Ehrh.	Species		4 Seedling	Present		5/26/16 10:19 PM

RESULTS TABLE 2: Species Observed at Waypoint Sample Points (see Results Table 1).

Wypt ID	UNIQCODE	HERBNAME	Latin_Name	COMMON NAME	Synonym	Certainty	PHENDESC	Veg_Layer	AbunDesc	State List	Date
973	HESPSPAR	Hesperostipa spartea (Trin.) Barkworth	Hesperostipa spartea	porcupine grass	Hesperostipa spartea (Trin.) Barkworth	Species Certain		7 Graminoid	Present		5/26/16 11:43 PM
973	HIER_SPP	Hieracium	Hieracium	Hawkweed species	Hieracium	Genus Certain		6 Herb	Present		5/26/16 11:43 PM
973	ELYMREPE	Elymus repens (L.) Gould	Elymus repens	Quack grass	Elymus repens (L.) Gould	Species		7 Graminoid	Present		5/26/16 11:43 PM
973	ELYM_SPP	Elymus spp.	Elymus	Wild rye	Elymus spp.	Genus Certain		7 Graminoid	Present		5/26/16 11:43 PM
973	GEUMTRIF	Geum triflorum Pursh	Geum triflorum	Prairie smoke	Geum triflorum Pursh	Species		6 Herb	Present		5/26/16 11:43 PM
973	ASCL_SPP	Asclepias	Asclepias	Milkweed	Asclepias	Genus Certain		6 Herb	Present		5/26/16 11:43 PM
973	AMBRPSIL	Ambrosia psilostachya DC.	Ambrosia psilostachya	cumin ragweed	[Ambrosia coronopifolia Torr. & A. Gray see Ambrosia psilostachya]	Species Certain		6 Herb	Present		5/26/16 11:43 PM
973	FRAGSSAM	Fragaria vesca L. subsp. americana (Porter) Staudt	Fragaria vesca subsp. americana	woodland strawberry		cf. Species			Present		5/26/16 11:43 PM
973	ANTEPLAN	Antennaria plantaginifolia (L.) Richardson [varieties not recognized FNA]	Antennaria plantaginifolia	Plantain-leaved pussytoes	Antennaria plantaginifolia (L.) Richardson [varieties not recognized FNA]	Species Certain		6 Herb	Present		5/26/16 11:43 PM
973	TRAGDUBI	Tragopogon dubius Scop.	Tragopogon dubius	Yellow goat's-beard	Tragopogon dubius Scop.	Species		6 Herb	Present		5/26/16 11:43 PM
973	OXALDILL	Oxalis dillenii Jacq.	Oxalis dillenii	Southern wood-sorrel	Oxalis dillenii Jacq.	cf. Species	03 = Flowering	6 Herb	Present		5/26/16 11:43 PM
973	ROSAACIC	Rosa acicularis Lindl. [subspecies not recognized by some; MN see subsp. sayi]	Rosa acicularis	Prickly rose	Rosa acicularis Lindl. [subspecies not recognized by some; MN see subsp. sayi]	cf. Species	01= Immature	4 Subshrub	Present		5/27/16 7:26 PM
973	SOLIMISS	Solidago missouriensis Nutt. [varieties not recognized]	Solidago missouriensis	Missouri goldenrod	Solidago missouriensis Nutt. [varieties not recognized]	cf. Species	01= Immature	6 Herb	Present		5/27/16 7:26 PM
973	FESTRUBR	Festuca rubra L [subspecies unknown]	Festuca rubra	Red fescue	Festuca rubra L [subspecies unknown]	Species Certain	02 = Pre-Bloom (Bud)	7 Graminoid	Present		5/27/16 7:26 PM
973	OXAL_SPP	Oxalis sp	Oxalis	Wood-sorrel; Sheep-sorrel	Oxalis sp	Genus Certain	01= Immature	6 Herb	Present		5/27/16 7:26 PM
973	SOLINEMO	Solidago nemoralis Aiton [subsp. unknown]	Solidago nemoralis	Gray goldenrod	Solidago nemoralis Aiton [subsp. unknown]	Species Certain	01= Immature	6 Herb	Present		5/27/16 7:26 PM
977	QUER12EL	Quercus ellipsoidalis E.J. Hill	Quercus ellipsoidalis	Northern pin oak	Quercus ellipsoidalis E.J. Hill	Species Certain		4 Seedling	Present		5/28/16 4:22 PM
977	TARAOFFI	Taraxacum officinale F.H. Wiggers	Taraxacum officinale	Common dandelion	Taraxacum officinale F.H. Wiggers	Species Certain		6 Herb	Present		5/28/16 4:22 PM
977	PINUBANK	Pinus banksiana Lamb.	Pinus banksiana	Jack pine	Pinus banksiana Lamb.	Species		3 Shrub	Present		5/28/16 4:22 PM
978	VIOLVAOV	Viola sagittata Aiton var. ovata (Nutt.) Torr. & A. Gray	Viola sagittata var. ovata	arrowleaf violet	[Viola fimbriatula Sm. SEE Viola sagittata Aiton var. ovata (Nutt.) Torr. & A. Gray]	Species Certain	03 = Flowering	6 Herb	Present	WI - END	5/28/16 4:40 PM
979	VIOLSSLA	Viola lanceolata L. subsp. lanceolata	Viola lanceolata subsp. lanceolata	bog white violet	Viola lanceolata L.	Species Certain		6 Herb	Present		5/28/16 7:44 PM
979	CAREBUXB	Carex buxbaumii	Carex buxbaumii	Buxbaum's sedge	Carex buxbaumii	Species		7 Graminoid	Present		5/28/16 7:44 PM
979	CARESCOP	Carex scoparia Schkuhr ex Willd. [variety unknown see var. scoparia]	Carex scoparia	Pointed-broom sedge	Carex scoparia Schkuhr ex Willd. [variety unknown see var. scoparia]	Species Certain		7 Graminoid	Present		5/28/16 7:44 PM
980	UNKNOWN	Unknown Species	Unknown Species	Unknown Species	Unknown Species			Unknown			5/28/16 8:07 PM

RESULTS TABLE 2: Species Observed at Waypoint Sample Points (see Results Table 1).

Wypt ID	UNIQCODE	HERBNAME	Latin_Name	COMMON NAME	Synonym	Certainty	PHENDESC	Veg_Layer	AbunDesc	State List	Date
981	RUBU_SPP	Rubus spp.	Rubus	Blackberry or raspberry	Rubus (Trailing dewberry group)	Genus Certain		4 Subshrub	Present		5/28/16 8:47 PM
981	VIOLVAOV	Viola sagittata Aiton var. ovata (Nutt.) Torr. & A. Gray	Viola sagittata var. ovata	arrowleaf violet	[Viola fimbriatula Sm. SEE Viola sagittata Aiton var. ovata (Nutt.) Torr. & A. Gray]	Species Certain	03 = Flowering	6 Herb	<1% (few 2-20)	WI - END	5/28/16 4:40 PM
982	CAREPRAE	Carex praegracilis W.	Carex praegracilis	Very-slender sedge	Carex praegracilis W.	Species		7 Graminoid	Present		5/28/16 9:24 PM
983	PINU69BA	Pinus banksiana Lamb.	Pinus banksiana	Jack pine, T	Pinus banksiana Lamb.	Species		1 Canopy	>75-100%		5/28/16 9:31 PM
983	LYSIBORE	Lysimachia borealis U. Manns & Anderb.	Lysimachia borealis	starflower	[Trientalis borealis Raf. see Lysimachia borealis]	Species Certain		6 Herb	Present		5/28/16 9:31 PM
983	DRYOCART	Dryopteris carthusiana (Vill.) H.P. Fuchs	Dryopteris carthusiana	Spinulose shield-fern	Dryopteris carthusiana (Vill.) H.P. Fuchs	Species Certain		6 Herb	Present		5/28/16 9:31 PM
983	CORY_SPP	Corylus	Corylus	Hazelnut species	Corylus	Genus Certain		3 Shrub	Present		5/28/16 9:31 PM
983	POPU69GR	Populus grandidentata Michx.	Populus grandidentata	Big-toothed aspen, T	Populus grandidentata Michx.	Species Certain		1 Canopy	1-5% (many >20)		5/28/16 9:31 PM
983	ACER12RU	Acer rubrum L.	Acer rubrum	Red maple	Acer rubrum L.	Species		4 Seedling	Present		5/28/16 9:31 PM
983	QUER12RU	Quercus rubra L.	Quercus rubra	Northern red oak	Quercus rubra L.	Species		4 Seedling	Present		5/28/16 9:31 PM
983	MAIASSRA	Maianthemum racemosum (L.) Link subsp. racemosum	Maianthemum racemosum subsp. racemosum	feathery false lily-of-the-valley	[Smilacina racemosa (L.) Desf. see Maianthemum racemosum subsp. racemosum]	Species Certain		6 Herb	Present		5/28/16 9:31 PM
983	PINUSTRO	Pinus strobus L.	Pinus strobus	White pine	Pinus strobus L.	Species		3 Shrub	Present		5/28/16 9:31 PM
983	RHAM12FR	Rhamnus frangula L. [= Frangula alnus Mill.]	Rhamnus frangula	Alder buckthorn	Rhamnus frangula L. [= Frangula alnus Mill.]	Species Certain		4 Seedling	Present		5/28/16 9:31 PM
983	ANEMVAQU	Anemone quinquefolia L. var. quinquefolia	Anemone quinquefolia var. quinquefolia	Wood-anemone	Anemone quinquefolia L. [var. unknown]. MN see Anemone quinquefolia L. var. quinquefolia	Species Certain		6 Herb	Present		5/28/16 9:31 PM
983	VACCANGU	Vaccinium angustifolium Aiton	Vaccinium angustifolium	Lowbush blueberry	Vaccinium angustifolium Aiton	Species Certain		4 Subshrub	Present		5/28/16 9:31 PM
983	TOXIRYDB	Toxicodendron rydbergii (Small ex Rydb.) Greene	Toxicodendron rydbergii	Western Poison ivy	Toxicodendron rydbergii (Small ex Rydb.) Greene	Species Certain		4 Subshrub	Present		5/28/16 9:31 PM
984	POPU15GR	Populus grandidentata Michx.	Populus grandidentata	Big-toothed aspen, U	Populus grandidentata Michx.	Species Certain		2 Understory	<1% (few 2-20)		5/28/16 9:41 PM
984	POPUGRAN	Populus grandidentata Michx.	Populus grandidentata	Big-toothed aspen	Populus grandidentata Michx.	Species Certain		3 Shrub	Present		5/28/16 9:41 PM

RESULTS TABLE 3: Species Observerd and Waypoint Observation Count.

Species Observed	Observation Count
Acer rubrum	**1**
Red maple	1
Achillea millefolium	**4**
Yarrow	4
Ambrosia psilostachya	**2**
cumin ragweed	2
Andropogon gerardii	**1**
Big bluestem	1
Anemone cylindrica	**3**
Long-headed thimbleweed	3
Anemone quinquefolia var. quinquefolia	**1**
Wood-anemone	1
Antennaria neglecta	**3**
Field pussytoes	3
Antennaria plantaginifolia	**1**
Plantain-leaved pussytoes	1
Artemisia campestris subsp. caudata	**6**
Tall wormwood	6
Asclepias	**3**
Milkweed	3
Brassicaceae Unknown	**10**
Unknown mustard	10
Carex buxbaumii	**1**
Buxbaum's sedge	1
Carex pensylvanica	**8**
Pennsylvania sedge	8
Carex praegracilis	**1**
Very-slender sedge	1
Carex scoparia	**1**
Pointed-broom sedge	1
Carex siccata	**1**
dry-spike or hay sedge	1
Carex vesicaria	**2**
Inflated sedge	2
Ceanothus herbaceus	**5**
Oval-leaved New Jersey tea	5
Centaurea stoebe subsp. micranthos	**4**
spotted knapweed	4
Coreopsis palmata	**2**
Stiff tickseed	2
Corylus	**1**
Hazelnut species	1
Corylus americana	**3**
American hazelnut	3
Crocanthemum bicknellii	**7**
hoary frostweed	7

RESULTS TABLE 3: Species Observerd and Waypoint Observation Count.

Species Observed	Observation Count
Dichanthelium	**3**
Panic Grass	3
Dichanthelium leibergii	**1**
Leiberg's panicgrass	1
Dryopteris carthusiana	**1**
Spinulose shield-fern	1
Elymus	**1**
Wild rye	1
Elymus repens	**1**
Quack grass	1
Euphorbia corollata var. corollata	**7**
Flowering spurge	7
Euthamia graminifolia	**1**
Grass-leaved goldenrod	1
Festuca rubra	**4**
Red fescue	4
Fragaria vesca subsp. americana	**1**
woodland strawberry	1
Fragaria virginiana	**5**
Common strawberry	5
Geum triflorum	**1**
Prairie smoke	1
Hedyotis longifolia	**7**
Bluets	7
Helianthus pauciflorus	**8**
stiff sunflower	8
Hesperostipa spartea	**1**
porcupine grass	1
Hieracium	**2**
Hawkweed species	2
Hieracium longipilum	**3**
Long-bearded hawkweed	3
Hieracium umbellatum	**2**
narrow-leaf hawkweed	2
Iris versicolor	**1**
Northern blue Flag	1
Koeleria macrantha	**1**
June-grass	1
Lechea	**2**
Pinweed	2
Lespedeza capitata	**10**
Round-headed bush-clover	10
Liatris	**4**
Blazing star; Gayfeather	4
Lithospermum caroliniense var. croceum	**11**
Carolina pucoon	11

RESULTS TABLE 3: Species Observerd and Waypoint Observation Count.

Species Observed	Observation Count
Lonicera xbella	**2**
Pretty honeysuckle	2
Lysimachia borealis	**1**
starflower	1
Lysimachia ciliata	**1**
Fringed loosestrife	1
Maianthemum canadense	**1**
Canada mayflower	1
Maianthemum racemosum subsp. racemosu	**1**
feathery false lily-of-the-valley	1
Maianthemum stellatum	**5**
starry false lily-of-the-valley	5
Oenothera	**2**
evening-primrose	2
Oenothera clelandii	**1**
Cleland's evening-primrose	1
Oxalis	**1**
Wood-sorrel; Sheep-sorrel	1
Oxalis dillenii	**1**
Southern wood-sorrel	1
Panicum virgatum	**3**
Switchgrass	3
Pinus banksiana	**12**
Jack pine	2
Jack pine, T	2
Jack pine, U	8
Pinus strobus	**1**
White pine	1
Poa pratensis	**10**
Kentucky bluegrass	10
Populus grandidentata	**3**
Big-toothed aspen	1
Big-toothed aspen, T	1
Big-toothed aspen, U	1
Potentilla simplex	**7**
Old-field cinquefoil	7
Prunus	**1**
Plum; Cherry	1
Prunus pumila	**1**
Sand cherry	1
Prunus serotina	**4**
Black cherry	2
Black cherry, U	2
Quercus ellipsoidalis	**4**
Northern pin oak	1
Northern pin oak, U	3

RESULTS TABLE 3: Species Observerd and Waypoint Observation Count.

Species Observed	Observation Count
Quercus macrocarpa	**6**
Bur oak	4
Bur oak, T	1
Bur oak, U	1
Quercus rubra	**1**
Northern red oak	1
Ranunculus rhomboideus	**5**
Prairie buttercup	5
Rhamnus frangula	**8**
Alder buckthorn	8
Rhus	**1**
Sumac; Poison-Ivy	1
Rosa	**3**
Wild Rose	3
Rosa acicularis	**1**
Prickly rose	1
Rosa blanda	**1**
Smooth wild rose	1
Rubus	**1**
Blackberry or raspberry	1
Rudbeckia hirta	**6**
Black-eyed Susan	6
Rumex acetosella	**7**
Red sorrel	7
Schizachyrium scoparium	**12**
Little bluestem	12
Selaginella rupestris	**3**
Rock spikemoss	3
Sisyrinchium campestre	**8**
Field blue-eyed grass	8
Solidago missouriensis	**1**
Missouri goldenrod	1
Solidago nemoralis	**1**
Gray goldenrod	1
Solidago rigida	**4**
Stiff goldenrod	4
Spiraea alba	**1**
Meadowsweet	1
Symphyotrichum sericeum	**3**
western silky aster	3
Taraxacum officinale	**1**
Common dandelion	1
Toxicodendron rydbergii	**1**
Western Poison ivy	1
Tradescantia	**2**
Spiderwort	2

RESULTS TABLE 3: Species Observerd and Waypoint Observation Count.

Species Observed	Observation Count
Tragopogon dubius	**1**
Yellow goat's-beard	1
Unknown Forb	**5**
Unknown Forb	5
Unknown Species	**1**
Unknown Species	1
Vaccinium angustifolium	**2**
Lowbush blueberry	2
Verbascum thapsus	**2**
Common mullein	2
Veronica peregrina var. xalapensis	**1**
Purslane speedwell	1
Viola lanceolata subsp. lanceolata	**1**
bog white violet	1
Viola pedata var. pedata	**7**
birdfoot violet	7
Viola sagittata var. ovata	**2**
arrowleaf violet	2
Grand Total	**310**

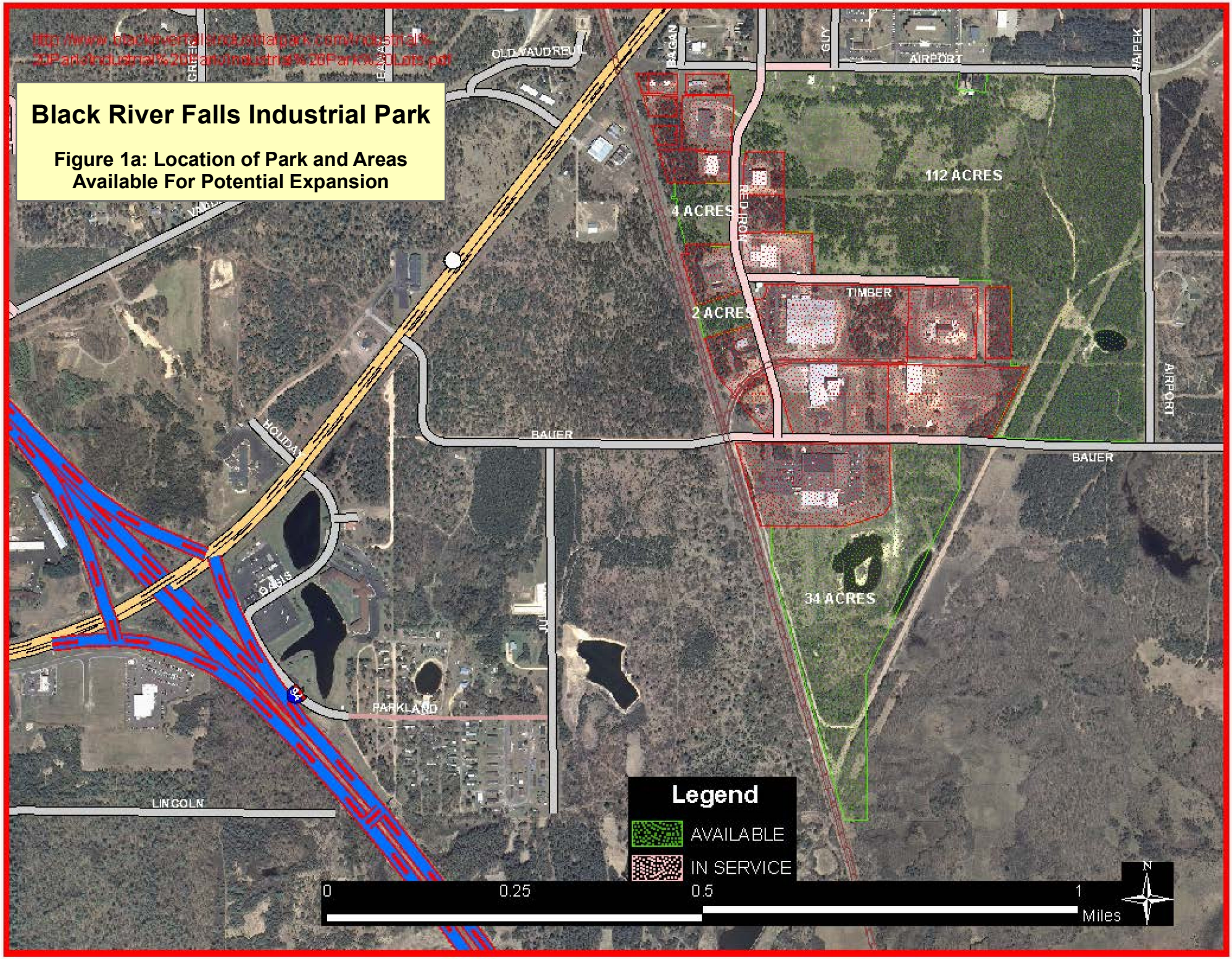
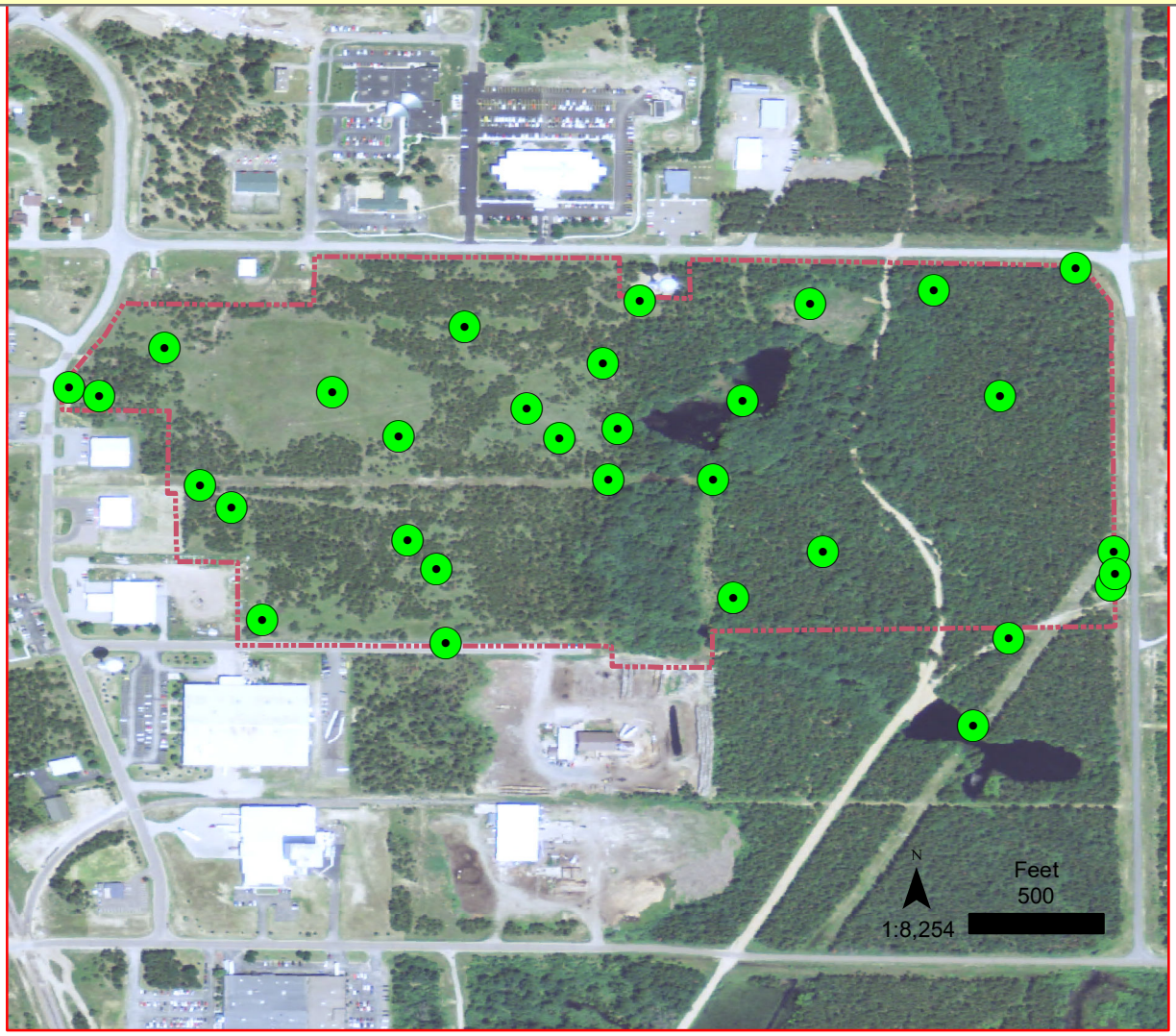

http://www.blackriverfallsindustrialpark.com/Industrial%20Park/Industrial%20Park%20Lots.pdf
Black River Falls Industrial Park
Figure 1a: Location of Park and Areas Available For Potential Expansion
OLD WAUBRU
BAGAN
GUY
AIRPORT
HAIPEK
112 ACRES
4 ACRES
RED IRON
TIMBER
2 ACRES
AIRPORT
BAUER
BAUER
HOUDA
DAVIS
34 ACRES
PARKLAND
LINCOLN
94
Legend
AVAILABLE
IN SERVICE
0
0.25
0.5
1
Miles
N

Fig. 01b

Certified Site Area - Proposed Industrial Park
City of Black River Falls, Jackson County, WI
- a Karner Blue Butterfly HCP Partner -

Karner Blue Butterfly - Habitat Conservation Plan
Level 1 Survey Wild Lupine Survey
And Search For Other Species of Interest

Dates May 25-28, 2016.



Wildlands Ecological Services
Map Created by Scott C. Zager, Plant Ecologist
Wildlands Ecological Services
scott.zager@wildlands.biz
Map Date: May 31, 2016

Legend

Waypoint Observation
(within approximate area searched)

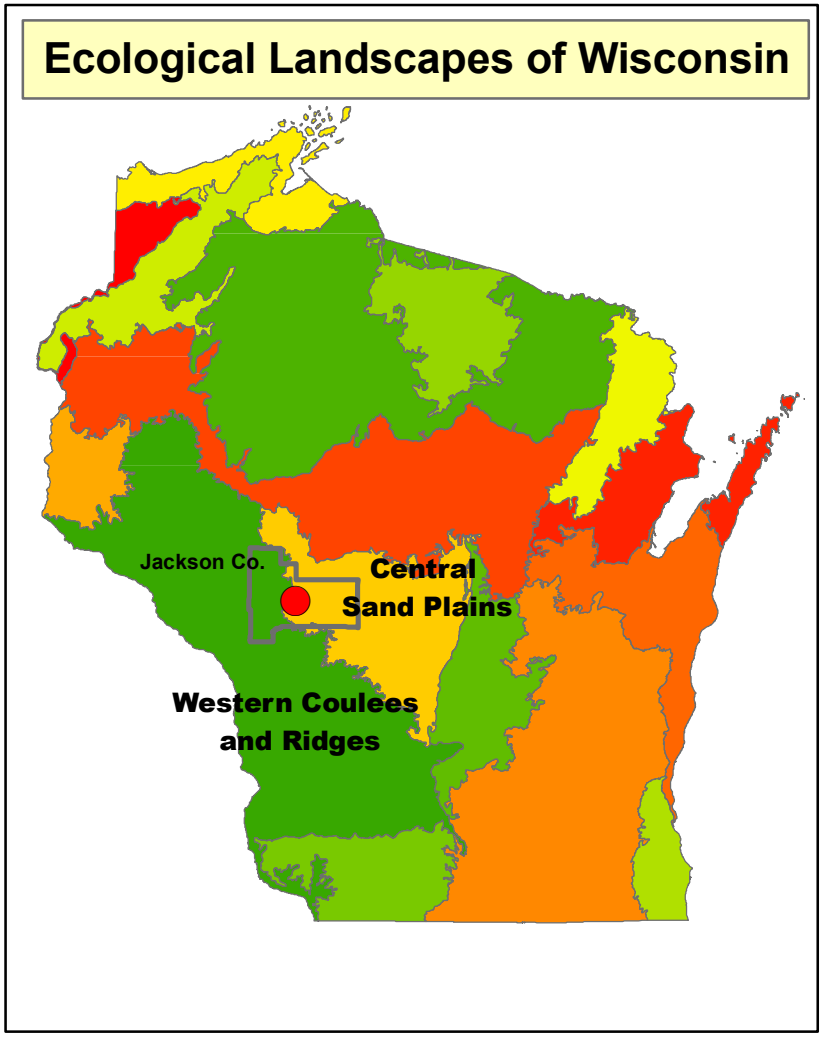
Industrial Park - Proposed Certified Area
(Note: Boundaries are Approximate)

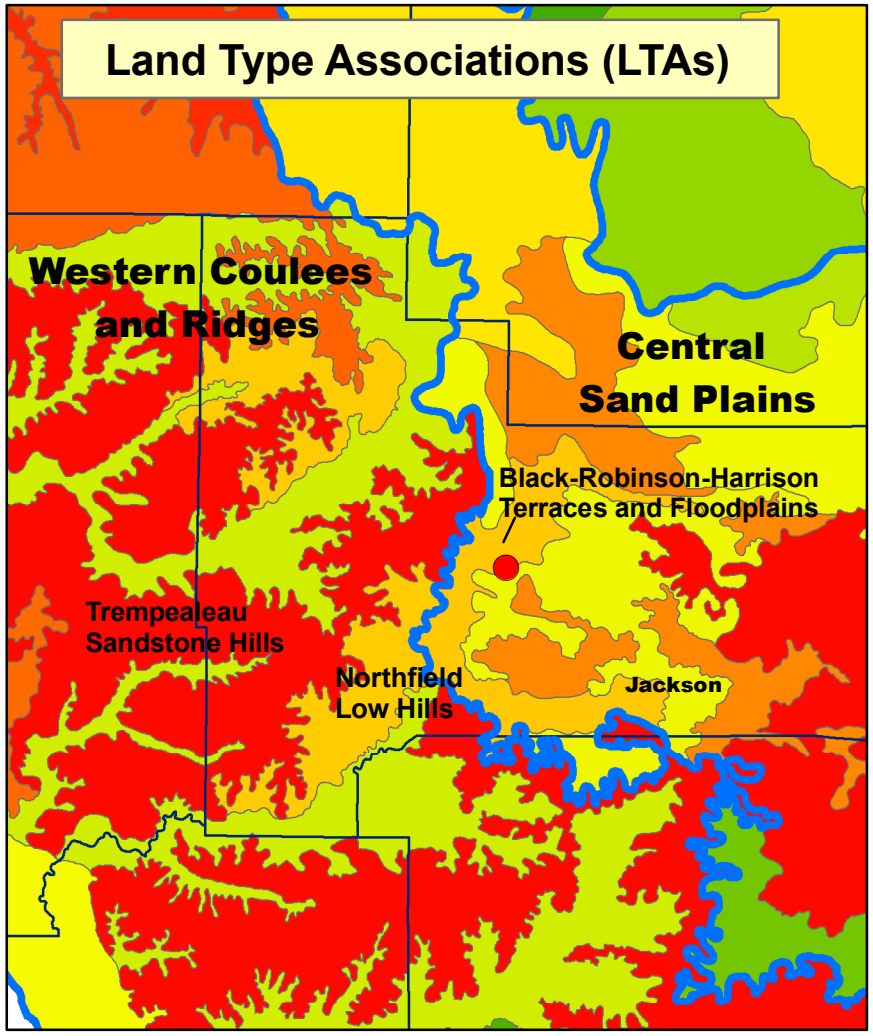
Fig. 02

Proposed Certified Site Area - City of Black River Falls

Wildlands Ecological Services

Location of Project: Black River Falls, Jackson County, WI





Wildlands Ecological Services

Map Created by Scott C. Zager, Plant Ecologist
Wildlands Ecological Services
scott.zager@wildlands.biz

Map Date: Jan. 10, 2016

Project Location: Approximately in Black River Falls, WI

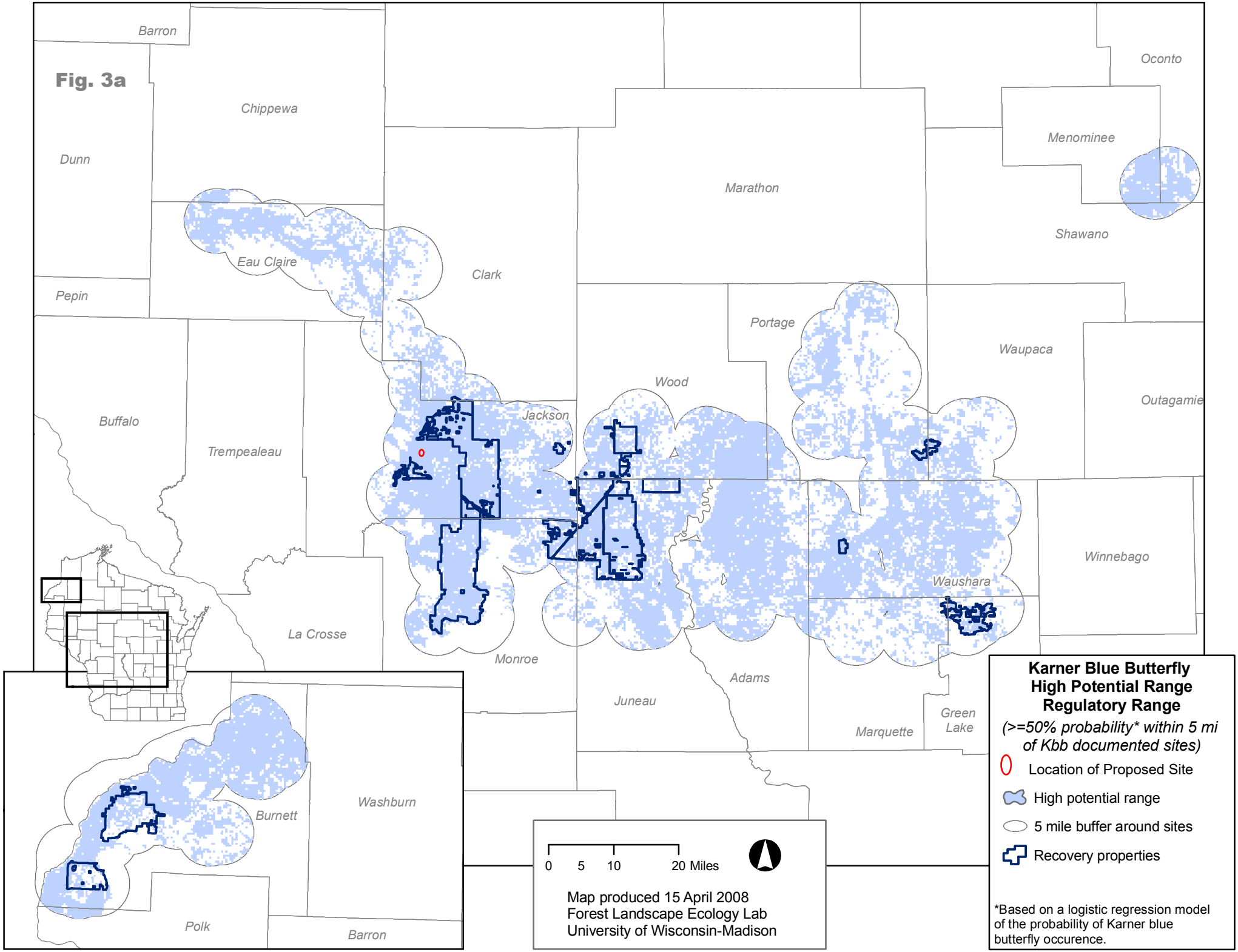


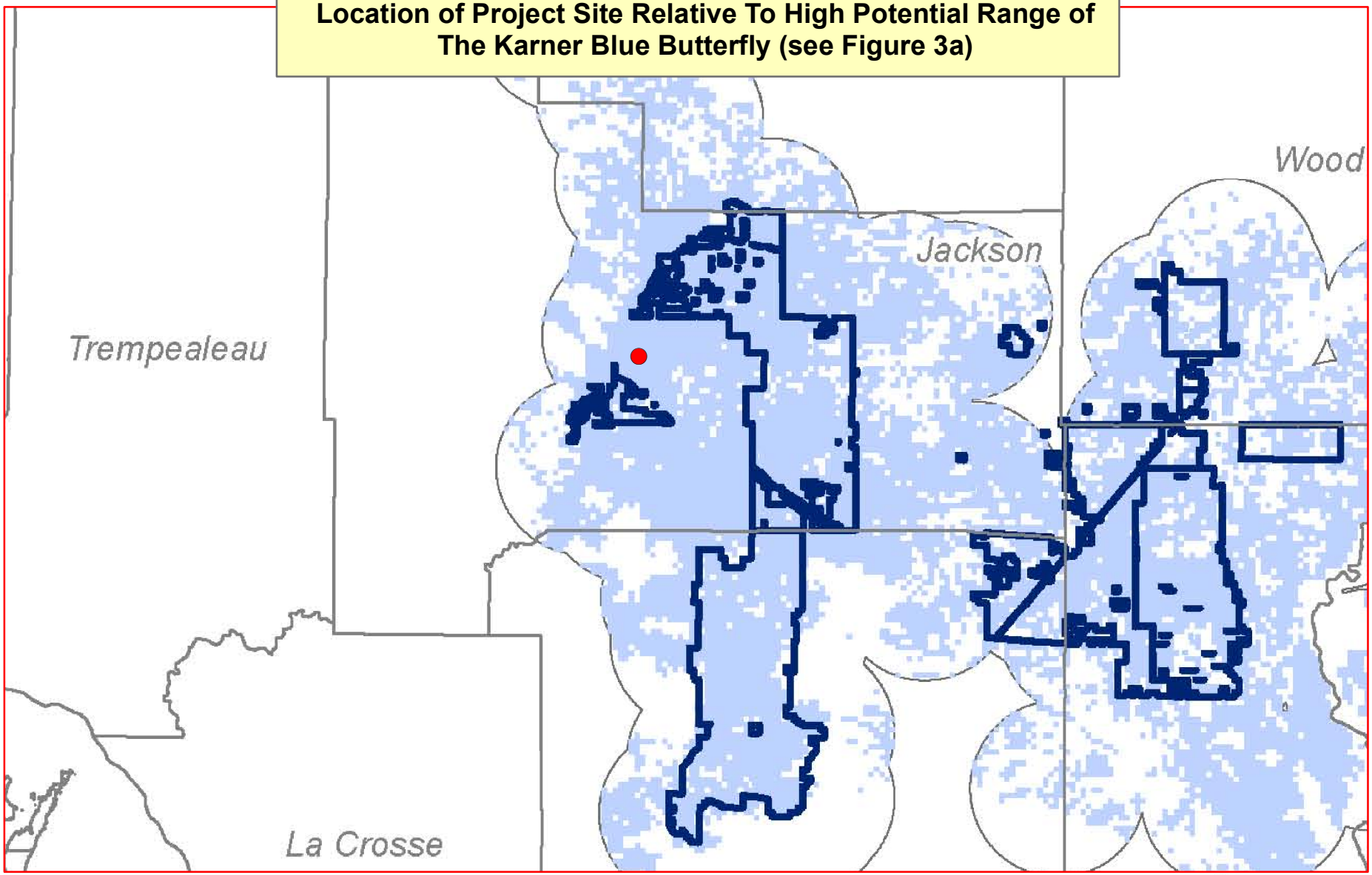
Fig. 3a
Barron
Chippewa
Dunn
Eau Claire
Pepin
Clark
Marathon
Oconto
Menominee
Shawano
Portage
Waupaca
Outagamie
Wood
Jackson
Buffalo
Trempealeau
La Crosse
Monroe
Juneau
Adams
Waushara
Winnebago
Marquette
Green Lake
Washburn
Burnett
Polk
Barron
0 5 10 20 Miles
Map produced 15 April 2008
Forest Landscape Ecology Lab
University of Wisconsin-Madison
Karner Blue Butterfly
High Potential Range
Regulatory Range
(>=50% probability* within 5 mi of Kbb documented sites)
Location of Proposed Site
High potential range
5 mile buffer around sites
Recovery properties
*Based on a logistic regression model of the probability of Karner blue butterfly occurence.

Fig. 3b

Cedar Corporation: Certified Site Area

Black River Falls, Jackson County, WI

Location of Project Site Relative To High Potential Range of The Karner Blue Butterfly (see Figure 3a)



N

Feet
37,000

1:511,59

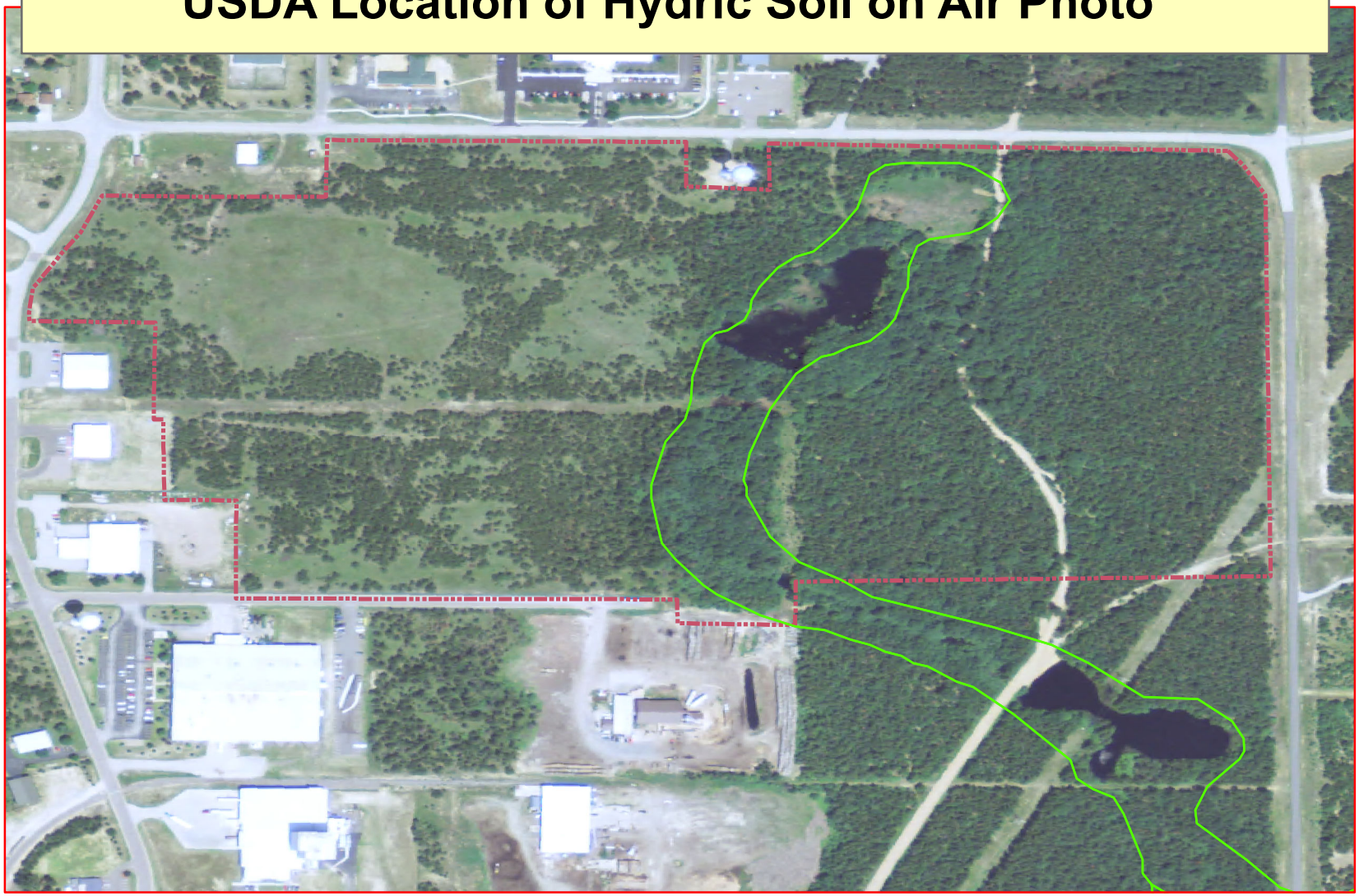
Map Created by Scott C. Zager, Plant Ecologist
Wildlands Ecological Services
scott.zager@wildlands.biz
Map Date: Jan. 10, 2016

Project Location: Approximately in Black River Falls, WI

Wildlands Ecological Services

Fig. 04

Proposed Certified Site Area - City of Black River Falls
USDA Location of Hydric Soil on Air Photo



Legend

- Waypoint Observation (within approximate area searched)
- Jackson_Soil_Moisture
- Industrial Park - Proposed Certified Area (Note: Boundaries are Approximate)

Miles
0.1

1 inch = 500 feet

1:6,000

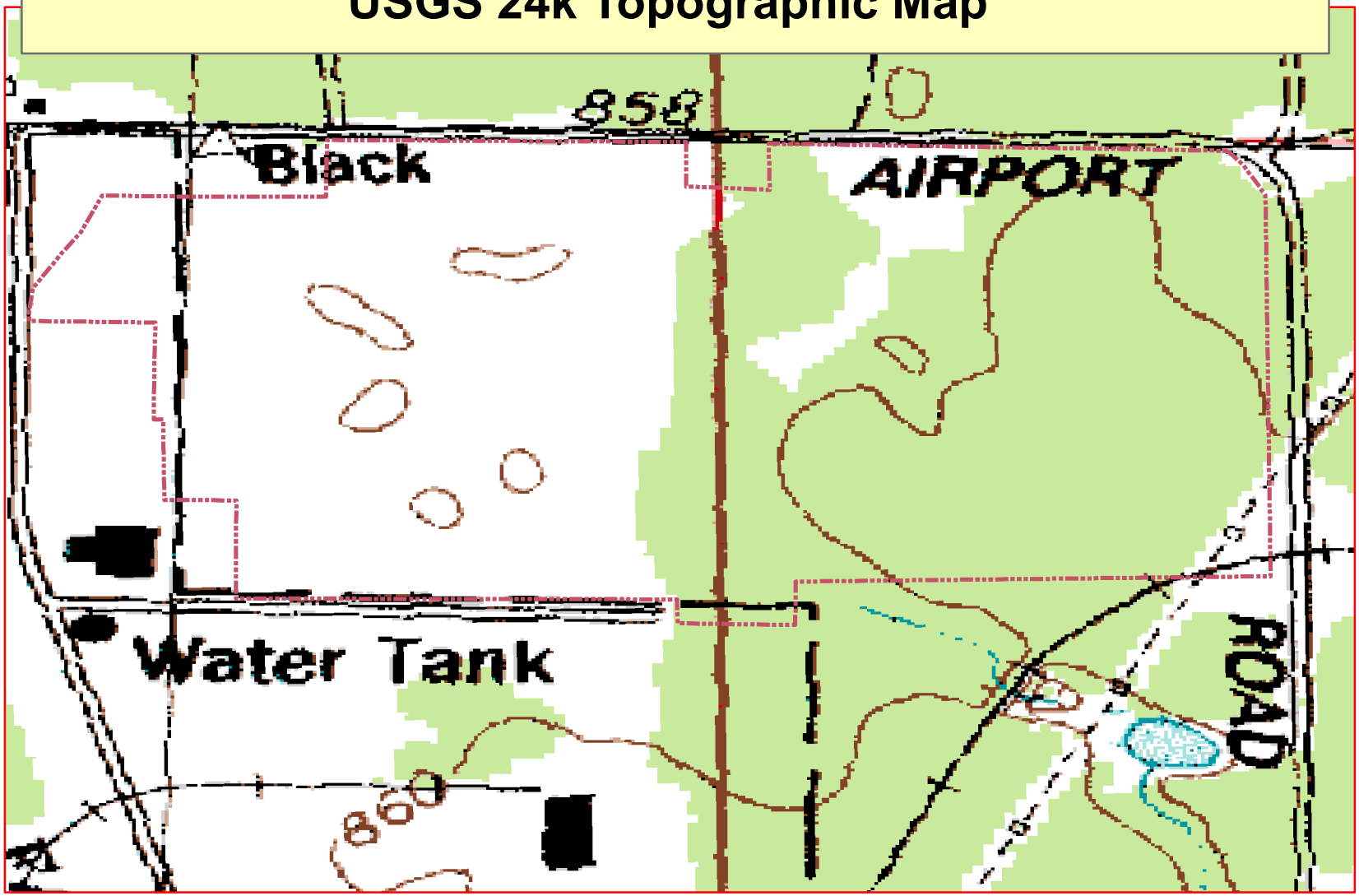
Wildlands Ecological Services

Map Created by Scott C. Zager, Plant Ecologist
Wildlands Ecological Services
scott.zager@wildlands.biz
Map Date: May 31, 2016

Air Photo Publisher:
USDA_FSA_APFO Aerial Photography Field Office

Fig. 05

Proposed Certified Site Area - City of Black River Falls
USGS 24k Topographic Map



Legend

- Waypoint Observation (within approximate area searched)
- Jackson_Soil_Moisture
- Industrial Park - Proposed Certified Area (Note: Boundaries are Approximate)

Miles
0.1

1 inch = 500 feet

1:6,000

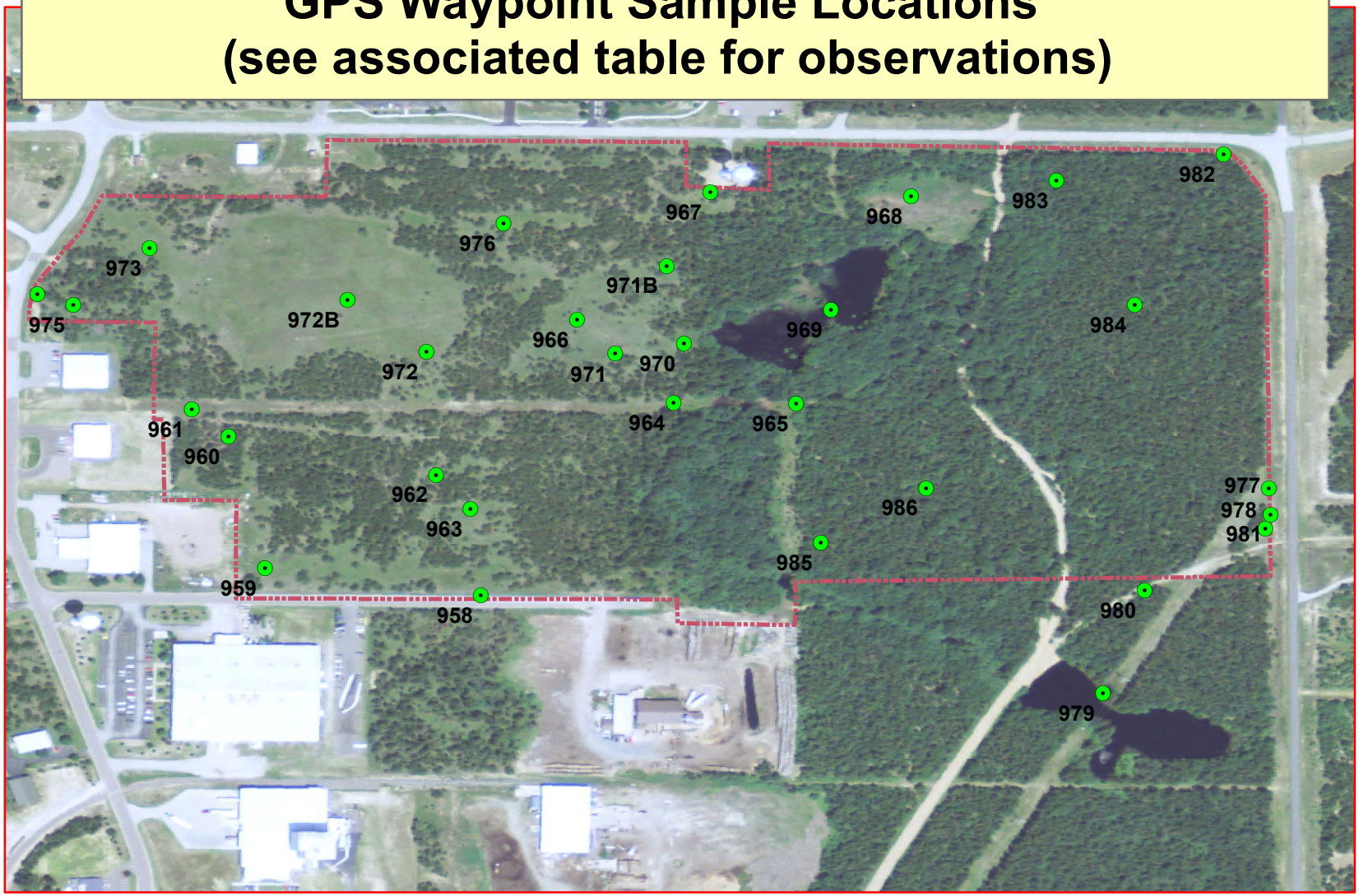
Wildlands Ecological Services

Map Created by Scott C. Zager, Plant Ecologist
Wildlands Ecological Services
scott.zager@wildlands.biz
Map Date: May 31, 2016

Air Photo Publisher:
USDA_FSA_APFO Aerial Photography Field Office

Fig. 06

Proposed Certified Site Area - City of Black River Falls
GPS Waypoint Sample Locations
(see associated table for observations)



Legend

- Waypoint Observation (within approximate area searched)
- Jackson_Soil_Moisture
- Industrial Park - Proposed Certified Area (Note: Boundaries are Approximate)

Miles
0.1

1 inch = 500 feet

1:6,000

Wildlands Ecological Services

Map Created by Scott C. Zager, Plant Ecologist
Wildlands Ecological Services
scott.zager@wildlands.biz
Map Date: May 31, 2016

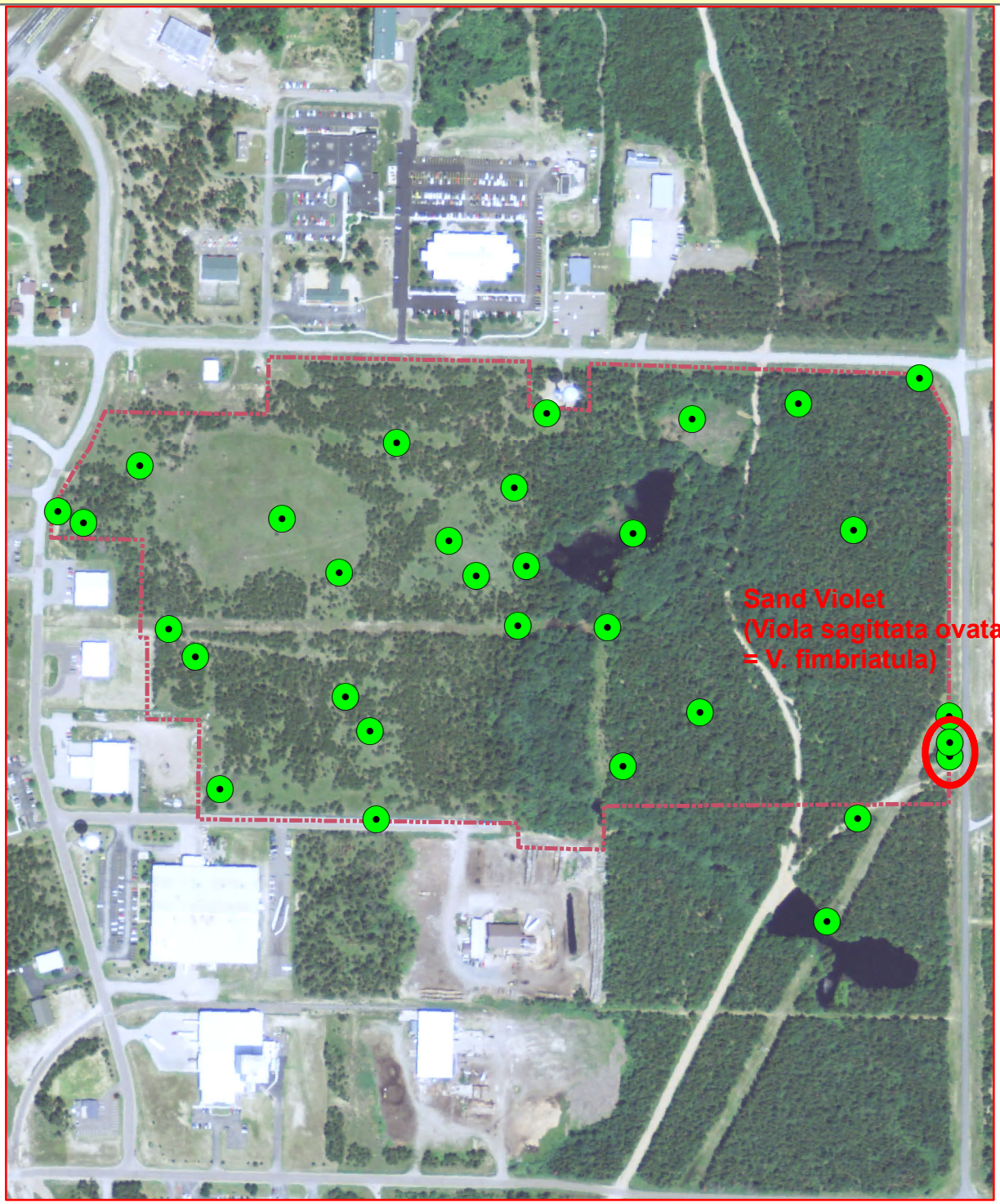
Air Photo Publisher:
USDA_FSA_APFO Aerial Photography Field Office

Fig. 07

Cedar Corporation: Certified Site Area

Location of Project: Black River Falls, Jackson County, WI

Revised Area for Wild Lupine Survey And Other Species of Interest
Waypoints indicate specific observations or vicinity searched
Dates May 25-28, 2016.



N

1:5,890

Feet
500

Map Created by Scott C. Zager, Plant Ecologist
Wildlands Ecological Services
scott.zager@wildlands.biz
Map Date: May 31, 2016

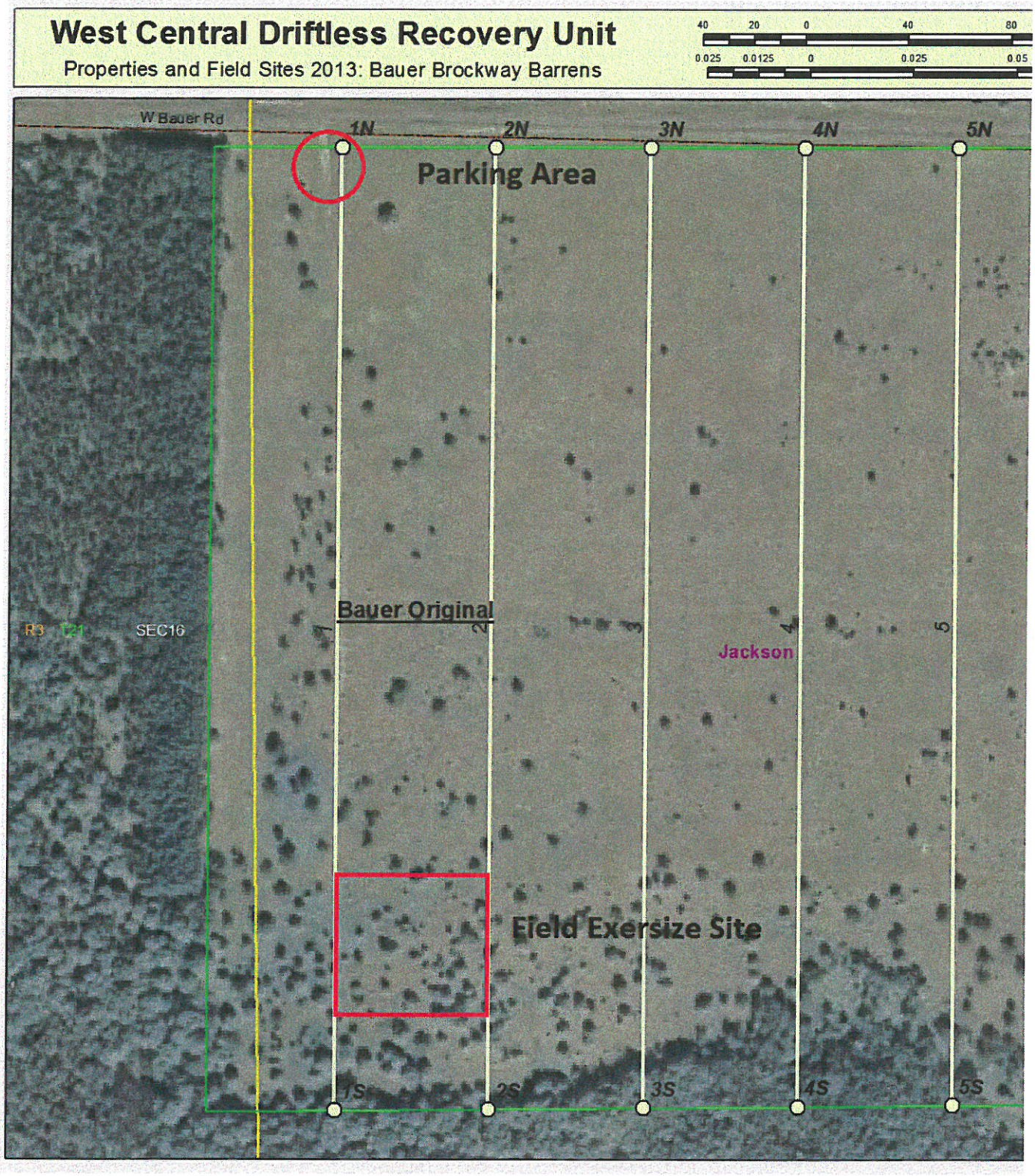
Wildlands Ecological Services

Legend

Waypoint Observation
(within approximate area searched)

Industrial Park - Proposed Certified Area
(Note: Boundaries are Approximate)

Fig. 08


West Central Driftless Recovery Unit
Properties and Field Sites 2013: Bauer Brockway Barrens
40 20 0 40 80
0.025 0.0125 0 0.025 0.05
W Bauer Rd
1N
2N
3N
4N
5N
Parking Area
Bauer Original
R3 T21 SEC16
Jackson
Field Exersize Site
1S
2S
3S
4S
5S

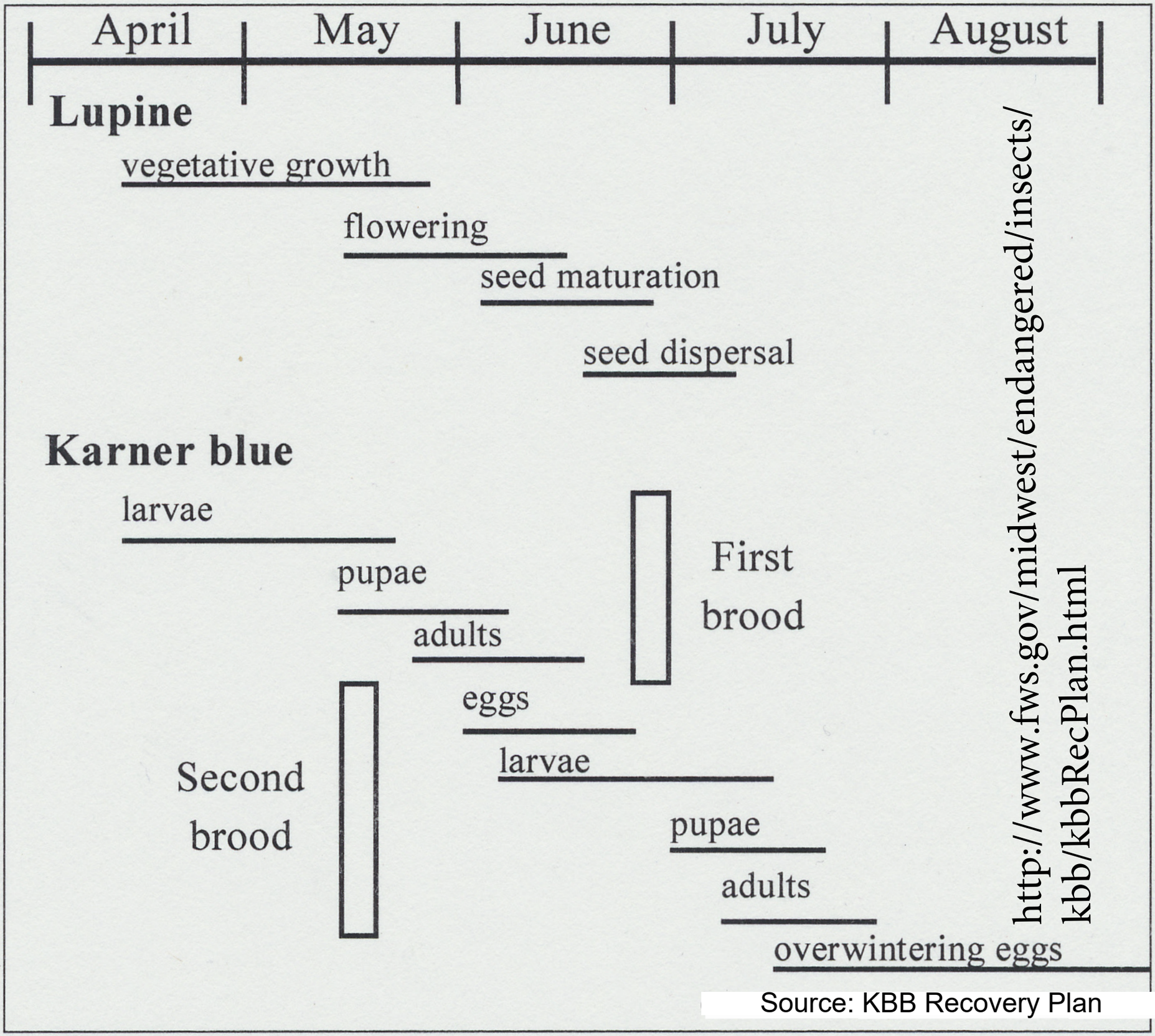
APPENDIX 1

Appendix 1 Fig A1- Karner Blue Butterfly Life Cycle

Appendix 1 Fig A2 - KBB Emergence Date Model

Appendix 1 Fig A3 - Phenology Charts of Various Wisconsin Listed Butterflies

Figure A1 Phenology of the Karner blue and lupine. In colder (warmer) areas and years phenologies will be delayed (advanced).



Source: KBB Recovery Plan

Karner Blue Butterfly Emergence Model: http://dnr.wi.gov/topic/forestplanning/karner/emergence.html (downloaded May 25, 2016)

Station	Emergence First Flight	Peak First Flight	Emergence Second Flight	Peak Second Flight
Berlin	05/25/2016	06/11/2016	07/12/2016	07/29/2016
Eau Claire	05/19/2016	06/05/2016	07/08/2016	07/24/2016
Friendship	05/22/2016	06/08/2016	07/10/2016	07/28/2016
Grantsburg	05/29/2016	06/15/2016	07/18/2016	08/06/2016
Hancock	05/24/2016	06/09/2016	07/11/2016	07/28/2016
Mather	05/21/2016	06/07/2016	07/13/2016	08/01/2016
Neillsville	05/22/2016	06/08/2016	07/14/2016	08/03/2016
Sparta	05/20/2016	06/04/2016	07/07/2016	07/23/2016
Stevens Point	05/25/2016	06/12/2016	07/15/2016	08/02/2016
Waupaca	05/23/2016	06/08/2016	07/11/2016	07/28/2016
Wild River	05/20/2016	06/04/2016	07/11/2016	07/30/2016
Wisconsin Rapids	05/27/2016	06/13/2016	07/14/2016	08/01/2016

Figure A2

Figure A3

Phenology Charts

Butterflies

The elfins are alike in their yearly life cycles. Both are possibly found where Karner blue butterflies reside. The frosted uses wild lupine as its host plant. Henry's elfin uses a plant most likely of the heath family nectar on violets, puccoons, and perhaps, rock cress. Gorgone checkerspot and tawny crescent are of the same family. Both use plants of the Compositae: asters for tawny and asters or *Ratibida pinnata or Helianthus* sp. for gorgone. The checkerspot also chooses yellow-orange flowers for nectaring; i.e. puccoon, orange hawkweed, rock cress. The latter two butterflies are less likely to be found in the same microhabitats of the barrens landscape as are the Karner blues. The tawny crescent, for the most part, inhabits moist areas.

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	WINTER
FROSTED ELFIN	P	ADULT	Larvae in lupine flowers, eating flowers, pods					Pupae
	Eggs laid singly on flower buds. Pupae in loose cocoon in litter at base of plant or underground.							
HENRY' ELFIN	P	ADULT	Larvae feed on buds and leaves of host shrub					Pupae
	Eggs laid on flower buds. Probably (?) in litter at base of host plant.							
Gorgone Checker-Spot	P	ADULT	P	ADULT	Larvae feed together on leaves			Larvae
	Pupae where? Eggs laid clustered under leaves. Where?							
Tawny Crescent	Larvae	P	ADULT	Larvae in communal webs under leaves				Larvae
	Eggs laid in groups under leaves. Probably (?) at base of host plant.							
Karner	Eggs	P	AD	P	ADULT	Larvae feed on leaves		Eggs

APPENDIX 2

Table B1 - Rare Species Associated with Karner Blue Butterflies

Table B2 - Rare Species of the Central Sand Plains Ecological Landscape

Appendix 2 Table B1: A Short List of Rare Species Associated With The Karner Blue Butterfly and Its Habitat (Insects, Plants, Birds, Snakes Turtles). See larger list Appendix Table B2.

WI DNR (Wisconsin Department of Natural Resources). 2010. Wisconsin Statewide Karner Blue Butterfly Habitat Conservation Plan. Appendix B. Species Associated with the Karner Blue Butterfly and its HabitatUpdated for Application to Renew Federal Fish and Wildlife Permit TE010064-5 May 27, 2010. PUBL-SS-947 2010 Rev. Kirk, K. 1996. The Karner blue community: Understanding and protecting associated rare species of the barrens. Final Rept. to USFWS (Amendment #38 to Cooperative Agreement #14-16-0003-89-933). Wisconsin Dept. Natural Resources, Madison. (Pages B-3 - B-84) Borth, R.J. 1997. Karner blue management implications for some associated Lepidoptera of Wisconsin barrens. Unpub Rept. to HCP partners. Wisconsin Gas, Milwaukee. (Pages B-85 - B-113)
Rare Species & Their Habitats Associated With the Karner Blue Butterfly
Natural Communities
Central Sands Pine-Oak Forest
Dry Prairie
Dry-mesic Prairie
Pine Barrens
Pine Relict
Sand Barrens
Sand Prairie
Oak Barrens
Insects
Cicindela patruela huberi (tiger beetle)
Erynnis martialis (mottled dusky wing)
Erynnis persius (Persius dusky wing)
Hesperia leonardus (Leonard's skipper)
Hesperia metea (cobweb skipper)
Incisalia henrici (Henry's elfin)
Incisalia irus (frosted elfin)
Phyciodes batesii (tawny crescent)
Schinia indiana (phlox moth)

Appendix 2 Table B1: A Short List of Rare Species Associated With The Karner Blue Butterfly and Its Habitat (Insects, Plants, Birds, Snakes Turtles). See larger list Appendix Table B2.

Rare Species & Their Habitats Associated With the Karner Blue Butterfly
Plants
Asclepias ovalifolia (oval milkweed)
Talinum rugospermum (rough-seeded fameflower)
Viola fimbriatula (sand violet)
Birds
Dendroica kirtlandii (Kirtland's warbler)
Lanius ludovicianus (loggerhead shrike)
Pedioecetes phasianellus (sharp-tailed grouse)
Herptiles
Sistrurus catenatus catenatus (eastern massasauga)
Ophisaurus attenuatus attenuatus (western slender glass lizard)
Emydoidea blandingii (Blanding's turtle)
Clemmys insculpta (wood turtle)

Appendix 2 Table B2: A subset of Rare Species Known To Occur In The Central Sand Plains of Wisconsin (Butterflies, Plants, Birds, Reptiles and the Natural Communities They Inhabit). *See Definitions Below.

WI DNR (Wisconsin Department of Natural Resources). 2014. The ecological landscapes of Wisconsin: an assessment of ecological resources and a guide to planning sustainable management. Wisconsin Department of Natural Resources, PUB-SS-1131 2014, Madison.
http://dnr.wi.gov/topic/landscapes/Book.html

WI DNR (Wisconsin Department of Natural Resources). 2014. The ecological landscapes of Wisconsin: an assessment of ecological resources and a guide to planning sustainable management. Chapter 10, Central Sand Plains Ecological Landscape. 108 pp. Wisconsin Department of Natural Resources, PUB-SS-1131L 2014, Madison. Central Sand PlainsEcological Landscape - Wisconsin DNR
http://dnr.wi.gov/topic/landscapes/index.asp?mode=detail&Landscape=5

Appendix 10.C. The Natural Heritage Inventory (NHI) table of rare species and natural community occurrences (plus a few miscellaneous features tracked by the NHI program) for the Central Sand Plains (CSP) Ecological Landscape in November 2009. See the Wisconsin Natural Heritage Working List online for the most current status (Wisconsin DNR 2009).

Scientific name (common name)	Last obs date	EOs in CSP	Eos in WI	Percent in CSP	State status	Federal status
BUTTERFLIES/MOTHS						
Atrytonopsis hianna (dusted skipper)	2002	20	31	65%	SC/N	
Callophrys gryneus (juniper hairstreak)	1987	1	8	13%	SC/N	
Callophrys henrici (henry's elfin)	2003	5	19	26%	SC/N	
Callophrys irus (frosted elfin)	2006	17	17	100%	THR	
Chlosyne gorgone (gorgone checker spot)	2006	12	40	30%	SC/N	
Erynnis martialis (mottled dusky wing)	1995	3	10	30%	SC/N	
Erynnis persius (persius dusky wing)	2003	21	26	81%	SC/N	
Euphyes bimacula (two-spotted skipper)	1998	6	17	35%	SC/N	
Grammia phyllira (phyllira tiger moth)	1993	1	14	7%	SC/N	
Hemileuca sp. 3 (midwestern fen buckmoth)	2002	4	10	40%	SC/N	
Hesperia leonardus (Leonard's skipper)	2002	7	29	24%	SC/N	
Hesperia metea (cobweb skipper)	1996	6	12	50%	SC/N	
Lycaeides melissa samuelis (Karner blue)	2006	189	316	60%	SC/FL	LE
Lycaena dione (gray copper)	2002	4	14	29%	SC/N	
Papaipema beeriana (liatris borer moth)	1997	1	11	9%	SC/N	
Phyciodes batesii lakota (Lakota crescent)	1992	1	24	4%	SC/N	
Poanes massasoit (mulberry wing)	1988	1	56	2%	SC/N	
Schinia indiana (phlox moth)	2002	11	31	35%	END	
Speyeria idalia (regal fritillary)	2008	4	24	17%	END	

Appendix 2 Table B2: A subset of Rare Species Known To Occur In The Central Sand Plains of Wisconsin (Butterflies, Plants, Birds, Reptiles and the Natural Communities They Inhabit). *See Definitions Below.

Scientific name (common name)	Last obs date	EOs in CSP	Eos in WI	Percent in CSP	State status	Federal status
PLANTS						
Agalinis gattingeri (roundstem foxglove)	1997	1	23	4%	THR	
Anemone multifida var. hudsoniana (early anemone)	2000	1	1	100%	END	
Arethusa bulbosa (swamp-pink)	1998	1	96	1%	SC	
Asclepias ovalifolia (dwarf milkweed)	2000	24	60	40%	THR	
Asplenium trichomanes (maidenhair spleenwort)	2000	8	27	30%	SC	
Aster longifolius (long-leaved aster)	1982	2	2	100%	SC	
Bartonia paniculata (twining screwstem)	2005	3	4	75%	SC	
Bartonia virginica (yellow screwstem)	2007	77	81	95%	SC	
Cacalia suaveolens (sweet-scented Indian-plantain)	1981	1	28	4%	SC	
Calamagrostis stricta (slim-stem small-reedgrass)	1985	3	34	9%	SC	
Carex assiniboinensis (assiniboine sedge)	1997	3	33	9%	SC	
Carex backii (rocky mountain sedge)	1981	1	4	25%	SC	
Carex cumulata (clustered sedge)	1997	8	8	100%	SC	
Carex folliculata (long sedge)	2007	60	69	87%	SC	
Carex livida var. radicaulis (livid sedge)	1998	1	21	5%	SC	
Carex straminea (straw sedge)	1999	2	2	100%	SC	
Ceratophyllum echinatum (prickly hornwort)	1998	3	61	5%	SC	
Crotalaria sagittalis (arrow-headed rattle-box)	1973	1	2	50%	SC	
Diarrhena obovata (beak grass)	2006	1	11	9%	END	
Didiplis diandra (water-purslane)	1997	3	4	75%	SC	
Dryopteris fragrans var. remotiuscula (fragrant fern)	1995	1	27	4%	SC	
Eleocharis wolfii (wolf spikerush)	1995	1	2	50%	END	
Eleocharis engelmannii (engelmann spike-rush)	1972	1	4	25%	SC	
Glycyrrhiza lepidota (wild licorice)	1974	2	6	33%	SC	
Gnaphalium helleri var. micradenium (catfoot)	1998	1	1	100%	SC	
Gnaphalium obtusifolium var. saxicola (cliff cudweed)	2001	6	10	60%	THR	
Houstonia caerulea (innocence)	1975	1	8	13%	SC	
Huperzia porophila (rock clubmoss)	1997	8	22	36%	SC	
Juncus marginatus (grassleaf rush)	1997	9	10	90%	SC	

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Lycopodiella margueritae (northern prostrate clubmoss)	2002	1	1	100%	SC	
Myriophyllum farwellii (Farwell's water-milfoil)	1997	12	60	20%	SC	
Opuntia fragilis (brittle prickly-pear)	1997	3	36	8%	THR	
Orobanche uniflora (one-flowered broomrape)	1994	1	30	3%	SC	
Oryzopsis canadensis (Canada mountain-ricegrass)	1997	1	4	25%	SC	
Platanthera flava var. herbiola (pale green orchid)	1994	3	20	15%	THR	
Poa paludigena (bog bluegrass)	1997	4	41	10%	THR	
Poa sylvestris (woodland bluegrass)	1988	1	3	33%	SC	
Polygala cruciata (crossleaf milkwort)	2007	80	83	96%	SC	
Polytaenia nuttallii (prairie parsley)	1990	2	26	8%	THR	
Potamogeton confervoides (algae-like pondweed)	1975	1	9	11%	THR	
Potamogeton diversifolius (water-thread pondweed)	2005	11	29	38%	SC	
Potamogeton vaseyi (Vasey's pondweed)	1970	1	19	5%	SC	
Primula mistassinica (bird's-eye primrose)	1995	4	42	10%	SC	
Rhexia virginica (Virginia meadow-beauty)	2007	17	22	77%	SC	
Rhododendron lapponicum (Lapland azalea)	1991	1	2	50%	END	
Scirpus torreyi (Torrey's bulrush)	1998	3	21	14%	SC	
Scleria reticularis (reticulated nutrush)	2007	4	4	100%	END	
Scleria triglomerata (whip nutrush)	1997	7	17	41%	SC	
Solidago sciaphila (shadowy goldenrod)	1997	19	57	33%	SC	
Strophostyles leiosperma (small-flowered woolly bean)	1997	3	6	50%	SC	
Talinum rugospermum (prairie fame-flower)	1999	8	54	15%	SC	
Thelypteris simulata (bog fern)	2006	66	72	92%	SC	
Utricularia geminiscapa (hidden-fruited bladderwort)	2007	23	95	24%	SC	
Utricularia purpurea (purple bladderwort)	1998	1	55	2%	SC	
Viola fimbriatula (sand violet)	1997	14	17	82%	END	

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Scientific name (common name)	Last obs date	EOs in CSP	Eos in WI	Percent in CSP	State status	Federal status
BIRDS						
Accipiter gentilis (Northern Goshawk)	1999	6	141	4%	SC/M	
Ammodramus henslowii (Henslow's Sparrow)	2006	6	82	7%	THR	
Ammodramus leconteii (Le Conte's Sparrow)	2006	7	22	32%	SC/M	
Ardea alba (Great Egret)	1986	1	14	7%	THR	
Bartramia longicauda (Upland Sandpiper)	2002	1	54	2%	SC/M	
Botaurus lentiginosus (American Bittern)	2005	7	41	17%	SC/M	
Buteo lineatus (Red-shouldered Hawk)	2007	40	301	13%	THR	
Chlidonias niger (Black Tern)	1999	10	60	17%	SC/M	
Coccyzus americanus (Yellow-billed Cuckoo)	2007	1	39	3%	SC/M	
Cygnus buccinator (Trumpeter Swan)	1999	9	22	41%	SC/M	
Dendroica cerulea (Cerulean Warbler)c	2001	8	92	9%	THR	
Dendroica kirtlandii (Kirtland's Warbler)c	2009	7	11	64%	SC/FL	LE
Empidonax virescens (Acadian Flycatcher)	2001	2	47	4%	THR	
Haliaeetus leucocephalus (Bald Eagle)	2008	52	1286	4%	SC/P	
Ixobrychus exilis (Least Bittern)	1999	4	23	17%	SC/M	
Lanius ludovicianus (Loggerhead Shrike)	2001	2	31	6%	END	
Nyctanassa violacea (Yellow-crowned Night-heron)	1984	1	7	14%	THR	
Oporornis agilis (Connecticut Warbler)	1999	2	27	7%	SC/M	
Oporornis formosus (Kentucky Warbler)c	1997	1	31	3%	THR	
Pandion haliaetus (Osprey)	2007	48	733	7%	SC/M	
Podiceps grisegena (Red-necked Grebe)	1999	1	13	8%	END	
Protonotaria citrea (Prothonotary Warbler)	2001	4	40	10%	SC/M	
Rallus elegans (King Rail)	1985	1	6	17%	SC/M	
Seiurus motacilla (Louisiana Waterthrush)c	2001	9	34	26%	SC/M	
Sterna forsteri (Forster's Tern)	1986	1	31	3%	END	
Tympanuchus cupido (Greater Prairie-chicken)	2005	40	60	67%	THR	
Tympanuchus phasianellus (Sharp-tailed Grouse)	2003	3	7	43%	SC/H	
Tyto alba (Barn Owl)	1979	3	29	10%	END	
Vireo bellii (Bell's Vireo)	1987	1	43	2%	THR	
HERPTILES						
Acris crepitans (northern cricket frog)	1984	6	102	6%	END	
Apalone mutica (smooth softshell)	2006	2	5	40%	SC/H	
Coluber constrictor (North American racer)	2000	1	14	7%	SC/P	

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Scientific name (common name)	Last obs date	EOs in CSP	Eos in WI	Percent in CSP	State status	Federal status
Diadophis punctatus edwardsii						
(Northern ring-necked snake)	1999	2	23	9%	SC/H	
Emydoidea blandingii (Blanding's turtle)	2008	33	316	10%	THR	
Glyptemys insculpta (wood turtle)	2007	18	262	7%	THR	
Hemidactylium scutatum (four-toed salamander)	1998	5	63	8%	SC/H	
Lithobates catesbeianus (American bullfrog)	1998	3	70	4%	SC/H	
Ophisaurus attenuatus (slender glass lizard)	2006	15	67	22%	END	
Sistrurus catenatus catenatus (eastern massasauga)	2005	4	13	31%	END	C
Terrapene ornata (ornate box turtle)	1986	1	29	3%	END	
NATURAL COMMUNITIES						
Alder Thicket	1997	19	106	18%	NA	
Black Spruce Swamp Calcareous Fen	1997 1997	1 2	41 84	2% 2%	NA NA	
Central Poor Fen	2007	30	30	100%	NA	
Central Sands Pine-Oak Forest	2007	11	11	100%	NA	
Coastal Plain Marsh	2000	2	6	33%	NA	
Dry Cliff	2002	14	88	16%	NA	
Dry Prairie	1981	8	146	5%	NA	
Dry-mesic Prairie	1999	1	37	3%	NA	
Emergent Marsh	1998	6	272	2%	NA	
Floodplain Forest	2001	24	182	13%	NA	
Forested Seep	1997	1	15	7%	NA	
Hardwood Swamp	1997	1	53	2%	NA	
Hemlock Relict	1997	5	32	16%	NA	
Lake—Oxbow	1978	1	14	7%	NA	
Lake—Shallow, Hard, Seepage	1980	1	52	2%	NA	
Lake—Shallow, Soft, Seepage	2004	1	87	1%	NA	
Mesic Prairie	1989	1	44	2%	NA	
Moist Cliff	2001	17	176	10%	NA	
Moist Sandy Meadow	1999	1	3	33%	NA	
Northern Dry Forest	1998	21	63	33%	NA	
Northern Dry-mesic Forest	2005	55	284	19%	NA	
Northern Mesic Forest	1992	7	383	2%	NA	
Northern Sedge Meadow	2005	44	231	19%	NA	
Northern Wet Forest	1999	29	322	9%	NA	
Northern Wet-mesic Forest	1980	2	243	1%	NA	
Oak Barrens	1997	10	38	26%	NA	

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Scientific name (common name)	Last obs date	EOs in CSP	Eos in WI	Percent in CSP	State status	Federal status
Open Bog	1997	7	173	4%	NA	
Pine Barrens	1999	25	56	45%	NA	
Pine Relict	1999	5	61	8%	NA	
Sand Barrens	1997	4	29	14%	NA	
Sand Prairie	1999	4	28	14%	NA	
Shrub-carr	2007	16	143	11%	NA	
Southern Dry Forest	1997	5	97	5%	NA	
Southern Dry-mesic Forest	2006	20	293	7%	NA	
Southern Mesic Forest	1997	5	221	2%	NA	
Southern Sedge Meadow	1989	7	182	4%	NA	
Southern Tamarack Swamp (Rich)	2007	1	32	3%	NA	
Springs and Spring Runs, Hard	1995	4	71	6%	NA	
Stream—Fast, Hard, Cold	1995	14	98	14%	NA	
Stream—Fast, Soft, Cold	1987	2	15	13%	NA	
Stream—Fast, Soft, Warm	1997	2	5	40%	NA	
Stream—Slow, Hard, Cold	1981	3	22	14%	NA	
Stream—Slow, Hard, Warm	1981	2	20	10%	NA	
Stream—Slow, Soft, Cold	1981	2	8	25%	NA	
Stream—Slow, Soft, Warm	1983	1	14	7%	NA	
Tamarack (Poor) Swamp	2005	10	33	30%	NA	
White Pine-Red Maple Swamp	2005	19	21	90%	NA	

STATUS AND RANKING DEFINITIONS

U.S. Status—Current federal protection status designated by the Office of Endangered Species, U.S. Fish and Wildlife Service, indicating the biological status of a species in Wisconsin:
LE = listed endangered.
LT = listed threatened.
PE = proposed as endangered.
NEP = nonessential experimental population.
C = candidate for future listing.
CH = critical habitat.

State Status—Protection category designated by the Wisconsin DNR:
END = Endangered. Endangered species means any species whose continued existence as a viable component of this state's wild animals or wild plants is determined by the Wisconsin DNR to be in jeopardy on the basis of scientific evidence.
THR = Threatened species means any species of wild animals or wild plants that appears likely, within the foreseeable future, on the basis of scientific evidence to become endangered.
SC = Special Concern. Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proven. The main purpose of this category is to focus attention on certain species before they become threatened or endangered.

Wisconsin DNR and federal regulations regarding Special Concern species range from full protection to no protection. The current categories and their respective level of protection are as follows:
SC/P = fully protected;
SC/N = no laws regulating use, possession, or harvesting;
SC/H = take regulated by establishment of open closed seasons;
SC/FL = federally protected as endangered or threatened but not so designated by Wisconsin DNR;
SC/M = fully protected by federal and state laws under the Migratory Bird Act.

Global Element Ranks:
G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single state or physiographic region) or because of other factor(s) making it vulnerable to extinction throughout its range; typically 21-100 occurrences.
G4 = Uncommon but not rare (although it may be quite rare in parts of its range, especially at the periphery) and usually widespread. Typically > 100 occurrences.
G5 = Common, widespread, and abundant (although it may be quite rare in parts of its range, especially at the periphery). Not vulnerable in most of its range.
GH = Known only from historical occurrence throughout its range, with the expectation that it may be rediscovered.
GNR = Not ranked. Replaced G? rank and some GU ranks.
GU = Currently unrankable due to lack of data or substantially conflicting data on status or trends. Possibly in peril range-wide, but status is uncertain.

GX = Presumed to be extinct throughout its range (e.g., Passenger pigeon) with virtually no likelihood that it will be rediscovered.
Species with a questionable taxonomic assignment are given a “Q” after the global rank. Subspecies and varieties are given subranks composed of the letter “T” plus a number or letter. The definition of the second character of the subrank parallels that of the full global rank. (Examples: a rare subspecies of a rare species is ranked G1T1; a rare subspecies of a common species is ranked G5T1.)

State Element Ranks:
S1 = Critically imperiled in Wisconsin because of extreme rarity, typically 5 or fewer occurrences and/or very few (<1,000) remaining individuals or acres, or due to some factor(s) making it especially vulnerable to extirpation from the state.
S2 = Imperiled in Wisconsin because of rarity, typically 6–20 occurrences and/or few (1,000– 3,000) remaining individuals or acres, or due to some factor(s) making it very vulnerable to extirpation from the state.
S3 = Rare or uncommon in Wisconsin, typically 21–100 occurrences and/or 3,000–10,000 individuals.

S4 = Apparently secure in Wisconsin, usually with > 100 occurrences and > 10,000 individuals.
S5 = Demonstrably secure in Wisconsin and essentially ineradicable under present conditions.
SNA = Accidental, nonnative, reported but unconfirmed, or falsely reported.
SH = Of historical occurrence in Wisconsin, perhaps having not been verified in the past 20 years and suspected to be still extant. Naturally, an element would become SH without such a 20-year delay if the only known occurrence were destroyed or if it had been extensively and unsuccessfully looked for.

SNR = Not Ranked; a state rank has not yet been assessed.
SU = Currently unrankable. Possibly in peril in the state, but status is uncertain due to lack of information or substantially conflicting data on status or trends.
SX = Apparently extirpated from the state.

WILDLANDS

ECOLOGICAL SERVICES

WILDLANDS

Wildlands Ecological Services (WILDLANDS) is a small company that surveys vegetation and constructs ecological maps using a combination of techniques including Geographic Information System (GIS) software, remote sensing (air photo interpretation), and field investigation. Clients include federal, tribal, state and county agencies – as well as private engineering firms – requiring vegetation surveys and GIS maps of parks, wildlife management areas, ecologically-managed commercial forests, etc. WILDLANDS also conducts not-for-profit research in habitat conservation, plant taxonomy and floristics. Products include databases, electronic maps, ecological analysis and interpretive reports. As the name implies, WILDLANDS focuses on large natural areas often in remote wilderness settings. Our mission is to provide affordable data useful toward sustainable management of important ecosystems.

Scott Zager is the sole proprietor of WILDLANDS. Since receiving his master's degree in botany at the University of Northern Iowa, he has been a professional botanist and plant ecologist for over twenty-six years since beginning floristic studies as an Assistant Park Ranger for Iowa State Parks. Later as a natural resource technician for Black Hawk County, IA; he restored prairies, planted trees and managed natural areas on public and private lands. As a research assistant at the University of Northern Iowa, he researched native plant establishment and erosion control. For nearly twelve years he worked as a plant ecologist of for the Minnesota County Biological Survey (MCBS), where he mapped vegetation and searched for rare plants in nearly every type of plant community within the eastern half of Minnesota from border to border. As a private consultant for Wildlands Ecological Services, he has expanded his geographic range to include much of the Midwest. He was the principal ecologist in plant and vegetation surveys of the Red Lake Peatlands - the largest peatland complex in the contiguous United States. He mapped vegetation for Lake Itasca State Park and St. Croix State Park (Minnesota's largest state parks). He as also mapped vegetation in U.S. National Wildlife Refuges (Agassiz National Wildlife Refuge). Other projects have been completed in Iowa and Wisconsin. He has taught Plant Taxonomy at the University of Minnesota - Crookston. His academic research is focused on plant taxonomy and systematics. His graduate studies investigated a very difficult taxonomic group of sedges in the genus Carex. He is currently working with Dr. William Norris on an illustrated monograph of the genus Carex in Iowa.

ECOLOGICAL

SERVICES