

Natural Community Delineation and Floristic Quality Assessments of Grass River Natural Area, Antrim County, Michigan



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***Cypripedium parviflorum* (yellow lady-slipper) was found in northern fen, rich conifer swamp and poor conifer swamp in GRNA. Photo by Liana May.**

Executive Summary

In the summer 2017, Michigan Natural Features Inventory contracted with Grass River Natural Area (GRNA) to delineate natural communities and conduct floristic quality assessments on their properties. Nine natural communities were identified among the property parcels with a pooled species richness of 368. GRNA is dominated by rich conifer swamp, mesic northern forest, and northern fen, with smaller components of emergent marsh, northern wet meadow, northern shrub thicket, poor conifer swamp, hardwood-conifer swamp and dry-mesic northern forest. Eleven potential vernal pools were mapped and require spring surveys for confirmation. The open wetland communities along Grass River were in good condition with many signs of wildlife and few non-native species and should be prioritized for protection.

The northern fen areas meet criteria for an A/B-ranked natural community element occurrence for the Biotics database. This is the second largest occurrence of 31 northern fens in northern Lower Michigan and one of only six in the region that are ranked A/B. Rich conifer swamp, northern fen and northern wet meadow have FQIs over 50 and are of considerable biodiversity value to the state. Poor conifer swamp, hardwood-conifer swamp and mesic northern forest have FQIs greater than 35 and are floristically important. Twenty percent of the documented flora has C values greater than seven, including 22 species with C values of 10. As a whole, the natural communities at GRNA comprise a significant biodiversity hotspot amidst a highly fragmented landscape that is highly deserving of its status and protection as a natural area.

Twenty-seven species were documented as new Antrim County records for the Michigan Flora. A suspected occurrence of *Sarracenia purpurea* f. *heterophylla* (yellow pitcher plant) was photographed and mapped; however, confirmation requires inspection of flowers which were not present during surveys. This rare form of pitcher plant was recently delisted from its state threatened status. No federal or state threatened or endangered species were observed, however, many occurrences of orchids, carnivorous plants, parasitic plants, and coral fungi were documented. Future surveys could target state threatened *Calypso bulbosa* (calypso orchid) and special concern *Cypripedium arietinum* (ram's-head orchid), both of which have been documented in Antrim County. Other listed species that occur in nearby counties could also be sought, including state threatened *Berula erecta* (cut-leaved water-parsnip), state threatened *Gymnocarpium robertianum* (limestone oak fern) and federal and state endangered *Mimulus michiganensis* (Michigan monkey-flower). Several animals could be targeted as well, including federal and state endangered *Somatochlora hineana* (Hine's emerald dragonfly), special concern *Accipiter gentilis* northern (goshawk), state threatened *Buteo lineatus* (red-shouldered hawk), special concern *Emydoidea blandingii* (Blanding's turtle) and state threatened *Sistrurus catenatus* (eastern massasauga).

Eighteen invasive species of high concern were documented during surveys, most of which were in low abundance, providing an invaluable window of opportunity for early detection and response. It is recommended that a dedicated effort be undertaken to map, prioritize and manage them as soon as possible to prevent ecological degradation and to minimize costs and maximize success of control efforts. Management should focus on preventing new species from arriving and existing species from spreading into the highest quality and most valued areas.

Introduction

In summer 2017, Michigan Natural Features Inventory (MNFI) contracted with Grass River Natural Area (GRNA) to conduct vegetative surveys of the Natural Area, with a focus on wetlands. Priorities for this study were to delineate the natural communities and conduct baseline plant inventories and floristic quality assessments (FQAs) for each type. Plant species that are rare, of special interest, or invasive were also documented, and potential vernal pools were mapped. In addition, recently acquired or rarely visited parcels were prioritized for survey. The most recent comprehensive survey of Grass River Natural Area was conducted 34 years prior (ER Squiers & Associates 1983). The 2017 study was intended to update the plant communities described in that report with current plant species lists and delineation of natural communities according to those defined in Cohen et al. (2015).

Survey Site

Grass River Natural Area is in Antrim County, Michigan, south of Bellaire and north of Alden Highway (Figure 1, 2). Most parcels (Figure 3) occur along the banks of the Grass River between Lake Bellaire and Clam Lake stretching to a rail-trail, derived from the former Pere-Marquette Railway (Galbraith & U.S. Railway Mail Service 1897, Meyers et al. 1987). Several properties occur south of the rail-trail and several are on the north shores of Lake Bellaire and Clam Lake. These properties total approximately 1492 acres, including seven miles of trails (GRNA 2016).



Figure 1. Haley Breniser, Executive Director of GRNA, enjoys a loon visiting Clam Lake.

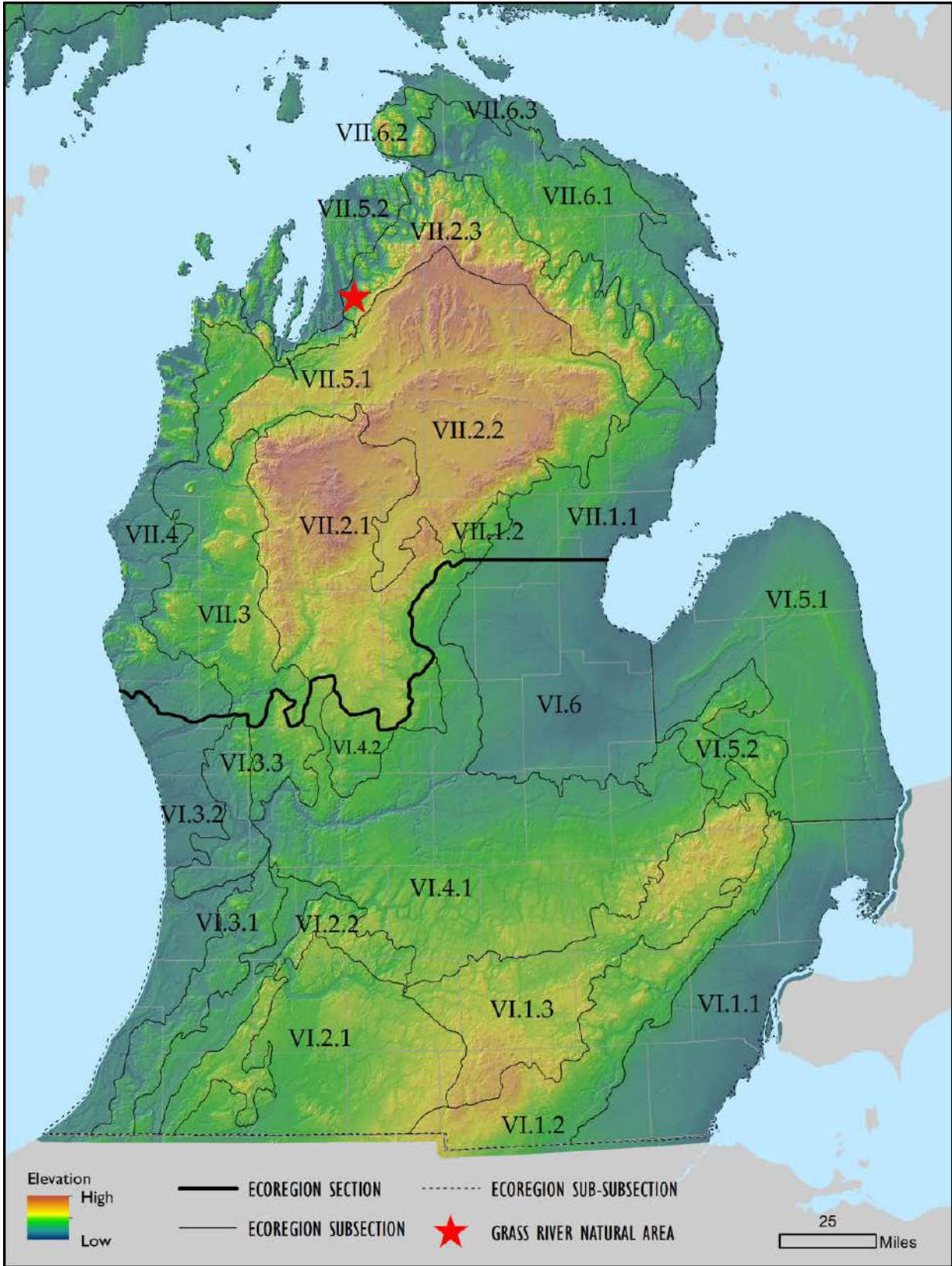


Figure 2. Location of GRNA in Sub-subsection VII.2.3 Vanderbilt Moraines.



Figure 3. Grass River Natural Area Parcel Map.

GRNA is located in the western portion of the Vanderbilt Moraines Sub-subsection (VII.2.3) approximately two kilometers from the neighboring Traverse City Sub-subsection (VII.5.3) (Albert 1995, Figure 2). The Vanderbilt Moraines Sub-subsection is comprised of morainal ridges that make up some of the steepest topography in Michigan's Lower Peninsula. Outwash channels and plains were created when the Valdres glacial front retreated to the north (ER Squiers & Associates 1983). As the ice sheet melted, meltwater streams flowed and self-sorted sediment as it became too heavy or large to carry. These channels and plains adjacent to steep moraines create conditions for groundwater fed streams and springs and their associated wetland communities. Because much of the underlying bedrock is limestone, the groundwater is laden with calcium and magnesium, facilitating the development of calciphytic communities including northern fen and rich conifer swamp (Figure 4). The circa 1800 landcover map (Figure 5) classified the historic forested wetlands as cedar and mixed conifer swamp and the open wetlands as shrub swamp and emergent marsh. Upland forested communities in the Vanderbilt Moraines Sub-subsection were predominantly mesic northern forests. The current study shows a finer scale delineation of natural communities present today, including significant components of northern wet meadow and northern fen within the historical emergent marsh category, and poor conifer swamp, rich conifer swamp and hardwood-conifer swamp within the historical cedar and mixed conifer swamp.



Figure 4. Groundwater-influenced northern fen adjacent to moraine observed from the MI #1 parcel.

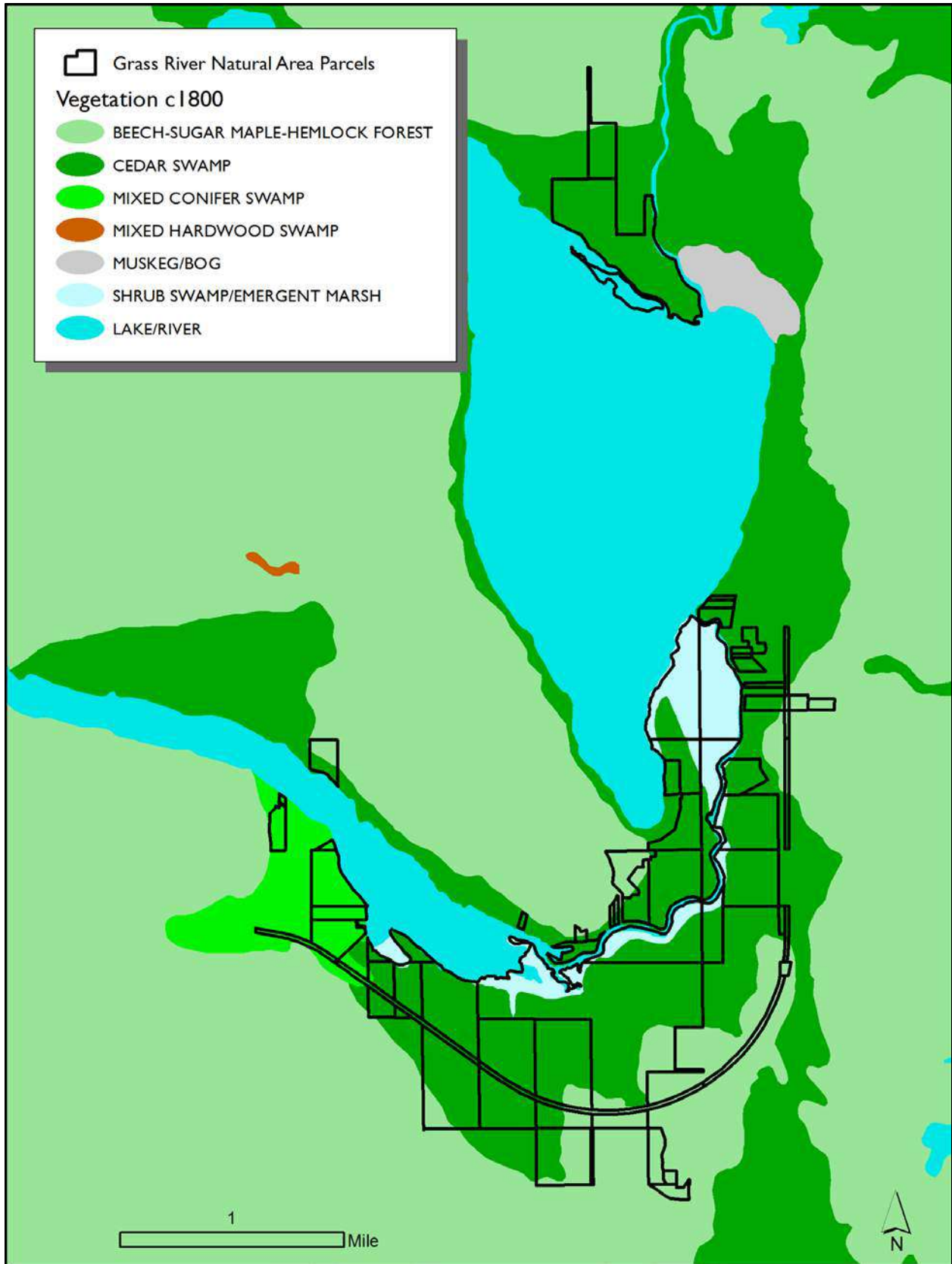


Figure 5. Circa 1800 vegetation of GRNA.

Methods

In preparation for surveys, a comprehensive list of target species was developed using the 1983 report (ER Squiers & Associates) and MNFI's abstracts of natural communities likely to occur in the sub-subsection. Taxonomy was updated to that used in the Michigan Flora (Reznicek et al. 2011). Species targeted for collection were identified by comparing the overall target species list with the Michigan Flora Online to identify species that did not have an Antrim county specimen deposited in a herbarium. These species were collected, where possible, and submitted as new county records to update the Michigan Flora (Reznicek et al. 2011).

Meander surveys of potential natural communities were conducted June 9, from June 19 to June 23, and from August 14 to August 18, 2017. Natural communities were identified following Cohen et al. (2015). All species observed were recorded by natural community type and apparent threats were noted. Point occurrences of species of interest and invasive species were mapped and GPS tracks of surveys conducted were recorded using Back Country Navigator installed on a Samsung tablet. Photographs were taken to showcase each natural community and document significant boundaries to assist the delineation of natural communities. Notes were taken of any wildlife or wildlife sign encounters and photographs were captured when possible. Natural community ranking criteria (MNFI 1988) were utilized to determine whether any delineated natural communities met criteria for inclusion as element occurrences (EOs) in the Biotics database.

Vascular plants were identified and keyed in the field, or documented for later identification. Plant species requiring specimens from Antrim County for the Michigan Flora were collected if: 1) collection would not decimate the population, 2) the specimen was accessible, 3) there was a specimen in fruit or flower, and 4) the collector had made a note to collect that species.

Lists of vascular plant species were compiled for each natural community, pooled for all of sites surveyed at GRNA and entered into the Universal FQA Calculator (Freyman and Masters 2013) following the Michigan Floristic Quality Assessment (FQA) Database (Reznicek et al. 2014). Alpha diversity metrics of total, native, and non-native species richness, mean coefficient of conservatism (C) and the floristic quality index (FQI) were calculated. C values are a measure of a plant's fidelity to specific circa 1800 natural communities (conservatism), ranging from zero to ten, with high values indicating greater fidelity to specific natural habitats and lower values indicating more general habitat requirements. Mean C is calculated by summing all species C values and dividing the sum by the total number of species. The FQI is determined by multiplying the mean C by the square root of the species richness, which allows for better comparison between large sites with a greater number of species and small sites with fewer species. Generally, an FQI score less than 20 indicates that the site is of insignificant floristic value, a score greater than 35 indicates a floristically important site, and a score greater than 50 indicates a site with considerable biodiversity value to the state (Herman et al. 2001).

The 1983 report (ER Squiers & Associates) noted a concern about contaminants reaching the waters of GRNA from adjacent sites. Current potential risks to groundwater were investigated using the Michigan Department of Environmental Quality's risks to (MDEQ) Environmental Mapper (<http://www.mcgi.state.mi.us/EnvironmentalMapper/>). GRNA and surrounding areas were examined for *Land Use Restrictions* imposed for environmental contamination (e.g.,

restrictive covenant, notice of corrective action), *Environmental Management Notices* (e.g., leaking underground storage tanks, brownfields), and *Wellhead Protection Areas*. Further investigation of these risks or remediation actions was beyond the scope of this project.

Results

Natural Communities

Nearly all parcels were surveyed directly during at least one of the survey periods. Parcels referred to as ASB #3, KNAPP, SHEMEMAN, BRAKE, BROWN, KIERSTEAD, HALEY and OKLESLEY were not accessed directly and their community composition was determined by views from adjacent areas via kayak or car, composition of surrounding areas, and aerial imagery.

Grass River Natural Area contains considerable botanical diversity supporting at least 368 species (315 native, 53 non-native) documented across nine natural community types (Table 1; Appendices 1-11). Occurrences of emergent marsh, northern wet meadow, northern fen, northern shrub thicket, poor conifer swamp, rich conifer swamp, hardwood-conifer swamp, dry-mesic northern forest, and mesic northern forest were delineated, including 185 acres of northern fen that met criteria for an A/B-ranked natural community EO (Figure 6, 7). One hundred and thirteen acres were significantly altered by anthropogenic disturbance, including pine plantations, residential properties, old fields, agricultural areas and a rail-trail that crosses through the southern portion of the natural area. These are considered anthropogenic systems, not natural communities.

Table 1. Summary of natural communities and anthropogenic communities documented in GRNA in 2017.

Natural Community	Abbr.	Class	Canopy	Area (Acres)	Percent native	Total FQI
Emergent marsh	EM	wetland	open	6	94.7	22.7
Northern wet meadow	NWM	wetland	open	49	93.5	55.5
Northern fen	NF	wetland	open	185	91.8	68.7
Northern shrub thicket	NST	wetland	shrub	41	96.2	26.5
Poor conifer swamp	PCS	wetland	forested	82	98.5	46.0
Rich conifer swamp	RCS	wetland	forested	503	92.3	69.1
Hardwood-conifer swamp	HCS	wetland	forested	53	92.8	32.4
Dry-mesic northern forest	DMNF	upland	forested	30	89.1	39.2
Mesic northern forest	MNF	upland	forested	283	96.2	19.4
Anthropogenic systems	ANTH	upland	open, forested	113	67.9	24.0

Emergent marsh, northern fen, northern wet meadow and rich conifer swamp occurred directly adjacent to the Bellaire and Clam Lakes and the Grass River. Northern fens and northern wet meadow, transitioned to rich conifer swamp, poor conifer swamp or hardwood-conifer swamp, based on soils and groundwater influence. These transitioned with increasing elevation and soil drainage to dry-mesic or mesic northern forest. Northern shrub thicket occurred between northern wet meadow and rich conifer swamp on the north shore of Lake Bellaire near the mouth of the Intermediate River. Anthropogenic systems occurred mostly along the outer boundaries of the GRNA. Each of the natural communities and anthropogenic systems are described below.



Figure 6. *Phragmites australis* subsp. *americanus* (native reed/phragmites) was observed in northern fen in the DELANGE #1B parcel.

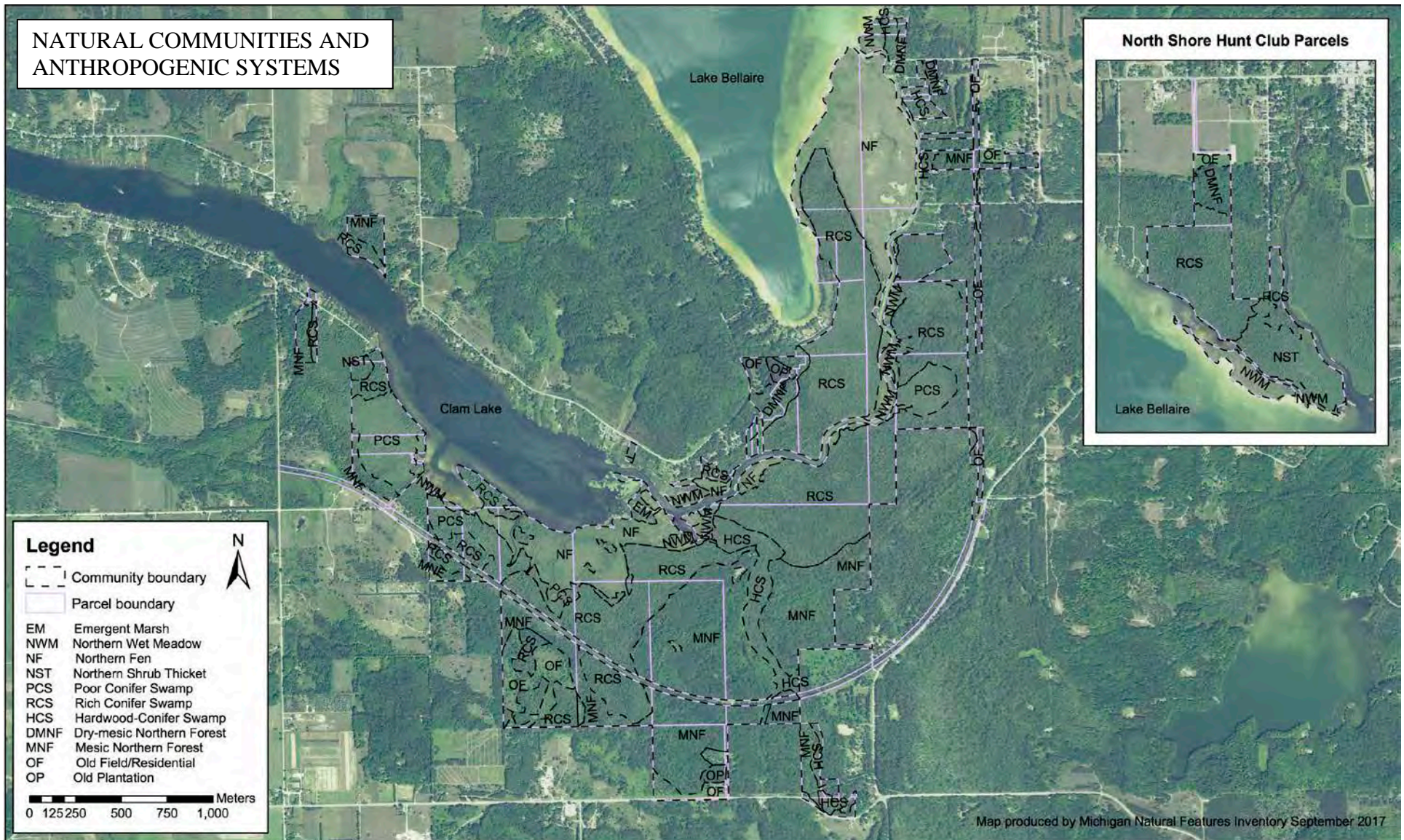


Figure 7. Natural communities and anthropogenic systems delineated within the parcel boundaries of GRNA are marked by dashed black lines. GRNA parcels are outlined in purple. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

Emergent Marsh

Emergent marsh is an herbaceous wetland that is typically inundated with at least six inches of water the majority of the year (Figure 8). These marshes occur along the shores of rivers, lakes, and streams throughout Michigan and are subject to fluctuating water levels, seasonal flooding and flooding by beaver. Due to the continuous flooding of these wetlands, the vegetative community is composed predominantly of emergent and floating plants (Kost et al. 2007).



Figure 8. Emergent marsh along the edge of northern shrub thicket in the NSHC #3 parcel.

Emergent marsh (Figure 9) comprised approximately six acres of GRNA, primarily near the juncture of the Grass River and Clam Lake and along the Grass River just south of Lake Bellaire. The species richness was 19, with 18 native and one non-native species, and the total FQI was 22.7. The marshes were dominated by *Carex aquatilis* (sedge), *Carex lasiocarpa* (wire sedge), *Carex stricta* (tussock sedge), *Decodon verticillatus* (whorled loosestrife), *Lemna* spp. (duckweed), *Nuphar variegata* (yellow pond-lilies), *Nymphaea odorata* (sweet-scented waterlily), *Persicaria amphibia* (water smartweed), *Pontederia cordata* (pickerel-weed), *Schoenoplectus acutus* (hardstem bulrush), *S. tabernaemontani* (softstem bulrush), *Sparganium emersum* (green-fruited bur-reed), *S. eurycarpum* (common bur-reed) and *T. latifolia* (broad-leaved cat-tail). In areas more protected from wave action, *Utricularia vulgaris* (common bladderwort) was found. Patches of *Phragmites australis* var. *americanus* (native reed/ phragmites) were also noted in this community type.

The only non-native species observed in emergent marsh was the invasive *Typha angustifolia* (narrow-leaved cat-tail) which was sparse.



Figure 9. Emergent marsh delineated within the parcel boundaries of GRNA is highlighted in cyan. The purple lines outline parcels owned by GRNA. The black dashed lines outline natural communities within GRNA property.

Northern Wet Meadow

Northern wet meadow is an open wetland community dominated by sedges, grasses, and occasional small shrubs (Figure 10). It occurs along the borders of rivers and streams, and occasionally lakes and ponds, on strongly acidic to circumneutral sapric peat or sometimes on saturated mineral soils (Cohen and Kost 2007). It is primarily groundwater fed and is subject to seasonally fluctuating water levels. Water levels typically remain at or near the surface throughout the year.



Figure 10. Northern wet meadow borders the Grass River in the MI #2C parcel.

Northern wet meadow comprised approximately 49 acres of GRNA, bordering northern fen, rich conifer swamp, poor conifer swamp, and emergent marsh (Figure 11). The species richness was 123, with 115 native and 8 non-native species, and the total FQI was 55.5. The gradual transition between highly diverse and similar communities likely contributed to its high species richness. The community was mostly dominated by *Carex stricta* (sedge), with an abundance of *C. lasiocarpa* (wiregrass sedge), *Cladium mariscoides* (twig-rush), and *Calamagrostis stricta* (narrow-leaved reedgrass) with occasional *Carex utriculata* (sedge) and *C. interior* (inland sedge). Shrubby areas of *Myrica gale* (sweet gale) and *Dasiphora fruticosa* (shrubby cinquefoil) were frequent, and stunted *Thuja occidentalis* (northern white-cedar) and *Larix laricina* (tamarack) dotted the landscape. *Sarracenia purpurea* (pitcher plant) and *Platanthera psycodes* (purple fringed orchid) were occasionally observed. Patches of native phragmites were also noted here.

Occasional occurrences of invasive *Cirsium palustre* (marsh thistle), *Elaeagnus umbellata* (autumn olive), *Iris pseudacorus* (yellow flag), *Lythrum salicaria* (purple loosestrife) and narrow-leaved cat-tail were documented. These species are highly invasive and can spread quickly, displacing native species. Several other non-native species of less immediate concern were observed occasionally, including *Populus alba* (white poplar), bittersweet nightshade and *Mentha x piperita* (peppermint).

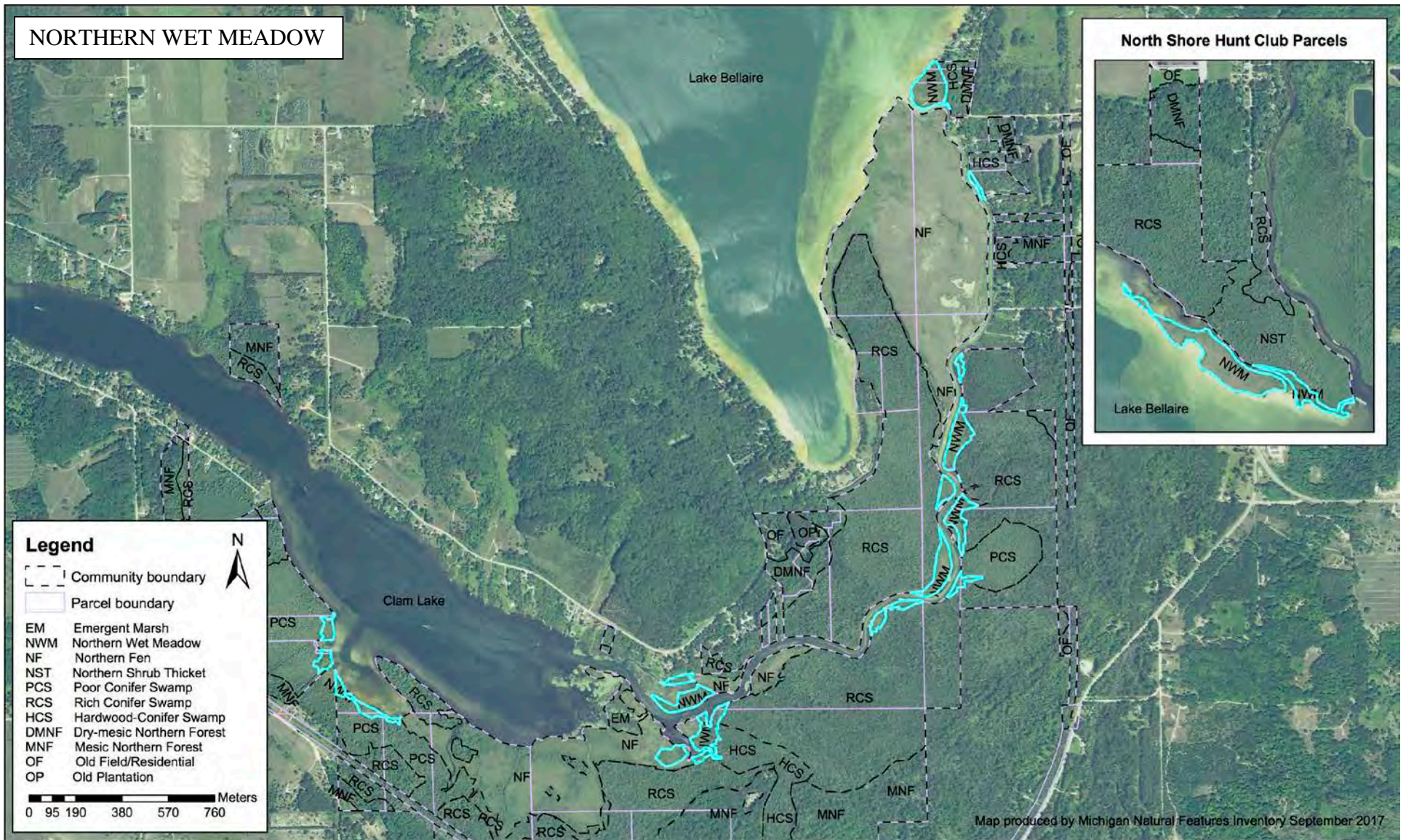


Figure 11. Northern wet meadow delineated within the parcel boundaries of GRNA is highlighted in cyan. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

Northern Fen

Northern fen is a highly diverse, open canopy wetland system dominated by sedges, rushes, forbs, and shrubs, growing on neutral to moderately alkaline saturated peat and marl. It typically occurs where water infiltrates down through steep moraines overlaying dolomite and limestone bedrock producing cold, calcareous groundwater that seeps out from the base. Marl zones form where algae interact with the calcium and magnesium-rich groundwater to produce a gray mineral precipitate of calcium carbonate at the surface (Figure 12). Peat mounds carpeted by sphagnum, low-growing shrubby patches, and stunted conifers are also common (Figure 13). Variations in the amount of calcareous ground water seepage and lateral flow, flooding by beaver and occasional fires influence the species composition and structure and the formation of distinct vegetative zones.



Figure 12. *Utricularia cornuta* (horned bladderwort) growing in a marl zone of a northern fen in parcel MI #1A.

Northern fen comprised approximately 185 acres of GRNA, the third most abundant natural community documented during this inventory (Figure 19). It borders northern wet meadow, poor conifer swamp, and rich conifer swamp. The species richness was 170, with 156 native and 14 non-native species and the total FQI was 65.2. The marl zones were dominated by twig-rush, *Rhynchospora alba* (beak rush), *Rhynchospora capillacea* (beak rush), *Schoenoplectus* spp. (bulrushes), *Triglochin maritima* (common bog arrow-grass), and *Utricularia* spp. (bladderworts). This zone transitions to a diversity of sedges, grasses, forbs, and small shrubs in the surrounding areas (Figure 14, 15). Several orchids, including *Calopogon tuberosus* (grass-pink), *Cypripedium parviflorum* (yellow lady-slipper), *Pogonia ophioglossoides* (rose pogonia),

and *Spiranthes cernua* (nodding ladies-tresses), were observed, as well as carnivorous *Sarracenia purpurea* (pitcher plant) and *Drosera rotundifolia* (round-leaved sundew). Patches of native phragmites were also noted.



Figure 13. Peat mounds covered with sphagnum mosses, sedges and stunted conifers in the GORSUCH H #1A parcel.



Figure 14. *Sarracenia purpurea* (pitcher plant) observed in the DELANGE #1B parcel.



Figure 15. Many forbs bloom in late summer among the sedges in northern fen in the DELANGE #1B parcel.

Wildlife, especially birds, was commonly encountered in the northern fen communities. Sandhill cranes (*Grus canadensis*), mute swans (*Cygnus olor*), trumpeter swans (*Cygnus buccinator*), Wilson's snipes (*Gallinago delicata*), green herons (*Butorides virescens*), common mergansers (*Mergus merganser*) were a daily occurrence (Figure 16). Crayfish exoskeletons, leopard frogs (*Lithobates pipiens*; Figure 16), and green frogs (*Rana clamitans*) were also frequently observed. A green snake and several occurrences of mammal scat were also spotted. It is suspected that some of the scat was that of river otters (*Lontra canadensis*) given the high shell content and altered vegetation in the area. One location appeared to be a dwelling of some sort of river-going mammal.

Several highly invasive species were observed in low numbers including marsh thistle, autumn olive, yellow flag and *Phalaris arundinacea* (reed canary grass). Several dense patches (~25 m²) of narrow-leaved cat-tail were noted in the fen areas south of Grass River, but it was absent from the large northern fen 'island' near the SE end of Lake Bellaire (MI parcels).

Several other non-native species of less concern were occasionally observed, including *Hieracium aurantiacum* (orange hawkweed), *Hieracium caespitosum* (yellow hawkweed), *Hieracium piloselloides* (king devil), *Leucanthemum vulgare* (ox-eye daisy), *Phleum pretense* (timothy grass), *Poa compressa* (Canada bluegrass), *Poa pratensis* (Kentucky bluegrass), *Ranunculus acris* (tall buttercup), *Rumex acetosella* (sheep sorrel), and *Stellaria media* (common chickweed).

Due to the high species richness and FQI, representative composition and structure, large acreage (185 acres) and low abundance of invasive species, the northern fen areas at GRNA qualify as a new A/B-ranked EO for the MNFI Biotics database. Natural communities are ranked from A to D, where A-ranked occurrences are excellent examples of communities, representative of historical conditions (structure, composition, natural processes, size, landscape context) and D-ranked occurrences are highly disturbed from natural conditions and not likely to recover for many years. An A/B occurrence is largely representative of natural conditions, but with some artificial disturbances, such as presence of invasive species or minor alteration of hydrology. Thirty-one percent of the species documented in northern fen had C values greater than seven including *Lobelia kalmia* (Kalm's lobelia; C=10; Fig. 17) and *Trichophorum alpinum* (bulrush; C=10; Fig. 18).



Figure 16. A sandhill crane in northern fen in the MI #1A parcel.



Figure 17. *Lobelia kalmii* (Kalm's lobelia) was observed in the MI #1A parcel.



Figure 18. *Trichophorum alpinum* (bulrush) in northern fen in the DELANGE #1B parcel.

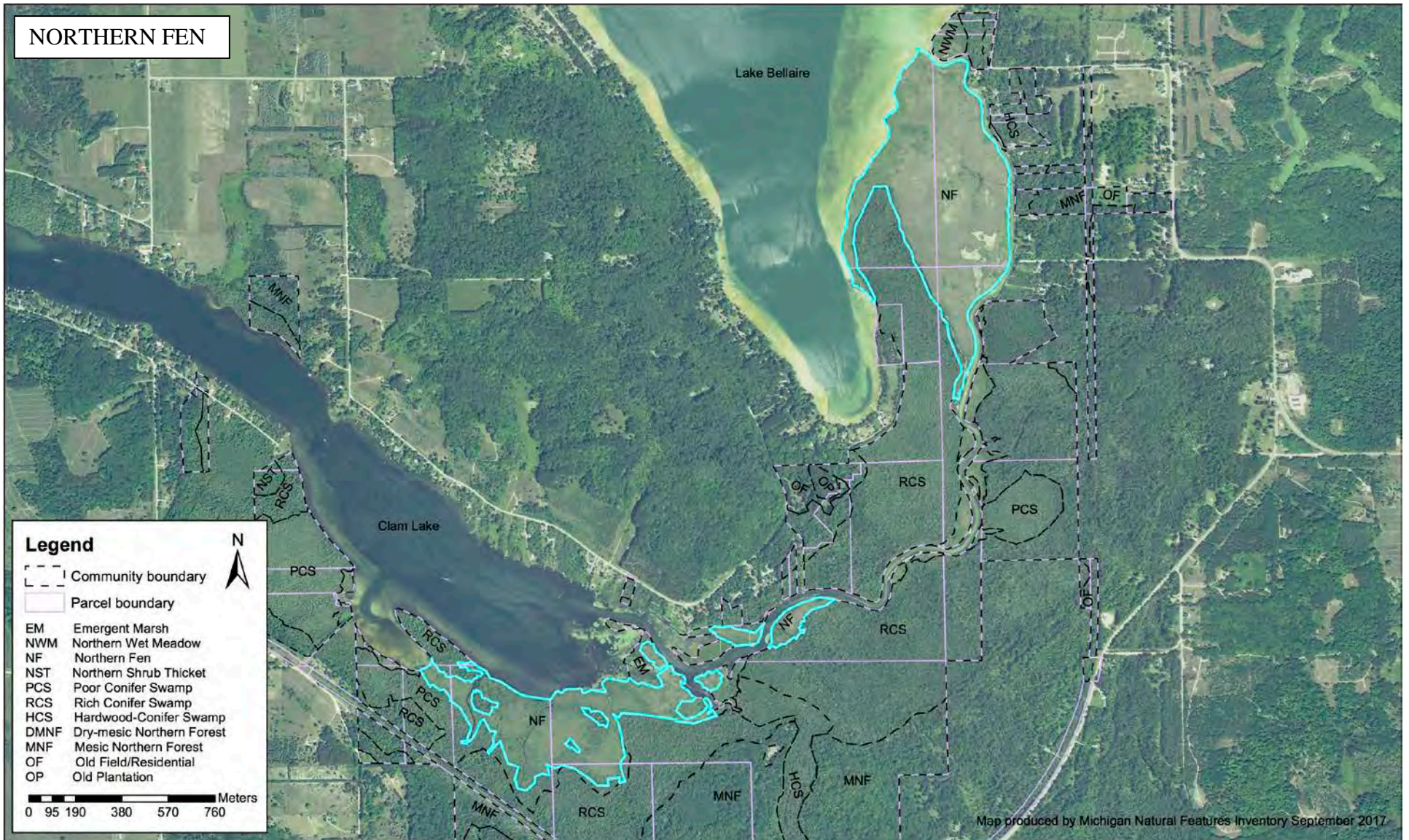


Figure 19. Northern fen delineated within the parcel boundaries of GRNA is highlighted in cyan.

Northern Shrub Thicket

Northern shrub thicket is a mostly-closed, low-canopy wetland community dominated by shrubs including *Alnus incana* (tag alder), *Cornus* spp. (dogwoods) and *Salix* spp. (willows), with few mature trees (Figure 20). It occurs along the borders of rivers and streams, and occasionally ponds and lakes (Cohen and Kost 2007). The soils are saturated, nutrient-rich organics, often with peat. Northern shrub thickets are subject to frequent water level fluctuations, flooding by beaver, and windthrows which influence the community composition and structure. Dense tag alder shrubs and lack of mature tree canopy distinguish it from other open and forested wetlands. Tag alder shades and crowds out many herbaceous species and tree saplings often resulting in lower diversity than surrounding communities (Cohen and Kost 2007).



Figure 20. Dense shrubs dominate northern shrub thicket in the NSHC #1 parcel.

Northern shrub thicket comprised approximately 41 acres of GRNA, mostly in parcels on the north shore of Lake Bellaire (Figure 21), where it occurred adjacent to northern wet meadow and rich conifer swamp. The species richness was 26, with 25 native and one non-native species, and the total FQI was 26.5. It was dominated by *Alnus incana* (tag alder), *Toxicodendron vernix* (poison sumac), *Cornus amomum* (silky dogwood), *Myrica gale* (sweet gale), *Carex stricta* (tussock sedge), *Ribes* spp. (gooseberry, currant), *Onoclea sensibilis* (sensitive fern), and *Osmunda regalis* (royal fern), with occasional *Thuja occidentalis* (northern white-cedar), *Picea mariana* (black spruce), *Larix laricina* (tamarack), and *Fraxinus nigra* (black ash) trees less than 10 m tall. In the parcels on the north shore of Lake Bellaire, poison sumac was especially dense in both the northern shrub thicket and rich conifer swamp. An occurrence of *Euphorbia virgata* (leafy spurge) was observed on the shoreline of Lake Bellaire bordering the shrub-thicket.

River otter (*Lutra canadensis*) scat with anal jelly was observed near the mouth of the Intermediate River and several ground dwelling birds were flushed in the interior of the shrub thicket on the north shore of Lake Bellaire. Positive species identification could not be made due to the dense growth and shadows, but they were likely ruffed grouse (*Bonasa umbellus*).

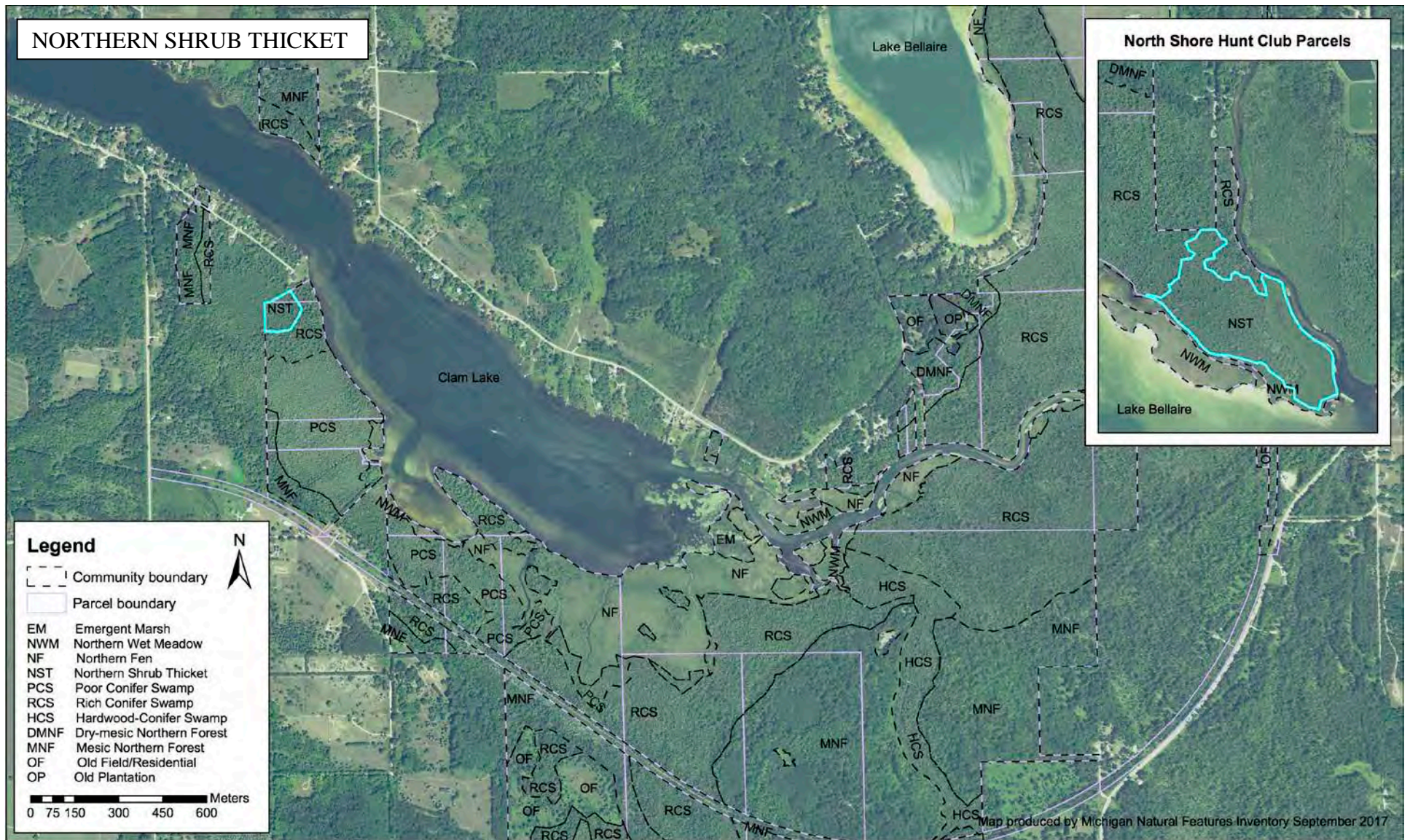


Figure 21. Northern shrub thicket delineated within the parcel boundaries of GRNA is highlighted in cyan. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

Poor Conifer Swamp

Poor conifer swamp is a forested wetland community dominated by *Picea mariana* (black spruce) and *Larix laricina* (tamarack) with a ground layer of sphagnum mosses and abundant ericaceous shrubs (heath family; Cohen 2006; Figure 22). It is a nutrient poor system with little groundwater influence and occurs on acidic, saturated peat soils, predominantly in depressions and kettles in glacial outwash and glacial lake plains. The community structure and composition are influenced by windthrow, flooding by beaver, insect outbreaks, peat accumulation and occasionally fire.



Figure 22. Poor conifer swamp in the GORSUCH H #1B parcel.

Poor conifer swamp comprised approximately 82 acres of GRNA (Figure 24) adjacent to rich conifer swamp and northern fen. The species richness was 65, with 64 native and one non-native species, and the total FQI was 46. The canopy was co-dominated by black spruce and tamarack with occasional northern white-cedar and balsam fir, and ranged from 25-70% closure. Poison sumac was common. Ericaceous species were abundant including *Andromeda glaucophylla* (bog-rosemary), *Chamaedaphne calyculata* (leatherleaf), *Gaultheria hispidula* (creeping-snowberry), *Gaultheria procumbens* (wintergreen), *Gaylussacia baccata* (huckleberry), *Rhododendron groenlandicum* (Labrador-tea), *Vaccinium myrtilloides* (Canada blueberry), and *Vaccinium oxycoccos* (small cranberry). There were many pockets of pitcher plant and *Parnassia*

glauca (grass-of-Parnassus), occasionally with round-leaved sundew. Grass-pink (Figure 23) and *Cypripedium reginae* (showy lady-slipper) orchids were occasionally observed.

In the GORSUCH H #1B parcel near the northern fen and west of 'Otter Creek', there were pitcher plants lacking red coloration in the leaves that are suspected to be the recently delisted *Sarracenia purpurea* f. *heterophylla* (yellow pitcher plant). These plants were unusually large compared to other pitcher plants observed in GRNA. Confirmation requires examination of flowers, which also lack red coloration, but they were absent at the time of observation. The justification for delisting this form of pitcher plant was that it arises from a gene mutation independently in different populations and is not an evolutionary unit (Reznicek pers. com.).

The only invasive species observed in poor conifer swamp during this study was *Elaeagnus umbellata* (autumn olive) which was occasional.



Figure 23. *Calopogon tuberosus* (grass pink) was observed in a poor conifer swamp opening surrounded by black spruce in the GORSUCH H #1B parcel.

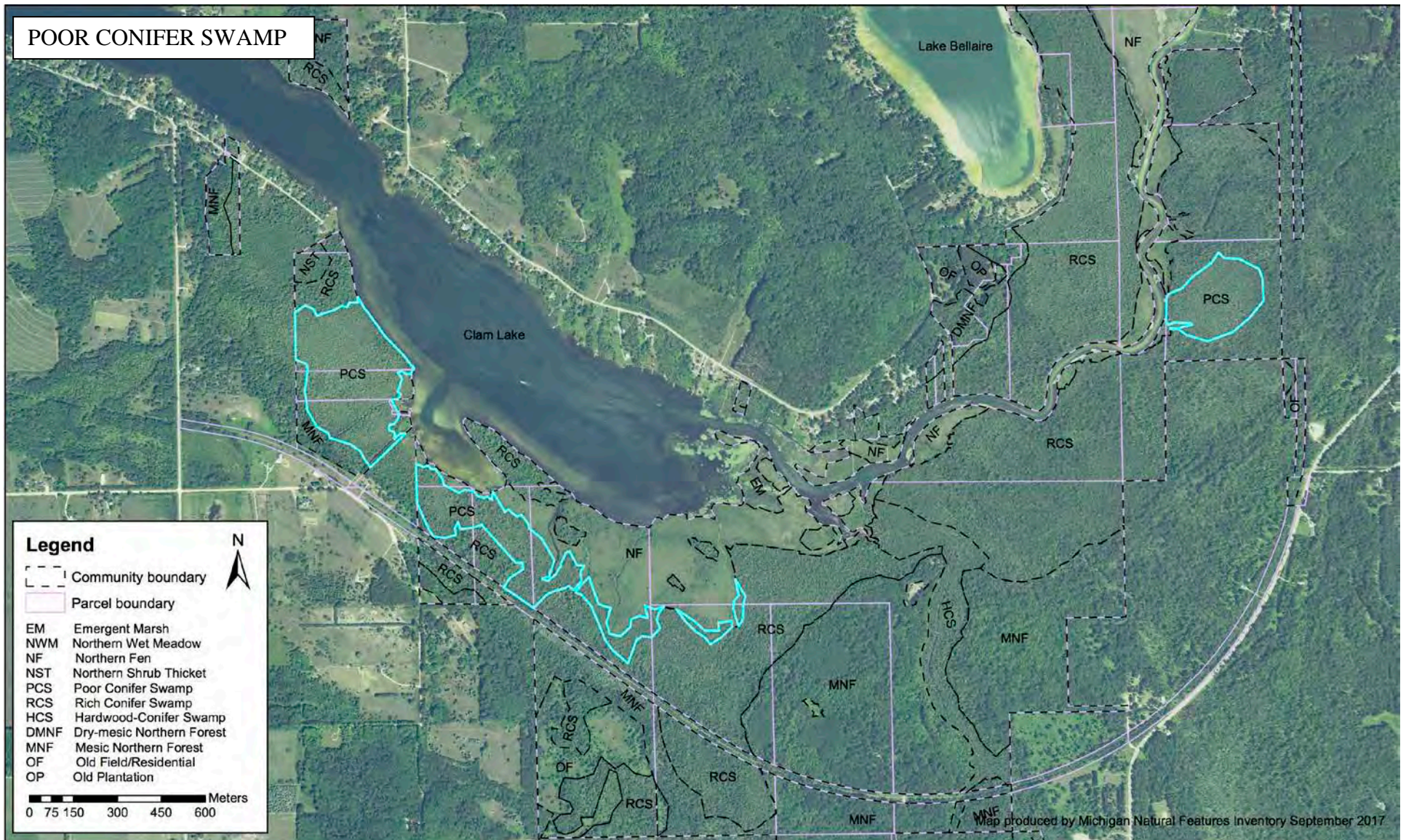


Figure 24. Poor conifer swamp delineated within the parcel boundaries of GRNA is highlighted in cyan.

Rich Conifer Swamp

Rich conifer swamp is a groundwater-influenced, nutrient-rich forested wetland dominated by northern white-cedar. It occurs in outwash channels and depressions in moraines, outwash plains and lakeplains, and is often associated with headwaters of cold, calcareous streams and groundwater springs (Figure 25). Soils are usually saturated circumneutral to moderately alkaline peats with frequent peat mounds covered by acidic *Sphagnum* spp. (sphagnum) mosses (Kost 2002, Cohen et al. 2015). Community composition and structure are influenced by groundwater seepage, seasonal water-level fluctuations, windthrow, flooding by beaver, hummock and hollow development, and occasionally fire.

Rich conifer swamp is the most abundant community in GRNA, covering approximately 503 acres (Figure 27). It lies adjacent to northern fen, northern wet meadow, northern shrub thicket, poor conifer swamp, dry-mesic northern forest, and mesic-northern forest. It had high species diversity with 207 total species (191 native and 16 non-native), and a total FQI of 69.1. Northern white-cedar dominated most of the canopy with co- or sub-dominants of tamarack and balsam fir. Less common canopy associates included *Pinus strobus* (white pine), *Acer rubrum* (red maple), black ash, and *Betula allegheniensis* (yellow birch). Tag alder dominated the understory, but poison sumac was abundant or co-dominant in several parcels, most densely in the north shore of the Lake Bellaire. Other shrubs and small trees included *Cornus alternifolia* (alternate leaved dogwood), *Cornus amomum* (silky dogwood), and *Cornus sericea* (red-osier dogwood), *Ilex verticillata* (winterberry), *Lonicera oblongifolia* (swamp fly honeysuckle), *Lonicera dioica* (red honeysuckle), Labrador-tea, *Rubus strigosus* (wild red raspberry), *Rubus pubescens* (dwarf raspberry) *Tsuga canadensis* (hemlock), and *Vaccinium* spp. (blueberries). The forest floor was uneven with many exposed roots, downed woody debris, and sphagnum mounds. Ferns, sedges, blueberries, grasses and bare ground were common. Occasional occurrences of *Lobelia cardinalis* (cardinal flower; Figure 26) were a striking contrast in the understory. Several carnivorous plants and orchids were also observed, including round-leafed sundew, pitcher plant, *Corallorhiza trifida* (early coral-root), yellow lady-slipper, showy lady-slipper, and purple fringed orchid.

Invasive species observed included *Alliaria petiolata* (garlic mustard), Japanese barberry, marsh thistle, autumn olive, yellow flag, *Myosotis scorpioides* (forget-me-not), reed canary grass, *Rosa multiflora* (multiflora rose) and narrow-leaved cat-tail. Non-native species of less immediate concern included *Epilobium parviflorum* (willow-herb), orange hawkweed, yellow hawkweed, *Hypericum perforatum* (common St. John's-wort), tall buttercup, bittersweet nightshade, *Taraxacum officinale* (common dandelion) and *Veronica arvensis* (corn speedwell).

Wildlife and wildlife signs observed included a green heron (*Butorides virescens*) and large padded down sedge-areas littered with shell-filled scat.



Figure 25. Rich conifer swamp with a small creek running through the MI #2B parcel .



Figure 26. *Lobelia cardinalis* (cardinal flower) in the understory of rich conifer swamp in the NSHC #1 parcel.

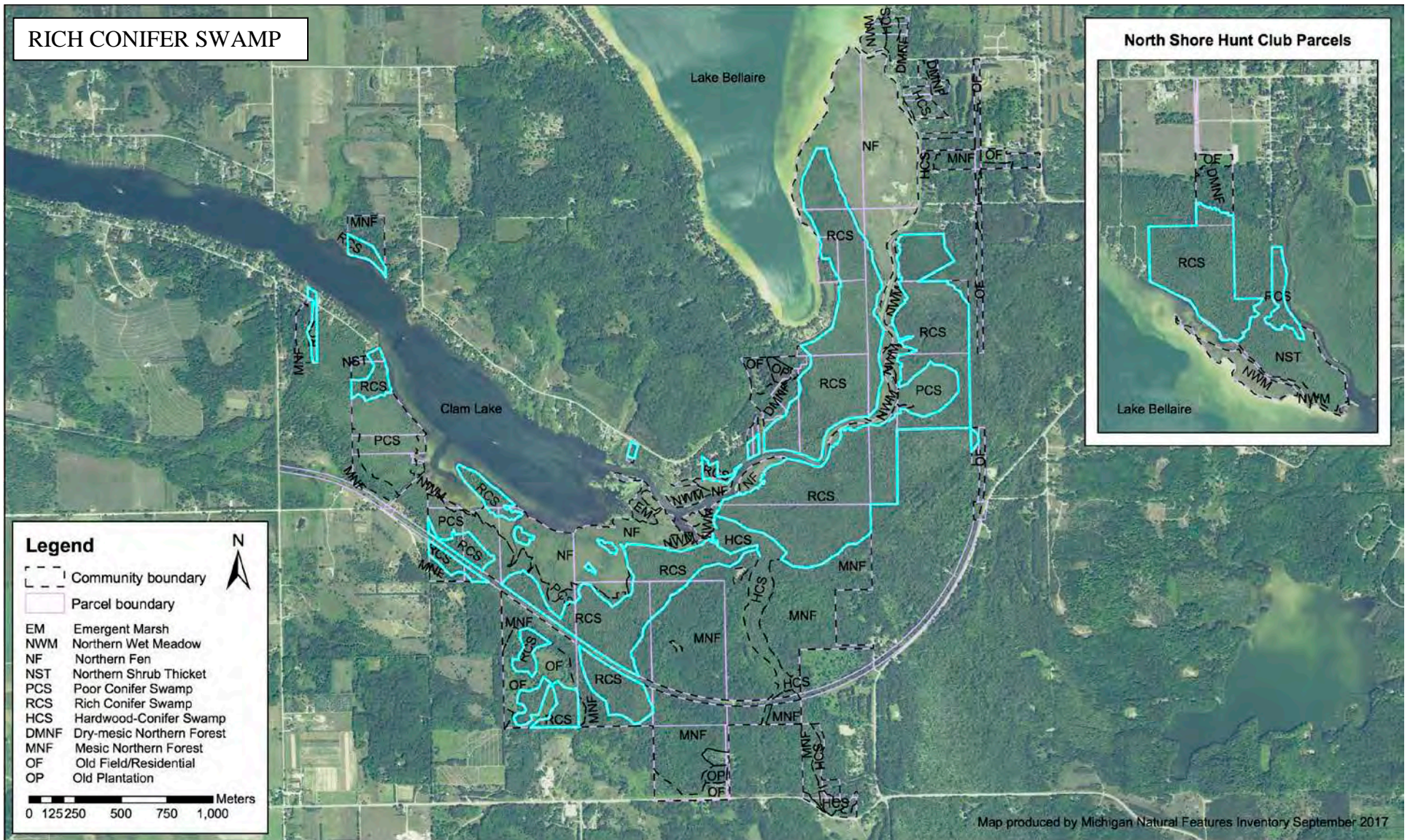


Figure 27. Rich conifer swamp delineated within the parcel boundaries of GRNA is highlighted in cyan. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

Hardwood-Conifer Swamp

Hardwood-Conifer Swamp is a forested wetland community dominated by a mix of lowland deciduous hardwoods and conifers (Slaughter et al. 2007). It is groundwater influenced and often associated with groundwater seepage areas and headwaters of streams. Water level fluctuations, windthrow, and flooding by beaver influence community composition and structure. Hardwood-conifer swamp is confined to ecotonal areas between uplands and other wetland communities and does not occur where peat accumulation isolates it from the groundwater. The canopy varies regionally, but is often dominated by balsam fir, red maple, yellow birch, white pine, *Populus tremuloides* (quaking aspen), northern white-cedar and hemlock (Slaughter et al. 2007, Cohen et al. 2015). Tag alder is common in the understory, in gaps and along the borders (Figure 28).



Figure 28. Tag alder is common in the understory and gaps in hardwood-conifer swamp as shown here in the ASB #2 parcel.

Hardwood-conifer swamp comprised approximately 53 acres (Figure 30) of GRNA and occurs adjacent to northern wet meadow and dry-mesic northern forest. There was a total species richness of 97, with 90 native and seven non-native species, and the total FQI was 39.4. The canopy was dominated by northern white-cedar and yellow birch with frequent occurrences of *Populus balsamifera* (balsam poplar) and *Populus grandidentata* (big-tooth aspen). Common shrubs included tag alder, *Lonicera canadensis*. (Canadian fly honeysuckle), *Rhamnus alnifolia* (alder-leaved buckthorn), wild red raspberry, dwarf raspberry *Sambucus canadensis* (elderberry), and poison sumac. Common herbaceous plants documented included *Equisetum* spp. (horsetails), *Carex disperma*, *C. hystericina*, *C. interior*, *C. intumescens*, *C. lupulina*, *C. stricta*, *C. utriculata*, *C. vulpinoidea*, *Lysimachia thyrsoiflora* (tufted loosestrife; Figure 29), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Solidago* spp. (goldenrods) and *Trientalis borealis* (star-flower).

Invasive species observed included marsh thistle, autumn olive, *Lysimachia nummularia* (moneywort), forget-me-not, and reed canary grass. Non-native species of less immediate concern included orange hawkweed, yellow hawkweed and bittersweet nightshade.



Figure 29. *Lysimachia thyrsiflora* (tufted loosestrife) growing in the understory of hardwood-conifer swamp in the DELANGE #1B parcel.

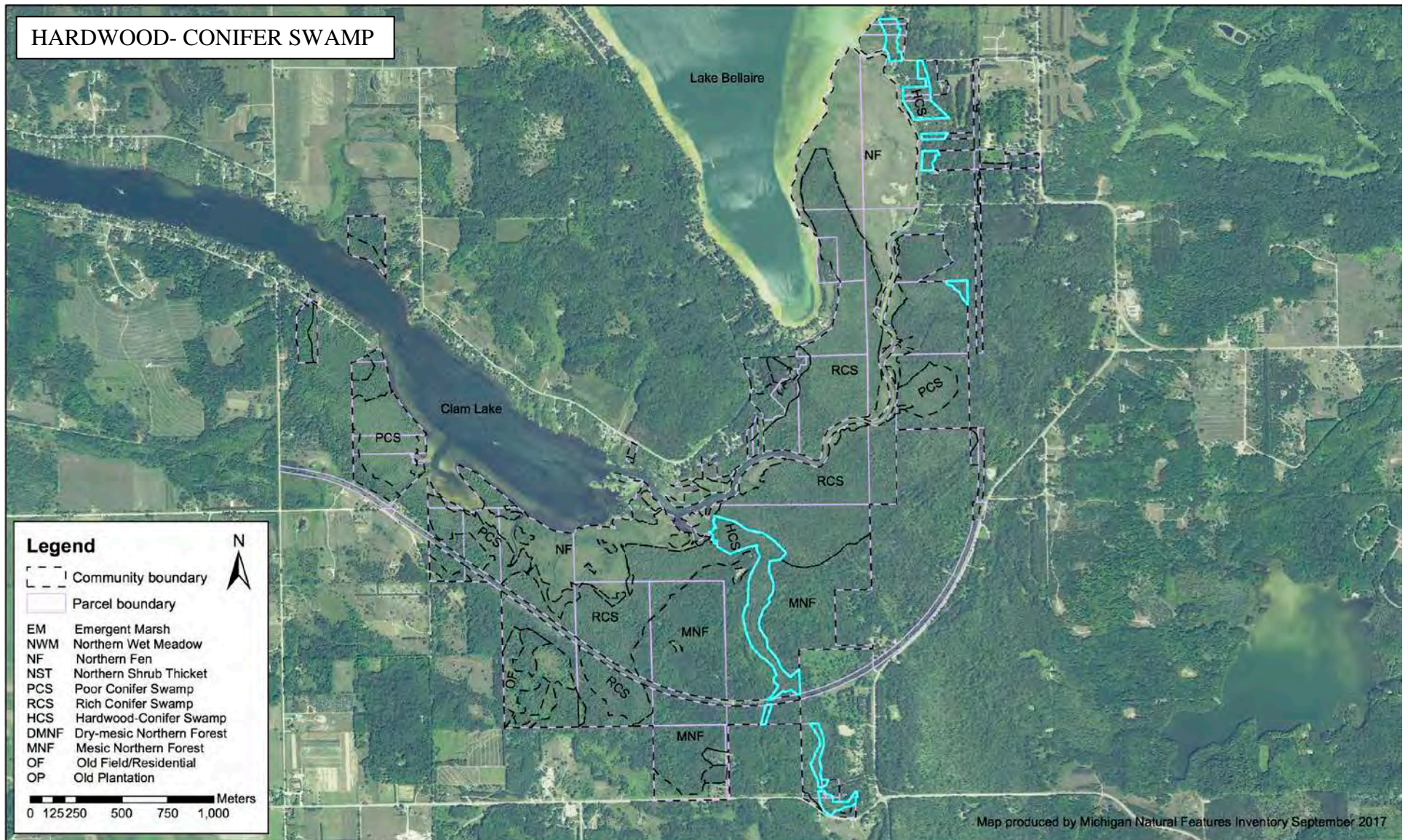


Figure 30. Harwood-conifer swamp delineated within the parcel boundaries of GRNA is highlighted in cyan.

Dry-mesic Northern Forest

Dry-mesic northern forest is an upland forested community with a pine or pine-hardwood canopy typically dominated by white pine and *Pinus resinosa* (red pine), with *Quercus rubra* (red oak), and/or hemlock associates. It occurs on acidic well-drained sands, most frequently on glacial outwash plains and lakeplains. The ground layer is often dominated by *Pteridium aquilinum* (bracken fern; Figure 31), with a diversity of shrubs, sedges, grasses and forbs intermixed. Historically, these forests originated from infrequent catastrophic fire and were maintained by frequent low-intensity ground fires. Fire creates areas of bare mineral soil that are most suitable for germination of the conifer dominants. Windthrow and insect outbreaks also influence the structure and composition of these forests.



Figure 31. White pine saplings and bracken fern are abundant in the understory of the dry-mesic northern forest community in the NSHC #2 parcel.

Dry-mesic northern forest comprised approximately 30 acres (Figure 32) of GRNA, bordering rich conifer swamp, hardwood conifer swamp, old field/residential areas and pine plantations. The species richness was 26, with 25 native and one non-native species, and the total FQI was 19.4. The canopy was almost exclusively white pine, with significant contributions from red maple, *Acer saccharum* (sugar maple), yellow birch, red pine, quaking aspen, red oak, and hemlock. The ground layer was mostly open with pockets of bracken fern, *Lycopodium* spp. (clubmosses), and clumps of *Carex communis* (sedge). Occasional occurrences of the invasive Japanese barberry were observed in the NSHC #2 parcel.

Six potential vernal pools were documented in this community. These are described further in the Vernal Pool section.

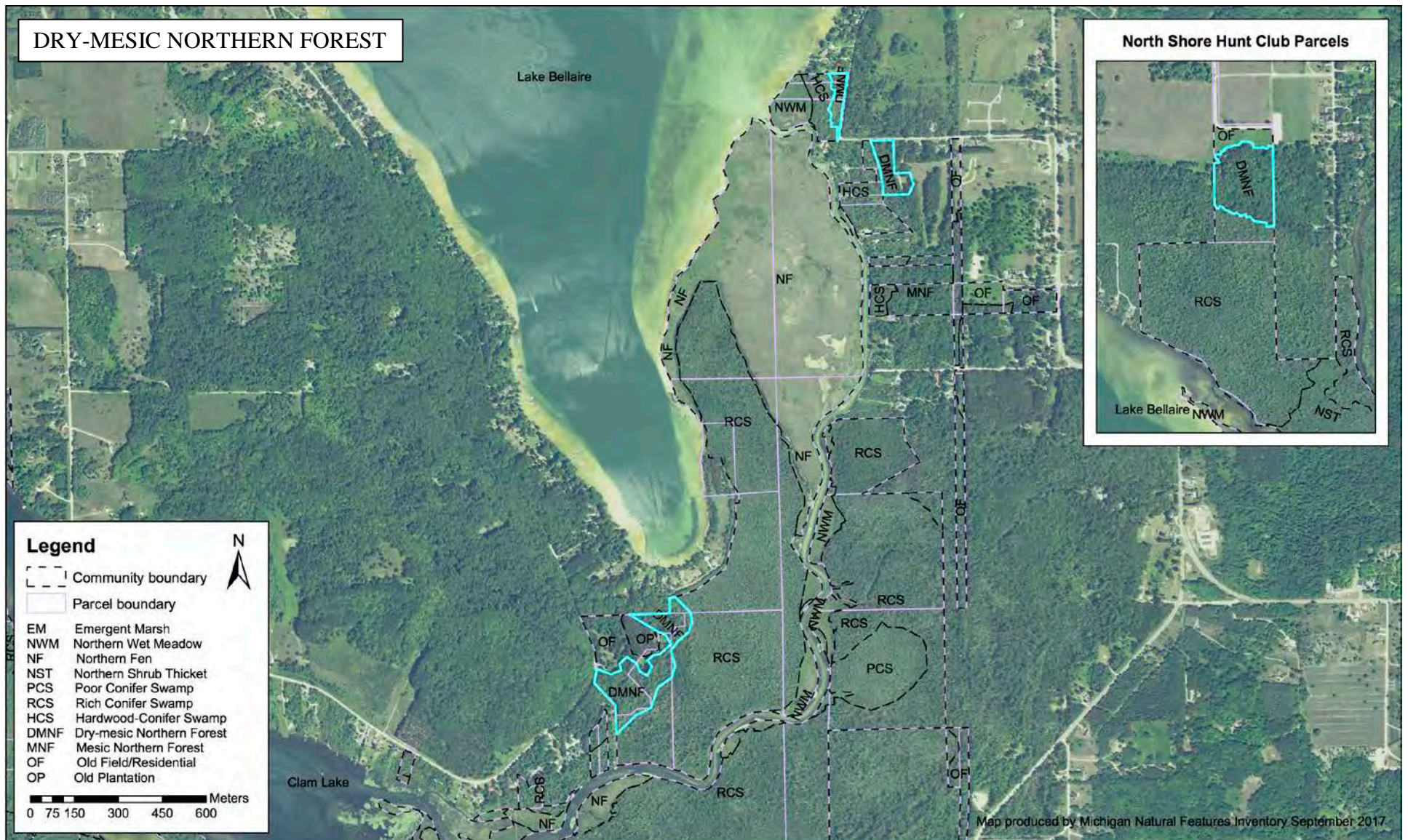


Figure 32. Dry-mesic northern forest delineated within the parcel boundaries of GRNA is highlighted in cyan. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

Mesic Northern Forest

Mesic northern forest is an upland forested community dominated by northern hardwoods, including sugar maple, *Fagus grandifolia* (American beech), with frequent associates of yellow birch, red oak, and hemlock and white pine (Figure 33). Soils are typically loamy sands to sandy loams (Cohen 2000). Mesic northern forests are sustained by frequent, small windthrow events which create canopy gaps that allow shade-tolerant canopy seedlings to regenerate. These forests occurred as a matrix community, covering over 12 million acres in Michigan prior to European settlement and logging (Comer et al. 1995, Cohen 2000). They were multigenerational, persisted for long time periods and experienced infrequent catastrophic windthrow events.



Figure 33. Mesic northern forest is dominated by northern hardwoods with conifer associates such as white pine and hemlock in the GAGE Parcel.

Mesic northern forest comprised approximately 283 acres, the second most abundant community in GRNA (Figure 34). It borders rich conifer swamp, poor conifer swamp, and hardwood-conifer swamp. The species richness reached 101, with 90 native and 11 non-native species, and the total FQI was 39.2. The canopy was comprised mostly of sugar maple, red maple, yellow birch, beech, red oak, and hemlock, with occasional *Picea glauca* (white spruce), white pine and northern white-cedar. There were pockets of *Abies balsamea* (balsam fir) and inclusions of small wetlands with species such as *Carex crinita*, *C. disperma*, *C. intumescens*, and *C. lupulina* (sedges).

Occasional occurrences of invasive marsh thistle, autumn olive, *Lonicera xbella* (hybrid honeysuckle), and *Lonicera morrowii* (morrow honeysuckle) were observed. Non-native species of less immediate concern include *Agrostis gigantea* (red-top), *Epipactis helleborine* (helleborine), orange hawkweed, *Picea pungens* (blue spruce), bittersweet nightshade, common dandelion and *Veronica officinalis* (common speedwell).

Five potential vernal pools were documented in this community. These are described further in the Vernal Pool section.

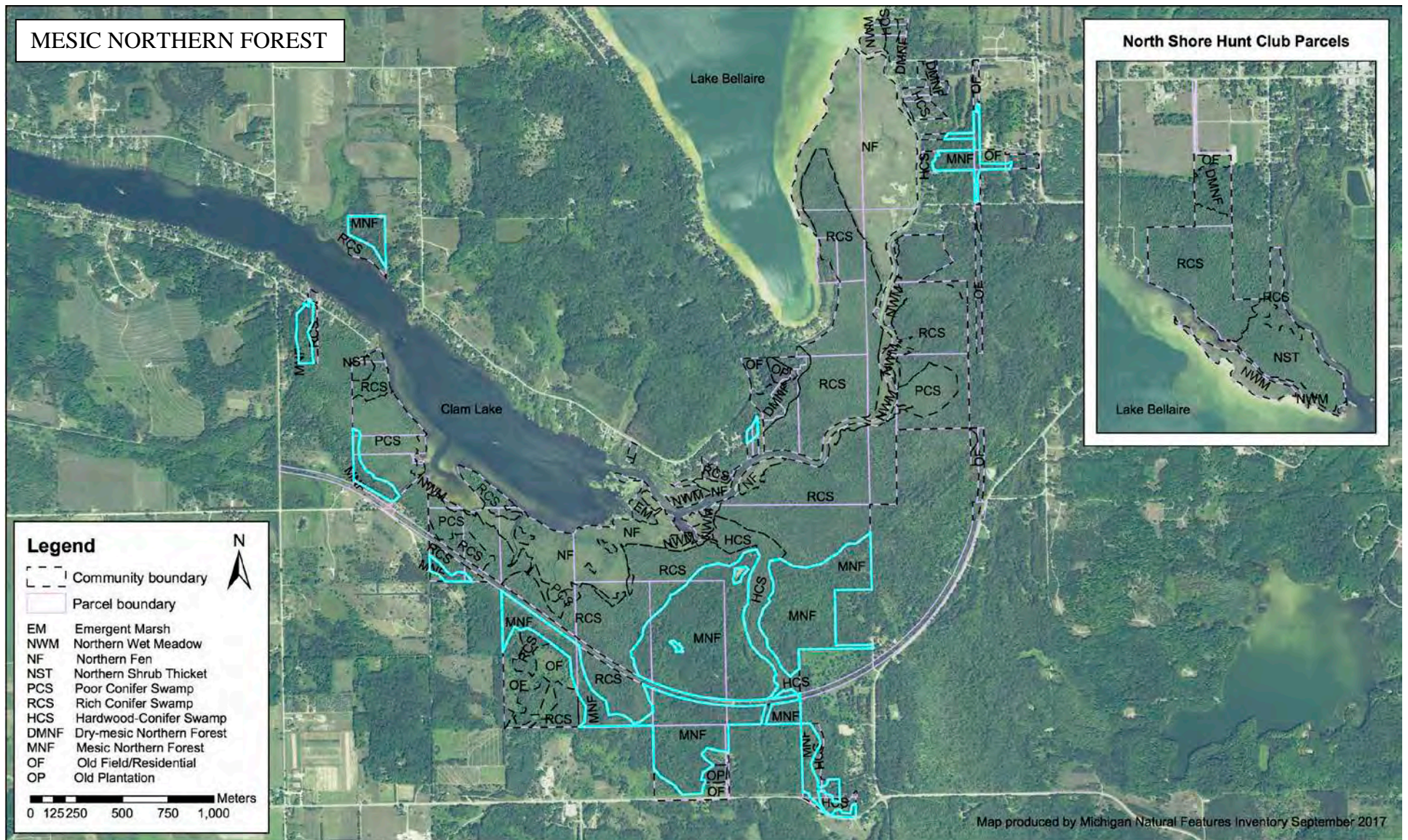


Figure 34. Mesic northern forest delineated within the parcel boundaries of GRNA is highlighted in cyan. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

Anthropogenic Systems

Approximately 113 acres of GRNA had strong anthropogenic disturbance and were delineated as anthropogenic systems (Figure 39, 40). These areas included old farmstead/residential areas (Figure 35), the rail-trail, utility right-of-ways, educational areas for the nature center, and old red pine plantations (Figure 36). These were mostly upland areas bordering upland forests, with many non-native invasive and weedy species. However, the rail-trail does bisect portions of rich and poor conifer swamp at the western edge of GRNA. A total of 109 plant species, 74 native and 35 non-native, were identified in these systems combined, and the total FQI was 24.



Figure 35. An old field/residential area on the GORSUCH H #1B parcel.



Figure 36. An old red pine plantation on the BAGINSKI #1B parcel.

The old field/residential area in the GORSUCH H #1B parcel south of the rail-trail contained large patches of native *Schizachyrium scoparium* (little bluestem), *Dasiphora fruticosa* (shrubby cinquefoil), and *Rubus* spp. bushes (raspberry/blackberry), both favorites of local wildlife for the fruits themselves or the insects that reside there (Figure 37). Unfortunately these areas also contained the invasive *Centaurea stoebe* (spotted knapweed), which often expands to form monocultures in open upland communities.



Figure 37. An old field/residential area dominated by little bluestem in the GORSUCH #1B parcel.

A pond that is isolated from the surface waters of Finch Creek occurs in the old field/residential area on the MILOCK parcels. It is surrounded by an assortment of native, non-native and cultivar species in a small open canopy area, and harbored a variety of wildlife.

Hypopitys monotropa (pinesap) was observed in the plantation in the BAGINSKI parcels. Lacking chlorophyll, this parasitic plant obtains its nutrients from fungi associated with trees in the Pinaceae (Pine) family (Figure 38). The similar *Monotropa uniflora* (Indian-pipe) has only a single flower; the nodding flowers in both species become erect as they mature into fruit. A patch of the non-native *Veronica officinalis* (common speedwell) was also observed in this plantation.



Figure 38. Maturing *Hypopitys monotropa* (pinesap) flowers in the BAGINSKI #1B parcel.

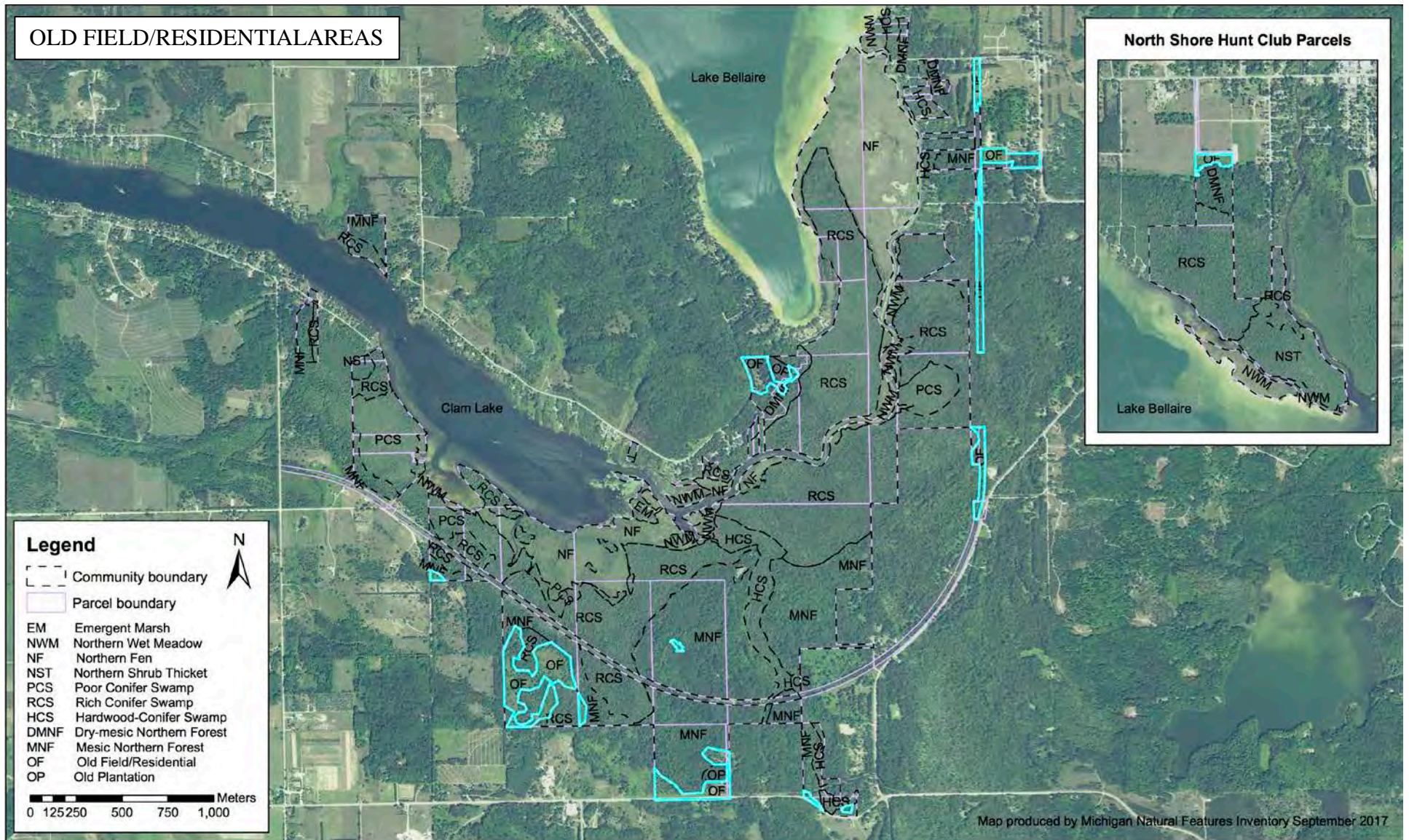


Figure 39. Old field/residential areas delineated within the parcel boundaries of GRNA are highlighted in cyan. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

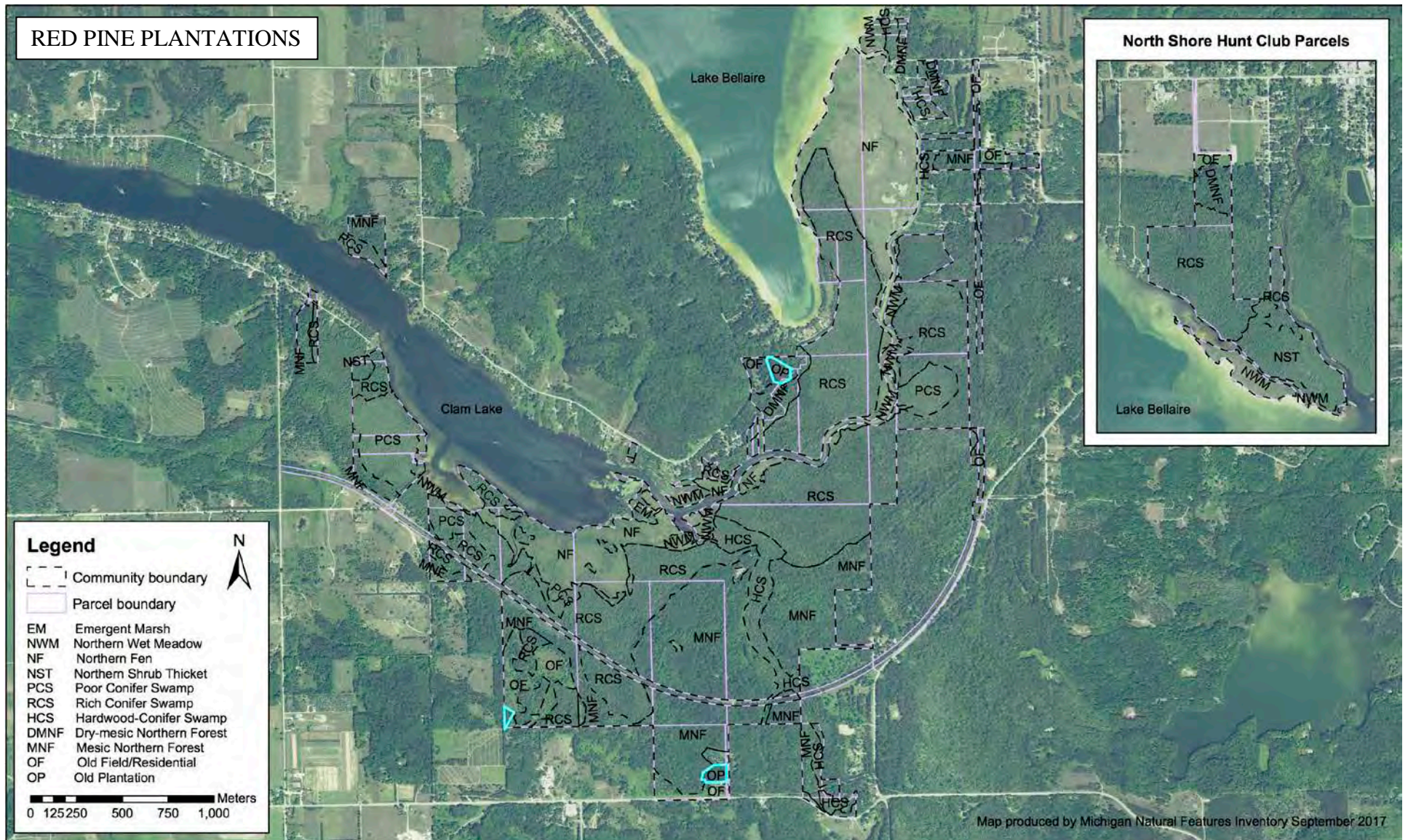


Figure 40. Old red pine plantations delineated within the parcel boundaries of GRNA are highlighted in cyan. The inset in the upper right corner shows the parcels along the North Shore of Lake Bellaire that once belonged to the Hunt Club.

Vernal pools

Vernal pools in Michigan are seasonal wetlands naturally occurring in small, shallow depressions in forested landscapes (Lee, pers. com; Figure 41) They are flooded in the spring and dry most of the rest of the year, although they can occasionally be wet in the fall. They lack a permanent connection to surface water and therefore lack fish. The cyclic nature of these pools allows many animals to breed, brood, and feed annually with less risk of higher level predation. Most vernal pools occur in upland forests where poorly drained or impermeable clay soils retain water at or near the surface for longer periods of time than the surrounding areas. Although vernal pools are best identified when they are wet, there are signs that indicate their presence when they are dry, including: 1) depression(s) in a mostly level and forested landscape, 2) leaves darkened by water stains or film of sediment and/or anoxic decay odors, 3) high water marks on nearby trees, 4) buttressed or stilted tree bases/roots, 5) presence of wetland vegetation in an otherwise upland area, and 6) obvious lack of upland vegetation (Thomas et al. 2010, Marchland 2016).



Figure 41. An example of a vernal pool during spring flooding in southern Michigan. (Photo by Yu Man Lee).

Evidence of vernal pools was observed in both mesic- and dry-mesic northern forests at GRNA, where there were depressions with darkened leaves, buttressed trees with water marks, and a lack of upland vegetation (Figure 42). Occasionally facultative wetland species or mosses were present. Eleven potential vernal pools were mapped (Figure 43). A detailed list by property associated with latitude, longitude and photos is included in Appendix 12. Faunal indicators are

necessary for determination of vernal pools, including breeding evidence of obligate or facultative amphibian species (several mated pairs, egg masses, larvae) or the presence of fairy shrimp (*Eubranchipus* spp.) or clam shrimp (e.g., *Lynceus brachyurus*). Obligate or facultative amphibians include spotted salamander (*Ambystoma maculatum*), blue-spotted salamander (*Ambystoma laterale*), wood frog (*Rana sylvatica*), spring peeper (*Pseudacris crucifer crucifer*), and gray treefrog (*Hyla versicolor*). These can usually only be found in the pools during the spring wet season.



Figure 42. A potential vernal pool in mesic northern forest in the SKINNER #1A parcel.

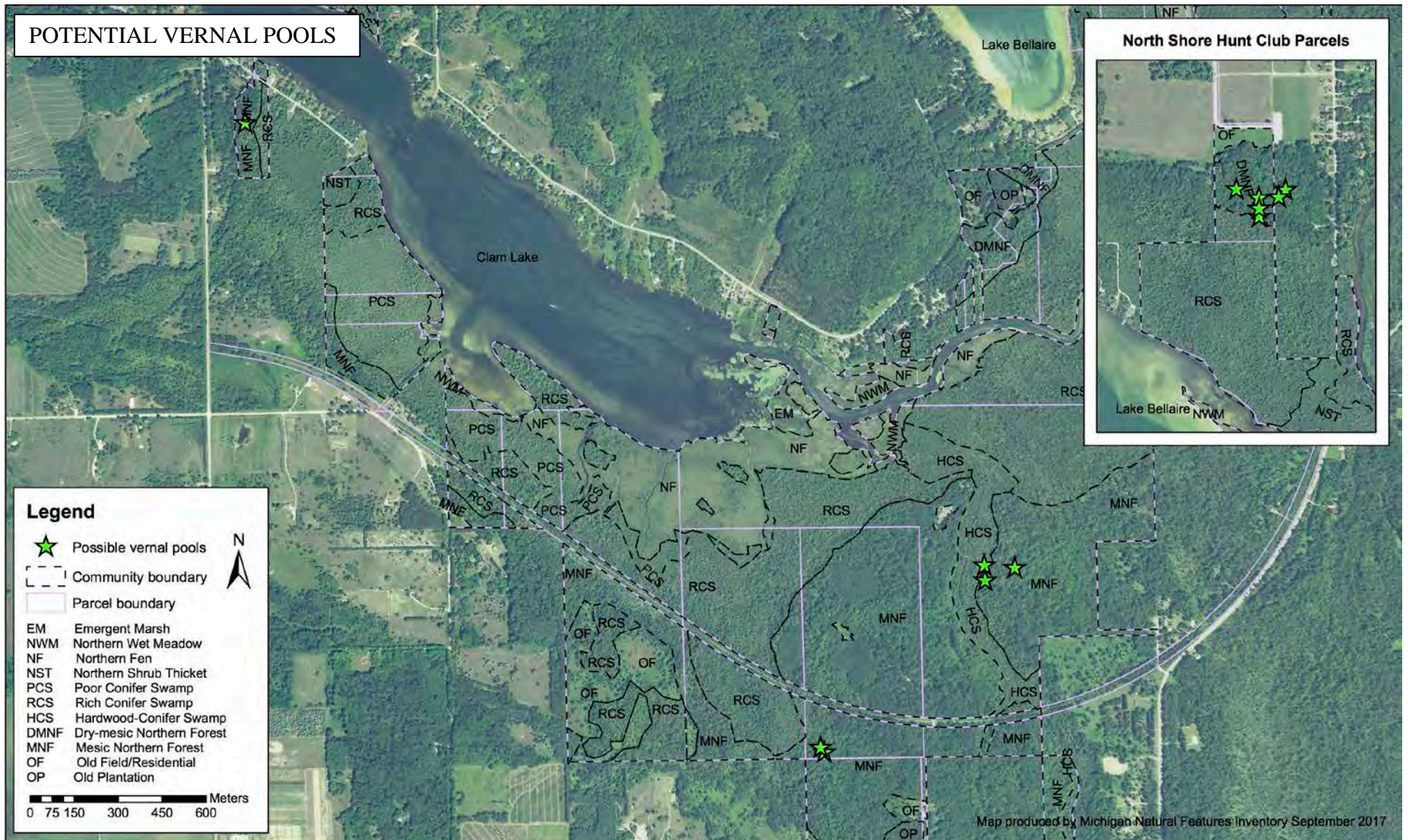


Figure 43. Potential vernal pools delineated within the parcel boundaries of GRNA are highlighted with green stars.

Species Documented

A total of 368 plants were identified to species (Appendix 1). Of that 315 (85.6%) were native and 53 (14.4%) were non-native. Seventy three species (20 %) have C values greater than seven. One suspected occurrence of the rare but recently delisted yellow pitcher plant (Figure 44) was documented in northern fen, but definitive identification requires flowers, which were not present at the time of survey. No federal or state listed plant species were observed during the 2017 surveys. Twenty-six specimens were collected as new Antrim County records (Table 2) and their locations are included in Appendix 13. Three specimens were deposited directly in the University of Michigan (UM) Herbarium and twenty-four (one duplicate) were deposited in the Central Michigan University Herbarium (CMC). The CMU specimens are digitally stored via the Symbiota Consortium of Midwest Herbaria Portal and digitally shared with the UM Herbarium. All verified specimens will be included in the Michigan Flora. An additional county record (*Arethusa bulbosa*) was photographed but not collected due to the small population size (Figure 45), and will be submitted as a photo-record for inclusion in the Michigan Flora.

Table 2. List of 27 new county records documented at GRNA with non-native species in bold.

Scientific Name	Common Name
<i>Arethusa bulbosa</i> *	dragon's mouth
<i>Apocynum cannabinum</i>	Indian-hemp
<i>Berberis thunbergii</i>	Japanese barberry
<i>Carex aquatilis</i>	sedge
<i>Carex buxbaumii</i>	sedge
<i>Carex diandra</i>	sedge
<i>Carex exilis</i> **	sedge
<i>Carex lupulina</i>	sedge
<i>Carex pseudocyperus</i>	sedge
<i>Cirsium vulgare</i>	bull thistle
<i>Dichanthelium depauperatum</i> **	panic grass
<i>Epilobium palustre</i>	marsh willow-herb
<i>Iris pseudacorus</i>	yellow flag
<i>Lonicera morrowii</i>	morrow honeysuckle
<i>Lycopus uniflorus</i>	northern bugle weed
<i>Lysimachia nummularia</i>	moneywort
<i>Phragmites australis</i> subsp. <i>americanus</i>	reed, native phragmites
<i>Picea pungens</i>	blue spruce
<i>Rumex orbiculatus</i>	great water dock
<i>Schoenoplectus tabernaemontani</i>	soft-stem bulrush
<i>Solidago canadensis</i>	Canada goldenrod
<i>Solidago gigantea</i>	late goldenrod
<i>Symphotrichum firmum</i>	smooth swamp aster
<i>Symphotrichum lanceolatum</i>	panicled aster
<i>Typha angustifolia</i>	narrow-leaved cat-tail
<i>Utricularia minor</i> **	small bladderwort
<i>Verbena hastata</i>	blue vervain

*Submitted by photo-record **Collected by Liana May; remainder by Rachel Hackett.



Figure 44. The suspected *Sarracenia purpurea* f. *heterophylla* (yellow pitcher plant) lacks the purple pigment in the leaves of the more common *S. purpurea*. It was photographed in northern fen in the GORSUCH H #1B parcel.

Many other native species of interest were found (Table 3), including ten orchids, seven carnivorous plants, one parasitic plant, several coral fungi and native phragmites. Appendix 14 provides a list of these species and their locations.

Table 3. Native species of interest documented during surveys.

Scientific name	Common name	Type	Obs.
<i>Arethusa bulbosa</i>	dragon's mouth	orchid	1
<i>Calopogon tuberosus</i>	grass-pink	orchid	1
<i>Clavulinopsis</i> spp. likely <i>C. fusiformis</i>	yellow coral fungus	coral fungus	5
<i>Corallorhiza trifida</i>	early coralroot orchid	orchid	1
<i>Cypripedium parviflorum</i>	yellow lady-slipper	orchid	4
<i>Cypripedium reginae</i>	showy pink lady-slipper	orchid	1
<i>Drosera rotundifolia</i>	round-leaf sundew	carnivorous	6
<i>Goodyera pubescens</i>	downy rattlesnake plantain	orchid	1
<i>Hypopitys monotropa</i>	pinemap	parasitic	1
<i>Phragmites australis</i> subsp. <i>americanus</i>	native reed/phragmites	native	1
<i>Platanthera huronensis</i>	Lake Huron green orchid	orchid	1
<i>Platanthera psycodes</i>	purple fringed orchid	orchid	15
<i>Pogonia ophioglossoides</i>	rose pogonia	orchid	3
<i>Ramariopsis kunzei</i> (likely)	white coral fungus	coral fungus	1
<i>Sarracenia purpurea</i>	pitcher plant	carnivorous	20
<i>Sarracenia purpurea</i> f. <i>heterophylla</i> *	yellow pitcher plant	carnivorous	1
<i>Spiranthes cernua</i>	nodding ladies-tresses	orchid	10
<i>Utricularia cornuta</i>	horned bladderwort	carnivorous	2
<i>Utricularia minor</i>	small bladderwort	carnivorous	1
<i>Utricularia intermedia</i>	flat-leaved bladderwort	carnivorous	1
<i>Utricularia vulgaris</i>	common bladderwort	carnivorous	1

*Requires confirmation when flowers are present.



Figure 45. *Arethusa bulbosa* (dragon's mouth) was observed in rich conifer swamp. Photo by Liana May.

Threats

Invasive Species

Of the 53 non-native species documented during surveys, 18 pose the highest threat to the ecological integrity of the natural communities at GRNA. These are listed in Table 4 with their acronyms and the natural and/or anthropogenic system they were observed in. A detailed list of these species and their coordinates are provided in Appendix 15. Point locations that were captured are shown in Figure 46.

Table 4. Invasive species of highest concern documented. The natural community acronyms are provided in Table 1 on page 8.

Scientific name	Common name	Acronym	Natural Community
<i>Alliaria petiolata</i>	garlic mustard	ALLPET	RCS (edge)
<i>Berberis thunbergii</i>	Japanese barberry	BERTHU	RCS, DMNF
<i>Centaurea stoebe</i>	spotted knapweed	CENSTO	ANTH
<i>Cirsium arvense</i>	Canada thistle	CIRARV	ANTH
<i>Cirsium palustre</i>	marsh thistle	CIRPAL	NWM, NF, RCS, HCS, MNF, ANTH
<i>Cirsium vulgare</i>	bull thistle	CIRVUL	ANTH
<i>Elaeagnus umbellata</i>	autumn olive	ELAUMB	NWM, NF, PCS, RCS, HCS, MNF, ANTH
<i>Euphorbia virgata</i>	leafy spurge	EUPVIR	NST (edge), ANTH
<i>Iris pseudacorus</i>	yellow flag	IRIPSE	NWM, NF, RCS
<i>Lonicera morrowii</i>	morrow honeysuckle	LONMOR	MNF, ANTH
<i>Lonicera xbella</i>	hybrid honeysuckle	LONBEL	MNF
<i>Lysimachia nummularia</i>	moneywort	LYSNUM	HCS
<i>Lythrum salicaria</i>	purple loosestrife	LYTSAL	NWM
<i>Myosotis scorpioides</i>	forget-me-not	MYOSCO	RCS, HCS
<i>Phalaris arundinacea</i>	reed canary grass	PHAARU	RCS, HCS
<i>Phragmites australis</i> subsp. <i>australis</i> *	Eurasian phragmites	PHRAUS	EM
<i>Rosa multiflora</i>	multiflora rose	ROSMUL	RCS
<i>Typha angustifolia</i>	narrow-leaved cat-tail	TYPANG	EM, NWM, NF, RCS

*Not on GRNA properties, but in the adjacent Clam Lake.

Typha angustifolia (narrow-leaved cat-tail) was the most commonly observed invasive species during surveys. There were several dense patches in the southern fen near the Sedge Meadow Boardwalk Loop and near the southeastern portion of Clam Lake. Otherwise it was sparsely scattered in emergent wetlands bordering the Grass River, and was occasionally observed further inland in conifer swamps. Notably, it was absent in the large northern fen island at the southeast end of Lake Bellaire. Several suspected hybrid cat-tail specimens were collected and examined. They were determined to have morphological characteristics of narrow-leaved cat-tail (eFloras 2008; Reznicek et al. 2011); however, genetic testing is required for definitive identification.

Phalaris arundinacea (reed canary grass) was observed occasionally in rich conifer swamp, hardwood-conifer swamp and mesic northern forest. This species is considered native to Michigan, however, it has intermixed with introductions from Europe (Reznicek et al. 2011), and

occurs as an invasive weed across much of Michigan's landscape. It is referred to as an invasive species in this report.

Cirsium palustre (marsh thistle) was observed occasionally in northern wet meadow, northern fen, rich conifer swamp, hardwood-conifer swamp, mesic northern forest, along the rail-trail and in old field. *Cirsium vulgare* (bull thistle) was observed primarily along ditches along the rail-trail where it was rare to occasional. *Cirsium arvense* (Canada thistle) was observed occasionally in old fields and along trails.

Lythrum salicaria (purple loosestrife) was observed only on the SPEET parcel within GRNA, but also on several parcels adjacent to GRNA along Clam Lake. *Iris pseudacorus* was observed occasionally along the Grass River in northern wet meadow and northern fen.

Lysimachia nummularia (moneywort) and *Myosotis scorpiodes* (forget-me-not) invade swamps as creeping ground covers on the forest floor. Moneywort was abundant in the ABS#1 parcel and the ABS #2 and SWAN parcels adjacent to Willow Day Park, but was not observed in any other areas. Forget-me-not was found in these same parcels and in several other areas of rich conifer swamp on the eastern and southern portions of GRNA. These parcels had a disproportionate number of non-native species compared to other areas of GRNA.

Only two occurrences of *Euphorbia virgata* (leafy spurge) and one of *Alliaria petiolata* (garlic mustard) were observed during these surveys. Leafy spurge was noted on the rail-trail and on the NSHC #1 parcel on the shore of Lake Bellaire. Garlic mustard was observed in the SKINNER parcel along the border of rich conifer swamp.

Centaurea stoebe (spotted knapweed) was common in portions of the old field/residential areas, and occurred occasionally along the rail-trail.

Five invasive shrub species were noted in GRNA. *Elaeagnus umbellata* (autumn-olive) was observed rarely in northern wet meadow and northern fen, and occasionally in mesic northern forest and forested wetlands. *Berberis thunbergii* (Japanese barberry) was occasionally observed in rich conifer swamp and dry-mesic northern forest. *Rosa multiflora* (multiflora rose) was observed near the Woodland Boardwalk in rich conifer swamp. Large shrubs of *Lonicera morrowii* (morrow honeysuckle) were observed in old fields, and smaller shrubs were observed infrequently in mesic northern forest. *Lonicera xbella* was observed occasionally in mesic northern forest bordering lands adjacent to GRNA.

Although not observed on GRNA property, the invasive *Phragmites australis subsp. australis* (Eurasian phragmites) was observed along the neighboring shores of Clam Lake.

The 35 other non-native species documented during this inventory are of less immediate concern to the high quality wetlands of GRNA. They are listed in Table 5 along with the natural communities they were found in.

Table 5. Non-native species of less immediate concern documented at GRNA. The natural community abbreviations are shown in Table 1 on page 8.

Scientific name	Common name	Natural Community
<i>Agrostis gigantea</i>	redtop	MNF, ANTH
<i>Berteroa incana</i>	hoary alyssum	RCS, DMNF, ANTH
<i>Bromus inermis</i>	smooth brome	ANTH
<i>Dactylis glomerata</i>	orchard grass	ANTH
<i>Daucus carota</i>	wild carrot	ANTH
<i>Dianthus armeria</i>	deptford pink	ANTH
<i>Elymus repens</i>	quack grass	ANTH
<i>Epilobium parviflorum</i>	willow-herb	RCS
<i>Epipactis helleborine</i>	helleborine	MNF
<i>Hieracium aurantiacum</i>	orange hawkweed	NF, RCS, HCS, MNF, ANTH
<i>Hieracium caespitosum</i>	king-devil, yellow hawkweed	NF, RCS, HCS, ANTH
<i>Hieracium piloselloides</i>	king-devil	NF
<i>Hypericum perforatum</i>	common St. john's-wort	RCS, ANTH
<i>Leucanthemum vulgare</i>	ox-eye daisy	NF, ANTH
<i>Medicago lupulina</i>	black medic	ANTH
<i>Melilotus albus</i>	white sweet-clover	ANTH
<i>Mentha x piperita</i>	peppermint	NWM
<i>Phleum pratense</i>	timothy	NF, ANTH
<i>Ranunculus acris</i>	tall buttercup	NF, RCS
<i>Rumex acetosella</i>	sheep sorrel	NF, RCS, ANTH
<i>Rumex obtusifolius</i>	bitter dock	ANTH
<i>Picea pungens</i>	blue spruce	MNF, ANTH
<i>Plantago lanceolata</i>	English plantain	ANTH
<i>Plantago major</i>	common plantain	ANTH
<i>Poa compressa</i>	Canada bluegrass	NF, ANTH
<i>Poa pratensis</i>	Kentucky bluegrass	NF, ANTH
<i>Populus alba</i>	white poplar	NWM
<i>Potentilla recta</i>	rough-fruited cinquefoil	ANTH
<i>Solanum dulcamara</i>	bittersweet nightshade	NWM, RCS, HCS, MNF
<i>Stellaria media</i>	common chickweed	NF, ANTH
<i>Taraxacum officinale</i>	dandelion	RCS, MNF, ANTH
<i>Tragopogon pratensis</i>	common goats beard	ANTH
<i>Trofolium pratense</i>	red clover	ANTH
<i>Verbascum thapsus</i>	common mullein	ANTH
<i>Veronica arvensis</i>	corn speedwell	RCS
<i>Veronica officinalis</i>	common speedwell	MNF, ANTH
<i>Vicia villosa</i>	hairy vetch	ANTH

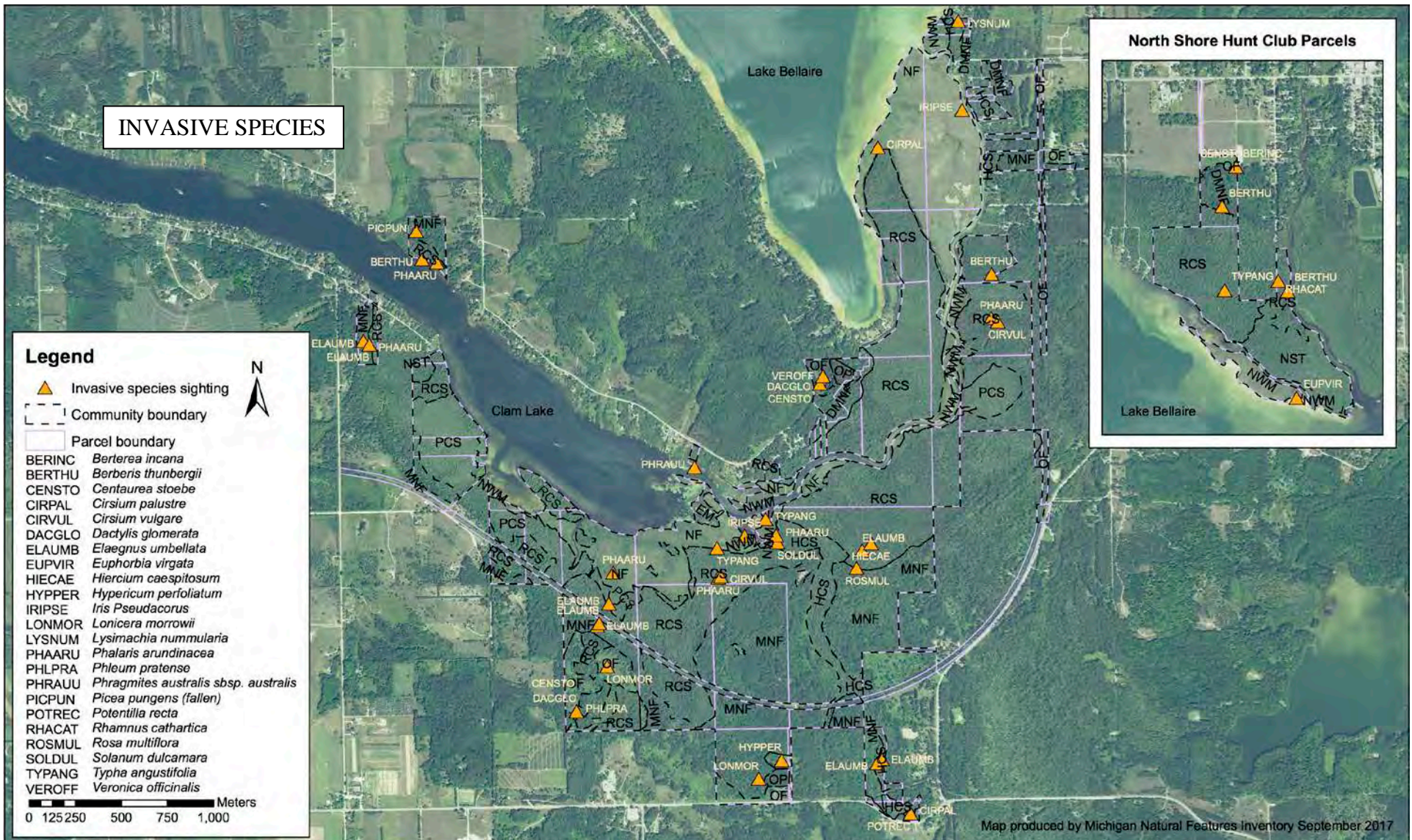


Figure 46. Invasive species mapped in GRNA during 2017 surveys. Comprehensive invasive species surveys were not conducted for this study.

Nutrient loading

There are many residential parcels near GRNA, along Lake Bellaire, Grass River, and Clam Lake with lawns that are mowed to the waterfront or that have other unnatural shorelines, such as seawalls and large rocks brought in from elsewhere and deposited. In addition, the 1983 report (ER Squiers & Associates) suggested that agricultural and/or domestic wastes may be entering the system from upstream sources. Nutrient run-off is typically higher from unnatural shorelines and high nutrient levels have been implicated in facilitating the establishment and persistence of some invasive species, such as Eurasian phragmites.

Groundwater contamination

Groundwater flows differently than the surface water of a watershed, and it is possible that areas outside of a watershed area could affect the water quality of groundwater-fed wetlands at GRNA. The MDEQ Environmental Mapper showed several documented land use restrictions and environmental management concerns in the watersheds surrounding GRNA, Lake Bellaire, and Clam Lake. They are described below.

Land use restrictions

There were three land use restriction sites in Bellaire, Michigan, two from the Lamina, Inc. (1999, 2000), and one from Woodland Oil Bellaire Bulk Plant (2000). The owners of those areas are prohibited from use of groundwater on that property and excavation without proper permits. Possible contaminants to the groundwater from those sources included copper, cyanide, trichloroethylene (TCE), and tetrachloroethylene (PCE) from the Lamina, Inc. site, and various petroleum products from Woodland Oil Bellaire Bulk Plant.

Underground storage tanks

There were eight documented underground storage tanks: six have been closed and two were documented as open. Contaminants of concern included gasoline or diesel fuel. The two open underground storage tanks were Bay Oil Co. (gasoline) and Derrer Oil and Son Co. (diesel fuel).

Environmental contamination

There were six sites documented for environmental contamination (Table 6). Most contamination appears to be shallow releases of volatile compounds in locations where they would be released in surface water before reaching groundwater-fed wetlands.

Abandoned wells

What appeared to be an open, abandoned, hand dug well was located in the GAGE parcel (44.90311883, -85.2156887) during surveys. Abandoned wells can cause injury to animals and pose a threat to water quality by providing a direct entry point for surface contaminants to reach groundwater aquifers. The Michigan Department of Environmental Quality has more information and resources to locate and seal abandoned wells.

(http://www.michigan.gov/deq/0,4561,7-135-3313_3675_3689---,00.html).

Table 6. Six sites of environmental contamination near GRNA property that were documented on the Michigan Department of Environmental Quality Environmental Mapper online tool.

Address	City	Contaminant
206 South Beech St	Bellaire	Selenium
East Broad St	Bellaire	1,2,4-trimethylbenzene, xylenes
3650 Derenzy Rd	Bellaire	Copper
7837 Crystal Springs Rd	Helena Twp.	fuel oil
East off Cemetery Rd, North of Westwood	Rapid River	not listed
US 131	Mancelona	2,4-dimethylphenol, benzene, ethylbenzene, phenol, toluene, xylenes, alkyl phenols

Discussion and Recommendations

Natural Communities

The open wetland communities, emergent marsh, northern wet meadow and northern fen, are in good condition with many signs of wildlife usage and few current threats. They appear to have experienced the least anthropogenic impacts in GRNA and retain species and structure characteristic of their reference communities. They are also subject to the natural processes that historically shaped them, with the exception of fire in the wet meadow and northern fen.

Northern wet meadow and northern fen have particularly high native species richness (115, 156) and total FQI values (55.5, 65.2). These FQIs are above the threshold value of 50 indicating they are of considerable biodiversity value to the state and worthy of protection. Emergent marsh has lower native species richness (19) and an FQI of only 22.7; however, surveys were limited to GRNA parcel boundaries and did not focus on submergent species. Also, native species comprise 94.7% of the total emergent marsh species with only one invasive species observed.

Northern fen spans 158 acres of GRNA and qualifies as an A/B ranked natural community to be included in Biotics. It is the second largest of 31 northern fen EOs in northern Lower Michigan and one of only six in the region with an A/B rank (Figure 47). The open wetlands should be prioritized for protection and monitored for threats, such as hydrologic alteration, disturbance by recreational activities and spread of invasive species, particularly in the Clam Lake region. Due to the large acreage of northern fen in GRNA, the difficulty of accessing portions of it and the short survey windows of this study, further survey is warranted to fully capture its ecological history and diversity, as well as potential threats that could influence the A/B/ ranking.

The presence of native phragmites in northern wet meadow and northern fen is notable in light of the devastating invasions of the invasive Eurasian phragmites in many parts of the state. Although not observed on GRNA property, Eurasian phragmites was observed nearby along the shores of Clam Lake. Keeping the native phragmites occurrences in GRNA isolated from Eurasian phragmites is important not only for the wetlands themselves, but also for sustaining the genetic diversity and viability of this taxon in Michigan.

Due to significant alterations from reference conditions through logging, fragmentation and or suppression of natural processes such as fire (Figure 48), the surrounding natural communities do

not meet criteria for EO status; however, they cover significant acreage, and harbor significant biological diversity and wildlife habitat. Except for dry-mesic northern forest, the percentages of native species are all greater than 90% and the abundance of invasive species is remarkably low. Rich conifer swamp covers the largest acreage (503) and has the highest species richness and FQI values (207; 69.1) of all of the natural communities surveyed during this study. It is well above the threshold for natural area status and protection. The FQIs of poor conifer swamp (46) and hardwood conifer swamp (39.4) are well above the threshold of 35, indicating they are of floristic importance to the state. Together, these forested wetland communities provide a substantial buffer for the high quality open wetlands along the Grass River and Clam Lake. The dry-mesic and mesic upland forests are the most altered from reference conditions in composition, structure, and natural processes, but, have remarkably low invasive species abundance.

Taken as a whole, the natural communities at GRNA comprise a significant biodiversity hotspot amidst a highly fragmented landscape that is highly deserving of its status and protection as a natural area.

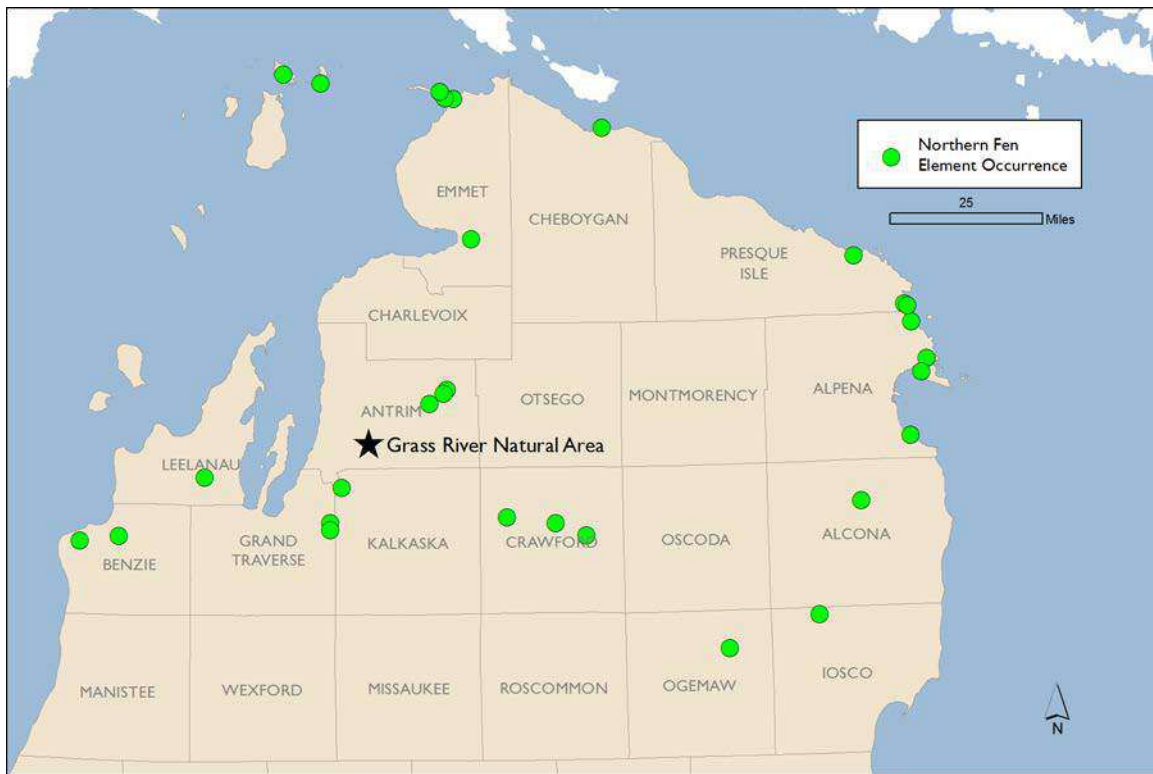


Figure 47. Northern fen occurrence documented in GRNA is the second largest of 31 northern fen element occurrences in northern Lower Michigan.

Anthropogenic Systems

The old field/residential areas are highly fragmented and altered from historical conditions and are a source of numerous weedy and invasive species, including the highly invasive *Centaurea stoebe* (spotted knapweed). There are some large pockets of *Schizachyrium scoparium* (little bluestem), native forbs and shrubs of interest to wildlife, however, these represent novel

ecosystems for the area. It is recommended that specific management goals be determined for these areas. Of greatest concern is keeping the many weedy and invasive species from spreading to higher quality areas.



Figure 48. 1938 aerial imagery showing extensive cutting of both upland and lowland forests in GRNA and the surrounding environment.

Species Documented

Three hundred and sixty-eight species were documented within GRNA, including 170 species that were not documented in the 1983 study and 27 new Antrim County records. Among the new species were 12 invasive species (Table 7) and 49 graminoids in the Poaceae (grass) and

Cyperaceae (sedge) families. One hundred and nine species were documented in 1983 that were not observed during the current study. The majority of these are likely to be found with additional survey, particularly during early spring in forested uplands and in submergent marsh zones, which were not the focus of this study. The addition of 170 species to the flora of GRNA and collection of 27 new county records is a substantial contribution to the state, both regionally and statewide.

Table 7. Invasive species newly documented since the 1983 (ER Squiers & Assoc.) study of GRNA.

Scientific Name	Common Name	Scientific Name	Common Name
<i>Alliaria petiolata</i>	garlic mustard	<i>Euphorbia virgata</i>	leafy spurge
<i>Berberis thunbergii</i>	Japanese barberry	<i>Lonicera morrowii</i>	morrow honeysuckle
<i>Centaurea stoebe</i>	spotted knapweed	<i>Lonicera xbella</i>	hybrid honeysuckle
<i>Cirsium arvense</i>	Canada thistle	<i>Lysimachia nummularia</i>	moneywort
<i>Cirsium vulgare</i>	bull thistle	<i>Lythrum salicaria</i>	purple loosestrife

Rare species

Of the five special concern (SC) species documented in 1983, four are no longer listed (dragon’s mouth, *Diphasiastrum complanatum* (ground cedar), yellow lady-slipper and *Chimaphila umbellata* (pipsissewa). One *Cuscuta* (dodder) was not keyed to species and therefore its rarity cannot be determined. *Vaccinium vitis-idaea* (mountain-cranberry), which was reported as a state threatened plant (T) in 1983, is a circumpolar arctic-subarctic species that is now listed as state endangered and is otherwise known only from Isle Royale in Michigan. Its noted occurrence in 1983 was likely a misidentification. One suspected occurrence of yellow pitcher plant was documented in GRNA in 2017, but requires flowers for confirmation. Although it is no longer a listed species in Michigan, if confirmed, it will be one of only a few reported occurrences of this form of pitcher plant in the state.

No federal or state-listed plants were observed, however, the approximately 500 acres of rich conifer and hardwood-conifer swamps documented provide potentially suitable habitat for *Calypso bulbosa* (calypso orchid, T) and *Cypripedium arietinum* (ram’s head orchid, SC). Both of these species have been documented in Antrim County. The *Pterospora andromedea* (pine-drops) reported in the 1983 study was not observed during the 2017 study, and is now listed as a state threatened species. It typically occurs in fairly dry soils in association with pine and other conifers species and could still persist at GRNA. Other rare species that could be sought *Berula erecta* (cut-leaved water parsnip, SC), *Gymnocarpium robertianum* (limestone oak fern, T) and *Mimulus michiganensis* (Michigan monkey-flower; federal and state endangered [LE, E]). Several animals could be targeted as well, including *Somatochlora hineana* (Hine’s emerald dragonfly, LE, E), *Accipiter gentilis* (northern goshawk, SC), *Buteo lineatus* (red-shouldered hawk, T), *Emydoidea blandingii* (Blanding’s turtle, SC) and *Sistrurus catenatus* (eastern massasauga, T).

Invasive Species

The 18 invasive species of high concern (Table 4) were found mostly in low abundance, providing an invaluable window of opportunity to address them before they become more widespread. It is recommended that they be surveyed and mapped, prioritized and managed as soon as possible to prevent ecosystem degradation and to minimize costs and maximize success

of control efforts. Management should focus on eradicating outliers where possible and preventing their spread in the highest quality and most valued areas. Mapping is essential to effective prioritization, by providing information on sources, outliers, and pathways so that control efforts can be directed to the most important places where success is likely to be achieved, instead of randomly or ineffectively. Thorough invasive species surveys were not within the scope of the current study, thus the mapped points do not likely represent the full picture of their distribution at GRNA. However, they do provide some guidance for next steps.

Open wetland invaders

Narrow-leaved cat-tail is the species of most immediate threat to the high quality open wetlands. This species spreads quickly, often forming near-monocultures that displace native species. It also hybridizes with the native common cat-tail producing an even more aggressive hybrid, *Typha xglauca* (hybrid cat-tail). Common cat-tail is prevalent in GRNA and hybridization with narrow-leaved cat-tail is likely without intervention. Preventing Eurasian phragmites from reaching GRNA from Clam Lake and preventing further spread of reed canary grass, purple loosestrife, marsh thistle and yellow-flag in these wetlands are also high priorities.

Early detection species

Rapid assessment and response to eradicate or contain garlic mustard, leafy spurge and purple loosestrife, which appear to be quite rare at GRNA, is another high priority. While not a threat to the open wetlands, garlic mustard will inevitably spread throughout the mesic northern forest and some of the forested wetlands if not checked. It is critical to prevent the development of a seed bank, as seeds are known to be viable for ten or more years. Leafy spurge will spread through the open uplands and even into some wet pockets. It forms deep, persistent roots that are extremely difficult to extract and will regenerate from root fragments. Purple loosestrife is a well-known invader that has been controlled effectively with biocontrol. However, small populations don't usually support the beetle and weevil populations that eat various parts of the plant, and control by other techniques is sometimes warranted.

Shrubs

Multiflora rose is a persistent perennial and due to its sharp, down-curved thorns, it can make normally open areas untraversable. The thorny Japanese barberry can do the same thing, although it is often not on the radar of land managers. Both species can persist as 'sleepers' for many years before they expand, and are often overlooked when they can be most easily controlled. Expansion of the invasive honeysuckles and autumn olive will also form impenetrable thickets. All of these shrubs change the structure and composition of the forest, altering or displacing habitat for native species. They produce abundant berries which are dispersed readily by birds, deer, turkey, and grouse. They typically don't thrive in full canopy, thus focusing on the outliers and pushing them back towards their sources, along with monitoring canopy openings is often an effective tactic to minimize their spread.

More thorough surveys may determine that multiflora rose, non-native honeysuckles and Japanese barberry, are rare enough for targeted early detection response—treat every occurrence as soon as possible to prevent them from becoming a significant problem. Autumn olive appears to be more widespread and will likely require prioritization, with a focus on protecting the most

valued areas. A better understanding of the distribution of outliers, sources and pathways will help in determining the most effective strategy.

Intensive detection monitoring for *Rhamnus cathartica* (common buckthorn) and *Alnus frangula* (glossy buckthorn), which, surprisingly, were not observed during this study, is recommended. The establishment and spread of these species, is extremely undesirable, particularly glossy buckthorn, which would be devastating to the high quality northern wet meadow and northern fen areas.

Thistles

The thistles are challenging due to their abundant wind-blown seed and prickly nature. Marsh thistle is currently the biggest concern, as it already occurs sporadically throughout both the open and forested wetlands. There is little data on the overall impacts of this species but it is becoming increasingly more common in wetlands throughout northern Michigan. It is a monocarpic biennial, which takes 2-3 years to flower and then dies. Thus, the focus for this species is to kill it before the flowers go to seed—noting that it can flower more than once during a season. It is thought to be somewhat shade-intolerant, so minimizing and monitoring canopy gaps will likely be helpful. Bull-thistle was observed near creeks in rich conifer swamp and in ditches along the rail-trail. It is not a threat to the open wetlands, but can establish dense patches in disturbed openings. Like marsh thistle, it dies after flowering. Canada thistle was only noted in old fields and occasionally along the rail-trail, but it can establish in northern wet meadows and possibly northern fen. Unlike the marsh and bull thistle it is a perennial that establishes deep tap roots and extensive lateral roots that generate new plants and will regenerate if fragmented—nipping the flowers before going to seed does not kill the plant. Early control of this species is essential to keep it from degrading the high quality open wetlands.

Swamp ground creepers

Long-term ecological impacts from moneywort and forget-me-not have yet to be determined (GLANSIS, 2014). However, due to many occurrences of these species that appear to be dominating and displacing native species in wetland seeps, including at least one where state and federal endangered Michigan monkey-flower occurs (Slaughter 2015), they are included in the list of invasive plants for GRNA. Determining the extent of these species and assessing their risk based upon GRNA management goals is recommended. It will be important to stay abreast of research on the ecological impacts and best control methods for these species.

Spotted knapweed

Unlike the uncommon occurrences of most invasive species at GRNA, spotted knapweed is well established in some of the anthropogenic systems. It is intolerant of shade and water and therefore not a direct threat to the high quality wetlands. Control efforts are best directed towards monitoring and eradicating outliers along foot trails, the rail-trail and forest openings. Where it is well established, it is best to control it only as part of a carefully considered, integrated management plan with specific management goals and monitoring to inform future management. It is important to note that prescribed burning may reduce non-native cool season grasses in favor of warm season grasses such as *Schizachyrium scoparium*, but fire alone does not control spotted knapweed and can increase its spread (Dewey 2000, Rice and Harrington 2005).

Other non-native species

The 35 other non-native species are of less immediate concern to the high quality wetlands at GRNA, however, they it is important to keep them on the radar and monitor for potential future impacts. Many of these can be invasive under certain conditions and may warrant treatment based upon specific management priorities and goals.

Invasive Species Decontamination Protocols

Due to the relatively low abundance and localized occurrences of many of the invasive species at GRNA, one of the most effective actions that can be implemented is to stop their spread by people. Seeds and other propagules are easily spread through recreational activities, vehicles, boats and equipment. Developing protocols for minimizing the spread of invasive species is a high priority. Sources of information that can be helpful include the Play-Clean-Go and Clean Boats-Clean Waters programs and decontamination policy and procedure and guidance documents recently developed State of Michigan:

<http://www.playcleango.org/>

http://www.canr.msu.edu/clean_boats_clean_waters/

https://www.michigan.gov/documents/deq/qol-wrd-policy-invasive-species-decontamination_476846_7.pdf

Particular attention should be paid to those residential properties with a higher abundance of invasive species, as the risk of spread from these areas is high. The ABS #1, ABS #2, SWAN, SKINNER, SPEET properties near Clam Lake, and the NOLD properties all had higher abundance of invasive species, such as autumn olive. The SPEET property contained the only occurrences of purple loosestrife and the SKINNER property contained the only occurrence of garlic mustard documented during this study. Outreach and education to these landowners would be useful to minimize these invasion pathways. Installing boot brushes at strategic locations would be an effective reminder of how people contribute to invasions and an effective tool for reducing their spread.

Shoreline Habitat

To reduce the threat of nutrient run-off and increase habitat for animals such as turtles and otters, it would be beneficial to support local efforts to educate landowners about the negative impacts of nutrient run-off and the benefits of restoring natural shorelines using native species. Natural shorelines are more effective at intercepting nutrients and toxins before they reach the waters of rivers, lakes and streams. Useful sources of information are the Michigan Inland Lakes Shoreline partnership and the Michigan Natural Shoreline Partnership:

<http://www.mishorelinepartnership.org/>

http://michiganlakes.msue.msu.edu/michigan_natural_shoreline_partnership

In addition, native species provide greater benefits to wildlife through their entire life cycle, unlike many non-native species. For example, some non-native species provide good nectaring resources for adult pollinators, but are toxic to their larva. Douglas Tallamy has documented the dramatic difference that native species have in supporting the tremendous diversity of native insects that are essential for baby birds (Tallamy 2009, Darke & Tallamy 2014). Baby birds are picky and voracious eaters. Loss of the native insects they require, by displacement of their native food sources and host plants by non-native species, affects the entire food chain.

Groundwater Contamination & Water Quality

The 1983 study (ER Squiers & Associates) indicated that the majority of soils found within GRNA are not suitable for septic drains and are vulnerable to surface water contamination. They noted that while the groundwater aquifers directly beneath GRNA are classified as ‘protected’ from surface contamination, those to the south and east of GRNA are ‘vulnerable’. They cited a 1979 report that listed the northern portion of the Grass River directly adjacent to GRNA, as an on-site problem area, stemming from on-site wastewater disposal in an area of high water table. Assessing water quality and groundwater contamination was beyond the scope of this study, however, the information retrieved from the MDEQ Environmental Mapper revealed several areas of potential concern. Since the natural communities of greatest proportion at GRNA are groundwater fed, a thorough assessment of current or future risks of water quality degradation and groundwater contamination is recommended. The abandoned well discovered during this study and any others should be properly closed to prevent contamination from that source and to prevent injury to animals.



Figure 49. *Platanthera huronensis* (Lake Huron green orchid) in northern fen in the GORSUCH H #1E parcel. Photo by Phyllis Higman.

Acknowledgements

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Figure 50. *Cypripedium parviflorum* (yellow lady-slipper) in northern fen in the DELANGE #1B parcel.

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Cypripedium reginae (showy lady-slipper) was found in northern fen and rich conifer swamp in GRNA.

Appendix 1. Grass River Natural Area - Floristic Quality Assessment: All Communities

Grass River Natural Area 2017

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett, Liana May, Phyllis Higman

Duration Notes: Surveys were conducted 9 June 2017 (Liana May), from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: The majority of the properties are rich conifer swamp, mesic northern forest, and northern fen. Other natural communities include emergent marsh, northern wet meadow, northern shrub thicket, poor conifer swamp, hardwood-conifer swamp, dry-mesic northern forest, and old fields/residential/red pine plantations.

Twenty-seven new county occurrence specimens were collected. Those collected by Rachel Hackett (24) will be deposited in Central Michigan University Herbarium (CMC), digitally stored via the Symbiota Consortium of Midwest Herbaria Portal, and sent to University of Michigan Herbarium for inclusion in Michigan Flora. Three specimens collected by Liana May will be deposited in the University of Michigan Herbarium for inclusion in Michigan Flora.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation: *Cardamine* spp., *Dryopteris* spp., *Eleocharis* spp., *Fraxinus* spp. saplings (*F. americana* likely), *Geum* spp., *Lonicera* spp., Lycopodiaceae, *Populus* spp. saplings, *Quercus* hybrid with one parent likely *Q. macrocarpa*, *Quercus* spp. saplings, and *Viola* spp.

Dichanthelium implicatum in Michigan Flora has the accepted name of *Dichanthelium acuminatum* via tropicos.org.

Conservatism-Based Metrics:		Species Richness:		Duration Metrics:	
Total Mean C:	4.3	Total Species:	368 85.60%	Annual:	14 3.80%
Native Mean C:	5.0	Native Species:	315 14.40%	Perennial:	344 93.50%
Total FQI:	82.5	Non-native Species:	53	Biennial:	10 2.70%
Native FQI:	88.7	Species Wetness:		Native Annual:	8 2.20%
Adjusted FQI:	46.3	Mean Wetness:	-1.0	Native Perennial:	305 82.90%
% C value 0:	16.3	Native Mean Wetness:	-1.6	Native Biennial:	2 0.50%
% C value 1-3:	20.4	Physiognomy Metrics:		Physiognomy Metrics:	
% C value 4-6:	42.9	Tree:	25 6.80%	Sedge:	49 13.30%
% C value 7-10:	20.4	Shrub:	49 13.30%	Rush:	3 0.80%
Native Tree Mean C:	4.0	Vine:	9 2.40%	Fern:	26 7.10%
Native Shrub Mean C:	5.3	Forb:	178 48.40%	Bryophyte:	0 0%
Native Herbaceous Mean C:	5.1	Grass:	29 7.90%		

Species:

Grass River Natural Area 2017

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Abies balsamea</i>	Pinaceae	ABIBAL	native	3	0	tree	perennial	balsam fir
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Acer saccharum</i>	Sapindaceae	ACESAU	native	5	3	tree	perennial	sugar maple
<i>Achillea millefolium</i>	Asteraceae	ACHMIL	native	1	3	forb	perennial	yarrow
<i>Adiantum pedatum</i>	Pteridaceae	ADIPED	native	6	3	fern	perennial	maidenhair fern
<i>Agalinis purpurea</i>	Orobanchaceae	AGAPUR	native	7	-3	forb	annual	purple false foxglove
<i>Agrostis gigantea</i>	Poaceae	AGRGIG	non-native	0	-3	grass	perennial	redtop
<i>Agrostis perennans</i>	Poaceae	AGRPER	native	5	3	grass	perennial	autumn bent
<i>Agrostis scabra; a. hyemalis</i>	Poaceae	AGRSCA	native	4	0	grass	perennial	ticklegrass
<i>Alliaria petiolata</i>	Brassicaceae	ALLPET	non-native	0	3	forb	biennial	garlic mustard
<i>Allium tricoccum</i>	Alliaceae	ALLTRI	native	5	3	forb	perennial	wild leek
<i>Alnus incana; a. rugosa</i>	Betulaceae	ALNINC	native	5	-3	shrub	perennial	speckled alder
<i>Anaphalis margaritacea</i>	Asteraceae	ANAMAR	native	3	5	forb	perennial	pearly everlasting
<i>Andromeda glaucophylla</i>	Ericaceae	ANDGLA	native	10	-5	shrub	perennial	bog-rosemary
<i>Anemone canadensis</i>	Ranunculaceae	ANECAN	native	4	-3	forb	perennial	canada anemone
<i>Anemone cylindrica</i>	Ranunculaceae	ANECYL	native	6	5	forb	perennial	thimbleweed
<i>Anemone virginiana</i>	Ranunculaceae	ANEVIR	native	3	3	forb	perennial	thimbleweed
<i>Antennaria howellii</i>	Asteraceae	ANTHOW	native	2	5	forb	perennial	small pussytoes
<i>Antennaria parlinii</i>	Asteraceae	ANTPAL	native	2	5	forb	perennial	smooth pussytoes
<i>Apocynum androsaemifolium</i>	Apocynaceae	APOAND	native	3	5	forb	perennial	spreading dogbane

Grass River Natural Area 2017

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Apocynum cannabinum; a. sibiricum</i>	Apocynaceae	APOCAN	native	3	0	forb	perennial	indian-hemp
<i>Aralia nudicaulis</i>	Araliaceae	ARANUD	native	5	3	forb	perennial	wild sarsaparilla
<i>Arethusa bulbosa</i>	Orchidaceae	AREBUL	native	10	-5	forb	perennial	dragons mouth
<i>Arisaema triphyllum</i>	Araceae	ARITRI	native	5	0	forb	perennial	jack-in-the-pulpit
<i>Artemisia campestris</i>	Asteraceae	ARTCAM	native	5	5	forb	biennial	wormwood
<i>Asclepias incarnata</i>	Apocynaceae	ASCINC	native	6	-5	forb	perennial	swamp milkweed
<i>Asclepias syriaca</i>	Apocynaceae	ASCSYR	native	1	5	forb	perennial	common milkweed
<i>Athyrium filix-femina</i>	Athyriaceae	ATHFIL	native	4	0	fern	perennial	lady fern
<i>Berberis thunbergii</i>	Berberidaceae	BERTHU	non-native	0	3	shrub	perennial	japanese barberry
<i>Berteroa incana</i>	Brassicaceae	BERINC	non-native	0	5	forb	annual	hoary alyssum
<i>Betula alleghaniensis</i>	Betulaceae	BETALL	native	7	0	tree	perennial	yellow birch
<i>Betula papyrifera</i>	Betulaceae	BETPAP	native	2	3	tree	perennial	paper birch
<i>Bidens comosa</i>	Asteraceae	BIDCOM	native	5	-3	forb	annual	swamp tickseed
<i>Bidens frondosa</i>	Asteraceae	BIDFRO	native	1	-3	forb	annual	common beggar-ticks
<i>Boehmeria cylindrica</i>	Urticaceae	BOECYL	native	5	-5	forb	perennial	false nettle
<i>Botrypus virginianus</i>	Ophioglossaceae	BOTVIR	native	5	3	fern	perennial	rattlesnake fern
<i>Brachyelytrum aristosum; b. erectum</i>	Poaceae	BRAARI	native	7	5	grass	perennial	northern shorthusk
<i>Bromus ciliatus</i>	Poaceae	BROCIL	native	6	-3	grass	perennial	fringed brome
<i>Bromus inermis</i>	Poaceae	BROINE	non-native	0	5	grass	perennial	smooth brome
<i>Calamagrostis canadensis</i>	Poaceae	CALCAN	native	3	-5	grass	perennial	blue-joint
<i>Calamagrostis stricta; c. inexpansa; c. lacustris</i>	Poaceae	CALSTR	native	10	-3	grass	perennial	narrow-leaved reedgrass
<i>Calopogon tuberosus</i>	Orchidaceae	CALTUB	native	9	-5	forb	perennial	grass-pink
<i>Caltha palustris</i>	Ranunculaceae	CALPAR	native	6	-5	forb	perennial	marsh-marigold
<i>Calystegia sepium</i>	Convolvulaceae	CALSEP	native	2	0	vine	perennial	hedge bindweed
<i>Campanula aparinoides</i>	Campanulaceae	CAMAPA	native	7	-5	forb	perennial	marsh bellflower
<i>Cardamine bulbosa</i>	Brassicaceae	CARBUL	native	4	-5	forb	perennial	spring cress
<i>Cardamine diphylla; dentaria d.</i>	Brassicaceae	CARDIP	native	5	3	forb	perennial	two-leaved toothwort
<i>Carex aquatilis</i>	Cyperaceae	CXAQUA	native	7	-5	sedge	perennial	sedge
<i>Carex arctata</i>	Cyperaceae	CXARTT	native	3	5	sedge	perennial	sedge
<i>Carex aurea</i>	Cyperaceae	CXAURE	native	3	-3	sedge	perennial	sedge
<i>Carex bebbii</i>	Cyperaceae	CXBEBB	native	4	-5	sedge	perennial	sedge
<i>Carex brunnescens</i>	Cyperaceae	CXBRUN	native	5	-3	sedge	perennial	sedge
<i>Carex buxbaumii</i>	Cyperaceae	CXBUXB	native	10	-5	sedge	perennial	sedge
<i>Carex communis</i>	Cyperaceae	CXCOMM	native	2	5	sedge	perennial	sedge
<i>Carex comosa</i>	Cyperaceae	CXCOMO	native	5	-5	sedge	perennial	sedge

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Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Carex crinita</i>	Cyperaceae	CXCRIN	native	4	-5	sedge	perennial	sedge
<i>Carex deweyana</i>	Cyperaceae	CXDEWE	native	3	3	sedge	perennial	sedge
<i>Carex diandra</i>	Cyperaceae	CXDIAN	native	8	-5	sedge	perennial	sedge
<i>Carex disperma</i>	Cyperaceae	CXDISP	native	10	-5	sedge	perennial	sedge
<i>Carex eburnea</i>	Cyperaceae	CXE BUR	native	7	3	sedge	perennial	sedge
<i>Carex exilis</i>	Cyperaceae	CXEXIL	native	10	-5	sedge	perennial	sedge
<i>Carex flava</i>	Cyperaceae	CXFLAV	native	4	-5	sedge	perennial	sedge
<i>Carex gracillima</i>	Cyperaceae	CXGRAA	native	4	3	sedge	perennial	sedge
<i>Carex hystericina</i>	Cyperaceae	CXHYST	native	2	-5	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Carex intumescens</i>	Cyperaceae	CXINTU	native	3	-3	sedge	perennial	sedge
<i>Carex lacustris</i>	Cyperaceae	CXLACU	native	6	-5	sedge	perennial	sedge
<i>Carex laevivaginata</i>	Cyperaceae	CXLAEV	native	8	-5	sedge	perennial	sedge
<i>Carex lasiocarpa</i>	Cyperaceae	CXLASI	native	8	-5	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex leptonevia</i>	Cyperaceae	CXLEPO	native	3	0	sedge	perennial	sedge
<i>Carex lupulina</i>	Cyperaceae	CXLUPA	native	4	-5	sedge	perennial	sedge
<i>Carex pedunculata</i>	Cyperaceae	CXPEDU	native	5	3	sedge	perennial	sedge
<i>Carex pensylvanica</i>	Cyperaceae	CXPENS	native	4	5	sedge	perennial	sedge
<i>Carex prairea</i>	Cyperaceae	CXPRAI	native	10	-3	sedge	perennial	sedge
<i>Carex retrorsa</i>	Cyperaceae	CXRETS	native	3	-5	sedge	perennial	sedge
<i>Carex rosea; c. convoluta</i>	Cyperaceae	CXROSE	native	2	5	sedge	perennial	curly-styled wood sedge
<i>Carex stipata</i>	Cyperaceae	CXSTIP	native	1	-5	sedge	perennial	sedge
<i>Carex stricta</i>	Cyperaceae	CXSTRI	native	4	-5	sedge	perennial	sedge
<i>Carex trisperma</i>	Cyperaceae	CXTRIS	native	9	-5	sedge	perennial	sedge
<i>Carex utriculata; c. rostrata</i>	Cyperaceae	CXUTRI	native	5	-5	sedge	perennial	sedge
<i>Carex vulpinoidea</i>	Cyperaceae	CXVULP	native	1	-5	sedge	perennial	sedge
<i>Centaurea stoebe; c. maculosa</i>	Asteraceae	CENSTO	non-native	0	5	forb	biennial	spotted knapweed
<i>Cephalanthus occidentalis</i>	Rubiaceae	CEPOCC	native	7	-5	shrub	perennial	buttonbush
<i>Chamaedaphne calyculata</i>	Ericaceae	CHACAL	native	8	-5	shrub	perennial	leatherleaf
<i>Chelone glabra</i>	Plantaginaceae	CHEGLB	native	7	-5	forb	perennial	turtlehead
<i>Chrysosplenium americanum</i>	Saxifragaceae	CHROME	native	6	-5	forb	perennial	golden saxifrage
<i>Cicuta bulbifera</i>	Apiaceae	CICBUL	native	5	-5	forb	perennial	water hemlock
<i>Circaea canadensis; c. lutetiana</i>	Onagraceae	CIRCAN	native	2	3	forb	perennial	enchanters-nightshade
<i>Cirsium arvense</i>	Asteraceae	CIRARV	non-native	0	3	forb	perennial	canada thistle
<i>Cirsium muticum</i>	Asteraceae	CIRMUT	native	6	-5	forb	biennial	swamp thistle
<i>Cirsium palustre</i>	Asteraceae	CIRPAL	non-native	0	-3	forb	biennial	marsh thistle
<i>Cirsium vulgare</i>	Asteraceae	CIRVUL	non-native	0	3	forb	biennial	bull thistle

Grass River Natural Area 2017

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Cladium mariscoides</i>	Cyperaceae	CLAMAR	native	10	-5	sedge	perennial	twig-rush
<i>Clematis virginiana</i>	Ranunculaceae	CLEVIR	native	4	0	vine	perennial	virgins bower
<i>Clinopodium vulgare</i>	Lamiaceae	CLIVUL	native	3	5	forb	perennial	wild-basil
<i>Clintonia borealis</i>	Convallariaceae	CLIBOR	native	5	0	forb	perennial	bluebead-lily; corn-lily
<i>Comarum palustre; potentilla p.</i>	Rosaceae	COMPAL	native	7	-5	forb	perennial	marsh cinquefoil
<i>Conyza canadensis</i>	Asteraceae	CONCAN	native	0	3	forb	annual	horseweed
<i>Coptis trifolia</i>	Ranunculaceae	COPTRI	native	5	-3	forb	perennial	goldthread
<i>Corallorhiza trifida</i>	Orchidaceae	CORTRF	native	6	-3	forb	perennial	early coral-root
<i>Cornus alternifolia</i>	Cornaceae	CORALT	native	5	3	tree	perennial	alternate-leaved dogwood
<i>Cornus amomum</i>	Cornaceae	CORAMO	native	2	-3	shrub	perennial	silky dogwood
<i>Cornus canadensis</i>	Cornaceae	CORCAA	native	6	0	shrub	perennial	bunchberry
<i>Cornus foemina</i>	Cornaceae	CORFOE	native	1	0	shrub	perennial	gray dogwood
<i>Cornus sericea; c. stolonifera</i>	Cornaceae	CORSER	native	2	-3	shrub	perennial	red-osier
<i>Cypripedium acaule</i>	Orchidaceae	CYPACA	native	5	-3	forb	perennial	pink lady-slipper; moccasin flower
<i>Cypripedium parviflorum; c. calceolus</i>	Orchidaceae	CYPPAR	native	5	0	forb	perennial	yellow lady-slipper
<i>Cypripedium reginae</i>	Orchidaceae	CYPREG	native	9	-3	forb	perennial	showy or queens lady-slipper
<i>Dactylis glomerata</i>	Poaceae	DACGLO	non-native	0	3	grass	perennial	orchard grass
<i>Danthonia spicata</i>	Poaceae	DANSPI	native	4	5	grass	perennial	poverty grass; oatgrass
<i>Dasiphora fruticosa; potentilla f.</i>	Rosaceae	DASFRU	native	8	-3	shrub	perennial	shrubby cinquefoil
<i>Daucus carota</i>	Apiaceae	DAUCAR	non-native	0	5	forb	biennial	queen-annes-lace
<i>Decodon verticillatus</i>	Lythraceae	DECVER	native	7	-5	shrub	perennial	whorled or swamp loosestrife
<i>Dendrolycopodium obscurum; lycopodium o.</i>	Lycopodiaceae	DENOBS	native	5	3	fern	perennial	ground-pine
<i>Dianthus armeria</i>	Caryophyllaceae	DIAARM	non-native	0	5	forb	annual	deptford pink
<i>Dichanthelium depauperatum; panicum d.</i>	Poaceae	DICDEP	native	4	5	grass	perennial	panic grass
<i>Dichanthelium implicatum; panicum i.</i>	Poaceae	DICIMP	native	3	0	grass	perennial	panic grass
<i>Doellingeria umbellata; aster u.</i>	Asteraceae	DOEUMB	native	5	-3	forb	perennial	flat-topped white aster
<i>Drosera rotundifolia</i>	Droseraceae	DROROT	native	6	-5	forb	perennial	round-leaved sundew
<i>Dryopteris carthusiana</i>	Dryopteridaceae	DRYCAR	native	5	-3	fern	perennial	spinulose woodfern
<i>Dryopteris clintoniana</i>	Dryopteridaceae	DRYCLI	native	8	-3	fern	perennial	clintons woodfern
<i>Dryopteris cristata</i>	Dryopteridaceae	DRYCRI	native	6	-5	fern	perennial	crested shield fern
<i>Dryopteris intermedia</i>	Dryopteridaceae	DRYINT	native	5	0	fern	perennial	evergreen woodfern

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Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Dulichium arundinaceum</i>	Cyperaceae	DULARU	native	8	-5	sedge	perennial	three-way sedge
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Eleocharis elliptica</i>	Cyperaceae	ELEELL	native	6	-5	sedge	perennial	golden-seeded spike rush
<i>Eleocharis erythropoda</i>	Cyperaceae	ELEERY	native	4	-5	sedge	perennial	spike-rush
<i>Eleocharis palustris; e. smallii</i>	Cyperaceae	ELEPAL	native	5	-5	sedge	perennial	spike-rush
<i>Elymus hystrix; hystrix patula</i>	Poaceae	ELYHYS	native	5	3	grass	perennial	bottlebrush grass
<i>Elymus repens; agropyron r.</i>	Poaceae	ELYREP	non-native	0	3	grass	perennial	quack grass
<i>Elymus trachycaulus; agropyron t.</i>	Poaceae	ELYTRA	native	8	3	grass	perennial	slender wheatgrass
<i>Epigaea repens</i>	Ericaceae	EPIREP	native	7	3	shrub	perennial	trailing-arbutus
<i>Epilobium ciliatum</i>	Onagraceae	EPICIL	native	3	-3	forb	perennial	willow-herb
<i>Epilobium palustre</i>	Onagraceae	EPIPAL	native	10	-5	forb	perennial	marsh willow-herb
<i>Epilobium parviflorum</i>	Onagraceae	EPIPAR	non-native	0	-5	forb	perennial	willow-herb
<i>Epipactis helleborine</i>	Orchidaceae	EPIHEL	non-native	0	0	forb	perennial	helleborine
<i>Equisetum arvense</i>	Equisetaceae	EQUARV	native	0	0	fern	perennial	common horsetail
<i>Equisetum fluviatile</i>	Equisetaceae	EQUFLU	native	7	-5	fern	perennial	water horsetail
<i>Equisetum hyemale</i>	Equisetaceae	EQUHYE	native	2	0	fern	perennial	scouring rush
<i>Equisetum palustre</i>	Equisetaceae	EQUPAL	native	8	-3	fern	perennial	marsh horsetail
<i>Equisetum scirpoides</i>	Equisetaceae	EQUSCI	native	7	0	fern	perennial	dwarf scouring rush
<i>Equisetum sylvaticum</i>	Equisetaceae	EQU SYL	native	5	-3	fern	perennial	woodland horsetail
<i>Erigeron strigosus</i>	Asteraceae	ERISTR	native	4	3	forb	perennial	daisy fleabane
<i>Eriophorum viridi-carinatum</i>	Cyperaceae	ERIVID	native	8	-5	sedge	perennial	green-keeled cotton-grass
<i>Erythronium americanum</i>	Liliaceae	ERYAME	native	5	5	forb	perennial	yellow trout lily
<i>Eupatorium perfoliatum</i>	Asteraceae	EUPPER	native	4	-3	forb	perennial	boneset
<i>Euphorbia corollata</i>	Euphorbiaceae	EUPCOR	native	4	5	forb	perennial	flowering spurge
<i>Euphorbia virgata; e. esula</i>	Euphorbiaceae	EUPVIR	non-native	0	5	forb	perennial	leafy spurge
<i>Euthamia graminifolia</i>	Asteraceae	EUTGRA	native	3	0	forb	perennial	grass-leaved goldenrod
<i>Eutrochium maculatum; eupatorium m.</i>	Asteraceae	EUTMAC	native	4	-5	forb	perennial	joe-pye-weed
<i>Fagus grandifolia</i>	Fagaceae	FAGGRA	native	6	3	tree	perennial	american beech
<i>Fragaria virginiana</i>	Rosaceae	FRAVIR	native	2	3	forb	perennial	wild strawberry
<i>Fraxinus americana</i>	Oleaceae	FRAAME	native	5	3	tree	perennial	white ash
<i>Fraxinus nigra</i>	Oleaceae	FRANIG	native	6	-3	tree	perennial	black ash
<i>Galium asprellum</i>	Rubiaceae	GALASP	native	5	-5	vine	perennial	rough bedstraw
<i>Galium labradoricum</i>	Rubiaceae	GALLAB	native	8	-5	forb	perennial	bog bedstraw
<i>Galium tinctorium</i>	Rubiaceae	GALTIN	native	5	-5	forb	perennial	stiff bedstraw
<i>Galium triflorum</i>	Rubiaceae	GALTRR	native	4	3	forb	perennial	fragrant bedstraw
<i>Gaultheria hispida</i>	Ericaceae	GAUHIS	native	8	-3	shrub	perennial	creeping-snowberry

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Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Gaultheria procumbens</i>	Ericaceae	GAUPRO	native	5	3	shrub	perennial	wintergreen
<i>Gaylussacia baccata</i>	Ericaceae	GAYBAC	native	7	3	shrub	perennial	huckleberry
<i>Geum canadense</i>	Rosaceae	GEUCAN	native	1	0	forb	perennial	white avens
<i>Geum rivale</i>	Rosaceae	GEURIV	native	7	-5	forb	perennial	purple avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Gnaphalium uliginosum</i>	Asteraceae	GNAULI	native	3	0	forb	annual	low cudweed
<i>Goodyera pubescens</i>	Orchidaceae	GOOPUB	native	7	3	forb	perennial	downy rattlesnake plantain
<i>Gymnocarpium dryopteris</i>	Cystopteridaceae	GYMDRY	native	5	3	fern	perennial	oak fern
<i>Hamamelis virginiana</i>	Hamamelidaceae	HAMVIR	native	5	3	shrub	perennial	witch-hazel
<i>Hieracium aurantiacum</i>	Asteraceae	HIEAUR	non-native	0	5	forb	perennial	orange hawkweed
<i>Hieracium caespitosum</i>	Asteraceae	HIECAE	non-native	0	5	forb	perennial	king devil
<i>Hieracium piloselloides</i>	Asteraceae	HIEPIS	non-native	0	5	forb	perennial	king devil
<i>Hydrocotyle americana</i>	Araliaceae	HYDAME	native	6	-5	forb	perennial	water-pennywort
<i>Hypericum kalmianum</i>	Hypericaceae	HYPKAL	native	10	-3	shrub	perennial	kalms st. johns-wort
<i>Hypericum perforatum</i>	Hypericaceae	HYPPER	non-native	0	5	forb	perennial	common st. johns-wort
<i>Hypopitys monotropa;</i> <i>monotropa hypopithys</i>	Ericaceae	HYPMON	native	6	5	forb	perennial	pinemap
<i>Ilex mucronata; nemopanthis m.</i>	Aquifoliaceae	ILEMUC	native	7	-5	shrub	perennial	mountain holly
<i>Ilex verticillata</i>	Aquifoliaceae	ILEVER	native	5	-3	shrub	perennial	michigan holly
<i>Impatiens capensis</i>	Balsaminaceae	IMPCAP	native	2	-3	forb	annual	spotted touch-me-not
<i>Iris pseudacorus</i>	Iridaceae	IRIPSE	non-native	0	-5	forb	perennial	yellow flag
<i>Iris virginica</i>	Iridaceae	IRIVIR	native	5	-5	forb	perennial	southern blue flag
<i>Juncus effusus</i>	Juncaceae	JUNEFF	native	3	-5	rush	perennial	soft-stemmed rush
<i>Juncus nodosus</i>	Juncaceae	JUNNOD	native	5	-5	rush	perennial	joint rush
<i>Juncus tenuis</i>	Juncaceae	JUNTEN	native	1	0	rush	perennial	path rush
<i>Juniperus communis</i>	Cupressaceae	JUNCOI	native	4	3	shrub	perennial	common or ground juniper
<i>Larix laricina</i>	Pinaceae	LARLAR	native	5	-3	tree	perennial	tamarack
<i>Lathyrus palustris</i>	Fabaceae	LATPAL	native	7	-3	vine	perennial	marsh pea
<i>Leersia oryzoides</i>	Poaceae	LEEORY	native	3	-5	grass	perennial	cut grass
<i>Lemna minor</i>	Araceae	LEMMIN	native	5	-5	forb	perennial	common duckweed
<i>Leucanthemum vulgare;</i> <i>chrysanthemum leucanthemum</i>	Asteraceae	LEUVUL	non-native	0	5	forb	perennial	ox-eye daisy
<i>Lilium philadelphicum</i>	Liliaceae	LILPHI	native	7	0	forb	perennial	wood lily
<i>Lindera benzoin</i>	Lauraceae	LINBEN	native	7	-3	shrub	perennial	spicebush
<i>Linnaea borealis</i>	Linnaeaceae	LINBOR	native	6	0	forb	perennial	twinflower
<i>Lobelia cardinalis</i>	Campanulaceae	LOBCAR	native	7	-5	forb	perennial	cardinal-flower

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<i>Lobelia kalmii</i>	Campanulaceae	LOBKAL	native	10	-5	forb	perennial	bog lobelia
<i>Lobelia siphilitica</i>	Campanulaceae	LOBSIP	native	4	-3	forb	perennial	great blue lobelia
<i>Lonicera canadensis</i>	Caprifoliaceae	LONCAN	native	5	3	shrub	perennial	canadian fly honeysuckle
<i>Lonicera dioica</i>	Caprifoliaceae	LONDIO	native	5	3	vine	perennial	red honeysuckle
<i>Lonicera morrowii</i>	Caprifoliaceae	LONMOR	non-native	0	3	shrub	perennial	morrow honeysuckle
<i>Lonicera oblongifolia</i>	Caprifoliaceae	LONOBL	native	8	-5	shrub	perennial	swamp fly honeysuckle
<i>Lonicera Å—bella</i>	Caprifoliaceae	LONBEL	non-native	0	3	shrub	perennial	hybrid honeysuckle
<i>Lycopodium clavatum</i>	Lycopodiaceae	LYCCLA	native	4	0	fern	perennial	running ground-pine
<i>Lycopus americanus</i>	Lamiaceae	LYCAME	native	2	-5	forb	perennial	common water horehound
<i>Lycopus uniflorus</i>	Lamiaceae	LYCUNI	native	2	-5	forb	perennial	northern bugle weed
<i>Lysimachia nummularia</i>	Myrsinaceae	LYSNUM	non-native	0	-3	forb	perennial	moneywort
<i>Lysimachia quadriflora</i>	Myrsinaceae	LYSQUR	native	10	-5	forb	perennial	whorled loosestrife
<i>Lysimachia thyrsoiflora</i>	Myrsinaceae	LYSTHY	native	6	-5	forb	perennial	tufted loosestrife
<i>Lythrum salicaria</i>	Lythraceae	LYTSAL	non-native	0	-5	forb	perennial	purple loosestrife
<i>Maianthemum canadense</i>	Convallariaceae	MAICAN	native	4	3	forb	perennial	canada mayflower
<i>Maianthemum stellatum</i> ; <i>smilacina s.</i>	Convallariaceae	MAISTE	native	5	0	forb	perennial	starry false solomon-seal
<i>Maianthemum trifolium</i> ; <i>smilacina t.</i>	Convallariaceae	MAITRI	native	10	-5	forb	perennial	false mayflower
<i>Matteuccia struthiopteris</i>	Onocleaceae	MATSTR	native	3	0	fern	perennial	ostrich fern
<i>Medeola virginiana</i>	Convallariaceae	MEDVIR	native	10	3	forb	perennial	indian cucumber-root
<i>Medicago lupulina</i>	Fabaceae	MEDLUP	non-native	0	3	forb	annual	black medick
<i>Melilotus albus</i>	Fabaceae	MELALB	non-native	0	3	forb	biennial	white sweet-clover
<i>Mentha canadensis</i> ; <i>m. arvensis</i>	Lamiaceae	MENCAS	native	3	-3	forb	perennial	wild mint
<i>Mentha Å—piperita</i>	Lamiaceae	MENPIP	non-native	0	-5	forb	perennial	peppermint
<i>Menyanthes trifoliata</i>	Menyanthaceae	MENTRI	native	8	-5	forb	perennial	buckbean
<i>Mimulus ringens</i>	Phrymaceae	MIMRIN	native	5	-5	forb	perennial	monkey-flower
<i>Mitchella repens</i>	Rubiaceae	MITREP	native	5	3	forb	perennial	partridge-berry
<i>Mitella nuda</i>	Saxifragaceae	MITNUD	native	8	-3	forb	perennial	naked miterwort
<i>Muhlenbergia glomerata</i>	Poaceae	MUHGLO	native	10	-5	grass	perennial	marsh wild-timothy
<i>Myosotis scorpioides</i>	Boraginaceae	MYOSCO	non-native	0	-5	forb	perennial	forget-me-not
<i>Myrica gale</i>	Myricaceae	MYRGAL	native	6	-5	shrub	perennial	sweet gale
<i>Nasturtium officinale</i>	Brassicaceae	NASOFF	native	4	-5	forb	perennial	watercress
<i>Nuphar variegata</i>	Nymphaeaceae	NUPVAR	native	7	-5	forb	perennial	yellow pond-lily
<i>Nymphaea odorata</i>	Nymphaeaceae	NYMODO	native	6	-5	forb	perennial	sweet-scented waterlily
<i>Onoclea sensibilis</i>	Onocleaceae	ONOSEN	native	2	-3	fern	perennial	sensitive fern
<i>Orthilia secunda</i>	Ericaceae	ORTSEC	native	7	0	forb	perennial	one-sided pyrola
<i>Oryzopsis asperifolia</i>	Poaceae	ORYASP	native	6	5	grass	perennial	rough-leaved rice-grass

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Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Osmunda cinnamomea</i>	Osmundaceae	OSMCIN	native	5	-3	fern	perennial	cinnamon fern
<i>Osmunda claytoniana</i>	Osmundaceae	OSMCLN	native	6	0	fern	perennial	interrupted fern
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern
<i>Packera paupercula</i> ; <i>senecio p.</i> ; <i>senecio plattensis</i>	Asteraceae	PACPAU	native	3	0	forb	perennial	balsam ragwort
<i>Panicum capillare</i>	Poaceae	PANCAP	native	0	0	grass	annual	witch grass
<i>Parnassia glauca</i>	Parnassiaceae	PARGLA	native	8	-5	forb	perennial	grass-of-parnassus
<i>Parthenocissus quinquefolia</i>	Vitaceae	PARQUI	native	5	3	vine	perennial	virginia creeper
<i>Persicaria amphibia</i> ; <i>polygonum a.</i>	Polygonaceae	PERAMP	native	6	-5	forb	perennial	water smartweed
<i>Persicaria hydropiperoides</i> ; <i>polygonum h.</i>	Polygonaceae	PERHYS	native	5	-5	forb	perennial	mild water-pepper
<i>Phalaris arundinacea</i>	Poaceae	PHAARU	native	0	-3	grass	perennial	reed canary grass
<i>Phegopteris connectilis</i> ; <i>thelypteris phegopteris</i>	Thelypteridaceae	PHECON	native	5	3	fern	perennial	northern beech-fern
<i>Phleum pratense</i>	Poaceae	PHLPRA	non-native	0	3	grass	perennial	timothy
<i>Phragmites australis var. americanus</i>	Poaceae	PHRAUM	native	5	-3	grass	perennial	reed
<i>Picea glauca</i>	Pinaceae	PICGLA	native	3	3	tree	perennial	white spruce
<i>Picea mariana</i>	Pinaceae	PICMAR	native	6	-3	tree	perennial	black spruce
<i>Picea pungens</i>	Pinaceae	PICPUN	non-native	0	3	tree	perennial	blue spruce
<i>Pilea fontana</i>	Urticaceae	PILFON	native	5	-3	forb	annual	bog clearweed
<i>Pinus resinosa</i>	Pinaceae	PINRES	native	6	3	tree	perennial	red pine
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	tree	perennial	white pine
<i>Plantago lanceolata</i>	Plantaginaceae	PLALAN	non-native	0	3	forb	perennial	english plantain
<i>Plantago major</i>	Plantaginaceae	PLAMAJ	non-native	0	3	forb	perennial	common plantain
<i>Platanthera clavellata</i> ; <i>habenaria c.</i>	Orchidaceae	PLACLA	native	6	-3	forb	perennial	small green wood orchid
<i>Platanthera huronensis</i> ; <i>habenaria hyperborea</i>	Orchidaceae	PLAHUR	native	5	-3	forb	perennial	lake huron green orchid
<i>Platanthera psycodes</i> ; <i>habenaria p.</i>	Orchidaceae	PLAPSY	native	7	-3	forb	perennial	purple fringed orchid
<i>Poa alsodes</i>	Poaceae	POAALS	native	9	0	grass	perennial	bluegrass
<i>Poa compressa</i>	Poaceae	POACOM	non-native	0	3	grass	perennial	canada bluegrass
<i>Poa palustris</i>	Poaceae	POAPAS	native	3	-3	grass	perennial	fowl meadow grass
<i>Poa pratensis</i>	Poaceae	POAPRA	non-native	0	3	grass	perennial	kentucky bluegrass
<i>Pogonia ophioglossoides</i>	Orchidaceae	POGOPH	native	10	-5	forb	perennial	rose pogonia
<i>Polygala paucifolia</i>	Polygalaceae	POLPAU	native	7	3	forb	perennial	gay-wings

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<i>Polygonatum pubescens</i>	Convallariaceae	POLPUB	native	5	5	forb	perennial	downy solomon seal
<i>Pontederia cordata</i>	Pontederiaceae	PONCOR	native	8	-5	forb	perennial	pickerel-weed
<i>Populus alba</i>	Salicaceae	POPALB	non-native	0	5	tree	perennial	white poplar
<i>Populus balsamifera</i>	Salicaceae	POPBAL	native	2	-3	tree	perennial	balsam poplar
<i>Populus grandidentata</i>	Salicaceae	POPGRA	native	4	3	tree	perennial	big-tooth aspen
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	tree	perennial	quaking aspen
<i>Potamogeton natans</i>	Potamogetonaceae	POTNAT	native	5	-5	forb	perennial	pondweed
<i>Potentilla anserina</i>	Rosaceae	POTANS	native	5	-3	forb	perennial	silverweed
<i>Potentilla recta</i>	Rosaceae	POTREC	non-native	0	5	forb	perennial	rough-fruited cinquefoil
<i>Proserpinaca palustris</i>	Haloragaceae	PROPAL	native	6	-5	forb	perennial	mermaid-weed
<i>Prunella vulgaris</i>	Lamiaceae	PRUVUL	native	0	0	forb	perennial	self-heal
<i>Prunus serotina</i>	Rosaceae	PRUSER	native	2	3	tree	perennial	wild black cherry
<i>Pteridium aquilinum</i>	Dennstaedtiaceae	PTEAQU	native	0	3	fern	perennial	bracken fern
<i>Pyrola elliptica</i>	Ericaceae	PYRELL	native	6	3	forb	perennial	large-leaved shinleaf
<i>Quercus rubra</i>	Fagaceae	QUERUB	native	5	3	tree	perennial	red oak
<i>Ranunculus abortivus</i>	Ranunculaceae	RANABO	native	0	0	forb	perennial	small-flowered buttercup
<i>Ranunculus acris</i>	Ranunculaceae	RANACR	non-native	0	0	forb	perennial	tall or common buttercup
<i>Ranunculus hispidus</i>	Ranunculaceae	RANHIS	native	5	0	forb	perennial	swamp buttercup
<i>Ranunculus recurvatus</i>	Ranunculaceae	RANREC	native	5	-3	forb	perennial	hooked crowfoot
<i>Rhamnus alnifolia</i>	Rhamnaceae	RHAALN	native	8	-5	shrub	perennial	alder-leaved buckthorn
<i>Rhododendron groenlandicum;</i> <i>ledum g.</i>	Ericaceae	RHOGRO	native	8	-5	shrub	perennial	labrador-tea
<i>Rhynchospora alba</i>	Cyperaceae	RHYALB	native	6	-5	sedge	perennial	beak-rush
<i>Rhynchospora capillacea</i>	Cyperaceae	RHYCAL	native	10	-5	sedge	perennial	beak-rush
<i>Ribes cynosbati</i>	Grossulariaceae	RIBCYN	native	4	3	shrub	perennial	prickly or wild gooseberry
<i>Ribes hirtellum</i>	Grossulariaceae	RIBHIR	native	6	-3	shrub	perennial	swamp gooseberry
<i>Ribes triste</i>	Grossulariaceae	RIBTRI	native	6	-5	shrub	perennial	swamp red currant
<i>Rosa multiflora</i>	Rosaceae	ROSMUL	non-native	0	3	shrub	perennial	multiflora rose
<i>Rosa palustris</i>	Rosaceae	ROSPAL	native	5	-5	shrub	perennial	swamp rose
<i>Rubus allegheniensis</i>	Rosaceae	RUBALL	native	1	3	shrub	perennial	common blackberry
<i>Rubus hispidus</i>	Rosaceae	RUBHIS	native	4	-3	shrub	perennial	swamp dewberry
<i>Rubus occidentalis</i>	Rosaceae	RUBOCC	native	1	5	shrub	perennial	black raspberry
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Rubus strigosus</i>	Rosaceae	RUBSTR	native	2	0	shrub	perennial	wild red raspberry
<i>Rudbeckia hirta</i>	Asteraceae	RUDHIR	native	1	3	forb	perennial	black-eyed susan
<i>Rumex acetosella</i>	Polygonaceae	RUMACL	non-native	0	3	forb	perennial	sheep sorrel
<i>Rumex obtusifolius</i>	Polygonaceae	RUMOBT	non-native	0	0	forb	perennial	bitter dock

Grass River Natural Area 2017								
Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Rumex orbiculatus</i>	Polygonaceae	RUMORB	native	9	-5	forb	perennial	great water dock
<i>Sagittaria latifolia</i>	Alismataceae	SAGLAT	native	4	-5	forb	perennial	common arrowhead
<i>Salix discolor</i>	Salicaceae	SALDIS	native	1	-3	shrub	perennial	pussy willow
<i>Salix petiolaris</i>	Salicaceae	SALPET	native	1	-3	shrub	perennial	slender willow
<i>Sambucus canadensis</i>	Adoxaceae	SAMCAN	native	3	-3	shrub	perennial	elderberry
<i>Sarracenia purpurea</i>	Sarraceniaceae	SARPUR	native	10	-5	forb	perennial	pitcher-plant
<i>Schizachne purpurascens</i>	Poaceae	SCHPUP	native	5	3	grass	perennial	false melic
<i>Schizachyrium scoparium;</i> <i>andropogon s.</i>	Poaceae	SCHSCO	native	5	3	grass	perennial	little bluestem
<i>Schoenoplectus acutus; scirpus</i> <i>a.</i>	Cyperaceae	SCHACU	native	5	-5	sedge	perennial	hardstem bulrush
<i>Schoenoplectus pungens; scirpus</i> <i>americanus</i>	Cyperaceae	SCHPUN	native	5	-5	sedge	perennial	threesquare
<i>Schoenoplectus</i> <i>tabernaemontani; scirpus</i> <i>validus</i>	Cyperaceae	SCHTAB	native	4	-5	sedge	perennial	softstem bulrush
<i>Scirpus atrovirens</i>	Cyperaceae	SCIATV	native	3	-5	sedge	perennial	bulrush
<i>Scirpus cyperinus</i>	Cyperaceae	SCICYP	native	5	-5	sedge	perennial	wool-grass
<i>Scutellaria galericulata</i>	Lamiaceae	SCUGAL	native	5	-5	forb	perennial	marsh skullcap
<i>Scutellaria lateriflora</i>	Lamiaceae	SCULAT	native	5	-5	forb	perennial	mad-dog skullcap
<i>Solanum dulcamara</i>	Solanaceae	SOLDUL	non-native	0	0	vine	perennial	bittersweet nightshade
<i>Solidago caesia</i>	Asteraceae	SOLCAE	native	6	3	forb	perennial	bluestem goldenrod
<i>Solidago canadensis</i>	Asteraceae	SOLCAN	native	1	3	forb	perennial	canada goldenrod
<i>Solidago gigantea</i>	Asteraceae	SOLGIG	native	3	-3	forb	perennial	late goldenrod
<i>Solidago patula</i>	Asteraceae	SOLPAT	native	6	-5	forb	perennial	swamp goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod
<i>Solidago uliginosa</i>	Asteraceae	SOLULI	native	4	-5	forb	perennial	bog goldenrod
<i>Sparganium emersum; s.</i> <i>chlorocarpum</i>	Typhaceae	SPAEME	native	6	-5	forb	perennial	green-fruited bur-reed
<i>Sparganium eurycarpum</i>	Typhaceae	SPAEUR	native	5	-5	forb	perennial	common bur-reed
<i>Spinulum annotinum;</i> <i>lycopodium a.</i>	Lycopodiaceae	SPIANN	native	5	0	fern	perennial	stiff clubmoss
<i>Spiraea alba</i>	Rosaceae	SPIALB	native	4	-3	shrub	perennial	meadowsweet
<i>Spiranthes cernua</i>	Orchidaceae	SPICER	native	4	-3	forb	perennial	nodding ladies-tresses
<i>Stellaria media</i>	Caryophyllaceae	STEMED	non-native	0	3	forb	annual	common chickweed
<i>Symphotrichum boreale; aster</i> <i>b.</i>	Asteraceae	SYMBOR	native	9	-5	forb	perennial	northern bog aster

Grass River Natural Area 2017

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Symphotrichum firmum</i> ; <i>aster puniceus</i>	Asteraceae	SYMFIR	native	4	-3	forb	perennial	smooth swamp aster
<i>Symphotrichum lanceolatum</i> ; <i>aster l.</i>	Asteraceae	SYMLAN	native	2	-3	forb	perennial	panicled aster
<i>Symphotrichum lateriflorum</i> ; <i>aster l.</i>	Asteraceae	SYMLAT	native	2	0	forb	perennial	calico aster
<i>Symphotrichum puniceum</i> ; <i>aster p.</i>	Asteraceae	SYMPUN	native	5	-5	forb	perennial	swamp aster
<i>Symphotrichum urophyllum</i> ; <i>aster sagittifolius</i>	Asteraceae	SYMURO	native	2	5	forb	perennial	arrow-leaved aster
<i>Taraxacum officinale</i>	Asteraceae	TAROFF	non-native	0	3	forb	perennial	common dandelion
<i>Thalictrum dasycarpum</i>	Ranunculaceae	THADAS	native	3	-3	forb	perennial	purple meadow-rue
<i>Thalictrum dioicum</i>	Ranunculaceae	THADIO	native	6	3	forb	perennial	early meadow-rue
<i>Thelypteris noveboracensis</i>	Thelypteridaceae	THENOV	native	5	0	fern	perennial	new york fern
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Tiarella cordifolia</i>	Saxifragaceae	TIACOR	native	9	3	forb	perennial	foamflower
<i>Tilia americana</i>	Malvaceae	TILAME	native	5	3	tree	perennial	basswood
<i>Toxicodendron rydbergii</i> ; <i>t. radicans</i>	Anacardiaceae	TOXRYD	native	3	0	shrub	perennial	poison-ivy
<i>Toxicodendron vernix</i>	Anacardiaceae	TOXVER	native	6	-5	shrub	perennial	poison sumac
<i>Tragopogon pratensis</i>	Asteraceae	TRAPRA	non-native	0	5	forb	biennial	common goats beard
<i>Triadenum fraseri</i>	Hypericaceae	TRIFRA	native	6	-5	forb	perennial	marsh st. johns-wort
<i>Trichophorum alpinum</i> ; <i>scirpus hudsonianus</i>	Cyperaceae	TRIALP	native	10	-5	sedge	perennial	bulrush
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	forb	perennial	star-flower
<i>Trifolium pratense</i>	Fabaceae	TRIPRA	non-native	0	3	forb	perennial	red clover
<i>Triglochin maritima</i>	Juncaginaceae	TRIMAR	native	8	-5	forb	perennial	common bog arrow-grass
<i>Trillium cernuum</i>	Trilliaceae	TRICER	native	5	0	forb	perennial	nodding trillium
<i>Tsuga canadensis</i>	Pinaceae	TSUCAN	native	5	3	tree	perennial	hemlock
<i>Typha angustifolia</i>	Typhaceae	TYPANG	non-native	0	-5	forb	perennial	narrow-leaved cat-tail
<i>Typha latifolia</i>	Typhaceae	TYPLAT	native	1	-5	forb	perennial	broad-leaved cat-tail
<i>Ulmus americana</i>	Ulmaceae	ULMAME	native	1	-3	tree	perennial	american elm
<i>Utricularia cornuta</i>	Lentibulariaceae	UTRCOR	native	10	-5	forb	perennial	horned bladderwort
<i>Utricularia intermedia</i>	Lentibulariaceae	UTRINT	native	10	-5	forb	perennial	flat-leaved bladderwort
<i>Utricularia minor</i>	Lentibulariaceae	UTRMIN	native	10	-5	forb	perennial	small bladderwort
<i>Utricularia vulgaris</i>	Lentibulariaceae	UTRVUL	native	6	-5	forb	perennial	common bladderwort
<i>Vaccinium myrtilloides</i>	Ericaceae	VACMYR	native	4	-3	shrub	perennial	canada blueberry

Grass River Natural Area 2017

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Vaccinium oxycoccos</i>	Ericaceae	VACOXY	native	8	-5	shrub	perennial	small cranberry
<i>Verbascum thapsus</i>	Scrophulariaceae	VERTHA	non-native	0	5	forb	biennial	common mullein
<i>Verbena hastata</i>	Verbenaceae	VERHAS	native	4	-3	forb	perennial	blue vervain
<i>Veronica arvensis</i>	Plantaginaceae	VERARV	non-native	0	3	forb	annual	corn speedwell
<i>Veronica officinalis</i>	Plantaginaceae	VEROOF	non-native	0	3	forb	perennial	common speedwell
<i>Viburnum acerifolium</i>	Adoxaceae	VIBACE	native	6	5	shrub	perennial	maple-leaved viburnum
<i>Viburnum cassinoides</i>	Adoxaceae	VIBCAS	native	6	3	shrub	perennial	wild-raisin
<i>Vicia villosa</i>	Fabaceae	VICVIL	non-native	0	5	vine	annual	hairy vetch
<i>Viola canadensis</i>	Violaceae	VIOCAN	native	5	3	forb	perennial	canada violet
<i>Viola cucullata</i>	Violaceae	VIOCUC	native	5	-5	forb	perennial	marsh violet
<i>Viola labradorica; v. conspersa</i>	Violaceae	VIOLAB	native	3	0	forb	perennial	dog violet
<i>Vitis riparia</i>	Vitaceae	VITRIP	native	3	0	vine	perennial	river-bank grape

Appendix 2. Grass River Natural Area - Floristic Quality Assessment: Emergent Marsh

Grass River Natural Area 2017: Emergent Marsh			
Bellaire, Antrim County, Michigan, USA			
FQA DB Region:	Michigan		
FQA DB Publication	2014		
Year:			
FQA DB Description:	Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. http://michiganflora.net		
Practitioner:	Rachel Hackett		
Duration Notes:	Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.		
Community Type	Emergent marsh was located along Grass River or shores of Lake Bellaire or Clam Lake and composed of mostly emergent and floating vegetation.		
Notes:			
Conservatism-Based Metrics:			
Total Mean C:	5.2		
Native Mean C:	5.5		
Total FQI:	22.7		
Native FQI:	23.3		
Adjusted FQI:	53.5		
% C value 0:	5.3		
% C value 1-3:	5.3		
% C value 4-6:	63.2		
% C value 7-10:	26.3		
Native Tree Mean C:	n/a		
Native Shrub Mean C:	7.0		
Native Herbaceous Mean C:	5.4		
Species Richness:			
Total Species:	19		
Native Species:	18	94.70%	
Non-native Species:	1	5.30%	
Species Wetness:			
Mean Wetness:	-4.9		
Native Mean Wetness:	-4.9		
Physiognomy Metrics:			
Tree:	0	0%	
Shrub:	1	5.30%	
Vine:	0	0%	
Forb:	10	52.60%	
Grass:	1	5.30%	
Duration Metrics:			
Annual:	0	0%	
Perennial:	19	100.00%	
Biennial:	0	0%	
Native Annual:	0	0%	
Native Perennial:	18	94.70%	
Native Biennial:	0	0%	
Physiognomy Metrics:			
Sedge:	7	36.80%	
Rush:	0	0%	
Fern:	0	0%	
Bryophyte:	0	0%	

Species:

Grass River Natural Area 2017: Emergent Marsh

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Carex aquatilis</i>	Cyperaceae	CXAQUA	native	7	-5	sedge	perennial	sedge
<i>Carex comosa</i>	Cyperaceae	CXCOMO	native	5	-5	sedge	perennial	sedge
<i>Carex lasiocarpa</i>	Cyperaceae	CXLASI	native	8	-5	sedge	perennial	sedge
<i>Carex stricta</i>	Cyperaceae	CXSTRI	native	4	-5	sedge	perennial	sedge
<i>Decodon verticillatus</i>	Lythraceae	DECVER	native	7	-5	shrub	perennial	whorled or swamp loosestrife
<i>Eleocharis palustris; e. smallii</i>	Cyperaceae	ELEPAL	native	5	-5	sedge	perennial	spike-rush
<i>Nuphar variegata</i>	Nymphaeaceae	NUPVAR	native	7	-5	forb	perennial	yellow pond-lily
<i>Nymphaea odorata</i>	Nymphaeaceae	NYMODO	native	6	-5	forb	perennial	sweet-scented waterlily
<i>Phragmites australis var. americanus</i>	Poaceae	PHRAUM	native	5	-3	grass	perennial	reed
<i>Pontederia cordata</i>	Pontederiaceae	PONCOR	native	8	-5	forb	perennial	pickerel-weed
<i>Proserpinaca palustris</i>	Haloragaceae	PROPAL	native	6	-5	forb	perennial	mermaid-weed
<i>Sagittaria latifolia</i>	Alismataceae	SAGLAT	native	4	-5	forb	perennial	common arrowhead
<i>Schoenoplectus acutus; scirpus a.</i>	Cyperaceae	SCHACU	native	5	-5	sedge	perennial	hardstem bulrush
<i>Schoenoplectus tabernaemontani; scirpus validus</i>	Cyperaceae	SCHTAB	native	4	-5	sedge	perennial	softstem bulrush
<i>Sparganium emersum; s. chlorocarpum</i>	Typhaceae	SPAEME	native	6	-5	forb	perennial	green-fruited bur-reed
<i>Sparganium eurycarpum</i>	Typhaceae	SPAEUR	native	5	-5	forb	perennial	common bur-reed
<i>Typha angustifolia</i>	Typhaceae	TYPANG	non-native	0	-5	forb	perennial	narrow-leaved cat-tail
<i>Typha latifolia</i>	Typhaceae	TYPLAT	native	1	-5	forb	perennial	broad-leaved cat-tail
<i>Utricularia vulgaris</i>	Lentibulariaceae	UTRVUL	native	6	-5	forb	perennial	common bladderwort

Appendix 3. Grass River Natural Area - Floristic Quality Assessment: Northern Wet Meadow

Grass River Natural Area 2017: Northern Wet Meadow

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication: 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett, Phyllis Higman

Duration Notes: Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type: In Grass River Natural Area, northern wet meadow borders northern fen, rich conifer swamp, poor conifer swamp, or emergent marsh. It occurs on strongly acid to circumneutral sapric peats and lacks the distinct marl zones of northern fen. It is a grass- and sedge-dominated wetland, often with an overwhelming abundance of *Carex stricta*, and lacks a shrub component.

Dichanthelium implicatum in Michigan Flora has the accepted name of *Dichanthelium acuminatum* via tropicos.org.

Conservatism-Based Metrics:		Species Richness:		Duration Metrics:	
Total Mean C:	5.0	Total Species:	123	Annual:	1 0.80%
Native Mean C:	5.4	Native Species:	115 93.50%	Perennial:	121 98.40%
Total FQI:	55.5	Non-native Species:	8 6.50%	Biennial:	1 0.80%
Native FQI:	57.9			Native Annual:	1 0.80%
Adjusted FQI:	52.2	Species Wetness:		Native Perennial:	114 92.70%
% C value 0:	6.5	Mean Wetness:	-3.7	Native Biennial:	0 0%
% C value 1-3:	24.4	Native Mean Wetness:	-3.8		
% C value 4-6:	39.8			Physiognomy Metrics:	
% C value 7-10:	29.3	Physiognomy Metrics:		Sedge:	24 19.50%
Native Tree Mean C:	2.7	Tree:	7 5.70%	Rush:	0 0%
Native Shrub Mean C:	5.2	Shrub:	18 14.60%	Fern:	4 3.30%
Native Herbaceous Mean C:	5.6	Vine:	4 3.30%	Bryophyte:	0 0%
		Forb:	57 46.30%		
		Grass:	9 7.30%		

Species:

Grass River Natural Area 2017: Northern Wet Meadow

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Agalinis purpurea</i>	Orobanchaceae	AGAPUR	native	7	-3	forb	annual	purple false foxglove
<i>Agrostis scabra; a. hyemalis</i>	Poaceae	AGRSCA	native	4	0	grass	perennial	ticklegass
<i>Alnus incana; a. rugosa</i>	Betulaceae	ALNINC	native	5	-3	shrub	perennial	speckled alder
<i>Andromeda glaucophylla</i>	Ericaceae	ANDGLA	native	10	-5	shrub	perennial	bog-rosemary
<i>Anemone canadensis</i>	Ranunculaceae	ANECAN	native	4	-3	forb	perennial	canada anemone
<i>Apocynum cannabinum; a. sibiricum</i>	Apocynaceae	APOCAN	native	3	0	forb	perennial	indian-hemp
<i>Asclepias incarnata</i>	Apocynaceae	ASCINC	native	6	-5	forb	perennial	swamp milkweed
<i>Boehmeria cylindrica</i>	Urticaceae	BOE CYL	native	5	-5	forb	perennial	false nettle
<i>Bromus ciliatus</i>	Poaceae	BROCIL	native	6	-3	grass	perennial	fringed brome
<i>Calamagrostis canadensis</i>	Poaceae	CALCAN	native	3	-5	grass	perennial	blue-joint
<i>Calamagrostis stricta; c. inexpansa; c. lacustris</i>	Poaceae	CALSTR	native	10	-3	grass	perennial	narrow-leaved reedgrass
<i>Calystegia sepium</i>	Convolvulaceae	CALSEP	native	2	0	vine	perennial	hedge bindweed
<i>Campanula aparinoides</i>	Campanulaceae	CAMAPA	native	7	-5	forb	perennial	marsh bellflower
<i>Carex aquatilis</i>	Cyperaceae	CXAQUA	native	7	-5	sedge	perennial	sedge
<i>Carex buxbaumii</i>	Cyperaceae	CXBUXB	native	10	-5	sedge	perennial	sedge
<i>Carex comosa</i>	Cyperaceae	CXCOMO	native	5	-5	sedge	perennial	sedge
<i>Carex diandra</i>	Cyperaceae	CXDIAN	native	8	-5	sedge	perennial	sedge
<i>Carex flava</i>	Cyperaceae	CXFLAV	native	4	-5	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Carex lacustris</i>	Cyperaceae	CXLACU	native	6	-5	sedge	perennial	sedge
<i>Carex lasiocarpa</i>	Cyperaceae	CXLASI	native	8	-5	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex pellita; c. lanuginosa</i>	Cyperaceae	CXPELL	native	2	-5	sedge	perennial	sedge
<i>Carex prairea</i>	Cyperaceae	CXPRAI	native	10	-3	sedge	perennial	sedge
<i>Carex stricta</i>	Cyperaceae	CXSTRI	native	4	-5	sedge	perennial	sedge
<i>Carex utriculata; c. rostrata</i>	Cyperaceae	CXUTRI	native	5	-5	sedge	perennial	sedge
<i>Cephalanthus occidentalis</i>	Rubiaceae	CEPOCC	native	7	-5	shrub	perennial	buttonbush
<i>Chelone glabra</i>	Plantaginaceae	CHEGLB	native	7	-5	forb	perennial	turtlehead
<i>Cicuta bulbifera</i>	Apiaceae	CICBUL	native	5	-5	forb	perennial	water hemlock
<i>Cirsium palustre</i>	Asteraceae	CIRPAL	non-native	0	-3	forb	biennial	marsh thistle
<i>Cladium mariscoides</i>	Cyperaceae	CLAMAR	native	10	-5	sedge	perennial	twig-rush
<i>Comarum palustre; potentilla p.</i>	Rosaceae	COMPAL	native	7	-5	forb	perennial	marsh cinquefoil
<i>Cornus amomum</i>	Cornaceae	CORAMO	native	2	-3	shrub	perennial	silky dogwood
<i>Cornus sericea; c. stolonifera</i>	Cornaceae	CORSER	native	2	-3	shrub	perennial	red-osier

Grass River Natural Area 2017: Northern Wet Meadow

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Dasiphora fruticosa</i> ; <i>potentilla</i> f.	Rosaceae	DASFRU	native	8	-3	shrub	perennial	shrubby cinquefoil
<i>Decodon verticillatus</i>	Lythraceae	DECVER	native	7	-5	shrub	perennial	whorled or swamp loosestrife
<i>Dichanthelium implicatum</i> ; <i>panicum</i> i.	Poaceae	DICIMP	native	3	0	grass	perennial	panic grass
<i>Dulichium arundinaceum</i>	Cyperaceae	DULARU	native	8	-5	sedge	perennial	three-way sedge
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Eleocharis elliptica</i>	Cyperaceae	ELEELL	native	6	-5	sedge	perennial	golden-seeded spike rush
<i>Eleocharis erythropoda</i>	Cyperaceae	ELEERY	native	4	-5	sedge	perennial	spike-rush
<i>Eleocharis palustris</i> ; <i>e. smallii</i>	Cyperaceae	ELEPAL	native	5	-5	sedge	perennial	spike-rush
<i>Epilobium palustre</i>	Onagraceae	EPICAL	native	10	-5	forb	perennial	marsh willow-herb
<i>Equisetum fluviatile</i>	Equisetaceae	EQUFLU	native	7	-5	fern	perennial	water horsetail
<i>Eriophorum viridi-carinatum</i>	Cyperaceae	ERIVID	native	8	-5	sedge	perennial	green-keeled cotton-grass
<i>Eupatorium perfoliatum</i>	Asteraceae	EUPPER	native	4	-3	forb	perennial	boneset
<i>Euthamia graminifolia</i>	Asteraceae	EUTGRA	native	3	0	forb	perennial	grass-leaved goldenrod
<i>Eutrochium maculatum</i> ; <i>eupatorium</i> m.	Asteraceae	EUTMAC	native	4	-5	forb	perennial	joe-pye-weed
<i>Galium labradoricum</i>	Rubiaceae	GALLAB	native	8	-5	forb	perennial	bog bedstraw
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Hypericum kalmianum</i>	Hypericaceae	HYPKAL	native	10	-3	shrub	perennial	kalms st. johns-wort
<i>Iris pseudacorus</i>	Iridaceae	IRIPSE	non-native	0	-5	forb	perennial	yellow flag
<i>Iris virginica</i>	Iridaceae	IRIVIR	native	5	-5	forb	perennial	southern blue flag
<i>Larix laricina</i>	Pinaceae	LARLAR	native	5	-3	tree	perennial	tamarack
<i>Lathyrus palustris</i>	Fabaceae	LATPAL	native	7	-3	vine	perennial	marsh pea
<i>Lemna minor</i>	Araceae	LEMMIN	native	5	-5	forb	perennial	common duckweed
<i>Lobelia kalmii</i>	Campanulaceae	LOBKAL	native	10	-5	forb	perennial	bog lobelia
<i>Lycopus americanus</i>	Lamiaceae	LYCAME	native	2	-5	forb	perennial	common water horehound
<i>Lycopus uniflorus</i>	Lamiaceae	LYCUNI	native	2	-5	forb	perennial	northern bugle weed
<i>Lysimachia thysiflora</i>	Myrsinaceae	LYSTHY	native	6	-5	forb	perennial	tufted loosestrife
<i>Lythrum salicaria</i>	Lythraceae	LYTSAL	non-native	0	-5	forb	perennial	purple loosestrife
<i>Mentha canadensis</i> ; <i>m. arvensis</i>	Lamiaceae	MENCAS	native	3	-3	forb	perennial	wild mint
<i>Mentha</i> Æ— <i>piperita</i>	Lamiaceae	MENPIP	non-native	0	-5	forb	perennial	peppermint
<i>Menyanthes trifoliata</i>	Menyanthaceae	MENTRI	native	8	-5	forb	perennial	buckbean
<i>Muhlenbergia glomerata</i>	Poaceae	MUHGLO	native	10	-5	grass	perennial	marsh wild-timothy
<i>Myrica gale</i>	Myricaceae	MYRGAL	native	6	-5	shrub	perennial	sweet gale
<i>Nasturtium officinale</i>	Brassicaceae	NASOFF	native	4	-5	forb	perennial	watercress
<i>Nuphar variegata</i>	Nymphaeaceae	NUPVAR	native	7	-5	forb	perennial	yellow pond-lily
<i>Nymphaea odorata</i>	Nymphaeaceae	NYMODO	native	6	-5	forb	perennial	sweet-scented waterlily

Grass River Natural Area 2017: Northern Wet Meadow

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Onoclea sensibilis</i>	Onocleaceae	ONosen	native	2	-3	fern	perennial	sensitive fern
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern
<i>Parnassia glauca</i>	Parnassiaceae	PARGLA	native	8	-5	forb	perennial	grass-of-parnassus
<i>Persicaria amphibia; polygonum</i>	Polygonaceae	PERAMP	native	6	-5	forb	perennial	water smartweed
<i>a.</i>								
<i>Phragmites australis var. americanus</i>	Poaceae	PHRAUM	native	5	-3	grass	perennial	reed
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	tree	perennial	white pine
<i>Poa palustris</i>	Poaceae	POAPAS	native	3	-3	grass	perennial	fowl meadow grass
<i>Pogonia ophioglossoides</i>	Orchidaceae	POGOPH	native	10	-5	forb	perennial	rose pogonia
<i>Pontederia cordata</i>	Pontederiaceae	PONCOR	native	8	-5	forb	perennial	pickerel-weed
<i>Populus alba</i>	Salicaceae	POPALB	non-native	0	5	tree	perennial	white poplar
<i>Populus balsamifera</i>	Salicaceae	POPBAL	native	2	-3	tree	perennial	balsam poplar
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	tree	perennial	quaking aspen
<i>Proserpinaca palustris</i>	Haloragaceae	PROPAL	native	6	-5	forb	perennial	mermaid-weed
<i>Ranunculus hispidus</i>	Ranunculaceae	RANHIS	native	5	0	forb	perennial	swamp buttercup
<i>Rhamnus alnifolia</i>	Rhamnaceae	RHAALN	native	8	-5	shrub	perennial	alder-leaved buckthorn
<i>Rhynchospora alba</i>	Cyperaceae	RHYALB	native	6	-5	sedge	perennial	beak-rush
<i>Rosa palustris</i>	Rosaceae	ROSPAL	native	5	-5	shrub	perennial	swamp rose
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Sagittaria latifolia</i>	Alismataceae	SAGLAT	native	4	-5	forb	perennial	common arrowhead
<i>Salix discolor</i>	Salicaceae	SALDIS	native	1	-3	shrub	perennial	pussy willow
<i>Salix petiolaris</i>	Salicaceae	SALPET	native	1	-3	shrub	perennial	slender willow
<i>Sambucus canadensis</i>	Adoxaceae	SAMCAN	native	3	-3	shrub	perennial	elderberry
<i>Sarracenia purpurea</i>	Sarraceniaceae	SARPUR	native	10	-5	forb	perennial	pitcher-plant
<i>Schoenoplectus acutus; scirpus</i>	Cyperaceae	SCHACU	native	5	-5	sedge	perennial	hardstem bulrush
<i>a.</i>								
<i>Schoenoplectus pungens; scirpus americanus</i>	Cyperaceae	SCHPUN	native	5	-5	sedge	perennial	threesquare
<i>Schoenoplectus tabernaemontani; scirpus validus</i>	Cyperaceae	SCHTAB	native	4	-5	sedge	perennial	softstem bulrush
<i>Scutellaria galericulata</i>	Lamiaceae	SCUGAL	native	5	-5	forb	perennial	marsh skullcap
<i>Solanum dulcamara</i>	Solanaceae	SOLDUL	non-native	0	0	vine	perennial	bittersweet nightshade
<i>Solidago canadensis</i>	Asteraceae	SOLCAN	native	1	3	forb	perennial	canada goldenrod
<i>Solidago gigantea</i>	Asteraceae	SOLGIG	native	3	-3	forb	perennial	late goldenrod
<i>Solidago ohioensis</i>	Asteraceae	SOLOHI	native	8	-5	forb	perennial	ohio goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod

Grass River Natural Area 2017: Northern Wet Meadow								
Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Sparganium emersum</i> ; <i>s. chlorocarpum</i>	Typhaceae	SPAEME	native	6	-5	forb	perennial	green-fruited bur-reed
<i>Sparganium eurycarpum</i>	Typhaceae	SPAEUR	native	5	-5	forb	perennial	common bur-reed
<i>Spiraea alba</i>	Rosaceae	SPIALB	native	4	-3	shrub	perennial	meadowsweet
<i>Symphotrichum boreale</i> ; <i>aster b.</i>	Asteraceae	SYMBOR	native	9	-5	forb	perennial	northern bog aster
<i>Symphotrichum firmum</i> ; <i>aster puniceus</i>	Asteraceae	SYMFIR	native	4	-3	forb	perennial	smooth swamp aster
<i>Symphotrichum lanceolatum</i> ; <i>aster l.</i>	Asteraceae	SYMLAN	native	2	-3	forb	perennial	panicked aster
<i>Symphotrichum lateriflorum</i> ; <i>aster l.</i>	Asteraceae	SYMLAT	native	2	0	forb	perennial	calico aster
<i>Symphotrichum puniceum</i> ; <i>aster p.</i>	Asteraceae	SYMPUN	native	5	-5	forb	perennial	swamp aster
<i>Thalictrum dasycarpum</i>	Ranunculaceae	THADAS	native	3	-3	forb	perennial	purple meadow-rue
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Toxicodendron vernix</i>	Anacardiaceae	TOXVER	native	6	-5	shrub	perennial	poison sumac
<i>Triadenum fraseri</i>	Hypericaceae	TRIFRA	native	6	-5	forb	perennial	marsh st. johns-wort
<i>Trichophorum alpinum</i> ; <i>scirpus hudsonianus</i>	Cyperaceae	TRIALP	native	10	-5	sedge	perennial	bulrush
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	forb	perennial	star-flower
<i>Triglochin maritima</i>	Juncaginaceae	TRIMAR	native	8	-5	forb	perennial	common bog arrow-grass
<i>Typha angustifolia</i>	Typhaceae	TYPANG	non-native	0	-5	forb	perennial	narrow-leaved cat-tail
<i>Typha latifolia</i>	Typhaceae	TYPLAT	native	1	-5	forb	perennial	broad-leaved cat-tail
<i>Utricularia intermedia</i>	Lentibulariaceae	UTRINT	native	10	-5	forb	perennial	flat-leaved bladderwort
<i>Utricularia vulgaris</i>	Lentibulariaceae	UTRVUL	native	6	-5	forb	perennial	common bladderwort
<i>Vitis riparia</i>	Vitaceae	VITRIP	native	3	0	vine	perennial	river-bank grape

Appendix 4. Grass River Natural Area - Floristic Quality Assessment: Northern Fen

Grass River Natural Area 2017: Northern Fen

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett, Liana May, Phyllis Higman

Duration Notes: Surveys were conducted 9 June 2017 (Liana May), from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: In Grass River Natural Area, northern fen borders northern wet meadow, poor conifer swamp, or rich conifer swamp. It is strongly influenced by calcareous ground-water occurring on circumneutral to moderately alkaline peats. It supports a diverse array of graminoids, forbs, shrubs and stunted conifers, including many cacliphytic species.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation: *Cardamine* spp., *Eleocharis* spp., and *Viola* spp.

Dichanthelium implicatum in Michigan Flora has the accepted name of *Dichanthelium acuminatum* via tropicos.org.

Conservatism-Based Metrics:		Species Richness:		Duration Metrics:	
Total Mean C:	5.0	Total Species:	170	Annual:	4 2.40%
Native Mean C:	5.5	Native Species:	156 91.80%	Perennial:	163 95.90%
Total FQI:	65.2	Non-native Species:	14 8.20%	Biennial:	3 1.80%
Native FQI:	68.7			Native Annual:	3 1.80%
Adjusted FQI:	52.7	Species Wetness:		Native Perennial:	151 88.80%
% C value 0:	9.4	Mean Wetness:	-2.7	Native Biennial:	2 1.20%
% C value 1-3:	21.2	Native Mean Wetness:	-3.1		
% C value 4-6:	38.2			Physognomy Metrics:	
% C value 7-10:	31.2	Physiognomy Metrics:		Sedge:	29 17.10%
Native Tree Mean C:	3.7	Tree:	10 5.90%	Rush:	0 0%
Native Shrub Mean C:	5.9	Shrub:	21 12.40%	Fern:	9 5.30%
Native Herbaceous Mean C:	5.5	Vine:	3 1.80%	Bryophyte:	0 0%
		Forb:	82 48.20%		
		Grass:	16 9.40%		

Species:

Grass River Natural Area 2017: Northern Fen

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Agalinis purpurea</i>	Orobanchaceae	AGAPUR	native	7	-3	forb	annual	purple false foxglove
<i>Agrostis scabra; a. hyemalis</i>	Poaceae	AGRSCA	native	4	0	grass	perennial	ticklegass
<i>Alnus incana; a. rugosa</i>	Betulaceae	ALNINC	native	5	-3	shrub	perennial	speckled alder
<i>Andromeda glaucophylla</i>	Ericaceae	ANDGLA	native	10	-5	shrub	perennial	bog-rosemary
<i>Anemone canadensis</i>	Ranunculaceae	ANECAN	native	4	-3	forb	perennial	canada anemone
<i>Antennaria howellii</i>	Asteraceae	ANTHOW	native	2	5	forb	perennial	small pussytoes
<i>Apocynum cannabinum; a. sibiricum</i>	Apocynaceae	APOCAN	native	3	0	forb	perennial	indian-hemp
<i>Artemisia campestris</i>	Asteraceae	ARTCAM	native	5	5	forb	biennial	wormwood
<i>Asclepias incarnata</i>	Apocynaceae	ASCINC	native	6	-5	forb	perennial	swamp milkweed
<i>Asclepias syriaca</i>	Apocynaceae	ASCSYR	native	1	5	forb	perennial	common milkweed
<i>Betula alleghaniensis</i>	Betulaceae	BETALL	native	7	0	tree	perennial	yellow birch
<i>Betula papyrifera</i>	Betulaceae	BETPAP	native	2	3	tree	perennial	paper birch
<i>Bidens comosa</i>	Asteraceae	BIDCOM	native	5	-3	forb	annual	swamp tickseed
<i>Boehmeria cylindrica</i>	Urticaceae	BOE CYL	native	5	-5	forb	perennial	false nettle
<i>Bromus ciliatus</i>	Poaceae	BROCIL	native	6	-3	grass	perennial	fringed brome
<i>Calamagrostis canadensis</i>	Poaceae	CALCAN	native	3	-5	grass	perennial	blue-joint
<i>Calamagrostis stricta; c. inexpansa; c. lacustris</i>	Poaceae	CALSTR	native	10	-3	grass	perennial	narrow-leaved reedgrass
<i>Calopogon tuberosus</i>	Orchidaceae	CALTUB	native	9	-5	forb	perennial	grass-pink
<i>Caltha palustris</i>	Ranunculaceae	CALPAR	native	6	-5	forb	perennial	marsh-marigold
<i>Calystegia sepium</i>	Convolvulaceae	CALSEP	native	2	0	vine	perennial	hedge bindweed
<i>Campanula aparinoides</i>	Campanulaceae	CAMAPA	native	7	-5	forb	perennial	marsh bellflower
<i>Carex aquatilis</i>	Cyperaceae	CXAQUA	native	7	-5	sedge	perennial	sedge
<i>Carex buxbaumii</i>	Cyperaceae	CXBUXB	native	10	-5	sedge	perennial	sedge
<i>Carex comosa</i>	Cyperaceae	CXCOMO	native	5	-5	sedge	perennial	sedge
<i>Carex diandra</i>	Cyperaceae	CXDIAN	native	8	-5	sedge	perennial	sedge
<i>Carex eburnea</i>	Cyperaceae	CXE BUR	native	7	3	sedge	perennial	sedge
<i>Carex exilis</i>	Cyperaceae	CXEXIL	native	10	-5	sedge	perennial	sedge
<i>Carex flava</i>	Cyperaceae	CXFLAV	native	4	-5	sedge	perennial	sedge
<i>Carex hystericina</i>	Cyperaceae	CXHYST	native	2	-5	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Carex lasiocarpa</i>	Cyperaceae	CXLASI	native	8	-5	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex prairea</i>	Cyperaceae	CXPRAI	native	10	-3	sedge	perennial	sedge
<i>Carex pseudo-cyperus</i>	Cyperaceae	CXPSEU	native	5	-5	sedge	perennial	sedge

Grass River Natural Area 2017: Northern Fen

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Carex stricta</i>	Cyperaceae	CXSTRI	native	4	-5	sedge	perennial	sedge
<i>Carex trisperma</i>	Cyperaceae	CXTRIS	native	9	-5	sedge	perennial	sedge
<i>Carex utriculata; c. rostrata</i>	Cyperaceae	CXUTRI	native	5	-5	sedge	perennial	sedge
<i>Chamaedaphne calyculata</i>	Ericaceae	CHACAL	native	8	-5	shrub	perennial	leatherleaf
<i>Cicuta bulbifera</i>	Apiaceae	CICBUL	native	5	-5	forb	perennial	water hemlock
<i>Cirsium muticum</i>	Asteraceae	CIRMUT	native	6	-5	forb	biennial	swamp thistle
<i>Cirsium palustre</i>	Asteraceae	CIRPAL	non-native	0	-3	forb	biennial	marsh thistle
<i>Cladium mariscoides</i>	Cyperaceae	CLAMAR	native	10	-5	sedge	perennial	twig-rush
<i>Comarum palustre; potentilla p.</i>	Rosaceae	COMPAL	native	7	-5	forb	perennial	marsh cinquefoil
<i>Cornus amomum</i>	Cornaceae	CORAMO	native	2	-3	shrub	perennial	silky dogwood
<i>Cornus canadensis</i>	Cornaceae	CORCAA	native	6	0	shrub	perennial	bunchberry
<i>Cornus sericea; c. stolonifera</i>	Cornaceae	CORSER	native	2	-3	shrub	perennial	red-osier
<i>Cypripedium parviflorum; c. calceolus</i>	Orchidaceae	CYPPAR	native	5	0	forb	perennial	yellow lady-slipper
<i>Cypripedium reginae</i>	Orchidaceae	CYPREG	native	9	-3	forb	perennial	showy or queens lady-slipper
<i>Danthonia spicata</i>	Poaceae	DANSPI	native	4	5	grass	perennial	poverty grass; oatgrass
<i>Dasiphora fruticosa; potentilla f.</i>	Rosaceae	DASFRU	native	8	-3	shrub	perennial	shrubby cinquefoil
<i>Decodon verticillatus</i>	Lythraceae	DECVER	native	7	-5	shrub	perennial	whorled or swamp loosestrife
<i>Dichanthelium depauperatum; panicum d.</i>	Poaceae	DICDEP	native	4	5	grass	perennial	panic grass
<i>Dichanthelium implicatum; panicum i.</i>	Poaceae	DICIMP	native	3	0	grass	perennial	panic grass
<i>Drosera rotundifolia</i>	Droseraceae	DROROT	native	6	-5	forb	perennial	round-leaved sundew
<i>Dryopteris cristata</i>	Dryopteridaceae	DRYCRI	native	6	-5	fern	perennial	crested shield fern
<i>Dulichium arundinaceum</i>	Cyperaceae	DULARU	native	8	-5	sedge	perennial	three-way sedge
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Eleocharis elliptica</i>	Cyperaceae	ELEELL	native	6	-5	sedge	perennial	golden-seeded spike rush
<i>Eleocharis erythropoda</i>	Cyperaceae	ELEERY	native	4	-5	sedge	perennial	spike-rush
<i>Eleocharis palustris; e. smallii</i>	Cyperaceae	ELEPAL	native	5	-5	sedge	perennial	spike-rush
<i>Elymus trachycaulus; agropyron t.</i>	Poaceae	ELYTRA	native	8	3	grass	perennial	slender wheatgrass
<i>Epilobium palustre</i>	Onagraceae	EPIPAL	native	10	-5	forb	perennial	marsh willow-herb
<i>Equisetum arvense</i>	Equisetaceae	EQUARV	native	0	0	fern	perennial	common horsetail
<i>Equisetum fluviatile</i>	Equisetaceae	EQUFLU	native	7	-5	fern	perennial	water horsetail
<i>Equisetum hyemale</i>	Equisetaceae	EQUHYE	native	2	0	fern	perennial	scouring rush
<i>Equisetum palustre</i>	Equisetaceae	EQUPAL	native	8	-3	fern	perennial	marsh horsetail

Grass River Natural Area 2017: Northern Fen

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Eriophorum viridi-carinatum</i>	Cyperaceae	ERIVID	native	8	-5	sedge	perennial	green-keeled cotton-grass
<i>Erythronium americanum</i>	Liliaceae	ERYAME	native	5	5	forb	perennial	yellow trout lily
<i>Eupatorium perfoliatum</i>	Asteraceae	EUPPER	native	4	-3	forb	perennial	boneset
<i>Eutrochium maculatum</i> ; <i>eupatorium m.</i>	Asteraceae	EUTMAC	native	4	-5	forb	perennial	joe-pye-weed
<i>Fragaria virginiana</i>	Rosaceae	FRAVIR	native	2	3	forb	perennial	wild strawberry
<i>Galium labradoricum</i>	Rubiaceae	GALLAB	native	8	-5	forb	perennial	bog bedstraw
<i>Gaultheria hispidula</i>	Ericaceae	GAUHIS	native	8	-3	shrub	perennial	creeping-snowberry
<i>Geum rivale</i>	Rosaceae	GEURIV	native	7	-5	forb	perennial	purple avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Hieracium aurantiacum</i>	Asteraceae	HIEAUR	non-native	0	5	forb	perennial	orange hawkweed
<i>Hieracium caespitosum</i>	Asteraceae	HIECAE	non-native	0	5	forb	perennial	king devil
<i>Hieracium piloselloides</i>	Asteraceae	HIEPIS	non-native	0	5	forb	perennial	king devil
<i>Hypericum kalmianum</i>	Hypericaceae	HYPKAL	native	10	-3	shrub	perennial	kalms st. johns-wort
<i>Impatiens capensis</i>	Balsaminaceae	IMPCAP	native	2	-3	forb	annual	spotted touch-me-not
<i>Iris pseudacorus</i>	Iridaceae	IRIPSE	non-native	0	-5	forb	perennial	yellow flag
<i>Iris virginica</i>	Iridaceae	IRIVIR	native	5	-5	forb	perennial	southern blue flag
<i>Larix laricina</i>	Pinaceae	LARLAR	native	5	-3	tree	perennial	tamarack
<i>Lathyrus palustris</i>	Fabaceae	LATPAL	native	7	-3	vine	perennial	marsh pea
<i>Leucanthemum vulgare</i> ; <i>chrysanthemum leucanthemum</i>	Asteraceae	LEUVUL	non-native	0	5	forb	perennial	ox-eye daisy
<i>Lilium philadelphicum</i>	Liliaceae	LILPHI	native	7	0	forb	perennial	wood lily
<i>Linnaea borealis</i>	Linnaeaceae	LINBOR	native	6	0	forb	perennial	twinflower
<i>Lobelia cardinalis</i>	Campanulaceae	LOBCAR	native	7	-5	forb	perennial	cardinal-flower
<i>Lobelia kalmii</i>	Campanulaceae	LOBKAL	native	10	-5	forb	perennial	bog lobelia
<i>Lycopus americanus</i>	Lamiaceae	LYCAME	native	2	-5	forb	perennial	common water horehound
<i>Lycopus uniflorus</i>	Lamiaceae	LYCUNI	native	2	-5	forb	perennial	northern bugle weed
<i>Lysimachia quadriflora</i>	Myrsinaceae	LYSQUR	native	10	-5	forb	perennial	whorled loosestrife
<i>Lysimachia thyrsoiflora</i>	Myrsinaceae	LYSTHY	native	6	-5	forb	perennial	tufted loosestrife
<i>Mentha canadensis</i> ; <i>m. arvensis</i>	Lamiaceae	MENCAS	native	3	-3	forb	perennial	wild mint
<i>Menyanthes trifoliata</i>	Menyanthaceae	MENTRI	native	8	-5	forb	perennial	buckbean
<i>Muhlenbergia glomerata</i>	Poaceae	MUHGLO	native	10	-5	grass	perennial	marsh wild-timothy
<i>Myrica gale</i>	Myricaceae	MYRGAL	native	6	-5	shrub	perennial	sweet gale
<i>Nuphar variegata</i>	Nymphaeaceae	NUPVAR	native	7	-5	forb	perennial	yellow pond-lily
<i>Nymphaea odorata</i>	Nymphaeaceae	NYMODO	native	6	-5	forb	perennial	sweet-scented waterlily
<i>Onoclea sensibilis</i>	Onocleaceae	ONosen	native	2	-3	fern	perennial	sensitive fern
<i>Osmunda cinnamomea</i>	Osmundaceae	OSMCIN	native	5	-3	fern	perennial	cinnamon fern
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern

Grass River Natural Area 2017: Northern Fen

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Parnassia glauca</i>	Parnassiaceae	PARGLA	native	8	-5	forb	perennial	grass-of-parnassus
<i>Phalaris arundinacea</i>	Poaceae	PHAARU	native	0	-3	grass	perennial	reed canary grass
<i>Phleum pratense</i>	Poaceae	PHLPRA	non-native	0	3	grass	perennial	timothy
<i>Phragmites australis</i> var. <i>americanus</i>	Poaceae	PHRAUM	native	5	-3	grass	perennial	reed
<i>Picea mariana</i>	Pinaceae	PICMAR	native	6	-3	tree	perennial	black spruce
<i>Pinus resinosa</i>	Pinaceae	PINRES	native	6	3	tree	perennial	red pine
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	tree	perennial	white pine
<i>Platanthera huronensis</i> ; <i>habenaria hyperborea</i>	Orchidaceae	PLAHUR	native	5	-3	forb	perennial	lake huron green orchid
<i>Platanthera psycodes</i> ; <i>habenaria</i> <i>p.</i>	Orchidaceae	PLAPSY	native	7	-3	forb	perennial	purple fringed orchid
<i>Poa compressa</i>	Poaceae	POACOM	non-native	0	3	grass	perennial	canada bluegrass
<i>Poa palustris</i>	Poaceae	POAPAS	native	3	-3	grass	perennial	fowl meadow grass
<i>Poa pratensis</i>	Poaceae	POAPRA	non-native	0	3	grass	perennial	kentucky bluegrass
<i>Pogonia ophioglossoides</i>	Orchidaceae	POGOPH	native	10	-5	forb	perennial	rose pogonia
<i>Pontederia cordata</i>	Pontederiaceae	PONCOR	native	8	-5	forb	perennial	pickerel-weed
<i>Populus balsamifera</i>	Salicaceae	POPBAL	native	2	-3	tree	perennial	balsam poplar
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	tree	perennial	quaking aspen
<i>Potamogeton natans</i>	Potamogetonaceae	POTNAT	native	5	-5	forb	perennial	pondweed
<i>Potentilla anserina</i>	Rosaceae	POTANS	native	5	-3	forb	perennial	silverweed
<i>Proserpinaca palustris</i>	Haloragaceae	PROPAL	native	6	-5	forb	perennial	mermaid-weed
<i>Ranunculus acris</i>	Ranunculaceae	RANACR	non-native	0	0	forb	perennial	tall or common buttercup
<i>Rhamnus alnifolia</i>	Rhamnaceae	RHAALN	native	8	-5	shrub	perennial	alder-leaved buckthorn
<i>Rhododendron groenlandicum</i> ; <i>ledum</i> g.	Ericaceae	RHOGRO	native	8	-5	shrub	perennial	labrador-tea
<i>Rhynchospora alba</i>	Cyperaceae	RHYALB	native	6	-5	sedge	perennial	beak-rush
<i>Rhynchospora capillacea</i>	Cyperaceae	RHYCAL	native	10	-5	sedge	perennial	beak-rush
<i>Rosa palustris</i>	Rosaceae	ROSPAL	native	5	-5	shrub	perennial	swamp rose
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Rudbeckia hirta</i>	Asteraceae	RUDHIR	native	1	3	forb	perennial	black-eyed susan
<i>Rumex acetosella</i>	Polygonaceae	RUMACL	non-native	0	3	forb	perennial	sheep sorrel
<i>Sagittaria latifolia</i>	Alismataceae	SAGLAT	native	4	-5	forb	perennial	common arrowhead
<i>Salix discolor</i>	Salicaceae	SALDIS	native	1	-3	shrub	perennial	pussy willow
<i>Salix petiolaris</i>	Salicaceae	SALPET	native	1	-3	shrub	perennial	slender willow
<i>Sarracenia purpurea</i>	Sarraceniaceae	SARPUR	native	10	-5	forb	perennial	pitcher-plant
<i>Schoenoplectus acutus</i> ; <i>scirpus</i> <i>a.</i>	Cyperaceae	SCHACU	native	5	-5	sedge	perennial	hardstem bulrush

Grass River Natural Area 2017: Northern Fen								
Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Schoenoplectus pungens</i> ; <i>scirpus americanus</i>	Cyperaceae	SCHPUN	native	5	-5	sedge	perennial	threesquare
<i>Schoenoplectus tabernaemontani</i> ; <i>scirpus validus</i>	Cyperaceae	SCHTAB	native	4	-5	sedge	perennial	softstem bulrush
<i>Scirpus atrovirens</i>	Cyperaceae	SCIATV	native	3	-5	sedge	perennial	bulrush
<i>Scutellaria galericulata</i>	Lamiaceae	SCUGAL	native	5	-5	forb	perennial	marsh skullcap
<i>Solidago canadensis</i>	Asteraceae	SOLCAN	native	1	3	forb	perennial	canada goldenrod
<i>Solidago gigantea</i>	Asteraceae	SOLGIG	native	3	-3	forb	perennial	late goldenrod
<i>Solidago patula</i>	Asteraceae	SOLPAT	native	6	-5	forb	perennial	swamp goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod
<i>Solidago uliginosa</i>	Asteraceae	SOLULI	native	4	-5	forb	perennial	bog goldenrod
<i>Sparganium eurycarpum</i>	Typhaceae	SPAEUR	native	5	-5	forb	perennial	common bur-reed
<i>Spiranthes cernua</i>	Orchidaceae	SPICER	native	4	-3	forb	perennial	nodding ladies-tresses
<i>Stellaria media</i>	Caryophyllaceae	STEMED	non-native	0	3	forb	annual	common chickweed
<i>Symphotrichum boreale</i> ; <i>aster b.</i>	Asteraceae	SYMBOR	native	9	-5	forb	perennial	northern bog aster
<i>Symphotrichum lanceolatum</i> ; <i>aster l.</i>	Asteraceae	SYMLAN	native	2	-3	forb	perennial	panicled aster
<i>Symphotrichum lateriflorum</i> ; <i>aster l.</i>	Asteraceae	SYMLAT	native	2	0	forb	perennial	calico aster
<i>Symphotrichum puniceum</i> ; <i>aster p.</i>	Asteraceae	SYMPUN	native	5	-5	forb	perennial	swamp aster
<i>Thalictrum dasycarpum</i>	Ranunculaceae	THADAS	native	3	-3	forb	perennial	purple meadow-rue
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Toxicodendron vernix</i>	Anacardiaceae	TOXVER	native	6	-5	shrub	perennial	poison sumac
<i>Triadenum fraseri</i>	Hypericaceae	TRIFRA	native	6	-5	forb	perennial	marsh st. johns-wort
<i>Trichophorum alpinum</i> ; <i>scirpus hudsonianus</i>	Cyperaceae	TRIALP	native	10	-5	sedge	perennial	bulrush
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	forb	perennial	star-flower
<i>Triglochin maritima</i>	Juncaginaceae	TRIMAR	native	8	-5	forb	perennial	common bog arrow-grass
<i>Typha angustifolia</i>	Typhaceae	TYPANG	non-native	0	-5	forb	perennial	narrow-leaved cat-tail
<i>Typha latifolia</i>	Typhaceae	TYPLAT	native	1	-5	forb	perennial	broad-leaved cat-tail
<i>Utricularia cornuta</i>	Lentibulariaceae	UTRCOR	native	10	-5	forb	perennial	horned bladderwort
<i>Utricularia intermedia</i>	Lentibulariaceae	UTRINT	native	10	-5	forb	perennial	flat-leaved bladderwort
<i>Utricularia minor</i>	Lentibulariaceae	UTRMIN	native	10	-5	forb	perennial	small bladderwort
<i>Utricularia vulgaris</i>	Lentibulariaceae	UTRVUL	native	6	-5	forb	perennial	common bladderwort

Grass River Natural Area 2017: Northern Fen

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Vaccinium myrtilloides</i>	Ericaceae	VACMYR	native	4	-3	shrub	perennial	canada blueberry
<i>Vaccinium oxycoccos</i>	Ericaceae	VACOXY	native	8	-5	shrub	perennial	small cranberry
<i>Verbena hastata</i>	Verbenaceae	VERHAS	native	4	-3	forb	perennial	blue vervain
<i>Vitis riparia</i>	Vitaceae	VITRIP	native	3	0	vine	perennial	river-bank grape

Appendix 5. Grass River Natural Area - Floristic Quality Assessment: Northern Shrub Thicket

Grass River Natural Area 2017: Northern Shrub Thicket

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett

Duration Notes: Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: In Grass River Natural Area, northern shrub thicket borders northern wet meadow and rich conifer swamp. It is very dense shrub and small tree vegetation with a low canopy, usually dominated by *Alnus incana*. Other abundant species include *Toxicodendron vernix* and *Cornus* spp.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation:
Cardamine spp., *Fraxinus* spp. saplings, and *Viola* spp.

Conservatism-Based Metrics:	Species Richness:	Duration Metrics:
Total Mean C: 5.2	Total Species: 26	Annual: 1 3.80%
Native Mean C: 5.4	Native Species: 25 96.20%	Perennial: 25 96.20%
Total FQI: 26.5	Non-native Species: 1 3.80%	Biennial: 0 0%
Native FQI: 27.0		Native Annual: 1 3.80%
Adjusted FQI: 53.0	Species Wetness:	Native Perennial: 24 92.30%
% C value 0: 7.7	Mean Wetness: -3.6	Native Biennial: 0 0%
% C value 1-3: 15.4	Native Mean Wetness: -3.9	
% C value 4-6: 50.0		Physiognomy Metrics:
% C value 7-10: 26.9	Physiognomy Metrics:	Sedge: 5 19.20%
Native Tree Mean C: 6.0	Tree: 1 3.80%	Rush: 0 0%
Native Shrub Mean C: 7.0	Shrub: 5 19.20%	Fern: 3 11.50%
Native Herbaceous Mean C: 4.9	Vine: 1 3.80%	Bryophyte: 0 0%
	Forb: 11 42.30%	
	Grass: 0 0%	

Species:

Grass River Natural Area 2017: Northern Shrub Thicket

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Anemone canadensis</i>	Ranunculaceae	ANECAN	native	4	-3	forb	perennial	canada anemone
<i>Carex buxbaumii</i>	Cyperaceae	CXBUXB	native	10	-5	sedge	perennial	sedge
<i>Carex diandra</i>	Cyperaceae	CXDIAN	native	8	-5	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Conyza canadensis</i>	Asteraceae	CONCAN	native	0	3	forb	annual	horseweed
<i>Dulichium arundinaceum</i>	Cyperaceae	DULARU	native	8	-5	sedge	perennial	three-way sedge
<i>Euphorbia virgata; e. esula</i>	Euphorbiaceae	EUPVIR	non-native	0	5	forb	perennial	leafy spurge
<i>Eutrochium maculatum; eupatorium m.</i>	Asteraceae	EUTMAC	native	4	-5	forb	perennial	joe-pye-weed
<i>Fraxinus nigra</i>	Oleaceae	FRANIG	native	6	-3	tree	perennial	black ash
<i>Hypericum kalmianum</i>	Hypericaceae	HYPKAL	native	10	-3	shrub	perennial	kalms st. johns-wort
<i>Iris virginica</i>	Iridaceae	IRIVIR	native	5	-5	forb	perennial	southern blue flag
<i>Menyanthes trifoliata</i>	Menyanthaceae	MENTRI	native	8	-5	forb	perennial	buckbean
<i>Mimulus ringens</i>	Phrymaceae	MIMRIN	native	5	-5	forb	perennial	monkey-flower
<i>Nuphar variegata</i>	Nymphaeaceae	NUPVAR	native	7	-5	forb	perennial	yellow pond-lily
<i>Onoclea sensibilis</i>	Onocleaceae	ONOSEN	native	2	-3	fern	perennial	sensitive fern
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern
<i>Persicaria hydropiperoides; polygonum h.</i>	Polygonaceae	PERHYS	native	5	-5	forb	perennial	mild water-pepper
<i>Potentilla anserina</i>	Rosaceae	POTANS	native	5	-3	forb	perennial	silverweed
<i>Rhamnus alnifolia</i>	Rhamnaceae	RHAALN	native	8	-5	shrub	perennial	alder-leaved buckthorn
<i>Ribes hirtellum</i>	Grossulariaceae	RIBHIR	native	6	-3	shrub	perennial	swamp gooseberry
<i>Rosa palustris</i>	Rosaceae	ROSPAL	native	5	-5	shrub	perennial	swamp rose
<i>Schoenoplectus tabernaemontani; scirpus validus</i>	Cyperaceae	SCHTAB	native	4	-5	sedge	perennial	softstem bulrush
<i>Sparganium eurycarpum</i>	Typhaceae	SPAEUR	native	5	-5	forb	perennial	common bur-reed
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Toxicodendron vernix</i>	Anacardiaceae	TOXVER	native	6	-5	shrub	perennial	poison sumac
<i>Vitis riparia</i>	Vitaceae	VITRIP	native	3	0	vine	perennial	river-bank grape

Appendix 6. Grass River Natural Area - Floristic Quality Assessment: Poor Conifer Swamp

Grass River Natural Area 2017: Poor Conifer Swamp

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett

Duration Notes: Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: In Grass River Natural Area, poor conifer swamp borders rich conifer swamp and northern fen. It in a nutrient-poor peatland occurring on extremely acidic saturated peats with little groundwater influence. Characteristic species include black spruce, tamarack, ericaceous shrubs and sphagnum mosses.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation: *Viola* spp.

Conservatism-Based Metrics:	Species Richness:	Duration Metrics:
Total Mean C: 5.7	Total Species: 65	Annual: 0 0%
Native Mean C: 5.8	Native Species: 64 98.50%	Perennial: 65 100.00%
Total FQI: 46.0	Non-native Species: 1 1.50%	Biennial: 0 0%
Native FQI: 46.4		Native Annual: 0 0%
Adjusted FQI: 57.6	Species Wetness:	Native Perennial: 64 98.50%
% C value 0: 1.5	Mean Wetness: -3.1	Native Biennial: 0 0%
% C value 1-3: 13.8	Native Mean Wetness: -3.2	
% C value 4-6: 47.7	Physiognomy Metrics:	Physiognomy Metrics:
% C value 7-10: 36.9	Tree: 5 7.70%	Sedge: 10 15.40%
Native Tree Mean C: 3.8	Shrub: 16 24.60%	Rush: 0 0%
Native Shrub Mean C: 6.5	Vine: 1 1.50%	Fern: 2 3.10%
Native Herbaceous Mean C: 5.8	Forb: 29 44.60%	Bryophyte: 0 0%
	Grass: 2 3.10%	

Species:

Grass River Natural Area 2017: Poor Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Abies balsamea</i>	Pinaceae	ABIBAL	native	3	0	tree	perennial	balsam fir
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Andromeda glaucophylla</i>	Ericaceae	ANDGLA	native	10	-5	shrub	perennial	bog-rosemary
<i>Asclepias incarnata</i>	Apocynaceae	ASCINC	native	6	-5	forb	perennial	swamp milkweed
<i>Bromus ciliatus</i>	Poaceae	BROCIL	native	6	-3	grass	perennial	fringed brome
<i>Calopogon tuberosus</i>	Orchidaceae	CALTUB	native	9	-5	forb	perennial	grass-pink
<i>Caltha palustris</i>	Ranunculaceae	CALPAR	native	6	-5	forb	perennial	marsh-marigold
<i>Carex flava</i>	Cyperaceae	CXFLAV	native	4	-5	sedge	perennial	sedge
<i>Carex hystericina</i>	Cyperaceae	CXHYST	native	2	-5	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Carex lasiocarpa</i>	Cyperaceae	CXLASI	native	8	-5	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex prairea</i>	Cyperaceae	CXPRAI	native	10	-3	sedge	perennial	sedge
<i>Carex stricta</i>	Cyperaceae	CXSTRI	native	4	-5	sedge	perennial	sedge
<i>Carex trisperma</i>	Cyperaceae	CXTRIS	native	9	-5	sedge	perennial	sedge
<i>Chamaedaphne calyculata</i>	Ericaceae	CHACAL	native	8	-5	shrub	perennial	leatherleaf
<i>Comarum palustre; potentilla p.</i>	Rosaceae	COMPAL	native	7	-5	forb	perennial	marsh cinquefoil
<i>Cornus canadensis</i>	Cornaceae	CORCAA	native	6	0	shrub	perennial	bunchberry
<i>Cypripedium reginae</i>	Orchidaceae	CYPREG	native	9	-3	forb	perennial	showy or queens lady-slipper
<i>Dasiphora fruticosa; potentilla f.</i>	Rosaceae	DASFRU	native	8	-3	shrub	perennial	whorled or swamp shrubby cinquefoil
<i>Decodon verticillatus</i>	Lythraceae	DECVER	native	7	-5	shrub	perennial	loosestrife
<i>Drosera rotundifolia</i>	Droseraceae	DROROT	native	6	-5	forb	perennial	round-leaved sundew
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Eriophorum viridi-carinatum</i>	Cyperaceae	ERIVID	native	8	-5	sedge	perennial	green-keeled cotton-grass
<i>Erythronium americanum</i>	Liliaceae	ERYAME	native	5	5	forb	perennial	yellow trout lily
<i>Eupatorium perfoliatum</i>	Asteraceae	EUPPER	native	4	-3	forb	perennial	boneset
<i>Eutrochium maculatum; eupatorium m.</i>	Asteraceae	EUTMAC	native	4	-5	forb	perennial	joe-pye-weed
<i>Galium labradoricum</i>	Rubiaceae	GALLAB	native	8	-5	forb	perennial	bog bedstraw
<i>Gaultheria hispidula</i>	Ericaceae	GAUHIS	native	8	-3	shrub	perennial	creeping-snowberry
<i>Gaultheria procumbens</i>	Ericaceae	GAUPRO	native	5	3	shrub	perennial	wintergreen
<i>Gaylussacia baccata</i>	Ericaceae	GAYBAC	native	7	3	shrub	perennial	huckleberry
<i>Geum rivale</i>	Rosaceae	GEURIV	native	7	-5	forb	perennial	purple avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Larix laricina</i>	Pinaceae	LARLAR	native	5	-3	tree	perennial	tamarack

Grass River Natural Area 2017: Poor Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Lathyrus palustris</i>	Fabaceae	LATPAL	native	7	-3	vine	perennial	marsh pea
<i>Lilium philadelphicum</i>	Liliaceae	LILPHI	native	7	0	forb	perennial	wood lily
<i>Linnaea borealis</i>	Linnaeaceae	LINBOR	native	6	0	forb	perennial	twinflower
<i>Lobelia kalmii</i>	Campanulaceae	LOBKAL	native	10	-5	forb	perennial	bog lobelia
<i>Lysimachia thyrsoiflora</i>	Myrsinaceae	LYSTHY	native	6	-5	forb	perennial	tufted loosestrife
<i>Maianthemum canadense</i>	Convallariaceae	MAICAN	native	4	3	forb	perennial	canada mayflower
<i>Menyanthes trifoliata</i>	Menyanthaceae	MENTRI	native	8	-5	forb	perennial	buckbean
<i>Mitchella repens</i>	Rubiaceae	MITREP	native	5	3	forb	perennial	partridge-berry
<i>Myrica gale</i>	Myricaceae	MYRGAL	native	6	-5	shrub	perennial	sweet gale
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern
<i>Parnassia glauca</i>	Parnassiaceae	PARGLA	native	8	-5	forb	perennial	grass-of-parnassus
<i>Picea mariana</i>	Pinaceae	PICMAR	native	6	-3	tree	perennial	black spruce
<i>Rhododendron groenlandicum;</i> <i>ledum g.</i>	Ericaceae	RHOGRO	native	8	-5	shrub	perennial	labrador-tea
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Sarracenia purpurea</i>	Sarraceniaceae	SARPUR	native	10	-5	forb	perennial	pitcher-plant
<i>Scirpus cyperinus</i>	Cyperaceae	SCICYP	native	5	-5	sedge	perennial	wool-grass
<i>Solidago ohioensis</i>	Asteraceae	SOLOHI	native	8	-5	forb	perennial	ohio goldenrod
<i>Solidago patula</i>	Asteraceae	SOLPAT	native	6	-5	forb	perennial	swamp goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod
<i>Solidago uliginosa</i>	Asteraceae	SOLULI	native	4	-5	forb	perennial	bog goldenrod
<i>Symphotrichum lateriflorum;</i> <i>aster l.</i>	Asteraceae	SYMLAT	native	2	0	forb	perennial	calico aster
<i>Symphotrichum puniceum;</i> <i>aster p.</i>	Asteraceae	SYMPUN	native	5	-5	forb	perennial	swamp aster
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Toxicodendron rydbergii; t.</i> <i>radicans</i>	Anacardiaceae	TOXRYD	native	3	0	shrub	perennial	poison-ivy
<i>Toxicodendron vernix</i>	Anacardiaceae	TOXVER	native	6	-5	shrub	perennial	poison sumac
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	forb	perennial	star-flower
<i>Typha latifolia</i>	Typhaceae	TYPLAT	native	1	-5	forb	perennial	broad-leaved cat-tail
<i>Vaccinium myrtilloides</i>	Ericaceae	VACMYR	native	4	-3	shrub	perennial	canada blueberry
<i>Vaccinium oxycoccos</i>	Ericaceae	VACOXY	native	8	-5	shrub	perennial	small cranberry
<i>Verbena hastata</i>	Verbenaceae	VERHAS	native	4	-3	forb	perennial	blue vervain

Appendix 7. Grass River Natural Area - Floristic Quality Assessment: Rich Conifer Swamp

Grass River Natural Area 2017: Rich Conifer Swamp

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication: 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett, Liana May, Phyllis Higman

Duration Notes: Surveys were conducted 9 June 2017 (Liana May), from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: Rich conifer swamp is the most abundant community in Grass River Natural Area, where it borders poor conifer swamp, northern fen, northern wet meadow, northern shrub thicket, mesic northern forest, and dry-mesic northern forest. It is a ground-water influenced system occurring on circumneutral to moderately alkaline peats with a canopy dominated by *Thuja occidentalis*. Other canopy species include *Larix laricina*, *Abies balsamea*, and *Picea* spp. *Alnus incana* and *Toxicodendron vernix* were common, and the diverse ground layer included many graminoids, forbs, ericaceous shrubs and sphagnum mosses.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation: *Cardamine* spp., *Dryopteris* spp., *Eleocharis* spp., *Geum* spp., *Lonicera* spp., and *Viola* spp.

Dichanthelium implicatum in Michigan Flora has the accepted name of *Dichanthelium acuminatum* via tropicos.org.

Conservatism-Based Metrics:		Species Richness:		Duration Metrics:	
Total Mean C:	4.8	Total Species:	207	Annual:	5 2.40%
Native Mean C:	5.2	Native Species:	191 92.30%	Perennial:	199 96.10%
Total FQI:	69.1	Non-native Species:	16 7.70%	Biennial:	3 1.40%
Native FQI:	71.9			Native Annual:	4 1.90%
Adjusted FQI:	49.9	Species Wetness:		Native Perennial:	186 89.90%
% C value 0:	9.7	Mean Wetness:	-2.0	Native Biennial:	1 0.50%
% C value 1-3:	20.3	Native Mean Wetness:	-2.3		
% C value 4-6:	44.9			Physiognomy Metrics:	
% C value 7-10:	25.1	Physiognomy Metrics:		Sedge:	29 14.00%
Native Tree Mean C:	3.9	Tree:	16 7.70%	Rush:	0 0%
Native Shrub Mean C:	6.0	Shrub:	32 15.50%	Fern:	17 8.20%
Native Herbaceous Mean C:	5.1	Vine:	7 3.40%	Bryophyte:	0 0%
		Forb:	95 45.90%		
		Grass:	11 5.30%		

Species:

Grass River Natural Area 2017: Rich Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Abies balsamea</i>	Pinaceae	ABIBAL	native	3	0	tree	perennial	balsam fir
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Adiantum pedatum</i>	Pteridaceae	ADIPEP	native	6	3	fern	perennial	maidenhair fern
<i>Agrostis perennans</i>	Poaceae	AGRPER	native	5	3	grass	perennial	autumn bent
<i>Alliaria petiolata</i>	Brassicaceae	ALLPET	non-native	0	3	forb	biennial	garlic mustard
<i>Alnus incana; a. rugosa</i>	Betulaceae	ALNINC	native	5	-3	shrub	perennial	speckled alder
<i>Anaphalis margaritacea</i>	Asteraceae	ANAMAR	native	3	5	forb	perennial	pearly everlasting
<i>Andromeda glaucophylla</i>	Ericaceae	ANDGLA	native	10	-5	shrub	perennial	bog-rosemary
<i>Anemone canadensis</i>	Ranunculaceae	ANECAN	native	4	-3	forb	perennial	canada anemone
<i>Apocynum cannabinum; a. sibiricum</i>	Apocynaceae	APOCAN	native	3	0	forb	perennial	indian-hemp
<i>Aralia nudicaulis</i>	Araliaceae	ARANUD	native	5	3	forb	perennial	wild sarsaparilla
<i>Arethusa bulbosa</i>	Orchidaceae	AREBUL	native	10	-5	forb	perennial	dragons mouth
<i>Arisaema triphyllum</i>	Araceae	ARITRI	native	5	0	forb	perennial	jack-in-the-pulpit
<i>Asclepias incarnata</i>	Apocynaceae	ASCINC	native	6	-5	forb	perennial	swamp milkweed
<i>Asclepias syriaca</i>	Apocynaceae	ASCSYR	native	1	5	forb	perennial	common milkweed
<i>Athyrium filix-femina</i>	Athyriaceae	ATHFIL	native	4	0	fern	perennial	lady fern
<i>Berberis thunbergii</i>	Berberidaceae	BERTHU	non-native	0	3	shrub	perennial	japanese barberry
<i>Betula alleghaniensis</i>	Betulaceae	BETALL	native	7	0	tree	perennial	yellow birch
<i>Betula papyrifera</i>	Betulaceae	BETPAP	native	2	3	tree	perennial	paper birch
<i>Bidens comosa</i>	Asteraceae	BIDCOM	native	5	-3	forb	annual	swamp tickseed
<i>Bidens frondosa</i>	Asteraceae	BIDFRO	native	1	-3	forb	annual	common beggar-ticks
<i>Boehmeria cylindrica</i>	Urticaceae	BOECYL	native	5	-5	forb	perennial	false nettle
<i>Botrypus virginianus</i>	Ophioglossaceae	BOTVIR	native	5	3	fern	perennial	rattlesnake fern
<i>Bromus ciliatus</i>	Poaceae	BROCIL	native	6	-3	grass	perennial	fringed brome
<i>Calamagrostis canadensis</i>	Poaceae	CALCAN	native	3	-5	grass	perennial	blue-joint
<i>Calamagrostis stricta; c. inexpansa; c. lacustris</i>	Poaceae	CALSTR	native	10	-3	grass	perennial	narrow-leaved reedgrass
<i>Caltha palustris</i>	Ranunculaceae	CALPAR	native	6	-5	forb	perennial	marsh-marigold
<i>Campanula aparinoides</i>	Campanulaceae	CAMAPA	native	7	-5	forb	perennial	marsh bellflower
<i>Cardamine bulbosa</i>	Brassicaceae	CARBUL	native	4	-5	forb	perennial	spring cress
<i>Carex arctata</i>	Cyperaceae	CXARTT	native	3	5	sedge	perennial	sedge
<i>Carex aurea</i>	Cyperaceae	CXAURE	native	3	-3	sedge	perennial	sedge
<i>Carex bebbii</i>	Cyperaceae	CXBEBB	native	4	-5	sedge	perennial	sedge
<i>Carex brunnescens</i>	Cyperaceae	CXBRUN	native	5	-3	sedge	perennial	sedge
<i>Carex comosa</i>	Cyperaceae	CXCOMO	native	5	-5	sedge	perennial	sedge

Grass River Natural Area 2017: Rich Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Carex crinita</i>	Cyperaceae	CXCRIN	native	4	-5	sedge	perennial	sedge
<i>Carex disperma</i>	Cyperaceae	CXDISP	native	10	-5	sedge	perennial	sedge
<i>Carex eburnea</i>	Cyperaceae	CXE BUR	native	7	3	sedge	perennial	sedge
<i>Carex exilis</i>	Cyperaceae	CXEXIL	native	10	-5	sedge	perennial	sedge
<i>Carex flava</i>	Cyperaceae	CXFLAV	native	4	-5	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Carex intumescens</i>	Cyperaceae	CXINTU	native	3	-3	sedge	perennial	sedge
<i>Carex lasiocarpa</i>	Cyperaceae	CXLASI	native	8	-5	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex leptoneuria</i>	Cyperaceae	CXLEPO	native	3	0	sedge	perennial	sedge
<i>Carex lupulina</i>	Cyperaceae	CXLUPA	native	4	-5	sedge	perennial	sedge
<i>Carex merritt-fernaldii</i>	Cyperaceae	CXMERR	native	4	5	sedge	perennial	sedge
<i>Carex pedunculata</i>	Cyperaceae	CXPEDU	native	5	3	sedge	perennial	sedge
<i>Carex pseudo-cyperus</i>	Cyperaceae	CXPSEU	native	5	-5	sedge	perennial	sedge
<i>Carex stipata</i>	Cyperaceae	CXSTIP	native	1	-5	sedge	perennial	sedge
<i>Carex stricta</i>	Cyperaceae	CXSTRI	native	4	-5	sedge	perennial	sedge
<i>Carex trisperma</i>	Cyperaceae	CXTRIS	native	9	-5	sedge	perennial	sedge
<i>Carex utriculata; c. rostrata</i>	Cyperaceae	CXUTRI	native	5	-5	sedge	perennial	sedge
<i>Carex vulpinoidea</i>	Cyperaceae	CXVULP	native	1	-5	sedge	perennial	sedge
<i>Chamaedaphne calyculata</i>	Ericaceae	CHACAL	native	8	-5	shrub	perennial	leatherleaf
<i>Chelone glabra</i>	Plantaginaceae	CHEGLB	native	7	-5	forb	perennial	turtlehead
<i>Circaea canadensis; c. lutetiana</i>	Onagraceae	CIRCAN	native	2	3	forb	perennial	enchanters-nightsshade
<i>Cirsium muticum</i>	Asteraceae	CIRMUT	native	6	-5	forb	biennial	swamp thistle
<i>Cirsium palustre</i>	Asteraceae	CIRPAL	non-native	0	-3	forb	biennial	marsh thistle
<i>Clematis virginiana</i>	Ranunculaceae	CLEVIR	native	4	0	vine	perennial	virgins bower
<i>Clintonia borealis</i>	Convallariaceae	CLIBOR	native	5	0	forb	perennial	bluebead-lily; corn-lily
<i>Comarum palustre; potentilla p.</i>	Rosaceae	COMPAL	native	7	-5	forb	perennial	marsh cinquefoil
<i>Coptis trifolia</i>	Ranunculaceae	COPTRI	native	5	-3	forb	perennial	goldthread
<i>Corallorhiza trifida</i>	Orchidaceae	CORTRF	native	6	-3	forb	perennial	early coral-root
<i>Cornus alternifolia</i>	Cornaceae	CORALT	native	5	3	tree	perennial	alternate-leaved dogwood
<i>Cornus amomum</i>	Cornaceae	CORAMO	native	2	-3	shrub	perennial	silky dogwood
<i>Cornus canadensis</i>	Cornaceae	CORCAA	native	6	0	shrub	perennial	bunchberry
<i>Cornus sericea; c. stolonifera</i>	Cornaceae	CORSER	native	2	-3	shrub	perennial	red-osier pink lady-slipper; moccasin flower
<i>Cypripedium acaule</i>	Orchidaceae	CYPACA	native	5	-3	forb	perennial	flower
<i>Cypripedium parviflorum; c. calceolus</i>	Orchidaceae	CYPPAR	native	5	0	forb	perennial	yellow lady-slipper

Grass River Natural Area 2017: Rich Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Cypripedium reginae</i>	Orchidaceae	CYPREG	native	9	-3	forb	perennial	showy or queens lady-slipper
<i>Dasiphora fruticosa</i> ; <i>potentilla</i> f.	Rosaceae	DASFRU	native	8	-3	shrub	perennial	shrubby cinquefoil
<i>Decodon verticillatus</i>	Lythraceae	DECVER	native	7	-5	shrub	perennial	whorled or swamp loosestrife
<i>Dichanthelium implicatum</i> ; <i>panicum</i> i.	Poaceae	DICIMP	native	3	0	grass	perennial	panic grass
<i>Drosera rotundifolia</i>	Droseraceae	DROROT	native	6	-5	forb	perennial	round-leaved sundew
<i>Dryopteris clintoniana</i>	Dryopteridaceae	DRYCLI	native	8	-3	fern	perennial	clintons woodfern
<i>Dryopteris cristata</i>	Dryopteridaceae	DRYCRI	native	6	-5	fern	perennial	crested shield fern
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Epigaea repens</i>	Ericaceae	EPIREP	native	7	3	shrub	perennial	trailing-arbutus
<i>Epilobium ciliatum</i>	Onagraceae	EPICIL	native	3	-3	forb	perennial	willow-herb
<i>Epilobium palustre</i>	Onagraceae	EPIPAL	native	10	-5	forb	perennial	marsh willow-herb
<i>Epilobium parviflorum</i>	Onagraceae	EPIPAR	non-native	0	-5	forb	perennial	willow-herb
<i>Equisetum fluviatile</i>	Equisetaceae	EQUFLU	native	7	-5	fern	perennial	water horsetail
<i>Equisetum palustre</i>	Equisetaceae	EQUPAL	native	8	-3	fern	perennial	marsh scourtail
<i>Equisetum scirpoides</i>	Equisetaceae	EQUSCI	native	7	0	fern	perennial	dwarf scouring rush
<i>Equisetum sylvaticum</i>	Equisetaceae	EQUSYL	native	5	-3	fern	perennial	woodland horsetail
<i>Eriophorum viridi-carinatum</i>	Cyperaceae	ERIVID	native	8	-5	sedge	perennial	green-keeled cotton-grass
<i>Eupatorium perfoliatum</i>	Asteraceae	EUPPER	native	4	-3	forb	perennial	boneset
<i>Eutrochium maculatum</i> ; <i>eupatorium</i> m.	Asteraceae	EUTMAC	native	4	-5	forb	perennial	joe-pye-weed
<i>Fraxinus americana</i>	Oleaceae	FRAAME	native	5	3	tree	perennial	white ash
<i>Fraxinus nigra</i>	Oleaceae	FRANIG	native	6	-3	tree	perennial	black ash
<i>Galium asprellum</i>	Rubiaceae	GALASP	native	5	-5	vine	perennial	rough bedstraw
<i>Galium labradoricum</i>	Rubiaceae	GALLAB	native	8	-5	forb	perennial	bog bedstraw
<i>Galium tinctorium</i>	Rubiaceae	GALTIN	native	5	-5	forb	perennial	stiff bedstraw
<i>Galium triflorum</i>	Rubiaceae	GALTRR	native	4	3	forb	perennial	fragrant bedstraw
<i>Gaultheria hispidula</i>	Ericaceae	GAUHIS	native	8	-3	shrub	perennial	creeping-snowberry
<i>Gaultheria procumbens</i>	Ericaceae	GAUPRO	native	5	3	shrub	perennial	wintergreen
<i>Gaylussacia baccata</i>	Ericaceae	GAYBAC	native	7	3	shrub	perennial	huckleberry
<i>Geum rivale</i>	Rosaceae	GEURIV	native	7	-5	forb	perennial	purple avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Gymnocarpium dryopteris</i>	Cystopteridaceae	GYMDRY	native	5	3	fern	perennial	oak fern
<i>Hieracium aurantiacum</i>	Asteraceae	HIEAUR	non-native	0	5	forb	perennial	orange hawkweed
<i>Hieracium caespitosum</i>	Asteraceae	HIECAE	non-native	0	5	forb	perennial	king devil
<i>Hydrocotyle americana</i>	Araliaceae	HYDAME	native	6	-5	forb	perennial	water-pennywort

Grass River Natural Area 2017: Rich Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Hypericum perforatum</i>	Hypericaceae	HYPPER	non-native	0	5	forb	perennial	common st. johns-wort
<i>Ilex mucronata; nemopanthus m.</i>	Aquifoliaceae	ILEMUC	native	7	-5	shrub	perennial	mountain holly
<i>Ilex verticillata</i>	Aquifoliaceae	ILEVER	native	5	-3	shrub	perennial	michigan holly
<i>Impatiens capensis</i>	Balsaminaceae	IMPCAP	native	2	-3	forb	annual	spotted touch-me-not
<i>Iris pseudacorus</i>	Iridaceae	IRIPSE	non-native	0	-5	forb	perennial	yellow flag
<i>Iris virginica</i>	Iridaceae	IRIVIR	native	5	-5	forb	perennial	southern blue flag
<i>Larix laricina</i>	Pinaceae	LARLAR	native	5	-3	tree	perennial	tamarack
<i>Lathyrus palustris</i>	Fabaceae	LATPAL	native	7	-3	vine	perennial	marsh pea
<i>Leersia oryzoides</i>	Poaceae	LEEORY	native	3	-5	grass	perennial	cut grass
<i>Lemna minor</i>	Araceae	LEMMIN	native	5	-5	forb	perennial	common duckweed
<i>Lilium philadelphicum</i>	Liliaceae	LILPHI	native	7	0	forb	perennial	wood lily
<i>Lindera benzoin</i>	Lauraceae	LINBEN	native	7	-3	shrub	perennial	spicebush
<i>Linnaea borealis</i>	Linnaeaceae	LINBOR	native	6	0	forb	perennial	twinflower
<i>Lobelia cardinalis</i>	Campanulaceae	LOBCAR	native	7	-5	forb	perennial	cardinal-flower
<i>Lobelia siphilitica</i>	Campanulaceae	LOBSIP	native	4	-3	forb	perennial	great blue lobelia
<i>Lonicera dioica</i>	Caprifoliaceae	LONDIO	native	5	3	vine	perennial	red honeysuckle
<i>Lonicera oblongifolia</i>	Caprifoliaceae	LONOBL	native	8	-5	shrub	perennial	swamp fly honeysuckle
<i>Lycopus uniflorus</i>	Lamiaceae	LYCUNI	native	2	-5	forb	perennial	northern bugle weed
<i>Lysimachia thyrsoiflora</i>	Myrsinaceae	LYSTHY	native	6	-5	forb	perennial	tufted loosestrife
<i>Maianthemum canadense</i>	Convallariaceae	MAICAN	native	4	3	forb	perennial	canada mayflower
<i>Maianthemum stellatum;</i> <i>smilacina s.</i>	Convallariaceae	MAISTE	native	5	0	forb	perennial	starry false solomon-seal
<i>Maianthemum trifolium;</i> <i>smilacina t.</i>	Convallariaceae	MAITRI	native	10	-5	forb	perennial	false mayflower
<i>Matteuccia struthiopteris</i>	Onocleaceae	MATSTR	native	3	0	fern	perennial	ostrich fern
<i>Medeola virginiana</i>	Convallariaceae	MEDVIR	native	10	3	forb	perennial	indian cucumber-root
<i>Mentha canadensis; m. arvensis</i>	Lamiaceae	MENCAS	native	3	-3	forb	perennial	wild mint
<i>Menyanthes trifoliata</i>	Menyanthaceae	MENTRI	native	8	-5	forb	perennial	buckbean
<i>Mitchella repens</i>	Rubiaceae	MITREP	native	5	3	forb	perennial	partridge-berry
<i>Mitella nuda</i>	Saxifragaceae	MITNUD	native	8	-3	forb	perennial	naked miterwort
<i>Myosotis scorpioides</i>	Boraginaceae	MYOSCO	non-native	0	-5	forb	perennial	forget-me-not
<i>Myrica gale</i>	Myricaceae	MYRGAL	native	6	-5	shrub	perennial	sweet gale
<i>Nuphar variegata</i>	Nymphaeaceae	NUPVAR	native	7	-5	forb	perennial	yellow pond-lily
<i>Onoclea sensibilis</i>	Onocleaceae	ONOSEN	native	2	-3	fern	perennial	sensitive fern
<i>Orthilia secunda</i>	Ericaceae	ORTSEC	native	7	0	forb	perennial	one-sided pyrola
<i>Osmunda cinnamomea</i>	Osmundaceae	OSMCIN	native	5	-3	fern	perennial	cinnamon fern
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern

Grass River Natural Area 2017: Rich Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Packera paupercula</i> ; <i>senecio p.</i> ;								
<i>senecio plattensis</i>	Asteraceae	PACPAU	native	3	0	forb	perennial	balsam ragwort
<i>Parnassia glauca</i>	Parnassiaceae	PARGLA	native	8	-5	forb	perennial	grass-of-parnassus
<i>Parthenocissus quinquefolia</i>	Vitaceae	PARQUI	native	5	3	vine	perennial	virginia creeper
<i>Phalaris arundinacea</i>	Poaceae	PHAARU	native	0	-3	grass	perennial	reed canary grass
<i>Phragmites australis</i> var.								
<i>americanus</i>	Poaceae	PHRAUM	native	5	-3	grass	perennial	reed
<i>Picea glauca</i>	Pinaceae	PICGLA	native	3	3	tree	perennial	white spruce
<i>Picea mariana</i>	Pinaceae	PICMAR	native	6	-3	tree	perennial	black spruce
<i>Pilea fontana</i>	Urticaceae	PILFON	native	5	-3	forb	annual	bog clearweed
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	tree	perennial	white pine
<i>Platanthera clavellata</i> ;								
<i>habenaria c.</i>	Orchidaceae	PLACLA	native	6	-3	forb	perennial	small green wood orchid
<i>Platanthera psycodes</i> ; <i>habenaria</i>								
<i>p.</i>	Orchidaceae	PLAPSY	native	7	-3	forb	perennial	purple fringed orchid
<i>Poa alsodes</i>	Poaceae	POAALS	native	9	0	grass	perennial	bluegrass
<i>Poa palustris</i>	Poaceae	POAPAS	native	3	-3	grass	perennial	fowl meadow grass
<i>Polygala paucifolia</i>	Polygalaceae	POLPAU	native	7	3	forb	perennial	gay-wings
<i>Populus balsamifera</i>	Salicaceae	POPBAL	native	2	-3	tree	perennial	balsam poplar
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	tree	perennial	quaking aspen
<i>Prunella vulgaris</i>	Lamiaceae	PRUVUL	native	0	0	forb	perennial	self-heal
<i>Pteridium aquilinum</i>	Dennstaedtiaceae	PTEAQU	native	0	3	fern	perennial	bracken fern
<i>Quercus rubra</i>	Fagaceae	QUERUB	native	5	3	tree	perennial	red oak
<i>Ranunculus abortivus</i>	Ranunculaceae	RANABO	native	0	0	forb	perennial	small-flowered buttercup
<i>Ranunculus acris</i>	Ranunculaceae	RANACR	non-native	0	0	forb	perennial	tall or common buttercup
<i>Ranunculus hispidus</i>	Ranunculaceae	RANHIS	native	5	0	forb	perennial	swamp buttercup
<i>Ranunculus recurvatus</i>	Ranunculaceae	RANREC	native	5	-3	forb	perennial	hooked crowfoot
<i>Rhamnus alnifolia</i>	Rhamnaceae	RHAALN	native	8	-5	shrub	perennial	alder-leaved buckthorn
<i>Rhododendron groenlandicum</i> ;								
<i>ledum g.</i>	Ericaceae	RHOGRO	native	8	-5	shrub	perennial	labrador-tea
<i>Ribes cynosbati</i>	Grossulariaceae	RIBCYN	native	4	3	shrub	perennial	prickly or wild gooseberry
<i>Ribes triste</i>	Grossulariaceae	RIBTRI	native	6	-5	shrub	perennial	swamp red currant
<i>Rosa multiflora</i>	Rosaceae	ROSMUL	non-native	0	3	shrub	perennial	multiflora rose
<i>Rosa palustris</i>	Rosaceae	ROSPAL	native	5	-5	shrub	perennial	swamp rose
<i>Rubus hispidus</i>	Rosaceae	RUBHIS	native	4	-3	shrub	perennial	swamp dewberry
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Rumex orbiculatus</i>	Polygonaceae	RUMORB	native	9	-5	forb	perennial	great water dock
<i>Sarracenia purpurea</i>	Sarraceniaceae	SARPUR	native	10	-5	forb	perennial	pitcher-plant

Grass River Natural Area 2017: Rich Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Schoenoplectus tabernaemontani</i> ; <i>scirpus validus</i>	Cyperaceae	SCHTAB	native	4	-5	sedge	perennial	softstem bulrush
<i>Scirpus atrovirens</i>	Cyperaceae	SCIATV	native	3	-5	sedge	perennial	bulrush
<i>Scirpus cyperinus</i>	Cyperaceae	SCICYP	native	5	-5	sedge	perennial	wool-grass
<i>Scutellaria galericulata</i>	Lamiaceae	SCUGAL	native	5	-5	forb	perennial	marsh skullcap
<i>Scutellaria lateriflora</i>	Lamiaceae	SCULAT	native	5	-5	forb	perennial	mad-dog skullcap
<i>Solanum dulcamara</i>	Solanaceae	SOLDUL	non-native	0	0	vine	perennial	bittersweet nightshade
<i>Solidago gigantea</i>	Asteraceae	SOLGIG	native	3	-3	forb	perennial	late goldenrod
<i>Solidago patula</i>	Asteraceae	SOLPAT	native	6	-5	forb	perennial	swamp goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod
<i>Solidago uliginosa</i>	Asteraceae	SOLULI	native	4	-5	forb	perennial	bog goldenrod
<i>Sparganium eurycarpum</i>	Typhaceae	SPAEUR	native	5	-5	forb	perennial	common bur-reed
<i>Symphotrichum boreale</i> ; <i>aster b.</i>	Asteraceae	SYMBOR	native	9	-5	forb	perennial	northern bog aster
<i>Symphotrichum firmum</i> ; <i>aster puniceus</i>	Asteraceae	SYMFIR	native	4	-3	forb	perennial	smooth swamp aster
<i>Symphotrichum lanceolatum</i> ; <i>aster l.</i>	Asteraceae	SYMLAN	native	2	-3	forb	perennial	panicled aster
<i>Symphotrichum lateriflorum</i> ; <i>aster l.</i>	Asteraceae	SYMLAT	native	2	0	forb	perennial	calico aster
<i>Symphotrichum puniceum</i> ; <i>aster p.</i>	Asteraceae	SYMPUN	native	5	-5	forb	perennial	swamp aster
<i>Taraxacum officinale</i>	Asteraceae	TAROFF	non-native	0	3	forb	perennial	common dandelion
<i>Thalictrum dasycarpum</i>	Ranunculaceae	THADAS	native	3	-3	forb	perennial	purple meadow-rue
<i>Thelypteris noveboracensis</i>	Thelypteridaceae	THENOV	native	5	0	fern	perennial	new york fern
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Tiarella cordifolia</i>	Saxifragaceae	TIACOR	native	9	3	forb	perennial	foamflower
<i>Toxicodendron rydbergii</i> ; <i>t. radicans</i>	Anacardiaceae	TOXRYD	native	3	0	shrub	perennial	poison-ivy
<i>Toxicodendron vernix</i>	Anacardiaceae	TOXVER	native	6	-5	shrub	perennial	poison sumac
<i>Trichophorum alpinum</i> ; <i>scirpus hudsonianus</i>	Cyperaceae	TRIALP	native	10	-5	sedge	perennial	bulrush
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	forb	perennial	star-flower
<i>Tsuga canadensis</i>	Pinaceae	TSUCAN	native	5	3	tree	perennial	hemlock
<i>Typha angustifolia</i>	Typhaceae	TYPANG	non-native	0	-5	forb	perennial	narrow-leaved cat-tail
<i>Typha latifolia</i>	Typhaceae	TYPLAT	native	1	-5	forb	perennial	broad-leaved cat-tail

Grass River Natural Area 2017: Rich Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Utricularia intermedia</i>	Lentibulariaceae	UTRINT	native	10	-5	forb	perennial	flat-leaved bladderwort
<i>Vaccinium myrtilloides</i>	Ericaceae	VACMYR	native	4	-3	shrub	perennial	canada blueberry
<i>Vaccinium oxycoccos</i>	Ericaceae	VACOXY	native	8	-5	shrub	perennial	small cranberry
<i>Veronica arvensis</i>	Plantaginaceae	VERARV	non-native	0	3	forb	annual	corn speedwell
<i>Viburnum cassinoides</i>	Adoxaceae	VIBCAS	native	6	3	shrub	perennial	wild-raisin
<i>Viola cucullata</i>	Violaceae	VIOCUC	native	5	-5	forb	perennial	marsh violet
<i>Vitis riparia</i>	Vitaceae	VITRIP	native	3	0	vine	perennial	river-bank grape

Appendix 8. Grass River Natural Area - Floristic Quality Assessment: Hardwood-Conifer Swamp

Grass River Natural Area 2017: Hardwood-Conifer Swamp

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication: 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett

Duration Notes: Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: Hardwood-conifer swamp is a groundwater influenced wetland with a mix of conifer and hardwood species. The canopy was dominated by *Thuja occidentalis* and *Betula alleghaniensis*, with frequent occurrences of *Populus balsamifera*, *Populus grandidentata* and *Tsuga canadensis*. The shrub and ground layers supported a diversity of shrubs, sedges, forbs, and ferns.

The parcels adjacent to Willow Day Park had more exotic species than most other parcels.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation:

Cardamine spp., *Fraxinus* spp. saplings (*F. americana* likely), *Geum* spp., *Lonicera* spp., *Populus* spp. saplings, and *Viola* spp.

Conservatism-Based Metrics:		Species Richness:		Duration Metrics:	
Total Mean C:	4.0	Total Species:	97	Annual:	1 1.00%
Native Mean C:	4.3	Native Species:	90 92.80%	Perennial:	95 97.90%
Total FQI:	39.4	Non-native Species:	7 7.20%	Biennial:	1 1.00%
Native FQI:	40.8			Native Annual:	1 1.00%
Adjusted FQI:	41.4	Species Wetness:		Native Perennial:	89 91.80%
% C value 0:	9.3	Mean Wetness:	-1.6	Native Biennial:	0 0%
% C value 1-3:	34.0	Native Mean Wetness:	-1.8		
% C value 4-6:	41.2			Physiognomy Metrics:	
% C value 7-10:	15.5	Physiognomy Metrics:		Sedge:	19 19.60%
Native Tree Mean C:	3.5	Tree:	10 10.30%	Rush:	1 1.00%
Native Shrub Mean C:	5.0	Shrub:	11 11.30%	Fern:	13 13.40%
Native Herbaceous Mean C:	4.4	Vine:	2 2.10%	Bryophyte:	0 0%
		Forb:	35 36.10%		
		Grass:	6 6.20%		

Species:

Grass River Natural Area 2017: Hardwood-Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Acer saccharum</i>	Sapindaceae	ACESAU	native	5	3	tree	perennial	sugar maple
<i>Adiantum pedatum</i>	Pteridaceae	ADIPED	native	6	3	fern	perennial	maidenhair fern
<i>Alnus incana; a. rugosa</i>	Betulaceae	ALNINC	native	5	-3	shrub	perennial	speckled alder
<i>Aralia nudicaulis</i>	Araliaceae	ARANUD	native	5	3	forb	perennial	wild sarsaparilla
<i>Arisaema triphyllum</i>	Araceae	ARITRI	native	5	0	forb	perennial	jack-in-the-pulpit
<i>Asclepias syriaca</i>	Apocynaceae	ASCSYR	native	1	5	forb	perennial	common milkweed
<i>Athyrium filix-femina</i>	Athyriaceae	ATHFIL	native	4	0	fern	perennial	lady fern
<i>Betula alleghaniensis</i>	Betulaceae	BETALL	native	7	0	tree	perennial	yellow birch
<i>Boehmeria cylindrica</i>	Urticaceae	BOECYL	native	5	-5	forb	perennial	false nettle
<i>Brachyelytrum aristosum; b. erectum</i>	Poaceae	BRAARI	native	7	5	grass	perennial	northern shorthusk
<i>Calamagrostis stricta; c. inexpansa; c. lacustris</i>	Poaceae	CALSTR	native	10	-3	grass	perennial	narrow-leaved reedgrass
<i>Caltha palustris</i>	Ranunculaceae	CALPAR	native	6	-5	forb	perennial	marsh-marigold
<i>Carex arcata</i>	Cyperaceae	CXARTT	native	3	5	sedge	perennial	sedge
<i>Carex aurea</i>	Cyperaceae	CXAURE	native	3	-3	sedge	perennial	sedge
<i>Carex bebbii</i>	Cyperaceae	CXBEBB	native	4	-5	sedge	perennial	sedge
<i>Carex communis</i>	Cyperaceae	CXCOMM	native	2	5	sedge	perennial	sedge
<i>Carex crinita</i>	Cyperaceae	CXCRIN	native	4	-5	sedge	perennial	sedge
<i>Carex disperma</i>	Cyperaceae	CXDISP	native	10	-5	sedge	perennial	sedge
<i>Carex flava</i>	Cyperaceae	CXFLAV	native	4	-5	sedge	perennial	sedge
<i>Carex hystericina</i>	Cyperaceae	CXHYST	native	2	-5	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Carex intumescens</i>	Cyperaceae	CXINTU	native	3	-3	sedge	perennial	sedge
<i>Carex laevivaginata</i>	Cyperaceae	CXLAEV	native	8	-5	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex lupulina</i>	Cyperaceae	CXLUPA	native	4	-5	sedge	perennial	sedge
<i>Carex stipata</i>	Cyperaceae	CXSTIP	native	1	-5	sedge	perennial	sedge
<i>Carex stricta</i>	Cyperaceae	CXSTRI	native	4	-5	sedge	perennial	sedge
<i>Carex trisperma</i>	Cyperaceae	CXTRIS	native	9	-5	sedge	perennial	sedge
<i>Carex utriculata; c. rostrata</i>	Cyperaceae	CXUTRI	native	5	-5	sedge	perennial	sedge
<i>Carex vulpinoidea</i>	Cyperaceae	CXVULP	native	1	-5	sedge	perennial	sedge
<i>Chelone glabra</i>	Plantaginaceae	CHEGLB	native	7	-5	forb	perennial	turtlehead
<i>Circaea canadensis; c. lutetiana</i>	Onagraceae	CIRCAN	native	2	3	forb	perennial	enchanters-nightshade

Grass River Natural Area 2017: Hardwood-Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Cirsium palustre</i>	Asteraceae	CIRPAL	non-native	0	-3	forb	biennial	marsh thistle
<i>Coptis trifolia</i>	Ranunculaceae	COPTRI	native	5	-3	forb	perennial	goldthread
<i>Cornus canadensis</i>	Cornaceae	CORCAA	native	6	0	shrub	perennial	bunchberry
<i>Dryopteris cristata</i>	Dryopteridaceae	DRYCRI	native	6	-5	fern	perennial	crested shield fern
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Epilobium ciliatum</i>	Onagraceae	EPICIL	native	3	-3	forb	perennial	willow-herb
<i>Equisetum fluviatile</i>	Equisetaceae	EQUFLU	native	7	-5	fern	perennial	water horsetail
<i>Equisetum palustre</i>	Equisetaceae	EQUPAL	native	8	-3	fern	perennial	marsh horsetail
<i>Equisetum scirpoides</i>	Equisetaceae	EQUSCI	native	7	0	fern	perennial	dwarf scouring rush
<i>Erythronium americanum</i>	Liliaceae	ERYAME	native	5	5	forb	perennial	yellow trout lily
<i>Euthamia graminifolia</i>	Asteraceae	EUTGRA	native	3	0	forb	perennial	grass-leaved goldenrod
<i>Galium triflorum</i>	Rubiaceae	GALTRR	native	4	3	forb	perennial	fragrant bedstraw
<i>Gaultheria hispidula</i>	Ericaceae	GAUHIS	native	8	-3	shrub	perennial	creeping-snowberry
<i>Geum rivale</i>	Rosaceae	GEURIV	native	7	-5	forb	perennial	purple avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Hieracium aurantiacum</i>	Asteraceae	HIEAUR	non-native	0	5	forb	perennial	orange hawkweed
<i>Hieracium caespitosum</i>	Asteraceae	HIECAE	non-native	0	5	forb	perennial	king devil
<i>Impatiens capensis</i>	Balsaminaceae	IMPCAP	native	2	-3	forb	annual	spotted touch-me-not
<i>Iris virginica</i>	Iridaceae	IRIVIR	native	5	-5	forb	perennial	southern blue flag
<i>Juncus effusus</i>	Juncaceae	JUNEFF	native	3	-5	rush	perennial	soft-stemmed rush
<i>Leersia oryzoides</i>	Poaceae	LEEORY	native	3	-5	grass	perennial	cut grass
<i>Lilium philadelphicum</i>	Liliaceae	LILPHI	native	7	0	forb	perennial	wood lily
<i>Lonicera canadensis</i>	Caprifoliaceae	LONCAN	native	5	3	shrub	perennial	canadian fly honeysuckle
<i>Lysimachia nummularia</i>	Myrsinaceae	LYSNUM	non-native	0	-3	forb	perennial	moneywort
<i>Lysimachia thyrsiflora</i>	Myrsinaceae	LYSTHY	native	6	-5	forb	perennial	tufted loosestrife
<i>Maianthemum canadense</i>	Convallariaceae	MAICAN	native	4	3	forb	perennial	canada mayflower
<i>Maianthemum stellatum;</i> <i>smilacina s.</i>	Convallariaceae	MAISTE	native	5	0	forb	perennial	starry false solomon-seal
<i>Mentha canadensis; m. arvensis</i>	Lamiaceae	MENCAS	native	3	-3	forb	perennial	wild mint
<i>Myosotis scorpioides</i>	Boraginaceae	MYOSCO	non-native	0	-5	forb	perennial	forget-me-not
<i>Onoclea sensibilis</i>	Onocleaceae	ONOSEN	native	2	-3	fern	perennial	sensitive fern
<i>Osmunda cinnamomea</i>	Osmundaceae	OSMCIN	native	5	-3	fern	perennial	cinnamon fern
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern
<i>Phalaris arundinacea</i>	Poaceae	PHAARU	native	0	-3	grass	perennial	reed canary grass
<i>Phegopteris connectilis;</i> <i>thelypteris phegopteris</i>	Thelypteridaceae	PHECON	native	5	3	fern	perennial	northern beech-fern
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	tree	perennial	white pine
<i>Poa palustris</i>	Poaceae	POAPAS	native	3	-3	grass	perennial	fowl meadow grass

Grass River Natural Area 2017: Hardwood-Conifer Swamp

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Populus balsamifera</i>	Salicaceae	POPBAL	native	2	-3	tree	perennial	balsam poplar
<i>Populus grandidentata</i>	Salicaceae	POPGRA	native	4	3	tree	perennial	big-tooth aspen
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	tree	perennial	quaking aspen
<i>Pteridium aquilinum</i>	Dennstaedtiaceae	PTEAQU	native	0	3	fern	perennial	bracken fern
<i>Ranunculus hispidus</i>	Ranunculaceae	RANHIS	native	5	0	forb	perennial	swamp buttercup
<i>Rhamnus alnifolia</i>	Rhamnaceae	RHAALN	native	8	-5	shrub	perennial	alder-leaved buckthorn
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Rubus strigosus</i>	Rosaceae	RUBSTR	native	2	0	shrub	perennial	wild red raspberry
<i>Rumex orbiculatus</i>	Polygonaceae	RUMORB	native	9	-5	forb	perennial	great water dock
<i>Sambucus canadensis</i>	Adoxaceae	SAMCAN	native	3	-3	shrub	perennial	elderberry
<i>Scirpus cyperinus</i>	Cyperaceae	SCICYP	native	5	-5	sedge	perennial	wool-grass
<i>Scutellaria galericulata</i>	Lamiaceae	SCUGAL	native	5	-5	forb	perennial	marsh skullcap
<i>Solanum dulcamara</i>	Solanaceae	SOLDUL	non-native	0	0	vine	perennial	bittersweet nightshade
<i>Solidago canadensis</i>	Asteraceae	SOLCAN	native	1	3	forb	perennial	canada goldenrod
<i>Solidago patula</i>	Asteraceae	SOLPAT	native	6	-5	forb	perennial	swamp goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod
<i>Symphotrichum lateriflorum</i> ; <i>aster l.</i>	Asteraceae	SYMLAT	native	2	0	forb	perennial	calico aster
<i>Thalictrum dasycarpum</i>	Ranunculaceae	THADAS	native	3	-3	forb	perennial	purple meadow-rue
<i>Thelypteris noveboracensis</i>	Thelypteridaceae	THENOV	native	5	0	fern	perennial	new york fern
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Toxicodendron rydbergii</i> ; <i>t. radicans</i>	Anacardiaceae	TOXRYD	native	3	0	shrub	perennial	poison-ivy
<i>Toxicodendron vernix</i>	Anacardiaceae	TOXVER	native	6	-5	shrub	perennial	poison sumac
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	forb	perennial	star-flower
<i>Tsuga canadensis</i>	Pinaceae	TSUCAN	native	5	3	tree	perennial	hemlock
<i>Typha latifolia</i>	Typhaceae	TYPLAT	native	1	-5	forb	perennial	broad-leaved cat-tail
<i>Vitis riparia</i>	Vitaceae	VITRIP	native	3	0	vine	perennial	river-bank grape

Appendix 9. Grass River Natural Area - Floristic Quality Assessment: Dry-mesic Northern Forest

Grass River Natural Area 2017: Dry-mesic Northern Forest

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett, Phyllis Higman

Duration Notes: Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: Dry-mesic northern forest is pine or pine-hardwood community shaped by fire that occurs on well-drained acidic sands or loamy sands. At GRNA, bracken fern was the most abundant species in the understory, which otherwise was fairly clear.

Conservatism-Based Metrics:		Species Richness:		Duration Metrics:	
Total Mean C:	3.8	Total Species:	26	Annual:	0 0%
Native Mean C:	3.9	Native Species:	25 96.20%	Perennial:	26 100.00%
Total FQI:	19.4	Non-native Species:	1 3.80%	Biennial:	0 0%
Native FQI:	19.5	Species Wetness:		Native Annual:	0 0%
Adjusted FQI:	38.2	Mean Wetness:	1.1	Native Perennial:	25 96.20%
% C value 0:	7.7		1.0	Native Biennial:	0 0%
% C value 1-3:	34.6	Native Mean Wetness:	1.0		
% C value 4-6:	46.2	Physiognomy Metrics:		Physiognomy Metrics:	
% C value 7-10:	11.5	Tree:	10 38.50%	Sedge:	4 15.40%
Native Tree Mean C:	3.6	Shrub:	3 11.50%	Rush:	0 0%
Native Shrub Mean C:	2.0	Vine:	0 0%	Fern:	3 11.50%
Native Herbaceous Mean C:	4.5	Forb:	3 11.50%	Bryophyte:	0 0%
		Grass:	3 11.50%		

Species:

Grass River Natural Area 2017: Dry-mesic Northern Forest

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Abies balsamea</i>	Pinaceae	ABIBAL	native	3	0	Tree	perennial	balsam fir
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	Tree	perennial	red maple
<i>Acer saccharum</i>	Sapindaceae	ACESAU	native	5	3	Tree	perennial	sugar maple
<i>Berberis thunbergii</i>	Berberidaceae	BERTHU	non-native	0	3	shrub	perennial	japanese barberry
<i>Betula alleghaniensis</i>	Betulaceae	BETALL	native	7	0	Tree	perennial	yellow birch
<i>Brachyelytrum aristosum</i> ; <i>b. erectum</i>	Poaceae	BRAARI	native	7	5	grass	perennial	northern shorthusk
<i>Carex communis</i>	Cyperaceae	CXCOMM	native	2	5	sedge	perennial	sedge
<i>Carex lupulina</i>	Cyperaceae	CXLUPA	native	4	-5	sedge	perennial	sedge
<i>Carex pensylvanica</i>	Cyperaceae	CXPENS	native	4	5	sedge	perennial	sedge
<i>Dendrolycopodium obscurum</i> ; <i>lycopodium o.</i>	Lycopodiaceae	DENOBS	native	5	3	Fern	perennial	ground-pine
<i>Elymus hystrix</i> ; <i>hystrix patula</i>	Poaceae	ELYHYS	native	5	3	grass	perennial	bottlebrush grass
<i>Fraxinus americana</i>	Oleaceae	FRAAME	native	5	3	Tree	perennial	white ash
<i>Mitchella repens</i>	Rubiaceae	MITREP	native	5	3	Forb	perennial	partridge-berry
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	Tree	perennial	white pine
<i>Poa alsodes</i>	Poaceae	POAALS	native	9	0	grass	perennial	bluegrass
<i>Populus balsamifera</i>	Salicaceae	POPBAL	native	2	-3	Tree	perennial	balsam poplar
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	Tree	perennial	quaking aspen
<i>Pteridium aquilinum</i>	Dennstaedtiaceae	PTEAQU	native	0	3	Fern	perennial	bracken fern
<i>Rubus allegheniensis</i>	Rosaceae	RUBALL	native	1	3	shrub	perennial	common blackberry
<i>Scirpus cyperinus</i>	Cyperaceae	SCICYP	native	5	-5	sedge	perennial	wool-grass
<i>Spinulum annotinum</i> ; <i>lycopodium a.</i>	Lycopodiaceae	SPIANN	native	5	0	Fern	perennial	stiff clubmoss
<i>Symphotrichum lateriflorum</i> ; <i>aster l.</i>	Asteraceae	SYMLAT	native	2	0	Forb	perennial	calico aster
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	Tree	perennial	arbor vitae
<i>Toxicodendron rydbergii</i> ; <i>t. radicans</i>	Anacardiaceae	TOXRYD	native	3	0	shrub	perennial	poison-ivy
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	Forb	perennial	star-flower
<i>Tsuga canadensis</i>	Pinaceae	TSUCAN	native	5	3	Tree	perennial	hemlock

Appendix 10. Grass River Natural Area - Floristic Quality Assessment: Mesic Northern Forest

Grass River Natural Area 2017: Mesic Northern Forest

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett, Phyllis Higman

Duration Notes: Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: In Grass River Natural Area, mesic northern forest comprised the second most abundant natural community. Its co-dominants are *Acer saccharum*, *Tsuga canadensis*, *Fagus grandifolia*, *Betula allegheniensis*, *Pinus strobus*, *Quercus rubra*, *Thuja occidentalis*, and *Acer rubrum*. The ground and shrub layers were diverse, but many species characteristic of the spring flora, such as *Trillium grandiflora* (common trillium), *Dicentra cucullaria* (Dutchman's- breeches) and *Erythronium* spp. (trout-lilies) were not observed during this inventory. Additional surveys, particularly in early spring are warranted.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation: *Fraxinus* spp. saplings (*F. americana* likely), *Lonicera* spp., Lycopodiaceae, *Populus* spp. saplings, *Quercus* hybrid with one parent likely *Q. macrocarpa*, and *Quercus* spp. saplings.

Conservatism-Based Metrics:		Species Richness:		Duration Metrics:	
Total Mean C:	3.9	Total Species:	101	Annual:	0 0%
Native Mean C:	4.4	Native Species:	90 89.10%	Perennial:	100 99.00%
Total FQI:	39.2	Non-native Species:	11 10.90%	Biennial:	1 1.00%
Native FQI:	41.7			Native Annual:	0 0%
Adjusted FQI:	41.5	Species Wetness:		Native Perennial:	90 89.10%
% C value 0:	12.9	Mean Wetness:	0.3	Native Biennial:	0 0%
% C value 1-3:	25.7	Native Mean Wetness:	0.2		
% C value 4-6:	51.5			Physiognomy Metrics:	
% C value 7-10:	9.9	Physiognomy Metrics:		Sedge:	14 13.90%
Native Tree Mean C:	3.9	Tree:	18.0 17.80%	Rush:	1 1.00%
Native Shrub Mean C:	3.7	Shrub:	13.0 12.90%	Fern:	15 14.90%
Native Herbaceous Mean C:	4.6	Vine:	2.0 2.00%	Bryophyte:	0 0%
		Forb:	31.0 30.70%		
		Grass:	7.0 6.90%		

Species:

Grass River Natural Area 2017: Mesic Northern Forest								
Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Abies balsamea</i>	Pinaceae	ABIBAL	native	3	0	tree	perennial	balsam fir
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Acer saccharum</i>	Sapindaceae	ACESAU	native	5	3	tree	perennial	sugar maple
<i>Agrostis gigantea</i>	Poaceae	AGRGIG	non-native	0	-3	grass	perennial	redtop
<i>Allium tricoccum</i>	Alliaceae	ALLTRI	native	5	3	forb	perennial	wild leek
<i>Alnus incana; a. rugosa</i>	Betulaceae	ALNINC	native	5	-3	shrub	perennial	speckled alder
<i>Arisaema triphyllum</i>	Araceae	ARITRI	native	5	0	forb	perennial	jack-in-the-pulpit
<i>Betula alleghaniensis</i>	Betulaceae	BETALL	native	7	0	tree	perennial	yellow birch
<i>Betula papyrifera</i>	Betulaceae	BETPAP	native	2	3	tree	perennial	paper birch
<i>Brachyelytrum aristosum; b. erectum</i>	Poaceae	BRAARI	native	7	5	grass	perennial	northern shorthusk
<i>Caltha palustris</i>	Ranunculaceae	CALPAR	native	6	-5	forb	perennial	marsh-marigold
<i>Cardamine diphylla; dentaria d.</i>	Brassicaceae	CARDIP	native	5	3	forb	perennial	two-leaved toothwort
<i>Carex bebbii</i>	Cyperaceae	CXBEBB	native	4	-5	sedge	perennial	sedge
<i>Carex communis</i>	Cyperaceae	CXCOMM	native	2	5	sedge	perennial	sedge
<i>Carex crinita</i>	Cyperaceae	CXCRIN	native	4	-5	sedge	perennial	sedge
<i>Carex deweyana</i>	Cyperaceae	CXDEWE	native	3	3	sedge	perennial	sedge
<i>Carex disperma</i>	Cyperaceae	CXDISP	native	10	-5	sedge	perennial	sedge
<i>Carex gracillima</i>	Cyperaceae	CXGRAA	native	4	3	sedge	perennial	sedge
<i>Carex interior</i>	Cyperaceae	CXINTE	native	3	-5	sedge	perennial	sedge
<i>Carex intumescens</i>	Cyperaceae	CXINTU	native	3	-3	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex lupulina</i>	Cyperaceae	CXLUPA	native	4	-5	sedge	perennial	sedge
<i>Carex pennsylvanica</i>	Cyperaceae	CXPENS	native	4	5	sedge	perennial	sedge
<i>Carex retrorsa</i>	Cyperaceae	CXRETS	native	3	-5	sedge	perennial	sedge
<i>Carex rosea; c. convoluta</i>	Cyperaceae	CXROSE	native	2	5	sedge	perennial	curly-styled wood sedge
<i>Carex stipata</i>	Cyperaceae	CXSTIP	native	1	-5	sedge	perennial	sedge
<i>Chrysosplenium americanum</i>	Saxifragaceae	CHRAME	native	6	-5	forb	perennial	golden saxifrage
<i>Cirsium palustre</i>	Asteraceae	CIRPAL	non-native	0	-3	forb	biennial	marsh thistle
<i>Cornus alternifolia</i>	Cornaceae	CORALT	native	5	3	tree	perennial	alternate-leaved dogwood
<i>Cornus foemina</i>	Cornaceae	CORFOE	native	1	0	shrub	perennial	gray dogwood
<i>Dendrolycopodium obscurum; lycopodium o.</i>	Lycopodiaceae	DENOBS	native	5	3	fern	perennial	ground-pine
<i>Doellingeria umbellata; aster u.</i>	Asteraceae	DOEUMB	native	5	-3	forb	perennial	flat-topped white aster
<i>Dryopteris carthusiana</i>	Dryopteridaceae	DRYCAR	native	5	-3	fern	perennial	spinulose woodfern
<i>Dryopteris clintoniana</i>	Dryopteridaceae	DRYCLI	native	8	-3	fern	perennial	clintons woodfern
<i>Dryopteris cristata</i>	Dryopteridaceae	DRYCRI	native	6	-5	fern	perennial	crested shield fern
<i>Dryopteris intermedia</i>	Dryopteridaceae	DRYINT	native	5	0	fern	perennial	evergreen woodfern

Grass River Natural Area 2017: Mesic Northern Forest								
Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Elymus hystrix; hystrix patula</i>	Poaceae	ELYHYS	native	5	3	grass	perennial	bottlebrush grass
<i>Epigaea repens</i>	Ericaceae	EPIREP	native	7	3	shrub	perennial	trailing-arbutus
<i>Epipactis helleborine</i>	Orchidaceae	EPIHEL	non-native	0	0	forb	perennial	helleborine
<i>Equisetum fluviatile</i>	Equisetaceae	EQUFLU	native	7	-5	fern	perennial	water horsetail
<i>Equisetum palustre</i>	Equisetaceae	EQUPAL	native	8	-3	fern	perennial	marsh horsetail
<i>Fagus grandifolia</i>	Fagaceae	FAGGRA	native	6	3	tree	perennial	american beech
<i>Fraxinus americana</i>	Oleaceae	FRAAME	native	5	3	tree	perennial	white ash
<i>Galium labradoricum</i>	Rubiaceae	GALLAB	native	8	-5	forb	perennial	bog bedstraw
<i>Gaultheria procumbens</i>	Ericaceae	GAUPRO	native	5	3	shrub	perennial	wintergreen
<i>Geum canadense</i>	Rosaceae	GEUCAN	native	1	0	forb	perennial	white avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Goodyera pubescens</i>	Orchidaceae	GOOPUB	native	7	3	forb	perennial	downy rattlesnake plantain
<i>Hamamelis virginiana</i>	Hamamelidaceae	HAMVIR	native	5	3	shrub	perennial	witch-hazel
<i>Hieracium aurantiacum</i>	Asteraceae	HIEAUR	non-native	0	5	forb	perennial	orange hawkweed
<i>Juncus nodosus</i>	Juncaceae	JUNNOD	native	5	-5	rush	perennial	joint rush
<i>Lonicera morrowii</i>	Caprifoliaceae	LONMOR	non-native	0	3	shrub	perennial	morrow honeysuckle
<i>Lonicera xbella</i>	Caprifoliaceae	LONBEL	non-native	0	3	shrub	perennial	hybrid honeysuckle
<i>Lycopus uniflorus</i>	Lamiaceae	LYCUNI	native	2	-5	forb	perennial	northern bugle weed
<i>Maianthemum canadense</i>	Convallariaceae	MAICAN	native	4	3	forb	perennial	canada mayflower
<i>Medeola virginiana</i>	Convallariaceae	MEDVIR	native	10	3	forb	perennial	indian cucumber-root
<i>Mitchella repens</i>	Rubiaceae	MITREP	native	5	3	forb	perennial	partridge-berry
<i>Onoclea sensibilis</i>	Onocleaceae	ONOSEN	native	2	-3	fern	perennial	sensitive fern
<i>Oryzopsis asperifolia</i>	Poaceae	ORYASP	native	6	5	grass	perennial	rough-leaved rice-grass
<i>Osmunda claytoniana</i>	Osmundaceae	OSMCLN	native	6	0	fern	perennial	interrupted fern
<i>Osmunda regalis</i>	Osmundaceae	OSMREG	native	5	-5	fern	perennial	royal fern
<i>Parthenocissus quinquefolia</i>	Vitaceae	PARQUI	native	5	3	vine	perennial	virginia creeper
<i>Phalaris arundinacea</i>	Poaceae	PHAARU	native	0	-3	grass	perennial	reed canary grass
<i>Phegopteris connectilis; thelypteris phegopteris</i>	Thelypteridaceae	PHECON	native	5	3	fern	perennial	northern beech-fern
<i>Picea glauca</i>	Pinaceae	PICGLA	native	3	3	tree	perennial	white spruce
<i>Picea pungens</i>	Pinaceae	PICPUN	non-native	0	3	tree	perennial	blue spruce
<i>Pinus resinosa</i>	Pinaceae	PINRES	native	6	3	tree	perennial	red pine
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	tree	perennial	white pine
<i>Polygonatum pubescens</i>	Convallariaceae	POLPUB	native	5	5	forb	perennial	downy solomon seal
<i>Populus grandidentata</i>	Salicaceae	POPGRA	native	4	3	tree	perennial	big-tooth aspen
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	tree	perennial	quaking aspen
<i>Prunus serotina</i>	Rosaceae	PRUSER	native	2	3	tree	perennial	wild black cherry

Grass River Natural Area 2017: Mesic Northern Forest

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Pteridium aquilinum</i>	Dennstaedtiaceae	PTEAQU	native	0	3	fern	perennial	bracken fern
<i>Pyrola elliptica</i>	Ericaceae	PYRELL	native	6	3	forb	perennial	large-leaved shinleaf
<i>Rubus allegheniensis</i>	Rosaceae	RUBALL	native	1	3	shrub	perennial	common blackberry
<i>Rubus occidentalis</i>	Rosaceae	RUBOCC	native	1	5	shrub	perennial	black raspberry
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Rubus strigosus</i>	Rosaceae	RUBSTR	native	2	0	shrub	perennial	wild red raspberry
<i>Schizachne purpurascens</i>	Poaceae	SCHPUP	native	5	3	grass	perennial	false melic
<i>Solanum dulcamara</i>	Solanaceae	SOLDUL	non-native	0	0	vine	perennial	bittersweet nightshade
<i>Solidago caesia</i>	Asteraceae	SOLCAE	native	6	3	forb	perennial	bluestem goldenrod
<i>Solidago gigantea</i>	Asteraceae	SOLGIG	native	3	-3	forb	perennial	late goldenrod
<i>Solidago patula</i>	Asteraceae	SOLPAT	native	6	-5	forb	perennial	swamp goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod
<i>Spinulum annotinum;</i> <i>lycopodium a.</i>	Lycopodiaceae	SPIANN	native	5	0	fern	perennial	stiff clubmoss
<i>Symphotrichum urophyllum;</i> <i>aster sagittifolius</i>	Asteraceae	SYMURO	native	2	5	forb	perennial	arrow-leaved aster
<i>Taraxacum officinale</i>	Asteraceae	TAROFF	non-native	0	3	forb	perennial	common dandelion
<i>Thalictrum dioicum</i>	Ranunculaceae	THADIO	native	6	3	forb	perennial	early meadow-rue
<i>Thelypteris noveboracensis</i>	Thelypteridaceae	THENOV	native	5	0	fern	perennial	new york fern
<i>Thelypteris palustris</i>	Thelypteridaceae	THEPAL	native	2	-3	fern	perennial	marsh fern
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Tilia americana</i>	Malvaceae	TILAME	native	5	3	tree	perennial	basswood
<i>Trientalis borealis</i>	Myrsinaceae	TRIBOR	native	5	0	forb	perennial	star-flower
<i>Trillium cernuum</i>	Trilliaceae	TRICER	native	5	0	forb	perennial	nodding trillium
<i>Tsuga canadensis</i>	Pinaceae	TSUCAN	native	5	3	tree	perennial	hemlock
<i>Verbena hastata</i>	Verbenaceae	VERHAS	native	4	-3	forb	perennial	blue vervain
<i>Veronica officinalis</i>	Plantaginaceae	VEROOF	non-native	0	3	forb	perennial	common speedwell
<i>Viburnum acerifolium</i>	Adoxaceae	VIBACE	native	6	5	shrub	perennial	maple-leaved viburnum
<i>Viola canadensis</i>	Violaceae	VIOCAN	native	5	3	forb	perennial	canada violet
<i>Viola labradorica; v. conspersa</i>	Violaceae	VIOLAB	native	3	0	forb	perennial	dog violet

Appendix 11. Grass River Natural Area - Floristic Quality Assessment: Old field/residential/plantation

Grass River Natural Area 2017: Old field/residential/plantation

Bellaire, Antrim County, Michigan, USA

FQA DB Region: Michigan

FQA DB Publication 2014

Year:

FQA DB Description:

Reznicek, A.A., M.R. Penskar, B.S. Walters, and B.S. Slaughter. 2014. Michigan Floristic Quality Assessment Database. Herbarium, University of Michigan, Ann Arbor, MI and Michigan Natural Features Inventory, Michigan State University, Lansing, MI. <http://michiganflora.net>

Practitioner: Rachel Hackett, Phyllis Higman

Duration Notes: Surveys were conducted from 19 June 2017 to 23 June 2017, and from 14 August 2017 to 18 August 2017.

Community Type Notes: These areas have strong anthropological disturbances that have significantly altered the species composition and structure from reference conditions and are classified as anthropogenic systems. These are mostly old residential areas or agricultural fields, and red pine plantations.

Also noted but unable to determine species due to lack of reproductive organs or full-growth form at time of observation: *Lonicera* spp., Lycopodiaceae, *Populus* spp. saplings, *Quercus* hybrid with one parent likely *Q. macrocarpa*, and *Quercus* spp. saplings.

<p>Conservatism-Based Metrics:</p> <p>Total Mean C: 2.3</p> <p>Native Mean C: 3.4</p> <p>Total FQI: 24.0</p> <p>Native FQI: 29.2</p> <p>Adjusted FQI: 28.0</p> <p>% C value 0: 34.9</p> <p>% C value 1-3: 33.0</p> <p>% C value 4-6: 26.6</p> <p>% C value 7-10: 5.5</p> <p>Native Tree Mean C: 3.2</p> <p>Native Shrub Mean C: 3.2</p> <p>Native Herbaceous Mean C: 3.5</p>	<p>Species Richness:</p> <p>Total Species: 109</p> <p>Native Species: 74 67.90%</p> <p>Non-native Species: 35 32.10%</p> <p>Species Wetness:</p> <p>Mean Wetness: 1.0</p> <p>Native Mean Wetness: -0.1</p> <p>Physiognomy Metrics:</p> <p>Tree: 13 11.90%</p> <p>Shrub: 12 11.00%</p> <p>Vine: 2 1.80%</p> <p>Forb: 55 50.50%</p> <p>Grass: 12 11.00%</p>	<p>Duration Metrics:</p> <p>Annual: 6 5.50%</p> <p>Perennial: 96 88.10%</p> <p>Biennial: 7 6.40%</p> <p>Native Annual: 2 1.80%</p> <p>Native Perennial: 72 66.10%</p> <p>Native Biennial: 0 0%</p> <p>Physiognomy Metrics:</p> <p>Sedge: 9 8.30%</p> <p>Rush: 1 0.90%</p> <p>Fern: 5 4.60%</p> <p>Bryophyte: 0 0%</p>	
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Species:

Grass River Natural Area 2017: Old field/residential/plantation								
Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Abies balsamea</i>	Pinaceae	ABIBAL	native	3	0	tree	perennial	balsam fir
<i>Acer rubrum</i>	Sapindaceae	ACERUB	native	1	0	tree	perennial	red maple
<i>Achillea millefolium</i>	Asteraceae	ACHMIL	native	1	3	forb	perennial	yarrow
<i>Agrostis gigantea</i>	Poaceae	AGRGIG	non-native	0	-3	grass	perennial	redtop
<i>Anemone canadensis</i>	Ranunculaceae	ANECAN	native	4	-3	forb	perennial	canada anemone
<i>Anemone cylindrica</i>	Ranunculaceae	ANECYL	native	6	5	forb	perennial	thimbleweed
<i>Anemone virginiana</i>	Ranunculaceae	ANEVIR	native	3	3	forb	perennial	thimbleweed
<i>Antennaria parlinii</i>	Asteraceae	ANTPAL	native	2	5	forb	perennial	smooth pussytoes
<i>Apocynum androsaemifolium</i>	Apocynaceae	APOAND	native	3	5	forb	perennial	spreading dogbane
<i>Asclepias incarnata</i>	Apocynaceae	ASCINC	native	6	-5	forb	perennial	swamp milkweed
<i>Asclepias syriaca</i>	Apocynaceae	ASCSYR	native	1	5	forb	perennial	common milkweed
<i>Berteroa incana</i>	Brassicaceae	BERINC	non-native	0	5	forb	annual	hoary alyssum
<i>Brachyelytrum aristosum; b. erectum</i>	Poaceae	BRAARI	native	7	5	grass	perennial	northern shorthusk
<i>Bromus inermis</i>	Poaceae	BROINE	non-native	0	5	grass	perennial	smooth brome
<i>Caltha palustris</i>	Ranunculaceae	CALPAR	native	6	-5	forb	perennial	marsh-marigold
<i>Carex arctata</i>	Cyperaceae	CXARTT	native	3	5	sedge	perennial	sedge
<i>Carex disperma</i>	Cyperaceae	CXDISP	native	10	-5	sedge	perennial	sedge
<i>Carex flava</i>	Cyperaceae	CXFLAV	native	4	-5	sedge	perennial	sedge
<i>Carex gracillima</i>	Cyperaceae	CXGRAA	native	4	3	sedge	perennial	sedge
<i>Carex hystericina</i>	Cyperaceae	CXHYST	native	2	-5	sedge	perennial	sedge
<i>Carex leptalea</i>	Cyperaceae	CXLEPA	native	5	-5	sedge	perennial	sedge
<i>Carex vulpinoidea</i>	Cyperaceae	CXVULP	native	1	-5	sedge	perennial	sedge
<i>Centaurea stoebe; c. maculosa</i>	Asteraceae	CENSTO	non-native	0	5	forb	biennial	spotted knapweed
<i>Cirsium arvense</i>	Asteraceae	CIRARV	non-native	0	3	forb	perennial	canada thistle
<i>Cirsium palustre</i>	Asteraceae	CIRPAL	non-native	0	-3	forb	biennial	marsh thistle
<i>Cirsium vulgare</i>	Asteraceae	CIRVUL	non-native	0	3	forb	biennial	bull thistle
<i>Clematis virginiana</i>	Ranunculaceae	CLEVIR	native	4	0	vine	perennial	virgins bower
<i>Clinopodium vulgare</i>	Lamiaceae	CLIVUL	native	3	5	forb	perennial	wild-basil
<i>Cornus amomum</i>	Cornaceae	CORAMO	native	2	-3	shrub	perennial	silky dogwood
<i>Dactylis glomerata</i>	Poaceae	DACGLO	non-native	0	3	grass	perennial	orchard grass
<i>Danthonia spicata</i>	Poaceae	DANSPI	native	4	5	grass	perennial	poverty grass; oatgrass
<i>Dasiphora fruticosa; potentilla f.</i>	Rosaceae	DASFRU	native	8	-3	shrub	perennial	shrubby cinquefoil
<i>Daucus carota</i>	Apiaceae	DAUCAR	non-native	0	5	forb	biennial	queen-annes-lace
<i>Dianthus armeria</i>	Caryophyllaceae	DIAARM	non-native	0	5	forb	annual	deptford pink
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn-olive
<i>Elymus repens; agropyron r.</i>	Poaceae	ELYREP	non-native	0	3	grass	perennial	quack grass

Grass River Natural Area 2017: Old field/residential/plantation

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Equisetum hyemale</i>	Equisetaceae	EQUHYE	native	2	0	fern	perennial	scouring rush
<i>Equisetum palustre</i>	Equisetaceae	EQUPAL	native	8	-3	fern	perennial	marsh horsetail
<i>Erigeron strigosus</i>	Asteraceae	ERISTR	native	4	3	forb	perennial	daisy fleabane
<i>Eupatorium perfoliatum</i>	Asteraceae	EUPPER	native	4	-3	forb	perennial	boneset
<i>Euphorbia corollata</i>	Euphorbiaceae	EUPCOR	native	4	5	forb	perennial	flowering spurge
<i>Euphorbia virgata; e. esula</i>	Euphorbiaceae	EUPVIR	non-native	0	5	forb	perennial	leafy spurge
<i>Euthamia graminifolia</i>	Asteraceae	EUTGRA	native	3	0	forb	perennial	grass-leaved goldenrod
<i>Fragaria virginiana</i>	Rosaceae	FRAVIR	native	2	3	forb	perennial	wild strawberry
<i>Fraxinus americana</i>	Oleaceae	FRAAME	native	5	3	tree	perennial	white ash
<i>Galium triflorum</i>	Rubiaceae	GALTRR	native	4	3	forb	perennial	fragrant bedstraw
<i>Geum rivale</i>	Rosaceae	GEURIV	native	7	-5	forb	perennial	purple avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Gnaphalium uliginosum</i>	Asteraceae	GNAULI	native	3	0	forb	annual	low cudweed
<i>Hieracium aurantiacum</i>	Asteraceae	HIEAUR	non-native	0	5	forb	perennial	orange hawkweed
<i>Hieracium caespitosum</i>	Asteraceae	HIECAE	non-native	0	5	forb	perennial	king devil
<i>Hypericum perforatum</i>	Hypericaceae	HYPPER	non-native	0	5	forb	perennial	common st. johns-wort
<i>Hypopitys monotropa;</i> <i>monotropa hypopithys</i>	Ericaceae	HYPMON	native	6	5	forb	perennial	pinemap
<i>Juncus tenuis</i>	Juncaceae	JUNTEN	native	1	0	rush	perennial	path rush
<i>Juniperus communis</i>	Cupressaceae	JUNCOI	native	4	3	shrub	perennial	common or ground juniper
<i>Larix laricina</i>	Pinaceae	LARLAR	native	5	-3	tree	perennial	tamarack
<i>Leucanthemum vulgare;</i> <i>chrysanthemum leucanthemum</i>	Asteraceae	LEUVUL	non-native	0	5	forb	perennial	ox-eye daisy
<i>Lonicera morrowii</i>	Caprifoliaceae	LONMOR	non-native	0	3	shrub	perennial	morrow honeysuckle
<i>Lycopodium clavatum</i>	Lycopodiaceae	LYCCLA	native	4	0	fern	perennial	running ground-pine
<i>Lycopus americanus</i>	Lamiaceae	LYCAME	native	2	-5	forb	perennial	common water horehound
<i>Lycopus uniflorus</i>	Lamiaceae	LYCUNI	native	2	-5	forb	perennial	northern bugle weed
<i>Medicago lupulina</i>	Fabaceae	MEDLUP	non-native	0	3	forb	annual	black medick
<i>Melilotus albus</i>	Fabaceae	MELALB	non-native	0	3	forb	biennial	white sweet-clover
<i>Onoclea sensibilis</i>	Onocleaceae	ONOSEN	native	2	-3	fern	perennial	sensitive fern
<i>Packera paupercula; senecio p.;</i> <i>senecio plattensis</i>	Asteraceae	PACPAU	native	3	0	forb	perennial	balsam ragwort
<i>Panicum capillare</i>	Poaceae	PANCAP	native	0	0	grass	annual	witch grass
<i>Phleum pratense</i>	Poaceae	PHLPRA	non-native	0	3	grass	perennial	timothy
<i>Picea pungens</i>	Pinaceae	PICPUN	non-native	0	3	tree	perennial	blue spruce
<i>Pinus resinosa</i>	Pinaceae	PINRES	native	6	3	tree	perennial	red pine
<i>Pinus strobus</i>	Pinaceae	PINSTR	native	3	3	tree	perennial	white pine
<i>Plantago lanceolata</i>	Plantaginaceae	PLALAN	non-native	0	3	forb	perennial	english plantain

Grass River Natural Area 2017: Old field/residential/plantation

Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Plantago major</i>	Plantaginaceae	PLAMAJ	non-native	0	3	forb	perennial	common plantain
<i>Poa compressa</i>	Poaceae	POACOM	non-native	0	3	grass	perennial	canada bluegrass
<i>Poa pratensis</i>	Poaceae	POAPRA	non-native	0	3	grass	perennial	kentucky bluegrass
<i>Populus balsamifera</i>	Salicaceae	POPBAL	native	2	-3	tree	perennial	balsam poplar
<i>Populus tremuloides</i>	Salicaceae	POPTRE	native	1	0	tree	perennial	quaking aspen
<i>Potentilla recta</i>	Rosaceae	POTREC	non-native	0	5	forb	perennial	rough-fruited cinquefoil
<i>Prunella vulgaris</i>	Lamiaceae	PRUVUL	native	0	0	forb	perennial	self-heal
<i>Prunus serotina</i>	Rosaceae	PRUSER	native	2	3	tree	perennial	wild black cherry
<i>Pteridium aquilinum</i>	Dennstaedtiaceae	PTEAQU	native	0	3	fern	perennial	bracken fern
<i>Quercus rubra</i>	Fagaceae	QUERUB	native	5	3	tree	perennial	red oak
<i>Ranunculus hispidus</i>	Ranunculaceae	RANHIS	native	5	0	forb	perennial	swamp buttercup
<i>Ranunculus recurvatus</i>	Ranunculaceae	RANREC	native	5	-3	forb	perennial	hooked crowfoot
<i>Rhamnus alnifolia</i>	Rhamnaceae	RHAALN	native	8	-5	shrub	perennial	alder-leaved buckthorn
<i>Rubus allegheniensis</i>	Rosaceae	RUBALL	native	1	3	shrub	perennial	common blackberry
<i>Rubus occidentalis</i>	Rosaceae	RUBOCC	native	1	5	shrub	perennial	black raspberry
<i>Rubus pubescens</i>	Rosaceae	RUBPUB	native	4	-3	shrub	perennial	dwarf raspberry
<i>Rubus strigosus</i>	Rosaceae	RUBSTR	native	2	0	shrub	perennial	wild red raspberry
<i>Rudbeckia hirta</i>	Asteraceae	RUDHIR	native	1	3	forb	perennial	black-eyed susan
<i>Rumex acetosella</i>	Polygonaceae	RUMACL	non-native	0	3	forb	perennial	sheep sorrel
<i>Rumex obtusifolius</i>	Polygonaceae	RUMOBT	non-native	0	0	forb	perennial	bitter dock
<i>Salix discolor</i>	Salicaceae	SALDIS	native	1	-3	shrub	perennial	pussy willow
<i>Salix petiolaris</i>	Salicaceae	SALPET	native	1	-3	shrub	perennial	slender willow
<i>Schizachyrium scoparium;</i> <i>andropogon s.</i>	Poaceae	SCHSCO	native	5	3	grass	perennial	little bluestem
<i>Schoenoplectus</i> <i>tabernaemontani;</i> <i>scirpus</i> <i>validus</i>	Cyperaceae	SCHTAB	native	4	-5	sedge	perennial	softstem bulrush
<i>Scirpus cyperinus</i>	Cyperaceae	SCICYP	native	5	-5	sedge	perennial	wool-grass
<i>Solidago canadensis</i>	Asteraceae	SOLCAN	native	1	3	forb	perennial	canada goldenrod
<i>Solidago gigantea</i>	Asteraceae	SOLGIG	native	3	-3	forb	perennial	late goldenrod
<i>Solidago patula</i>	Asteraceae	SOLPAT	native	6	-5	forb	perennial	swamp goldenrod
<i>Solidago rugosa</i>	Asteraceae	SOLRUG	native	3	0	forb	perennial	rough-leaved goldenrod
<i>Symphotrichum urophyllum;</i> <i>aster sagittifolius</i>	Asteraceae	SYMURO	native	2	5	forb	perennial	arrow-leaved aster
<i>Taraxacum officinale</i>	Asteraceae	TAROFF	non-native	0	3	forb	perennial	common dandelion
<i>Thuja occidentalis</i>	Cupressaceae	THUOCC	native	4	-3	tree	perennial	arbor vitae
<i>Tragopogon pratensis</i>	Asteraceae	TRAPRA	non-native	0	5	forb	biennial	common goats beard
<i>Trifolium pratense</i>	Fabaceae	TRIPRA	non-native	0	3	forb	perennial	red clover

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Scientific Name	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Ulmus americana</i>	Ulmaceae	ULMAME	native	1	-3	tree	perennial	american elm
<i>Verbascum thapsus</i>	Scrophulariaceae	VERTHA	non-native	0	5	forb	biennial	common mullein
<i>Veronica officinalis</i>	Plantaginaceae	VEROOF	non-native	0	3	forb	perennial	common speedwell
<i>Vicia villosa</i>	Fabaceae	VICVIL	non-native	0	5	vine	annual	hairy vetch

Appendix 12. Possible vernal pools mapped during surveys and their coordinates in decimal degrees and parcel.

Parcel	Community	Latitude	Longitude	Photograph
NSHC #2	Dry-mesic Northern Forest	44.9695722	-85.21879087	DSC04033
NSHC #2	Dry-mesic Northern Forest	44.96985353	-85.21973882	DSC04053
NSHC #2	Dry-mesic Northern Forest	44.96900046	-85.21877267	DSC04308
NSHC #2	Dry-mesic Northern Forest	44.96900046	-85.21877267	DSC04309
NSHC #2	Dry-mesic Northern Forest	44.96923618	-85.21877082	DSC04310
NSHC #2	Dry-mesic Northern Forest	44.96923618	-85.21877082	DSC04311
SKINNER #1A	Mesic Northern Forest	44.92655199	-85.24989771	DSC04416
SKINNER #1A	Mesic Northern Forest	44.92655199	-85.24989771	DSC04417
DELANGE #1B	Mesic Northern Forest	44.9120263	-85.21836596	DSC04427
GORSUCH, N.	Mesic Northern Forest	44.9068667	-85.2254729	DSC04451
GORSUCH, N.	Mesic Northern Forest	44.90701166	-85.22562684	DSC04452

Appendix 13. List of new county occurrences collected at GRNA. Non-native species are in bold. Latitude and longitude are in decimal degrees.

Scientific Name	Common Name	Parcel	Latitude	Longitude
<i>Apocynum cannabinum</i>	Indian-hemp	ASB#1	44.941041	-85.209496
<i>Berberis thunbergii</i>	Japanese barberry	NSHC #2	44.969190	-85.219197
<i>Berberis thunbergii</i>	Japanese barberry	NSHC #1	44.964995	-85.214828
<i>Carex aquatilis</i>	Sedge	DELANGE	44.916788	-85.223876
<i>Carex buxbaumii</i>	Sedge	DELANGE	44.916693	-85.222285
<i>Carex diandra</i>	Sedge	DELANGE	44.915570	-85.223290
<i>Carex exilis</i>	Sedge	DELANGE	44.915529	-85.230442
<i>Carex exilis</i>	sedge	OKLESKY	44.932580	-85.212351
<i>Carex lupulina</i>	sedge	ASB #2	44.940380	-85.208109
<i>Carex pseudocyperis</i>	sedge	DELANGE	44.916788	-85.223876
<i>Cirsium vulgare</i>	bull thistle	BELLMORE	44.923461	-85.244131
<i>Dichanthelium depauperatum</i>	panic grass	AUSTIN	44.928447	-85.213080
<i>Epilobium palustre</i>	marsh willow-herb	NSHC #1	44.965102	-85.219144
<i>Iris pseudacorus</i>	yellow flag	DELANGE	44.916083	-85.223983
<i>Lonicera morrowii</i>	morrow honeysuckle	GORSUCH H #1B	44.909849	-85.233629
<i>Lycopus uniflorus</i>	northern bugle weed	NSHC #1	44.966693	-85.215332
<i>Lysimachia nummularia</i>	moneywort	ASB #1	44.940998	-85.208506
<i>Phragmites australis</i> subsp. <i>americanus</i>	common reed	DELANGE #1B	44.916022	-85.223933
<i>Phragmites australis</i> subsp. <i>americanus</i>	common reed	NOLD	44.929429	-85.244669
<i>Picea pungens</i>	blue spruce	NOLD	44.931312	-85.246101
<i>Rumex orbiculatus</i>	great water dock	DELANGE	44.917170	-85.221498
<i>Schoenoplectus tabernaemontani</i>	soft-stem bulrush	DELANGE	44.916788	-85.223876
<i>Solidago canadensis</i>	Canada goldenrod	AUSTIN #1A, MI #1C	44.936081	-85.213705
<i>Solidago gigantea</i>	late goldenrod	DEWEY	44.904690	-85.221300
<i>Symphyotrichum firmum</i>	smooth swamp aster	NHSC #1	44.967146	-85.218826
<i>Symphyotrichum lanceolatum</i>	panicled aster	MI #1D	44.918174	-85.222412
<i>Typha angustifolia</i>	narrow-leaved cat-tail	NHSC #1	44.965102	-85.219144
<i>Typha angustifolia</i>	narrow-leaved cat-tail	DELANGE #1B	44.916875	-85.222533
<i>Utricularia minor</i>	small bladderwort	AUSTIN	44.932097	-85.212142
<i>Verbena hastata</i>	blue vervain	NOLD	44.931155	-85.245552

Appendix 14. Native species of interest (e.g., orchids, carnivorous plants, parasitic plants, coral fungus). To see a complete list of native and non-natives species, see Appendices 1-11.

Scientific name	Common name	Parcel	Photo
<i>Arethusa bulbosa</i>	arethusa/dragon's mouth		
<i>Calopogon tuberosus</i>	grass-pink	GORSUCH, H #1B	DSC04139
<i>Calopogon tuberosus</i>	grass-pink	GORSUCH, H #1B	DSC04140
<i>Calopogon tuberosus</i>	grass-pink	GORSUCH, H #1B	DSC04141
<i>Calopogon tuberosus</i>	grass-pink	GORSUCH, H #1B	DSC04142
<i>Calopogon tuberosus</i>	grass-pink	GORSUCH, H #1B	DSC04143
<i>Calopogon tuberosus</i>	grass-pink	GORSUCH, H #1B	DSC04144
<i>Clavulinopsis spp. likely C. fusiformis</i>	yellow coral fungus	NSHC #1	DSC04305
<i>Clavulinopsis spp. likely C. fusiformis</i>	yellow coral fungus	NSHC #1	DSC04306
<i>Clavulinopsis spp. likely C. fusiformis</i>	yellow coral fungus	NSHC #1	DSC04307
<i>Clavulinopsis spp. likely C. fusiformis</i>	yellow coral fungus	NSHC #1	
<i>Clavulinopsis spp. likely C. fusiformis</i>	yellow coral fungus	MI #2A	
<i>Clavulinopsis spp. likely C. fusiformis</i>	yellow coral fungus	MI #2A	
<i>Clavulinopsis spp. likely C. fusiformis</i>	yellow coral fungus	DELANGÉ #1A	
<i>Corallorhiza trifida</i>	early coralroot orchid	NSHC #2	DSC04040
<i>Corallorhiza trifida</i>	early coralroot orchid	NSHC #2	DSC04041
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04163
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04164
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04165
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04166
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04167
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04190
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04191
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04192
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04193
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1B	DSC04194
<i>Cypripedium parviflorum</i>	yellow lady-slipper	DELANGÉ #1A	
<i>Cypripedium reginae</i>	showy lady-slipper	GORSUCH, H #1B	DSC04112
<i>Cypripedium reginae</i>	showy lady-slipper	GORSUCH, H #1B	DSC04113
<i>Cypripedium reginae</i>	showy lady-slipper	GORSUCH, H #1B	DSC04114

Scientific name	Common name	Parcel	Photo
<i>Cypripedium reginae</i>	showy lady-slipper	GORSUCH, H #1B	DSC04115
<i>Cypripedium spp.</i>	lady-slipper	DELANGE #1B	DSC04185
<i>Cypripedium spp.</i>	lady-slipper	DELANGE #1B	DSC04186
<i>Cypripedium spp.</i> (likely)	lady-slipper	Delange #1B	DSC03927
<i>Cypripedium spp.</i> (likely)	lady-slipper	Delange #1B	DSC03928
<i>Drosera rotundifolia</i>	round-leaf sundew	DELANGE #1B	
<i>Drosera rotundifolia</i>	round-leaf sundew	NSHC #2	DSC04038
<i>Drosera rotundifolia</i>	round-leaf sundew	NSHC #2	DSC04039
<i>Drosera rotundifolia</i>	round-leaf sundew	NSHC #1	
<i>Drosera rotundifolia</i>	round-leaf sundew	BELMOOR	
<i>Drosera rotundifolia</i>	round-leaf sundew	DELANGE #1B	
<i>Drosera rotundifolia</i> fruiting	round-leaf sundew	MI #3	
<i>Goodyera pubescens</i>	downy rattlesnake plantain	DELANGE #1B	
<i>Hypopitys monotropa</i>	pinemap	BAGINSKI #1B	DSC04320
<i>Hypopitys monotropa</i>	pinemap	BAGINSKI #1B	DSC04321
<i>Platanthera huronensis</i>	Lake Huron green orchid	GORSUCH H #1E	
<i>Platanthera psycodes</i>	purple fringed orchid	MI #2A	DSC04351
<i>Platanthera psycodes</i>	purple fringed orchid	MI #2A	DSC04352
<i>Platanthera psycodes</i>	purple fringed orchid	MI #2A	DSC04353
<i>Platanthera psycodes</i>	purple fringed orchid	MI #2A	DSC04356
<i>Platanthera psycodes</i>	purple fringed orchid	MI #2A	DSC04357
<i>Platanthera psycodes</i>	purple fringed orchid		DSC04383
<i>Platanthera psycodes</i>	purple fringed orchid	OLESKY	DSC04400
<i>Platanthera psycodes</i>	purple fringed orchid	OLESKY	DSC04401
<i>Platanthera psycodes</i>	purple fringed orchid	OLESKY	DSC04402
<i>Platanthera psycodes</i>	purple fringed orchid	GORSUCH, H #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	OLESKY	
<i>Platanthera psycodes</i>	purple fringed orchid	GORSUCH, H #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	GORSUCH, H #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	GORSUCH, H #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	DELANGE #1B	
<i>Platanthera psycodes</i>	purple fringed orchid	OLESKY	DSC04403
<i>Pogonia ophioglossoides</i>	rose pogonia	Delange #1B	DSC03919

Scientific name	Common name	Parcel	Photo
<i>Pogonia ophioglossoides</i>	rose pogonia	Delange #1B	DSC03921
<i>Pogonia ophioglossoides</i>	rose pogonia	GORSUCH, H #1B	
<i>Pogonia ophioglossoides</i>	rose pogonia	DELANGE #1B	DSC04158
<i>Pogonia ophioglossoides</i>	rose pogonia	DELANGE #1B	DSC04159
<i>Pogonia ophioglossoides</i>	rose pogonia	DELANGE #1B	DSC04156
<i>Pogonia ophioglossoides</i>	rose pogonia	DELANGE #1B	DSC04157
<i>Ramariopsis kunzei</i> (likely)	white coral fungus	DEWEY, W	DSC04447
<i>Sarracenia purpurea</i>	pitcher plant	GORSUCH, H #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03874
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03875
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03876
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03877
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03923
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03924
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03925
<i>Sarracenia purpurea</i>	pitcher plant	Delange #1B	DSC03926
<i>Sarracenia purpurea</i>	pitcher plant	MI #2C	
<i>Sarracenia purpurea</i>	pitcher plant	GORSUCH, H #1B	
<i>Sarracenia purpurea</i>	pitcher plant	NSHC #1	
<i>Sarracenia purpurea</i>	pitcher plant	BELMOOR	
<i>Sarracenia purpurea</i>	pitcher plant	GORSUCH, H #1B	
<i>Sarracenia purpurea</i>	pitcher plant	GORSUCH, H #1B	
<i>Sarracenia purpurea</i>	pitcher plant	GORSUCH, H #1B	
<i>Sarracenia purpurea</i>	pitcher plant	GORSUCH, H #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	DSC04158
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	DSC04159
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	DSC04156
<i>Sarracenia purpurea</i>	pitcher plant	DELANGE #1B	DSC04157
<i>S.purpurea f. heterophylla</i>	yellow pitcher pant	GORSUCH, H #1B	DSC04406
<i>S.purpurea f. heterophylla</i>	yellow pitcher plant	GORSUCH, H #1B	DSC04407

Scientific name	Common name	Parcel	Photo
<i>Schizachyrium scoparium</i>	little bluestem	DEWEY, D & STANLEY	
<i>Schizachyrium scoparium</i>	little bluestem	GORSUCH, H #1B	DSC04465
<i>Schizachyrium scoparium</i>	little bluestem	GORSUCH, H #1B	DSC04466
<i>Spiranthes cernua</i>	nodding ladies-tresses	MI #1D	DSC04372
<i>Spiranthes cernua</i>	nodding ladies-tresses	MI #1D	DSC04373
<i>Spiranthes cernua</i>	nodding ladies-tresses	MI #1D	DSC04374
<i>Spiranthes cernua</i>	nodding ladies-tresses	OLESKY	
<i>Spiranthes cernua</i>	nodding ladies-tresses	GORSUCH, H #1B	
<i>Spiranthes cernua</i>	nodding ladies-tresses	GORSUCH, H #1B	
<i>Spiranthes cernua</i>	nodding ladies-tresses	GORSUCH, H #1B	
<i>Spiranthes cernua</i>	nodding ladies-tresses	OLESKY	
<i>Spiranthes cernua</i>	nodding ladies-tresses	GORSUCH, H #1B	
<i>Spiranthes cernua</i>	nodding ladies-tresses	DELANGÉ #1B	
<i>Spiranthes cernua</i>	nodding ladies-tresses	DELANGÉ #1B	
<i>Spiranthes cernua</i>	nodding ladies-tresses	DELANGÉ #1B	
<i>Trichophorium alpinum</i>	alpine bulrush	DELANGÉ #1B	DSC03915
<i>Trichophorium alpinum</i>	alpine bulrush	DELANGÉ #1B	DSC03918
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03955
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03956
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03957
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03958
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03959
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03960
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03961
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03962
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03963
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03964
<i>Utricularia cornuta</i>	horned bladderwort	MI #1A	DSC03965
<i>Utricularia intermedia</i>	flat-leaved bladderwort	DELANGÉ #1B	DSC04492
<i>Utricularia intermedia</i>	flat-leaved bladderwort	DELANGÉ #1B	DSC04493
<i>Utricularia intermedia</i>	flat-leaved bladderwort	DELANGÉ #1B	DSC04494
<i>Utricularia minor</i>	small bladderwort		
<i>Utricularia vulgaris</i>	common bladderwort	MI #1A	DSC03967
<i>Utricularia vulgaris</i>	common bladderwort	MI #1A	DSC03968
<i>Utricularia vulgaris</i>	common bladderwort	MI #1A	DSC03969
<i>Utricularia vulgaris</i>	common bladderwort	MI #1A	DSC03970

Appendix 15. Invasive species of most concern and native but aggressive species found during surveys and their coordinates in decimal degrees or parcel. Some observations have multiple rows to accommodate multiple photos.

Scientific name	Common name	Parcel	Latitude	Longitude	Photo
<i>Alliaria petiolata</i>	garlic mustard	SKINNER			
<i>Berberis thunbergii</i>	Japanese barberry	NSHC #2	44.96919034	-85.21919718	DSC04035
<i>Berberis thunbergii</i>	Japanese barberry	NSHC #2	44.96919034	-85.21919718	DSC04036
<i>Berberis thunbergii</i>	Japanese barberry	NSHC #2	44.96919034	-85.21919718	DSC04037
<i>Berberis thunbergii</i>	Japanese barberry	NSHC #1	44.96499542	-85.21482845	
<i>Berberis thunbergii</i>	Japanese barberry	KOWALL #1, 2, 3	44.9285999	-85.20661813	
<i>Berberis thunbergii</i>	Japanese barberry	NOLD	44.92993987	-85.24572514	
<i>Centaurea stoebe</i>	spotted knapweed	NSHC #2	44.97111284	-85.21817808	DSC04021
<i>Centaurea stoebe</i>	spotted knapweed	NSHC #2	44.97111284	-85.21817808	DSC04022
<i>Cirsium arvense</i>	Canada thistle				
<i>Cirsium palustre</i>	marsh thistle				
<i>Cirsium palustre</i>	marsh thistle	AUSTIN #1A, MI #1C	44.93490822	-85.21424554	
<i>Cirsium vulgare</i>	bull thistle				
<i>Cirsium vulgare</i>	bull thistle	MI #2A	44.92626327	-85.20626153	
<i>Cirsium vulgare</i>	bull thistle	DELANGE #1B	44.91410799	-85.22567634	
<i>Elaeagnus umbellata</i>	autumn olive	GAGE	44.90500031	-85.21487387	DSC04074
<i>Elaeagnus umbellata</i>	autumn olive	GAGE	44.90482231	-85.21522581	DSC04075
<i>Elaeagnus umbellata</i>	autumn olive	DELANGE #1B	44.91522303	-85.21591605	DSC04184
<i>Elaeagnus umbellata</i>	autumn olive	SKINNER #1A	44.92599784	-85.24988303	DSC04418
<i>Elaeagnus umbellata</i>	autumn olive	GORSUCH, H #1B	44.91182556	-85.23422572	
<i>Elaeagnus umbellata</i>	autumn olive	GORSUCH, H #1B	44.91195904	-85.23410419	
<i>Elaeagnus umbellata</i>	autumn olive	GORSUCH, H #1B	44.91290743	-85.23340935	
<i>Elaeagnus umbellata</i>	autumn olive	SKINNER #1A	44.9258191	-85.24947817	DSC04420
<i>Phalaris arundinacea</i>	canary reed grass	SKINNER #1A	44.9258191	-85.24947817	DSC04420
<i>Euphorbia virgata</i>	leafy spurge	NSHC #1	44.95977838	-85.21435472	DSC04014
<i>Euphorbia virgata</i>	leafy spurge	NSHC #1	44.95977838	-85.21435472	DSC04015
<i>Euphorbia virgata</i>	leafy spurge	NSHC #1	44.95977838	-85.21435472	DSC04016
<i>Lonicera morrowii</i>	morrow honeysuckle	DEWEY, W	44.90419573	-85.22337101	
<i>Lonicera morrowii</i>	morrow honeysuckle	GORSUCH, H #1B	44.90984852	-85.23362853	DSC04386
<i>Lonicera x bella</i>	hybrid honeysuckle	NOLD			DSC04387
<i>Lonicera x bella</i>	hybrid honeysuckle	NOLD			
<i>Lysimachia nummularia</i>	moneywort	ASB #2			
<i>Lysimachia nummularia</i>	moneywort	SWAN			

Scientific name	Common name	Parcel	Latitude	Longitude	Photo
<i>Lysimachia nummularia</i>	moneywort	ASB #1	44.94099845	-85.20850586	
<i>Lythrum salicaria</i>	purple loosestrife	SPEET			
<i>Myosotis scorpiodes</i>	forget-me-not	MI #2A			
<i>Myosotis scorpiodes</i>	forget-me-not	KOWALL			
<i>Myosotis scorpiodes</i>	forget-me-not	ASB #1			
<i>Myosotis scorpiodes</i>	forget-me-not	ASB #2			
<i>Myosotis scorpiodes</i>	forget-me-not	SWAN			
<i>Phalaris arundinacea</i>	canary reed grass	MI #2A	44.9264466	-85.20673147	
<i>Phalaris arundinacea</i>	canary reed grass	NOLD	44.92975309	-85.24471089	
<i>Phalaris arundinacea</i>	canary reed grass	DELANGE #1B	44.91607748	-85.2217999	DSC04430
<i>Phalaris arundinacea</i>	canary reed grass	GORSUCH, H #1B	44.91441643	-85.23306031	
<i>Phalaris arundinacea</i>	canary reed grass	DELANGE #1B	44.91405629	-85.225854	
<i>Phragmites australis</i>	Phragmites	AUSTIN #1A, MI #1C	44.93614631	-85.21387756	
<i>Phragmites australis</i> subsp <i>australis</i> likely	Phragmites	Clam Lake	44.91947942	-85.22732693	
<i>Rosa multiflora</i>	multifloral rose	DELANGE #1B	44.91438555	-85.21635448	DSC04178
<i>Rosa multiflora</i>	multifloral rose	DELANGE #1B	44.91438555	-85.21635448	DSC04179
<i>Typha angustifolia</i>	narrow-leaf cattail	NSHC #1	44.96510235	-85.21914406	
<i>Typha angustifolia</i>	narrow-leaf cattail	DELANGE #1B	44.91687466	-85.22253267	DSC04431
<i>Typha angustifolia</i>	narrow-leaf cattail	DELANGE #1B	44.91687466	-85.22253267	DSC04432
<i>Typha angustifolia</i>	narrow-leaf cattail	DELANGE #1B	44.91687466	-85.22253267	DSC04433
<i>Typha angustifolia</i>	narrow-leaf cattail	DELANGE #1B	44.91550089	-85.22590216	
<i>Veronica officinalis</i>	common speedwell	BAGINSKI #1B	44.92379823	-85.21834425	DSC04322
<i>Veronica officinalis</i>	common speedwell	BAGINSKI #1B	44.92379823	-85.21834425	DSC04323
<i>Veronica officinalis</i>	common speedwell	BAGINSKI #1B	44.92379823	-85.21834425	DSC04324