

Ecological Surveys of Rare Plants and Plant Communities
in
Eastern Anoka County, Minnesota

Jason J. Husveth
Critical Connections, Inc.
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The following abstract describes the process and methods developed and performed by Jason Husveth while surveying over 60,000 acres of Eastern Anoka County for rare plant populations and rare plant community EOR's from 1997 through 2002. A summary of significant findings are provided along with recommendations for remote sensing endeavors and field surveys areas to be carried out in the future by DNR plant ecologists and botanists.

Since his discovery of rare Sandplain plants in a Pioneer Park wetland in Blaine Minnesota in December of 1997, Jason Husveth has been working to develop and refine remote sensing and field inventory methodologies to detect, survey, and document additional rare plant communities within the Anoka Sandplain landscape of Central Minnesota. Because this endeavor has been an evolving process, the methodologies have evolved over the course of this investigation. Furthermore, the principal investigator has gained access to improved data sources (such as infrared aerial photographs, herbarium database records, Natural Heritage EOR data, 2001 black and white digital ortho photos, etc.) and additional computer software (i.e. ArcView GIS) and hardware that have improved his ability to search for and detect potential locations of rare plants in Anoka County. With each additional discovery of a rare plant community EOR and/or rare plant population EOR's, correlations between this vegetation association and landscape variables have strengthened and search images have been improved, refined, and reinforced.

Initial Discoveries at Pioneer Park, Blaine (1997-1998):

It is important to note that Mr. Husveth encountered the Pioneer Park rare plant populations during the winter of 1997 by a matter of coincidence. The large population of twisted yellow-eyed grass and its distinct and unusual winter habitat are what first caught the eye of Husveth during a relatively snow-free winter. The very low vegetation stature (0.25– 0.75 meters) of the herbaceous community was quite unique when compared to the several thousand wetlands Husveth had surveyed throughout Minnesota and the Upper Midwest.

The following spring, a more thorough survey of this small, diverse meadow/rich fen remnant revealed several populations of very unusual plants that had not been documented for over two decades in Anoka County, and had never been documented within the City of Blaine. These species included: *Xyris torta*, *Polygala cruciata*, *Viola lanceolata*, *Platanthera flava* var. *herbiola*, *Fimbristylis autumnalis*, *Agrostis hyemalis*, *Agalinis purpurea*, as well as a disjunct population of *Utricularia cornuta*. Additional survey work by Welby Smith of the Minnesota DNR Natural Heritage and Non-Game Wildlife Research Program revealed two blackberry species (*Rubus* spp.) that were very uncommon to the state and may be considered for state-listing in the future. Almost one hundred native wetland species were documented within this one-acre of habitat, while the

surrounding wetland complex was quite less diverse and overgrown with native and non-native shrubs.

Additional research into historic aerial photographs revealed that the large rifle muck wetland complex had been ditched and partially drained in the mid to late 1930's, in attempt to convert the land to agricultural uses. Following this failed attempt, the site was left fallow and herbaceous and shrub-dominated wetland communities re-established on the site. A review of low-altitude Food Security Act (FSA) color slides between 1980 and 1990 revealed that the portion of the wetland containing the highest quality vegetation and rare species populations (approximately 1 acre of linear habitat) had been disturbed by the City of Blaine's Public Works Department in an attempt to construct a raised park trail through the otherwise impassible wetland. This was done by cutting and filling a spoil pile in a linear path through the wetland. Additional conversations with city staff revealed that the path project was abandoned halfway through construction due to complications with the heavy machinery on the saturated organic peat soils (Rifle Muck). Additional ATV use of this narrow herbaceous corridor appeared to have kept the soil slightly disturbed and the vegetation predominantly herbaceous since the mid-1980's.

Following the 1998 field season, the results of Mr. Husveth's voluntary surveys were presented the City of Blaine and the MN DNR. Mr. Husveth explained the significance of the rare resources within the city park to the Blaine City Council and the Citizen's Environmental Committee. He also emphasized the likelihood that additional rare natural resources may occur within the City and should be documented, and made the case to the Council for considering a comprehensive natural resource inventory of the City of Blaine in the following year.

The search image/community description of the vegetation association (known only to Pioneer Park) at the end of the 1998 field season included the following parameters:

- 1) A highly-diverse herbaceous wet meadow/rich fen with low vegetation stature,
- 2) Occurring on deep, saturated, acidic, organic soils (Rifle Muck),
- 3) At least some to moderate disturbance of germination micro-sites within the past 10 – 20 years (or less).

City of Blaine Natural Resource Inventory (1998 - 1999):

A planning grant from the Minnesota Department of Natural Resources' Metro Greenways Grant Program provided matching funding to the City of Blaine to conduct a natural resource inventory of the entire city during the 1999 field season. The grant was awarded to the City in March of 1999, and this allowed Mr. Husveth to begin a comprehensive search of Blaine's natural and semi-natural lands. Because the Pioneer Park populations were associated with past disturbance, one of Mr. Husveth's key assumptions was to include both undisturbed "high-quality" natural communities (i.e. County Biological Survey A-B/C ranking) as well as disturbed and very disturbed habitats (C-D ranking). To improve the search image of suitable habitats, Mr. Husveth reviewed the historic University of Minnesota Herbarium collection records for additional locations and habitat descriptions of *Xyris torta* and associated species (**Appendix A**). Each historic location of *Xyris*

torta was mapped as accurately as possible, either by legal description or narrative description (when no legal description was provided) and these sites were visited and surveyed in the field to determine if these populations and/or associated communities still existed and if they supported vegetation and/or species associations similar to the Pioneer Park community remnant.

Despite extensive ground searches of historic locations, none of the historic herbarium records of *Xyris torta* could be relocated from the label information provided by the original collectors. Extensive searching of such areas revealed potential habitat for twisted yellow-eyed grass and its rare associates in some cases (e.g. the Moores' 1966 Fish Lake record in the Cedar Creek NHA). In other locations, the vegetation had clearly been removed and replaced by urban and suburban development (e.g. Rosendhal's Moore Lake populations from 1926 in Fridley). Although these searches of historic locations revealed no rare species populations, they were useful in further refining the possible landscape variables (i.e. topographic position, hydrology, soils, associated species) that may correlate with suitable habitat for this unique vegetation type associated rare plant populations.

With this information in hand, Mr. Husveth used relatively standard inventory methods and procedures to conduct Blaine's natural resource inventory. During the early spring months, stereo pairs of 1994 infrared aerial photographs (DNR Forestry issue) were used to develop an infrared signature for the Pioneer Park vegetation type and other areas that contained historic records of rare plants. Mr. Husveth initially assumed that any additional locations would most like occur on deep organic peat soils. Under these assumptions, he mapped locations within Blaine that contained pinkish-red infrared signatures (i.e. sedge-dominated meadow remnants) on organic soil types using ArcView GIS. Such areas were then field investigated in early spring with some success in locating additional large populations of *Viola lanceolata* and vegetation associations very similar to the Pioneer Park remnant. Additional surveys of most of these wet meadow remnants on organic soils throughout Blaine during the 1999 field season revealed very few additional rare species and many of such area appeared overgrown and/or densely vegetated. One additional disturbed meadow on organic soils contained *Xyris torta*, *Viola lanceolata*, and *Polygala cruciata* (in Section 1 of northeast Blaine).

Mr. Husveth then began to search for other sedge-dominated infrared photo signatures within the City of Blaine that did not occur on deep organic soils. A citywide search of such signatures revealed many sedge-dominated meadow remnants occurring on Isanti soil types; a transitional soils type between very wet/organic wetland soils and very dry/sandy upland soils. Field checking of areas containing Isanti soil associations during the peak field season months of 1999 (June - August), dozens of sites containing wet meadow/rich fen/wet prairie vegetation complexes of various sizes and quality. Furthermore, many of these sites contained a very similar vegetation structure and key associated species as the Pioneer Park remnant. Hannah Dunevitz, DNR Regional Plant Ecologist, and Jason Husveth completed four relevés within higher quality examples of the vegetation associations discovered during this field season. Mr. Husveth began developing detailed species lists for five of the highest quality sites. Over forty additional rare plant populations were discovered within southeastern Blaine as a result of expanding the detailed field searched to include the Zimmerman-Isanti-Lino soil catena. However, the highest quality sites within this soil association contained additional species that were not common to the Pioneer Park site.

After completing an exhaustive survey of the wetlands of Blaine, the search image of this rare community and rare plant communities had been refined and expanded. The search image/community description of this rare plant vegetation association at the end of the 1999 field season included two “subtypes” with the following parameters:

Subtype 1: Deep Organic Soils (Figure 1)

- 1) A highly-diverse herbaceous wet meadow/rich fen with low vegetation stature,
- 2) On deep, saturated, acidic, organic soils (Riffle Muck),
- 3) At least some to moderate disturbance of germination micro-sites within the past 10 – 20 years (or less).
- 4) Key associates or ‘field indicator species’: *Spiraea tomentosa*, *Spiraea alba*, *Carex cryptolepis*, *Carex interior*, *Polygala sanguinea*, *Potentilla simplex*, *Juncus brevicaudatus*, *Dulichium arundinaceum*, *Drosera intermedia*, *Sphagnum* spp., *Rubus* spp., *Betula pumila*.

Subtype 2: Fine Sand Loam/Fine Sand Soils (Figure 2)

- 1) A highly-diverse herbaceous wet meadow/wet prairie/rich fen with low to moderate vegetation stature,
- 2) On saturated sandy soils with shallow (or no) organic material in upper soil horizon (Isanti Fine Sandy Loams),
- 3) Highly disturbed in recent past (i.e. scarified to bare soil by machinery, flooded and draw down), moderate disturbance (i.e. tire ruts, deer paths, fire), or little/no disturbance in the past (i.e. grazing, haying),
- 4) Key associates or ‘field indicator species’: *Liatris pycnostachya*, *Spiraea tomentosa*, *Spiraea alba*, *Carex interior*, *Potentilla simplex*, *Juncus brevicaudatus*, *Dulichium arundinaceum*, *Polygala sanguinea*, *Thelypteris palustris*, *Spiranthes cernua*, *Rubus* spp., *Sphagnum* spp., *Betula pumila*.



Figure 1. Wet meadow/ rich fen on deep organic soils (Pioneer Park, northern Blaine).



Figure 2. Wet meadow/wet prairie on Isanti soils (Xylite Street, southeast Blaine).

Rice Creek Corridor Land Cover Classification and Rare Species Surveys (2000 - 2002):

Following the completion of Blaine's natural resource inventory, Mr. Husveth worked with closely Hannah Dunevitz to explore opportunities to continue detailed vegetation surveys within suitable landscape types on the Anoka Sandplain. Together Ms. Dunevitz and Mr. Husveth developed a baseline GIS model, based primarily on correlations between known EOR point locations in Blaine, surficial geology, and major soil associations, to determine likely locations or major landscape areas where additional rare species populations or additional examples of this vegetation type might be found in the rest of Anoka County.

Plotting the community and rare plant EOR locations (from the Blaine survey work) with soils and surficial geology revealed a distinct spatial pattern forming along the Zimmerman-Isanti-Lino soil association in eastern Anoka County, between the Rice Creek Chain of Lakes and the Ham Lake, Coon Lake, Linwood Lake Chain (highlighted in red in **Figure 3**).

Collaborative funding through the DNR Metro Greenways Planning Grant Program, the MN DNR's Natural Heritage Program's Conservation Biology Grant Program, and support from local stakeholders such as the Rice Creek Watershed District and Anoka County Soil and Water Conservation District provided the needed resources for Mr. Husveth to conduct detailed land cover classification and rare species surveys within more than 38,000 areas of this primary search area. This area included large portions of Centerville, Lino Lakes, and Columbus Township, as well as the southeast corner of Ham Lake (delineated in yellow in Figure 3).

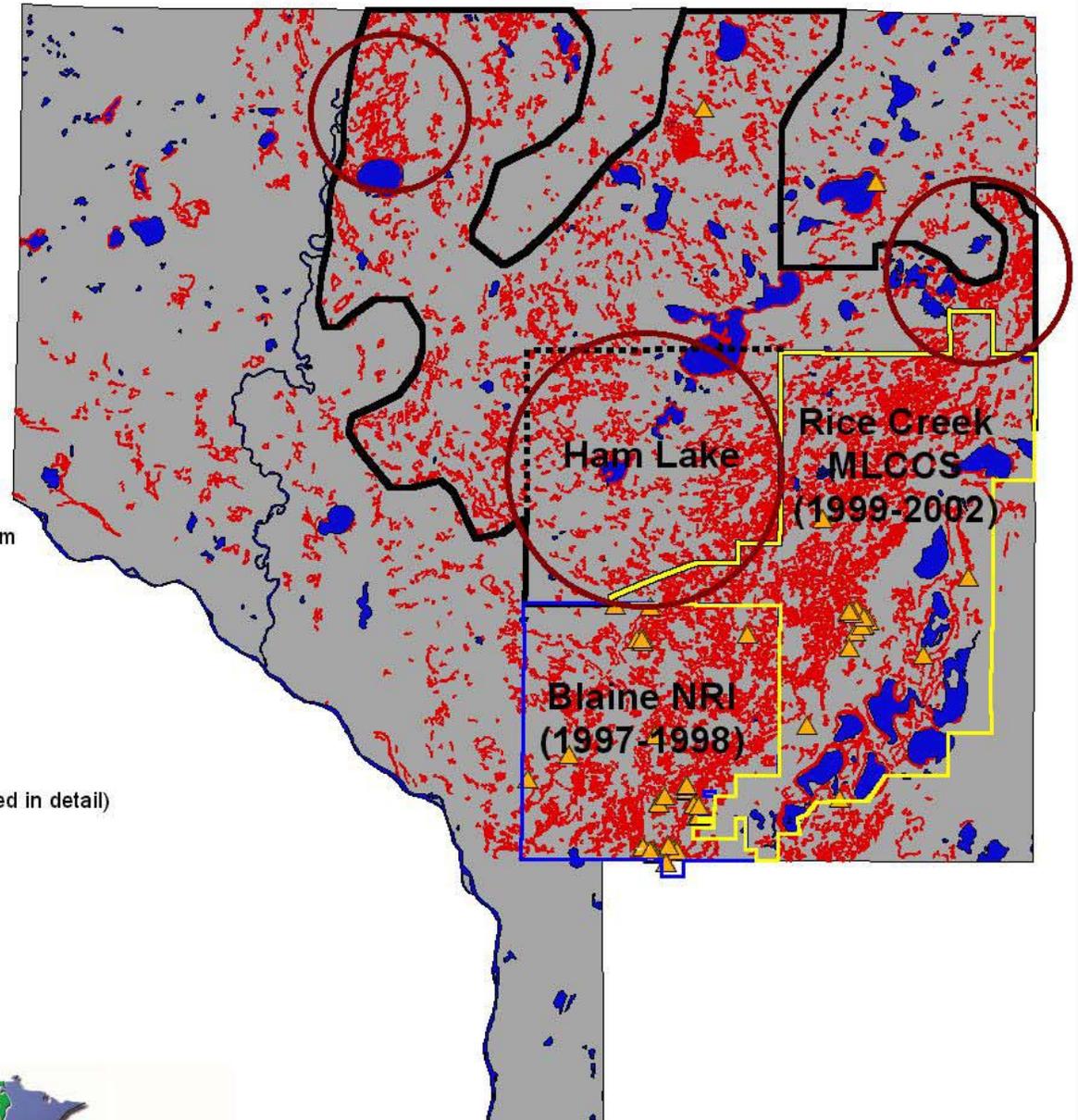
Land cover classification was conducted in accordance with the Minnesota Land Cover Classification System methodology (MLCCS; Leete et al. 2001). While conducting land cover classification within the 38,000 acre project area, all natural, semi-natural, and cultural land cover types were remotely classified with infrared aerial photographs, delineated on recent black and white aerial field sheets (1:2000 scale), and field checked for accuracy. Mr. Husveth was responsible for all of the remote sensing and field checking of land cover classification for this project. While interpreting the infrared aerial photographs, Mr. Husveth noted areas with similar signatures as the Blaine elements. During the process of field checking, such areas that were flagged during the remote sensing process were closely surveyed for community composition and quality, associated species, and the presence/absence of rare plant populations or suitable habitat. In most cases, such areas were visited three or more times during the 2001 and 2002 field seasons, to cover the flowering times of all species being searched for.

Additional rare plant populations and high to medium quality examples of the wet meadow/rich fen vegetation association were located as a result of the land cover classification and rare species searched within this expanded 38,000 acre search area. In addition to the species already discovered in Blaine, three new locations of *Rotala ramosior* and one uncommon metro location of *Malaxis unifolia* were discovered in Lino Lakes. A digital land cover layer was produced that contained over 7,000 polygons within the 38,000 acre project area and had a minimum mapping unit of 0.5 acres for natural community polygons. Furthermore, land cover mapping of the City of Blaine was completed in 2001 as part of a Phase II greenway planning grant, funded by the Metro Greenways grant program.

Anoka County Survey Areas 1997 - 2003

Legend:

-  Rice Creek Land Cover Classification Using the Minnesota Land Cover Classification System (38,000 acres reviewed in detail, 1999-2002)
-  City of Blaine Natural Resource Inventory (21,850 acres reviewed in detail, 1997 -1998)
-  Additional Highest Priority Survey Areas within Anoka County (yet to be surveyed in detail)
-  Remaining Priority Survey Area in Anoka County (83,500 acres of Isanti soil complex yet to be surveyed in detail)
-  Location and Distribution of the Zimmerman-Isanti-Lino and Isanti-Markey Soil Associations in Anoka County, Minnesota (Metropolitan Council Digital Soils Data, 2002)
-  Element Occurrence Records Documented in 1997-2002 by Jason J. Husveth
-  Major Lakes
-  Anoka County Boundary



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Figure 3.

During the course of this project, Mr. Husveth worked with many local governments, agencies, landowners, and organizations to educate others about the importance of these biological resources. In February of 2001, he presented a feature talk to the Minnesota Native Plant Society, and lead a field trip for the society the following two summers to observe and appreciate these plants first hand. He has given several presentations to the City of Blaine, the City of Lino Lakes, and local government agencies regarding these resources. Furthermore, he has trained local city and watershed staff on how to identify these plants and plant associations in the field, which has resulted in additional discoveries of rare plant populations in Lino Lakes, as well as prescribed burning management and restoration of degraded habitats.

At the completion of this project in fall of 2002, over one hundred new locations of rare plant populations had been discovered within several dozen locations in eastern Anoka County. Mr. Husveth completed rare species EOR forms for all rare populations encountered, as well as EOR forms for five high quality communities. Furthermore, Mr. Husveth and Ms. Dunevitz conducted relevés within higher quality natural community remnants. Detailed species lists were developed from multiple site visits within five community remnants. Mr. Husveth collected over fifty rare plant voucher specimens for inclusion in the University of Minnesota Natural Heritage Program. Lastly, Mr. Husveth documented a new species of native grass for the state, *Aristida longespica* var. *geniculata*.

To date, far more rare plant and natural community remnant EOR's had been recorded within the Zimmerman-Isanti-Lino association than on deep Rifle Muck complexes associated with glacial lakebeds and drainageways. A possible explanation for this is that there may be less disturbance and denser perennial vegetation within unconsolidated, wet, mucky soil types than within saturated, sandy, marginal wetland soil types within the present-day urbanizing land development patterns of Anoka County. Furthermore, large, mucky, saturated organic peatlands are probably less likely to experience disturbance from brushfires than the marginal Isanti soil types in the present day Anoka County landscape. After studying these plants and plant communities over the past five years, Mr. Husveth believes that most of these plants within this plant association (as well as the association itself) require some form of light to moderate disturbance (e.g. fire, aspen girdling, soil scarification, lake edge draw-down/exposed soils) to regenerate and persist as viable populations. With increasing development and expansion of the urban fringe, such disturbances will likely become less and less frequent, further endangering the persistence of these species.

It is recommended that additional surveys be conducted in other portions of Anoka County and elsewhere in the Anoka Sandplain that may contain appropriate habitat to support these species and/or vegetation association. The highest priority areas yet to be surveyed in Anoka County are delineated with maroon circles in Figure 3. Of these, the City of Ham Lake is probably the most urgent, due to increasing development pressure and urban sprawl. A larger area delineated with a thick black line in Figure 3 represents other priority areas to be considered for survey. Mr. Husveth has continued to assist Ms. Dunevitz in further development of a GIS model that may help predict additional survey locations within Anoka County. At present, a digital soils coverage is only available for Anoka County. Once a digital soils coverage is developed for Isanti and Sherburne Counties, such a model could be expanded to search for additional key areas to survey in these Sandplain counties.

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Appendix A

Historic Minnesota Records
Xyris torta J.E. Smith
University of Minnesota Herbarium

University of Minnesota Herbarium #603639

Plants of Anoka County, MN No. 26955 *Xyris torta* Smith

Collectors: John W. Moore and Marjorie F. Moore

Date of collection: July 22, 1966

Location: Growing in swale across road from the north shore of Fish Lake, Cedar Creek Natural History Area

Additional notes: *X. torta* Sm., verified by R. Kral 1972

University of Minnesota Herbarium #446304

Plants of Anoka County, MN No. 18761 *Xyris torta* Sm.

Collectors: John W. Moore, N.L. Huff, and C.O. Rosendahl

Date of collection: July 25, 1946

Location: Growing in Ham Lake meadow ½ mile east of highway 65

Additional notes: *X. torta* Sm., verified by R. Kral 1972

University of Minnesota Herbarium #229631

Xyris torta Sm. *Xyridaceae*

Collectors: C.O. Rosendahl and F.K. Butters

Date of collection: July 30, 1927

Location: Common throughout peaty meadow south of Ham Lake, Anoka County

Additional notes: *X. torta* Sm., verified by R. Kral 1972

University of Minnesota Herbarium #229632

Xyris torta Sm. *Xyridaceae*

Collectors: C.O. Rosendahl and F.K. Butters

Date of collection: July 30, 1927

Location: In peaty meadow abundant near Ham Lake.

Additional notes: *X. torta* Sm., verified by R. Kral 1972

University of Minnesota Herbarium #229633

Xyris torta J.E. Smith *Xyridaceae*

Collectors: C.O. Rosendahl and F.K. Butters

Date of collection: August 3, 1926

Location: Moist sandy soils, shores of Moore Lake, Anoka County

Additional notes: *X. torta* Sm., verified by R. Kral 1972

University of Minnesota Herbarium #84822

Xyris torta Sm.

Collectors: C.O. Rosendahl and F.K. Butters

Date of collection: July 1918

Location: Peaty meadow, southern Anoka County

Additional notes: Formerly *X. flexuosa* Muhl., *X. torta* Sm.

Handwritten notes: lateral sepals ciliolate FNB '37

University of Minnesota Herbarium #84823

Xyris torta Sm.

Collectors: C.O. Rosendahl and F.K. Butters

Date of collection: August 11, 1916

Location: In peaty meadow abundant near Ham Lake.

Additional notes: Formerly *X. flexuosa* Muhl., *X. torta* Sm. verified by R. Kral 1972

University of Minnesota Herbarium #84824

Flora of North America, Herbarium of George B. Aiton, Minneapolis, MN

Xyris torta Sm.

Collector: G.B.Aiton

Date of collection: August 1889

Location: Habitat: Swamp in Hennepin County

Additional notes: Originally identified as *X. flexuosa* Muhl., *X. torta* Sm. verified by R. Kral 1972