NES ECOLOGICAL SERVICES
A Division of Robert E. Lee & Associates, Inc.
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Serving Wisconsin, Michigan, Minnesota and Illinois

Lower Menominee River Area of Concern
Menekaunee Harbor Restoration Project
Great Lakes Restoration Initiative Grant
Grant/Project No. GL-00E01312-0

Prepared for

City of Marinette
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Project Overview

NES Ecological Services (NES) – A Division of Robert E. Lee and Associates, Inc. (REL), was contracted by the City of Marinette to provide vegetation monitoring services at Menekaunee Harbor located in Sections 4 & 9, T30N, R24E, City of Marinette, Marinette County, Wisconsin (Figure 1). The City began restoration at Menekaunee Harbor (herein referred to as the "Harbor") as part of a Great Lakes Restoration Initiative (GLRI) Grant to restore the Lower Menominee River Area of Concern (AOC). In the summer of 2015 NES/REL finalized a Restoration Plan for the Harbor and the Quality Assurance Project Plan (QAPP) was signed in October 2015. The Project area is approximately 16.77 acres in size and is designed to encompass 1 acre of emergent aquatic, 1.07 acres of emergent aquatic – wild rice (redefined in 2017 due to higher water levels), 0.05 acres of ephemeral pool, 0.32 acres of mesic to wet-mesic prairie, 0.82 acres of northern sedge meadow, 1.22 acres of wet mesic forest, 4.07 acres of open water (redefined in 2017 due to higher water levels), 0.32 acres of prairie, 0.51 acres of shrub-carr and 0.03 acres of submergent aquatic. Additional areas were added (0.06 acres of emergent/wet meadow, 0.22 acres of shady woodland and 7.08 acres of invasive species control) to the project site towards the end of the 2016 growing season due to acquiring additional funding.

NES ecologists conducted the second year of monitoring on August 15th and September 20th & 25th, 2017. The completion and submittal of this monitoring report (Year 2), satisfies the requirements outlined in the (QAPP). Report submittals are required for three consecutive post-construction growing seasons.

Goals, Objectives & Performance Standards

Goals

The purpose of the Menekaunee Harbor ecological restoration is to restore native vegetation and habitat within a degraded wetland complex. Per the QAPP, the goals of the site are as follows:

- Long-term protection is in place for natural areas and wetlands within the AOC.
- Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.
- The lake sturgeon (*Acipenser fulvescens*) population is enhanced.
- Diverse and functional native fish and mussel assemblages are present in the AOC that sustain natural recruitment.
- A healthy and diverse native vegetation community has been restored.

Objectives

In support of these goals, the objectives and related target criteria of this restoration are as follows:

1. Restore benthic habitats for use by invertebrates and native fish species, which historically utilized the harbor including: walleye (*Sander vitreus*), yellow perch (*Perca flavescens*), muskellunge (*Esox masquinongy*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), and bluegill (*Lepomis macrochirus*).

    a) Eliminate contaminated sediments and establish water depths averaging 6-7 feet.
    b) Install fish sticks, log structures, woody debris and rock structures to increase cover and feeding opportunities.
    c) Establish small populations of submergent native vegetation in the harbor.

   d) Eliminate and control invasive species within emergent aquatic communities, while establishing native plants to provide spawning habitat.
2. Establish healthy and diverse native vegetation communities.
   a) Restore/create community types found to be high priority communities within the Northern Lake Michigan Coastal Ecological Landscape.
   b) Install a variety of ferns, grasses, sedges, forbs, shrubs, and trees currently and historically found within Marinette County. Wild rice (*Zizania palustris*) was historically found within the Menominee River; therefore, an attempt will be made to re-establish a viable population.
   c) Increase plant diversity by adding a few species typically found more often within southern Wisconsin to account for temperature increases due to global climate shifts.
   d) Absolute cover of invasive species will be < 15% within each community type.
3. Restore wetland and upland habitat for use by invertebrates, amphibians, reptiles, mammals and birds.
   a) Native vegetation capable of providing a variety of food and cover will be established throughout the restored/created communities.
   b) Existing snags will be left and protected to provide food sources and potential future nesting sites.
   c) Rock and brush piles will be added to provide cover.
   d) Downed woody debris will be placed in the emergent aquatic and wet meadow communities to provide sites for loafing and basking.
   e) Nesting boxes and platforms will be installed to increase suitable nesting sites.
   f) Bat houses will be erected to provide roosting sites.

Over the course of the monitoring period it is expected that site functions will improve in all of the above categories.

Ecological Performance Standards

Performance standards are the measures utilized to determine whether desired objectives regarding the overall mitigation goal have been met. Post-construction monitoring activities are performed throughout the duration of a project to evaluate progress toward achieving the functional objectives. The below performance standards in Table 1, as outlined in the approved QAPP, will be used to verify the success of the emergent aquatic, emergent aquatic- wild rice, open water & submergent aquatic, ephemeral pool, mesic to wet mesic prairie & prairie, northern sedge meadow, wet mesic forest, and shrub-carr communities.

Table 1. Status of Ecological Performance Standard Achievement

Ecological Performance Standards (PS) For Year Two	PS Achievement 2016	2017	2018	Monitoring Results			Discussion of Monitoring Results/Trends
Aerial coverage of invasive, non-native species such as giant reed grass, reed canary grass, cattail spp., purple loosestrife and spotted knapweed will not be >5% after two years.	Y	Y	--	**Invasive, non-native species**	**% Cover**	**% Relative Cover**	The five main invasive species of concern currently have <5% total coverage within the project area.
				Giant reed grass	0.70	0.57	
				Reed canary grass	0.78	0.64	
				Cattail spp.	0.50	0.41	
				Purple loosestrife	0.70	0.57	
				Spotted knapweed	0.20	0.16	
After two years, >80% of the vegetative cover within the restoration site will be native species, <20% of the cover will be invasive, non-native species.	Y	Y	--	**Species**	**Percent cover**		Vegetative cover is currently exceeding the 80% minimum native species cover after two years. *Elodea canadensis* (Canadian waterweed), a submergent aquatic and *Acer negundo* (box elder) are accounting for the largest portion of vegetative cover of native species with 11.46 & 12.46% relative cover, respectively.
				Native	91.39		
				Invasive / Non-native	8.61		
Eighty five percent of the site will be vegetated within two years.	Y	Y	--	Sum of average percent cover across the site = 122.18%			Based on the sum of average percent cover across all communities this criterion has been met. The lowest percent cover across all communities was the submergent aquatic at 95% cover and the shady woodland planting at 96% cover.
520 of the 650 planted shrubs within the Shrub-Carr community will be present and healthy two years after installation.	Y	IP	--	-			Due to the continued water level increase there were many shrubs on the edge of being live or dead. Due to this NES did not conduct a count of live shrubs in 2017 but will conduct the count for the final year of monitoring in 2018. It is probable that this standard will not be met due to the dramatic water level increase during the establishment of installed shrubs.
800 of the 1,000 planted trees and shrubs within the Wet-Mesic Forest community will be present and healthy after two years of installation.	Y	IP	--	-			Due to the continued water level increase there were many trees on the edge of being live or dead. Due to this NES did not conduct a count of live shrubs in 2017 but will conduct the count for the final year of monitoring in 2018. It is probable that this standard will not be met due to the dramatic water level increase during the establishment of installed trees.
The Open Water with Submergent Vegetation community shall have a minimum of 5 native species present.	Y	Y		This community had 16 native species identified during the vegetation survey			Planted species along with naturally occurring species allowed this performance standard to be met.
The Emergent Aquatic, Northern Sedge Meadow, Shrub-Carr, Wet-Mesic Forest and Mesic to Wet Mesic Prairie & Prairie communities shall each have a minimum of 15 native, non-invasive species present.	P	Y	--	**Community**	**Number of Native, Non-invasive Species**		All communities for this performance standard currently meet the goal. The prairie has the lowest number of native species with 20. Because the prairie was started from bare soil it will take longer to become fully established and display a higher number of native species.
				Emergent Aquatic & Emergent Aquatic –Wild Rice	36		
				Northern Sedge Meadow	36		
				Shrub-Carr	52		
				Wet-Mesic Forest, Ephemeral Pool & Mesic to Wet-Mesic Prairie	52		
				Prairie	20		

Table 1. Continued

Ecological Performance Standards (PS) For Year Two	PS Achievement 2016	2017	2018	Monitoring Results	Discussion of Monitoring Results/Trends
To ensure the restored communities have natural significance, the floristic quality index (FQI) and Coefficient of Conservatism (Mean C) for each shall be ≥ 22 and ≥ 3.8, respectively, after two years. FQI values will be calculated utilizing all species present: non-native species will be assigned a value of zero.	P	P	--	**Community** / **FQI** / **Mean C** Emergent Aquatic & Emergent Aquatic – Wild Rice: 25.93 / 4.10 Northern Sedge Meadow: 26.25 / 4.15 Shrub-Carr: 27.11 / 3.19 Wet-Mesic Forest, Ephemeral Pool & Mesic to Wet-Mesic Prairie: 31.91 / 4.19 Prairie: 9.26 / 1.43 Open Water w/Submergent Veg: 21.00 / 5.25	The prairie, open water w/submergent veg and shrub-carr communities have not met the criteria for this performance standard. The prairie did trend positively in regards to both FQI (11.9 to 13.42) and mean C (1.67 to 3.00) since 2016 but will still require more time to establish due to being started from seed and bare soil. The open water w/submergent veg trended positively since 2016 in regards to FQI (15.20 to 21.00) but stayed relatively the same for mean C (5.38 to 5.25) which has met the standard. The shrub-carr community also trended positively since 2016 in regards to FQI (24.18 to 27.11) and also stayed relatively the same in regards to mean C (3.32 to 3.19).
Six of the twelve nesting and roosting boxes shall be utilized or occupied annually by year three.	IP	IP	-	This standard was not analyzed in Year 1 or 2.	-
Twenty avian species, five species of reptiles and amphibians, and five mammal species will be recorded, either through direct observation, calls or sign left by the species, utilizing the site after three years.	IP	IP	-	**Species Type** / **2016** / **2017** / **2018** **Avian**: 9 / 9 / - **Herptiles**: 3 / 3 / - **Mammals**: 3 / 3 / -	This standard does not need to be evaluated until Year 3, but it is currently on track to be met.

NA = Not Applicable IP = In Progress P = Performance Standard is Partially Met Y = Performance Standard is Met

Summary Data

Methods

Vegetation/Floristic Diversity

Meander surveys were conducted within the project area to gather a representative sample of the floristic diversity of each plant community. Surveys were completed between the months of August and September to compile a list of plant species and their associated coverages found within each community. A comprehensive species list of the entire site can be found in Appendix A.

In 2017 NES adopted the timed-meander sampling protocol for vegetation monitoring developed by the Wisconsin Department of Natural Resources (Appendix B). On August 15th and September 20th & 25th timed meanders were conducted in the wet-mesic forest, shrub carr, emergent aquatic, emergent aquatic – wild rice, northern sedge meadow, submergent aquatic, open water, mesic to wet-mesic prairie, prairie, ephemeral pond and two newly added zones (shady woodland planting & emergent/wet meadow planting). Additionally, the invasive species control area was surveyed to document the presence and cover of invasive species within its boundaries.

Due to the similarity of species in the herbaceous layer and the wet-mesic forest being in the early stages of development, NES combined the wet-mesic forest, ephemeral pool and mesic to wet-mesic prairie community data. Additionally, due to the similarity of species present the emergent aquatic and emergent aquatic – wild rice community data was also combined. Because the water levels increased in 2017, the wild rice was unable to take hold in its previously designated area so that zone was re-delineated and seeded in a more desirable location in the fall of 2017. The emergent aquatic – wild rice community will be surveyed separately during the 2018 meander to better capture the success of the wild rice establishment.

Results

Vegetation/Floristic Diversity

A list of species found during the meander surveys and a summary of each community type can be found in Appendix A. These data were used to compute the information reported in Table 2 below. A total of 163 plant species were recorded during the 2017 surveys.

Photos (Appendix C) documenting existing site conditions within each community type were taken throughout the site (Figure 2).

Native Species Dominance

All communities had a greater coverage of native plant species. Since 2016 there are an additional 31 native species and the percent native coverage has increased from 85.4% to 91.39% across the entire site. All dominant species in the Emergent Aquatic & Emergent Aquatic – Wild Rice (4 native), Shallow Marsh (2 native), Submergent Aquatic (4 native) and Shady Woodland Planting (1 native) were native while the Wet-Mesic Forest, Ephemeral Pool & Mesic to Wet-Mesic Prairie (1 non-native, 7 native), Shrub-Carr (2 non-native, 13 native), Prairie (1 non-native, 6 native) and Emergent/Wet Meadow Planting (1 non-native, 3 native) contained a mix of both native and non-native species. Table 3 contains a list of dominant species found within the Harbor communities. Additional information pertaining to the percent areal coverage of native and invasive species can be found in the community summary data (Appendix A).

Table 2. Vegetation Data Summary.

Community	# Total Species	# Native Species	FQI	Mean C	% Native Coverage	% Invasive Species Coverage
Open Water & Submergent Aquatic	16	16	21.00	5.25	100.00	0.0
Emergent Aquatic & Emergent Aquatic – Wild Rice	40	36	25.93	4.10	97.20	2.80
Northern Sedge Meadow	40	36	26.25	4.15	97.01	2.99
Shrub-Carr	57	52	27.11	3.19	91.07	8.93
Wet-Mesic Forest, Ephemeral Pool & Mesic to Wet-Mesic Prairie	58	52	31.91	4.19	90.76	9.24
Prairie	42	20	9.26	1.43	71.96	28.04
Shady Woodland Planting	25	13	6.00	1.43	86.46	13.54
Emergent/Wet Meadow Planting	42	33	17.99	2.65	84.13	15.87
Invasive Species Control Area	-	-	-	-	-	5.00
Entire Site	**163**	**127**	**44.66**	**3.50**	**91.39**	**8.61**

Table 3. Plant Species Dominance.

Community Type	Dominant Species
Open Water & Submergent Aquatic	*Ceratophyllum demersum*
	Elodea canadensis
	Heteranthera dubia
	Stuckenia pectinata
Emergent Aquatic & Emergent Aquatic – Wild Rice	*Ceratophyllum demersum*
	Elodea canadensis
	Schoenoplectus tabernaemontani
	Sparganium americanum
Northern Sedge Meadow	*Elodea canadensis*
	Schoenoplectus tabernaemontani
Shrub-Carr	*Agrostis stolonifera*
	Calamagrostis canadensis
	Carex aquatilis
	Carex comosa
	Carex lacustris
	Eleocharis palustris

Table 3. Continued.

Community Type	Dominant Species
Shrub-Carr	*Glyceria striata*
	Juncus brevicaudatus
	Lythrum salicaria
	Mentha canadensis
	Populus deltoides
	Schoenoplectus pungens
	Schoenoplectus tabernaemontani
	Spirea alba
Wet-Mesic Forest, Ephermeral Pool & Mesic to Wet – Mesic Prairie	*Agrostis stolonifera*
	Calamagrostis canadensis
	Carex aquatilis
	Juncus balticus
	Juncus brevicaudatus
	Juncus tenuis
	Populus deltoides
	Schoenoplectus tabernaemontani
Prairie	*Bromus inermis*
	Monarda fistulosa
	Monarda punctate
	Ratbida pinnata
	Rudbeckia hirta
	Verbena hastate
	Zizia aurea
Emergent/Wet Meadow Planting	*Agrostis gigantea*
	Carex scoparia
	Lemna minor
	Sparganium americanum
Shady Woodland Planting	*Acer negundo*

Invasive/Non-native Species

Based on the information in Table 4, there are currently 36 invasive and/or non-native species found across all communities with an overall coverage of 8.61%. Although there are two more invasive/non-native species since 2016 the coverage has decreased by 5.99%. Please see the plot data sheets in Appendix A for specific sample plot percentages. Table 4 includes a list of all non-native species identified during plant surveys in 2017. Several of the species listed below often invade newly seeded sites such as the Prairie community which has the largest number of non-native species present; however, many of these biennial and perennial weeds, including the most common species - spreading bent grass (*Agrostis stolonifera*) quickly disappears with proper maintenance and native species establishment. Continued monitoring and management of non-native species will eliminate or suppress their threat to spread throughout the site.

Table 4. Invasive/Non-native Species Coverage (%).

Species		Community						
Common Name	Scientific Name	Northern Sedge Meadow	Shrub-Carr	Wet-Mesic Forest	Prairie	Emergent Aquatic	Emergent/Wet Meadow Planting	Shady Woodland Planting
Alfalfa	*Medicago sativa*	-	-	-	0.93	-	-	-
Barnyard Grass	*Echinochloa crus-galli*	-	-	-	-	-	0.79	1.04
Bittersweet Nightshade	*Solanum dulcamara*	-	-	-	-	-	0.79	-
Black Medic	*Medicago lupulina*	-	-	-	0.93	-	-	1.04
Bull Thistle	*Cirsium vulgare*	-	-	-	0.93	-	-	-
Branching Centaury	*Centaurium pulchellum*	-	-	-	0.93	-	-	-
Canada Thistle	*Cirsium arvense*	-	-	-	0.93	-	0.79	-
Common Burdock	*Arctium minus*	-	-	-	-	-	-	1.04
Common mullein	*Verbascum Thapsus*	-	-	-	-	-	-	1.04
Common Plantain	*Plantago major*	-	-	-	1.87	-	-	1.04
Common Reed	*Phragmites australis*	0.60	0.89	0.84	-	0.70	0.79	-
Dandelion	*Taraxacum officinale*	-	-	-	0.93	-	-	1.04
Dog-fennel	*Anthemis cotula*	-	-	0.84	-	-	-	-
Birdsfoot Trefoil	*Lotus corniculatus*	-	-	-	0.93	-	-	-
Field Sow Thistle	*Sonchus arvensis*	-	-	-	0.93	-	-	1.04
Foxtail Barley	*Hordeum jubatum*	-	0.89	-	0.93	-	-	-
Hybrid Cattail	*Typha x glauca*	0.60	0.89	0.84		0.70	0.79	
Kentucky Bluegrass	*Poa pratensis*	-	-	-	1.87	-	-	-
Marsh-Pepper Smartweed	*Persicaria hydropiper*	-	-	-	-	-	2.38	-
Meadow Foxtail	*Alopecurus pratensis*	-	-	-	0.93	-	-	-

Table 4. Continued.

Species		Community						
Common Name	Scientific Name	Northern Sedge Meadow	Shrub-Carr	Wet-Mesic Forest	Prairie	Emergent Aquatic	Emergent/Wet Meadow Planting	Shady Woodland Planting
Oats	*Avena Sativa*	-	-	0.84	-	-	-	-
Purple Loosestrife	*Lythrum salicaria*	0.60	1.79	1.68	-	0.70	0.79	-
Quakgrass	*Elymus repens*	-	-	-	0.93	-	-	-
Queen Anne's-Lace	*Daucus carota*	-	-	-	0.93	-	-	1.04
Red Clover	*Trifolium pretense*	-	-	-	0.93	-	-	-
Reed Canary Grass	*Phalaris arundinacea*	0.60	0.89	0.84	0.93	0.70	0.79	1.04
Redtop	*Agrostis gigantea*	-	-	-	-	-	7.94	-
Smooth Brome	*Bromus inermis*	-	-	-	4.67	-	-	1.04
Spotted Lady's Thumb	*Persicaria maculosa*	-	-	-	-	-	0.79	-
Spotted Knapweed	*Centaurea maculosa*	-	-	-	0.93	-	-	-
Spreading Bent Grass	*Agrostis stolonifera*	1.20	4.46	4.20	0.93	0.70	-	-
White Clover	*Trifolium repens*	-	-	-	1.87	-	-	1.04
White Sweetclover	*Melilotus alba*	-	-	-	1.87	-	-	-
Yellow foxtail	*Setaria pumila*	-	-	-	-	-	-	2.08
Yellow Sweetclover	*Melilotus officinalis*	-	-	-	0.93	-	-	-

Wildlife Species

A total of 14 species were noted during the 2017 field season. There were three mammals, three herptiles and nine avian species. Observations were noted when personnel were on-site for monitoring activities (Table 5).

Table 5. Wildlife Observations

Species		Year Observed		
Common Name	Scientific Name	2016	2017	2018
Mammals				
American Mink	*Neovision vision*			
Muskrat	*Ondatra zibethicus*			
White-tailed Deer	*Odocoileus virginianus*			
Raccoon	*Procyon lotor*			
Herptiles				
Eastern American Toad	*Bufo americanus americanus*			
Painted Turtle	*Chrysemys picta*			
Leopard Frog	*Lithobates pipiens*			
Birds				
Canada Goose	*Branta canadensis*			
Common Tern	*Stirna herundo*			
Great Egret	*Ardea alba*			
Mallard	*Anas platyrhynchos*			
Northern Flicker	*Colaptes auratus*			
Great Blue Heron	*Ardea herodias*			
Bald Eagle	*Haleaeetus leucocephalus*			
Ringed-bill Gull	*Larus delawarensis*			
Belted Kingfisher	*Megaceryle alcyon*			

Conclusions & Recommendations

Overall, the condition of the Harbor two years after restoration is relatively normal. Native species can take 2-3 years to begin developing after seeding and planting. During that time many non-native upland and wetland species can become established due to the high levels of disturbance during initial restoration efforts, which negatively impacts the coverage of native species. Native species coverage has proven to be quite high at such an early stage of development in all of the planted and seeded communities with the prairie community being the lowest at 71.96% cover native. Since restoration efforts included only seeding within this community, the number of annual, non-native species was expected to be higher during the first few years of establishment. Routine maintenance activities conducted by Applied Ecological Services (AES) should help further reduce or eliminate many of these species and encourage native species development. Although not very abundant, species such as reed canary grass, *Phragmites*, purple loosestrife, spotted knapweed and hybrid cattail will need to continue to be aggressively treated throughout the upcoming growing season. Herbicide treatments and mowing operations should be conducted at the appropriate time of year to achieve best results. In some cases, maintenance activities should be conducted 2 or 3 times throughout the growing season in order to more effectively reduce

populations. Continuation of invasive species control will be critical while planted and seeded communities fill in with desirable plant species.

The new timed meander sampling protocol appears to have been efficient in capturing the total amount of species recorded for the harbor site. During the 2017 surveys a total of 163 species were recorded across all communities which is 33 more species that were recorded during the 2016 surveys. Of those 163 species 36 are non-native and of those 36 there are only 5 are of greater concern (reed canary grass, *Phragmites*, hybrid cattail, purple loosestrife & spotted knapweed). The greater concern non-natives are currently under good control but will continue to need aggressive monitoring and treatments in order to maintain their suppression and inhibit their ability to become reestablished.

In an attempt to re-establish Wild rice (*Zizania aquatica*) within the Harbor, seed was sown in the fall of 2017. Plants were observed growing naturally within the originally designated community zone that was supplementally seeded in 2015; however, since the water levels came up in 2016 and again in 2017, the original area designated for wild rice is now too deep for the plants to become established and maintain a healthy population. In 2017 a new area with more desirable water levels was delineated and reseeded in a second attempt at the establishment of the species. This area will continue to be monitored and surveyed to determine the success of the species and whether or not additional seeding may be needed.

A

APPENDIX A

Vegetation Survey Data

SITE NAME:
REFERENCE COMMUNITY: Wet Mesic Forest, Ephemeral Pool & Mesit to Wet-Mesic Prairie
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (119)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE) (107)	Origin	Duration	Form		W	Dominant
Herbaceous 5'	1	lobcar	1	0.84	*Lobelia cardinalis*	*cardinal-flower*	OBL	Native		0	0	-5	
	2	abibal	1	0.84	*Abies balsamea*	*balsam fir*	FACW / FAC	Native	perennial	tree		x	
	3	ilever	1	0.84	*Ilex verticillata*	*common winterberry*	FACW	Native	perennial	shrub		-3	
	4	salamy	1	0.84	*Salix amygdaloides*	*peach-leaved willow*	FACW	Native	perennial	tree		-3	
	5	phraus	1	0.84	*Phragmites australis*	*common reed grass*	FACW	Introduced	perennial	grass		-3	
	6	popdel	20	16.81	*Populus deltoides*	*eastern cottonwood*	FAC	Native	perennial	tree		0	x
	7	solgig	2	1.68	*Solidago gigantea*	*giant goldenrod*	FACW	Native	perennial	forb		-3	
	8	fravir	2	1.68	*Fragaria virginiana*	*wild strawberry*	FACU	Native	perennial	forb		3	
	9	potans	1	0.84	*Potentilla anserina*	*silver-weed*	FACW	Native		0	0	-3	
	10	acerub	1	0.84	*Acer rubrum*	*red maple*	FAC	Native	perennial	tree		0	
	11	junbre	10	8.40	*Juncus brevicaudatus*	*narrow-panicle rush*	OBL	Native	perennial	rush		-5	x
	12	quebic	1	0.84	*Quercus bicolor*	*swamp white oak*	FACW	Native	perennial	tree		-3	
	13	eupper	1	0.84	*Eupatorium perfoliatum*	*boneset*	OBL / FACW	Native	perennial	forb		x	
	14	antcot	1	0.84	*Anthemis cotula*	*dog-fennel, mayweed, stinking*	FACU	Introduced	annual	forb		3	
	15	agrsto	5	4.20	*Agrostis stolonifera*	*creeping bent grass, creeping tickle*	FACW	Introduced	perennial	grass		-3	x
	16	*equarv*	1	0.84	*Equisetum arvense*	*field horsetail*	FAC	Native	perennial	fern ally		0	
	17	zizaur	1	0.84	*Zizia aurea*	*golden alexanders*	FAC	Native	perennial	forb		0	
	18	solcan	2	1.68	*Solidago canadensis*	*Canadian goldenrod*	FACU	Native	perennial	forb		3	
	19	osmreg	1	0.84	*Osmunda regalis*	*royal fern*	0	Native	perennial	fern		x	
	20	eutgra	1	0.84	*Euthamia graminifolia*	*grass-leaved goldenrod*	FACW / FAC	Native	perennial	forb		x	
	21	osmcin	1	0.84	*Osmunda cinnamomea*	*cinnamon fern*	0	Native	perennial	fern		x	
	22	elycan	1	0.84	*Elymus canadensis*	*Canada wild-rye, Great Plains wild-*	FACU	Native	perennial	grass		3	
	23	junten	10	8.40	*Juncus tenuis*	*path rush*	FAC	Native	perennial	rush		0	x
	24	corser	1	0.84	*Cornus sericea*	*red osier dogwood*	FACW	Native	perennial	shrub		-3	
	25	latjap	1	0.84	*Lathyrus japonicus*	*beach pea*	FACU	Native	perennial	forb		3	
	26	schpun	1	0.84	*Schoenoplectus pungens*	*common three-square bulrush*	OBL	Native	perennial	sedge		-5	
	27	tsucan	1	0.84	*Tsuga canadensis*	*northern hemlock*	FACU	Native	perennial	tree		3	
	28	quemac	1	0.84	*Quercus macrocarpa*	*bur oak*	FAC / FACU	Native	perennial	tree		x	
	29	caraqu	5	4.20	*Carex aquatilis*	*water sedge*	OBL	Native		0	0	-5	x
	30	lytsal	2	1.68	*Lythrum salicaria*	*purple loosestrife*	OBL	Introduced	perennial	forb		-5	
	31	larlar	1	0.84	*Larix laricina*	*larch, tamarack*	FACW	Native	perennial	tree		-3	
	32	rosbla	1	0.84	*Rosa blanda*	*smooth rose, wild rose*	FACU	Native	perennial	shrub		3	
	33	mencan	1	0.84	*Mentha canadensis*	*field mint, wild mint*	0	Native	perennial	forb		x	
	34	*salnig*	1	0.84	*Salix nigra*	*black willow*	OBL	Native	perennial	tree		-5	
	35	phaaru	1	0.84	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass		-3	
	36	ulmrub	1	0.84	*Ulmus rubra*	*red elm, slippery elm*	FAC	Native	perennial	tree		0	
	37	alninc	1	0.84	*Alnus incana*	*speckled alder, tag alder*	FACW	Native	perennial	shrub		-3	
	38	mimrin	1	0.84	*Mimulus ringens*	*monkey-flower*	OBL	Native		0	0	-5	
	39	schtab	5	4.20	*Schoenoplectus tabernaemontani*	*soft-stem bulrush*	OBL	Native	perennial	sedge		-5	x
	40	ascinc	1	0.84	*Asclepias incarnata*	*swamp milkweed*	OBL	Native	perennial	forb		-5	
	41	*calcan*	5	4.20	*Calamagrostis canadensis*	*blue-joint grass*	OBL	Native	perennial	grass		-5	x
	42	equhye	1	0.84	*Equisetum hyemale*	*0*	FACW / FAC	Native	perennial	fern ally		x	
	43	typgla	1	0.84	*Typha X glauca*	*hybrid cat-tail, white cat-tail*	OBL	Introduced	perennial	semi-aquatic		-5	
	44	saglat	1	0.84	*Sagittaria latifolia*	*broad-leaved arrowhead*	OBL	Native	perennial	semi-aquatic		-5	
	45	ribame	1	0.84	*Ribes americanum*	*American black currant*	FACW	Native	perennial	shrub		-3	
	46	*avesat*	1	0.84	*Avena sativa*	*oats*	UPL	Introduced	annual	grass		5	
	47	phyvir	1	0.84	*Physostegia virginiana*	*obedience plant*	FACW	Native		0	0	-3	
	48	lycame	1	0.84	*Lycopus americanus*	*common water-horehound*	OBL	Native	perennial	forb		-5	
	49	alitri	1	0.84	*Alisma triviale*	*northern water-plantain*	OBL	Native	perennial	semi-aquatic		-5	
	50	samcan	1	0.84	*Sambucus canadensis*	*elderberry*	FACU	Native	perennial	shrub		3	
	51	spialb	1	0.84	*Spiraea alba*	*white meadowsweet*	FACW	Native	perennial	shrub		-3	
	52	vitrip	1	0.84	*Vitis riparia*	*river bank grape*	FACW / FAC	Native	perennial	vine		x	
	53	pedcan	1	0.84	*Pedicularis canadensis*	*Canadian lousewort, wood-betony*	FACU	Native		0	0	3	
	54	junbal	5	4.20	*Juncus balticus*	*Baltic rush*	OBL	Native	perennial	rush		-5	x
	55	agapau	1	0.84	*Agalinis paupercula*	*small-flowered false foxglove,*	OBL	Native	annual	forb		-5	
	56	iriver	1	0.84	*Iris versicolor*	*northern blue flag*	OBL	Native	perennial	forb		-5	
	57	glystr	1	0.84	*Glyceria striata*	*fowl manna grass*	OBL	Native	perennial	grass		-5	
	58	thuocc	1	0.84	*Thuja occidentalis*	*northern white-cedar*	FACW	Native	perennial	tree		-3	

Species Richness:

Total Species	58
Native Species	51
Non-Native Species	7
Proportion Native Cover	87.93
Percent Cover Native	89.92
Percent Cover Non-Native	10.08

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	4.76
Unweighted FQI	34.03
Weighted Mean C (wC)	4.05
Weighted FQI (wFQIn)	28.90

Floristic Quality Metrics: All Species

Unweighted Mean C	4.19
Unweighted FQIa	31.91
Weighted Mean C (wCa)	3.64
Weighted FQI (wFQIa)	27.71

Wetland Species:

Mean W	-2.10
Native Wetland Species	34
Percent Native Wetland Species	58.62
Percent Cover Native Wetland Species	74

Dominance

Percent Total Aerial Coverage	119
50%	59.5
20%	23.8

SITE NAME:
REFERENCE COMMUNITY: Shrub Carr
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (112)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE)	Origin	Duration	Form		W	Dominant (101)
Herbaceous 5'	1	lobcar	1	0.89	*Lobelia cardinalis*	*cardinal-flower*	OBL	Native		0	0	-5	
	2	bidfro	1	0.89	*Bidens frondosa*	*common beggar-ticks*	FACW	Native	annual	forb		-3	
	3	typgla	1	0.89	*Typha X glauca*	*hybrid cat-tail, white cat-tail*	OBL	Introduced	perennial	semi-aquatic		-5	
	4	schtab	5	4.46	*Schoenoplectus tabernaemontani*	*soft-stem bulrush*	OBL	Native	perennial	sedge		-5	X
	5	leeory	2	1.79	*Leersia oryzoides*	*rice cutgrass*	OBL	Native	perennial	grass		-5	X
	6	siusua	1	0.89	*Sium suave*	*hemlock water-parsnip, common*	OBL	Native	(annual?)/perennial	forb		-5	
	7	junbre	2	1.79	*Juncus brevicaudatus*	*narrow-panicle rush*	OBL	Native	perennial	rush		-5	X
	8	phaaru	1	0.89	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass		-3	
	9	lytsal	2	1.79	*Lythrum salicaria*	*purple loosestrife*	OBL	Introduced	perennial	forb		-5	X
	10	calcan	20	17.86	*Calamagrostis canadensis*	*blue-joint grass*	OBL	Native	perennial	grass		-5	X
	11	popdel	5	4.46	*Populus deltoides*	*eastern cottonwood*	FAC	Native	perennial	tree		0	X
	12	caraqu	15	13.39	*Carex aquatilis*	*water sedge*	OBL	Native		0	0	-5	X
	13	symlan	1	0.89	*Symphyotrichum lanceolatum*	*lance-leaved panicled aster*	FAC / FACW	Native	perennial	forb		x	
	14	ludpal	1	0.89	*Ludwigia palustris*	*marsh purslane, marsh seed-box,*	OBL	Native	perennial	forb		-5	
	15	carsco	1	0.89	*Carex scoparia*	*broom sedge*	FACW	Native	perennial	sedge		-3	
	16	eutmac	1	0.89	*Eutrochium maculatum*	*spotted Joe-Pye-weed*	OBL	Native	perennial	forb		-5	
	17	alitri	1	0.89	*Alisma triviale*	*northern water-plantain*	OBL	Native	perennial	semi-aquatic		-5	
	18	sciatr	1	0.89	*Scirpus atrovirens*	*dark-green bulrush*	OBL	Native	perennial	sedge		-5	
	19	spapec	1	0.89	*Spartina pectinata*	*prairie cord grass*	FACW	Native	perennial	grass		-3	
	20	phraus	1	0.89	*Phragmites australis*	*common reed grass*	FACW	Introduced	perennial	grass		-3	
	21	junnod	1	0.89	*Juncus nodosus*	*joint rush*	OBL	Native	perennial	rush		-5	
	22	iriver	1	0.89	*Iris versicolor*	*northern blue flag*	OBL	Native	perennial	forb		-5	
	23	carlac	2	1.79	*Carex lacustris*	*common lake sedge*	OBL	Native	perennial	sedge		-5	X
	24	carstr	1	0.89	*Carex stricta*	*tussock sedge*	OBL	Native	perennial	sedge		-5	
	25	sciatr	1	0.89	*Scirpus atrovirens*	*dark-green bulrush*	OBL	Native	perennial	sedge		-5	
	26	horjub	1	0.89	*Hordeum jubatum*	*foxtail barley, squirrel-tail grass*	FAC	Introduced	perennial	grass		0	
	27	mimrin	1	0.89	*Mimulus ringens*	*monkey-flower*	OBL	Native		0	0	-5	
	28	mencan	2	1.79	*Mentha canadensis*	*field mint, wild mint*	0	Native	perennial	forb		x	X
	29	elepal	2	1.79	*Eleocharis palustris*	*common spike-rush, marsh spike-rush*	OBL	Native	perennial	sedge		-5	X
	30	carcom	2	1.79	*Carex comosa*	*bristly sedge*	OBL	Native	perennial	sedge		-5	X
	31	verhas	1	0.89	*Verbena hastata*	*blue vervain, simpler's-joy, swamp*	FACW	Native	Biennial/perennial	forb		-3	
	32	onosen	1	0.89	*Onoclea sensibilis*	*sensitive fern*	FACW	Native	perennial	fern		-3	
	33	cypesc	1	0.89	*Cyperus esculentus*	*field nut sedge*	FACW	Native		0	0	-3	
	34	spialb	2	1.79	*Spiraea alba*	*white meadowsweet*	FACW	Native	perennial	shrub		-3	X
	35	agrsto	5	4.46	*Agrostis stolonifera*	*creeping bent grass, creeping tickle*	FACW	Introduced	perennial	grass		-3	X
	36	cicmac	1	0.89	*Cicuta maculata*	*spotted water-hemlock*	OBL	Native	perennial	forb		-5	
	37	alninc	1	0.89	*Alnus incana*	*speckled alder, tag alder*	FACW	Native	perennial	shrub		-3	
	38	salbeb	1	0.89	*Salix bebbiana*	*Bebb's willow*	FACW	Native	perennial	tree		-3	
	39	ilever	1	0.89	*Ilex verticillata*	*common winterberry*	FACW	Native	perennial	shrub		-3	
	40	ascinc	1	0.89	*Asclepias incarnata*	*swamp milkweed*	OBL	Native	perennial	forb		-5	
	41	saglat	1	0.89	*Sagittaria latifolia*	*broad-leaved arrowhead*	OBL	Native	perennial	semi-aquatic		-5	
	42	coramo	1	0.89	*Cornus amomum*	*silky dogwood*	FACW	Native	perennial	shrub		-3	
	43	elocan	1	0.89	*Elodea canadensis*	*Canadian waterweed, common*	OBL	Native	perennial	aquatic		-5	
	44	potnat	1	0.89	*Potamogeton natans*	*common pondweed*	OBL	Native	perennial	aquatic		-5	
	45	potric	1	0.89	*Potamogeton richardsonii*	*Richardson's pondweed*	OBL	Native	perennial	aquatic		-5	
	46	nupvar	1	0.89	*Nuphar variegata*	*bull-head pond-lily*	OBL	Native	perennial	aquatic		-5	
	47	corser	1	0.89	*Cornus sericea*	*red osier dogwood*	FACW	Native	perennial	shrub		-3	
	48	stupec	1	0.89	*Stuckenia pectinata*	*comb pondweed, sago pondweed*	OBL	Native	perennial	aquatic		-5	
	49	schpun	2	1.79	*Schoenoplectus pungens*	*common three-square bulrush*	OBL	Native	perennial	sedge		-5	X
	50	glystr	2	1.79	*Glyceria striata*	*fowl manna grass*	OBL	Native	perennial	grass		-5	X
	51	potans	1	0.89	*Potentilla anserina*	*silver-weed*	FACW	Native		0	0	-3	
	52	solgig	1	0.89	*Solidago gigantea*	*giant goldenrod*	FACW	Native	perennial	forb		-3	
	53	phyvir	1	0.89	*Physostegia virginiana*	*obedience plant*	FACW	Native		0	0	-3	
	54	stapal	1	0.89	*Stachys palustris*	*hedge-nettle, marsh hedge-nettle,*	OBL	Native	perennial	forb		-5	
	55	solcan	1	0.89	*Solidago canadensis*	*Canadian goldenrod*	FACU	Native	perennial	forb		3	
	56	rudhir	1	0.89	*Rudbeckia hirta*	*black-eyed Susan*	FACU	Native		0	0	3	
	57	thuocc	1	0.89	*Thuja occidentalis*	*northern white-cedar*	FACW	Native	perennial	tree		-3	

Species Richness:

Total Species	72
Native Species	51
Non-Native Species	21
Proportion Native Cover	70.83
Percent Cover Native	90.18
Percent Cover Non-Native	9.82

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	4.51
Unweighted FQI	32.21
Weighted Mean C (wC)	4.84
Weighted FQI (wFQIn)	34.58

Floristic Quality Metrics: All Species

Unweighted Mean C	3.19
Unweighted FQIa	27.11
Weighted Mean C (wCa)	4.37
Weighted FQI (wFQIa)	37.05

Wetland Species:

Mean W	-3.84
Native Wetland Species	47
Percent Native Wetland Species	65.28
Percent Cover Native Wetland Species	86

Dominance

Percent Total Aerial Coverage	112
50%	56
20%	22.4

SITE NAME:
REFERENCE COMMUNITY: Emergent Aquatic & Emergent Aquatic - Wild Rice
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (143)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE) (138)	Origin	Duration	Form	W	Dominant
Herbaceous 5'	1	schtab	25	17.48	*Schoenoplectus tabernaemontani*	*soft-stem bulrush*	OBL	Native	perennial	sedge	-5	x
	2	elocan	25	17.48	*Elodea canadensis*	*Canadian waterweed, common*	OBL	Native	perennial	aquatic	-5	x
	3	phaaru	1	0.70	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass	-3	
	4	nupvar	1	0.70	*Nuphar variegata*	*bull-head pond-lily*	OBL	Native	perennial	aquatic	-5	
	5	schpun	1	0.70	*Schoenoplectus pungens*	*common three-square bulrush*	OBL	Native	perennial	sedge	-5	
	6	lemmin	1	0.70	*Lemna minor*	*common duckweed*	OBL	Native	perennial	aquatic	-5	
	7	alninc	1	0.70	*Alnus incana*	*speckled alder, tag alder*	FACW	Native	perennial	shrub	-3	
	8	typgla	1	0.70	*Typha X glauca*	*hybrid cat-tail, white cat-tail*	OBL	Introduced	perennial	semi-aquatic	-5	
	9	saglat	1	0.70	*Sagittaria latifolia*	*broad-leaved arrowhead*	OBL	Native	perennial	semi-aquatic	-5	
	10	caraqu	1	0.70	*Carex aquatilis*	*water sedge*	OBL	Native		0 0	-5	
	11	stupec	5	3.50	*Stuckenia pectinata*	*comb pondweed, sago pondweed*	OBL	Native	perennial	aquatic	-5	
	12	leeory	1	0.70	*Leersia oryzoides*	*rice cutgrass*	OBL	Native	perennial	grass	-5	
	13	junten	1	0.70	*Juncus tenuis*	*path rush*	FAC	Native	perennial	rush	0	
	14	alitri	1	0.70	*Alisma triviale*	*northern water-plantain*	OBL	Native	perennial	semi-aquatic	-5	
	15	eupper	1	0.70	*Eupatorium perfoliatum*	*boneset*	OBL / FACW	Native	perennial	forb	x	
	16	cicmac	1	0.70	*Cicuta maculata*	*spotted water-hemlock*	OBL	Native	perennial	forb	-5	
	17	elepal	1	0.70	*Eleocharis palustris*	*common spike-rush, marsh spike-rush*	OBL	Native	perennial	sedge	-5	
	18	carsco	1	0.70	*Carex scoparia*	*broom sedge*	FACW	Native	perennial	sedge	-3	
	19	agrsto	1	0.70	*Agrostis stolonifera*	*creeping bent grass, creeping tickle*	FACW	Introduced	perennial	grass	-3	
	20	calcan	2	1.40	*Calamagrostis canadensis*	*blue-joint grass*	OBL	Native	perennial	grass	-5	
	21	junbal	1	0.70	*Juncus balticus*	*Baltic rush*	OBL	Native	perennial	rush	-5	
	22	iriver	1	0.70	*Iris versicolor*	*northern blue flag*	OBL	Native	perennial	forb	-5	
	23	junnod	1	0.70	*Juncus nodosus*	*joint rush*	OBL	Native	perennial	rush	-5	
	24	carluc	1	0.70	*Carex lucorum*	*Blue Ridge sedge, long-beaked oak*	0	Native	perennial	sedge	x	
	25	mimrin	1	0.70	*Mimulus ringens*	*monkey-flower*	OBL	Native		0 0	-5	
	26	cicbul	1	0.70	*Cicuta bulbifera*	*bulblet water-hemlock*	OBL	Native	perennial	forb	-5	
	27	phraus	1	0.70	*Phragmites australis*	*common reed grass*	FACW	Introduced	perennial	grass	-3	
	28	siusua	1	0.70	*Sium suave*	*hemlock water-parsnip, common*	OBL	Native	(annual?)/pe	forb	-5	
	29	lytsal	1	0.70	*Lythrum salicaria*	*purple loosestrife*	OBL	Introduced	perennial	forb	-5	
	30	potnat	5	3.50	*Potamogeton natans*	*common pondweed*	OBL	Native	perennial	aquatic	-5	
	31	lycame	1	0.70	*Lycopus americanus*	*common water-horehound*	OBL	Native	perennial	forb	-5	
	32	glygra	1	0.70	*Glyceria grandis*	*American manna grass*	OBL	Native	perennial	grass	-5	
	33	sciatr	2	1.40	*Scirpus atrovirens*	*dark-green bulrush*	OBL	Native	perennial	sedge	-5	
	34	potnod	2	1.40	*Potamogeton nodosus*	*long-leaf pondweed, long-leaved*	OBL	Native	perennial	aquatic	-5	
	35	potper	2	1.40	*Potamogeton perfoliatus*	*perfoliate pondweed*	OBL	Native		0 0	-5	
	36	potzos	2	1.40	*Potamogeton zosteriformis*	*flat-stem pondweed, flat-stemmed*	OBL	Native	perennial	aquatic	-5	
	37	najfle	5	3.50	*Najas flexilis*	*Nodding water-nymph*	OBL	Native	annual	aquatic	-5	
	38	ludpal	1	0.70	*Ludwigia palustris*	*marsh purslane, marsh seed-box,*	OBL	Native	perennial	forb	-5	
	39	spaame	25	17.48	*Sparganium americanum*	*American bur-reed*	OBL	Native	perennial	aquatic	-5	x
	40	cerdem	15	10.49	*Ceratophyllum demersum*	*coon's-tail, hornwort*	OBL	Native	perennial	aquatic	-5	x

Species Richness:

Total Species	40
Native Species	35
Non-Native Species	5
Proportion Native Cover	87.50
Percent Cover Native	96.50
Percent Cover Non-Native	3.50

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	4.69
Unweighted FQI	27.72
Weighted Mean C (wC)	4.66
Weighted FQI (wFQIn)	27.57

Floristic Quality Metrics: All Species

Unweighted Mean C	4.10
Unweighted FQIa	25.93
Weighted Mean C (wCa)	4.50
Weighted FQI (wFQIa)	28.44

Wetland Species:

Mean W	-4.61
Native Wetland Species	33
Percent Native Wetland Species	82.50
Percent Cover Native Wetland Species	95

Dominance

Percent Total Aerial Coverage	143
50%	71.5
20%	28.6

SITE NAME:
REFERENCE COMMUNITY: Northern Sedge Meadow
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (167)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE) (161)	Origin	Duration	Form	W	Dominant
Herbaceous 5'	1	schtab	20	11.98	*Schoenoplectus tabernaemontani*	*soft-stem bulrush*	OBL	Native	perennial	sedge	-5	x
	2	elocan	75	44.91	*Elodea canadensis*	*Canadian waterweed, common*	OBL	Native	perennial	aquatic	-5	x
	3	phaaru	1	0.60	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass	-3	
	4	schpun	2	1.20	*Schoenoplectus pungens*	*common three-square bulrush*	OBL	Native	perennial	sedge	-5	
	5	lemmin	1	0.60	*Lemna minor*	*common duckweed*	OBL	Native	perennial	aquatic	-5	
	6	typgla	1	0.60	*Typha X glauca*	*hybrid cat-tail, white cat-tail*	OBL	Introduced	perennial	semi-aquatic	-5	
	7	saglat	1	0.60	*Sagittaria latifolia*	*broad-leaved arrowhead*	OBL	Native	perennial	semi-aquatic	-5	
	8	caraqu	10	5.99	*Carex aquatilis*	*water sedge*	OBL	Native	0	0	-5	
	9	stupec	2	1.20	*Stuckenia pectinata*	*comb pondweed, sago pondweed*	OBL	Native	perennial	aquatic	-5	
	10	leeory	5	2.99	*Leersia oryzoides*	*rice cutgrass*	OBL	Native	perennial	grass	-5	
	11	junten	5	2.99	*Juncus tenuis*	*path rush*	FAC	Native	perennial	rush	0	
	12	alitri	2	1.20	*Alisma triviale*	*northern water-plantain*	OBL	Native	perennial	semi-aquatic	-5	
	13	eupper	1	0.60	*Eupatorium perfoliatum*	*boneset*	OBL / FACW	Native	perennial	forb	x	
	14	cicmac	1	0.60	*Cicuta maculata*	*spotted water-hemlock*	OBL	Native	perennial	forb	-5	
	15	elepal	2	1.20	*Eleocharis palustris*	*common spike-rush, marsh spike-rush*	OBL	Native	perennial	sedge	-5	
	16	carsco	1	0.60	*Carex scoparia*	*broom sedge*	FACW	Native	perennial	sedge	-3	
	17	agrsto	2	1.20	*Agrostis stolonifera*	*creeping bent grass, creeping tickle*	FACW	Introduced	perennial	grass	-3	
	18	calcan	5	2.99	*Calamagrostis canadensis*	*blue-joint grass*	OBL	Native	perennial	grass	-5	
	19	junbal	2	1.20	*Juncus balticus*	*Baltic rush*	OBL	Native	perennial	rush	-5	
	20	iriver	1	0.60	*Iris versicolor*	*northern blue flag*	OBL	Native	perennial	forb	-5	
	21	junnod	1	0.60	*Juncus nodosus*	*joint rush*	OBL	Native	perennial	rush	-5	
	22	carlac	5	2.99	*Carex lacustris*	*common lake sedge*	OBL	Native	perennial	sedge	-5	
	23	mimrin	1	0.60	*Mimulus ringens*	*monkey-flower*	OBL	Native	0	0	-5	
	24	cicbul	1	0.60	*Cicuta bulbifera*	*bulblet water-hemlock*	OBL	Native	perennial	forb	-5	
	25	phraus	1	0.60	*Phragmites australis*	*common reed grass*	FACW	Introduced	perennial	grass	-3	
	26	siusua	1	0.60	*Sium suave*	*hemlock water-parsnip, common*	OBL	Native	(annual?)/pe	forb	-5	
	27	lytsal	1	0.60	*Lythrum salicaria*	*purple loosestrife*	OBL	Introduced	perennial	forb	-5	
	28	potnat	1	0.60	*Potamogeton natans*	*common pondweed*	OBL	Native	perennial	aquatic	-5	
	29	lycame	1	0.60	*Lycopus americanus*	*common water-horehound*	OBL	Native	perennial	forb	-5	
	30	glygra	2	1.20	*Glyceria grandis*	*American manna grass*	OBL	Native	perennial	grass	-5	
	31	sciatr	2	1.20	*Scirpus atrovirens*	*dark-green bulrush*	OBL	Native	perennial	sedge	-5	
	32	potnod	1	0.60	*Potamogeton nodosus*	*long-leaf pondweed, long-leaved*	OBL	Native	perennial	aquatic	-5	
	33	potric	2	1.20	*Potamogeton richardsonii*	*Richardson's pondweed*	OBL	Native	perennial	aquatic	-5	
	34	potzos	1	0.60	*Potamogeton zosteriformis*	*flat-stem pondweed, flat-stemmed*	OBL	Native	perennial	aquatic	-5	
	35	najfle	1	0.60	*Najas flexilis*	*Nodding water-nymph*	OBL	Native	annual	aquatic	-5	
	36	spapec	1	0.60	*Spartina pectinata*	*prairie cord grass*	FACW	Native	perennial	grass	-3	
	37	bidfro	1	0.60	*Bidens frondosa*	*common beggar-ticks*	FACW	Native	annual	forb	-3	
	38	camapa	1	0.60	*Campanula aparinoides*	*marsh bellflower*	OBL	Native	perennial	forb	-5	
	39	ludpal	1	0.60	*Ludwigia palustris*	*marsh purslane, marsh seed-box,*	OBL	Native	perennial	forb	-5	
	40	mencan	1	0.60	*Mentha canadensis*	*field mint, wild mint*	0	Native	perennial	forb	x	

Species Richness:

Total Species	40
Native Species	35
Non-Native Species	5
Proportion Native Cover	87.50
Percent Cover Native	96.41
Percent Cover Non-Native	3.59

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	4.74
Unweighted FQI	28.06
Weighted Mean C (wC)	3.88
Weighted FQI (wFQIn)	22.93

Floristic Quality Metrics: All Species

Unweighted Mean C	4.15
Unweighted FQIa	26.25
Weighted Mean C (wCa)	3.74
Weighted FQI (wFQIa)	23.63

Wetland Species:

Mean W	-4.55
Native Wetland Species	33
Percent Native Wetland Species	82.50
Percent Cover Native Wetland Species	95

Dominance

Percent Total Aerial Coverage	167
50%	83.5
20%	33.4

SITE NAME:
REFERENCE COMMUNITY: Submergent Aquatic & Open Water
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (95)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE)	Origin	Duration	Form	W	Dominant (95)
Herbaceous 5'	1	nupvar	1	1.05	*Nuphar variegata*	*bull-head pond-lily*	OBL	Native	perennial	aquatic	-5	
	2	elocan	25	26.32	*Elodea canadensis*	*Canadian waterweed, common*	OBL	Native	perennial	aquatic	-5	X
	3	saglat	1	1.05	*Sagittaria latifolia*	*broad-leaved arrowhead*	OBL	Native	perennial	semi-aquatic	-5	
	4	cerdem	10	10.53	*Ceratophyllum demersum*	*coon's-tail, hornwort*	OBL	Native	perennial	aquatic	-5	X
	5	potzos	5	5.26	*Potamogeton zosteriformis*	*flat-stem pondweed, flat-stemmed*	OBL	Native	perennial	aquatic	-5	
	6	potric	5	5.26	*Potamogeton richardsonii*	*Richardson's pondweed*	OBL	Native	perennial	aquatic	-5	
	7	utrvul	5	5.26	*Utricularia vulgaris*	*Common bladderwort*	OBL	Native	perennial	aquatic	-5	
	8	potnod	5	5.26	*Potamogeton nodosus*	*long-leaf pondweed, long-leaved*	OBL	Native	perennial	aquatic	-5	
	9	potnat	5	5.26	*Potamogeton natans*	*common pondweed*	OBL	Native	perennial	aquatic	-5	
	10	lemmin	1	1.05	*Lemna minor*	*common duckweed*	OBL	Native	perennial	aquatic	-5	
	11	myrsib	5	5.26	*Myriophyllum sibiricum*	*common water-milfoil, short-spike*	OBL	Native	perennial	aquatic	-5	
	12	stupec	10	10.53	*Stuckenia pectinata*	*comb pondweed, sago pondweed*	OBL	Native	perennial	aquatic	-5	X
	13	nymodo	1	1.05	*Nymphaea odorata*	*fragrant water-lily*	OBL	Native	perennial	aquatic	-5	
	14	spaame	1	1.05	*Sparganium americanum*	*American bur-reed*	OBL	Native	perennial	aquatic	-5	
	15	hetdub	10	10.53	*Heteranthera dubia*	*water star-grass*	OBL	Native	perennial	aquatic	-5	X
	16	valame	5	5.26	*Vallisneria americana*	*American eelgrass, water-celery*	OBL	Native	perennial	aquatic	-5	
	17											
	18											
	19											
	20											
	21											
	22											
	23											
	24											
	25											
	26											
	27											
	28											
	29											

Species Richness:

Total Species	16
Native Species	16
Non-Native Species	0
Proportion Native Cover	100.00
Percent Cover Native	100
Percent Cover Non-Native	-

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	5.25
Unweighted FQI	21.00
Weighted Mean C (wC)	4.55
Weighted FQI (wFQIn)	18.19

Floristic Quality Metrics: All Species

Unweighted Mean C	5.25
Unweighted FQIa	21.00
Weighted Mean C (wCa)	4.55
Weighted FQI (wFQIa)	18.19

Wetland Species:

Mean W	-5.00
Native Wetland Species	16
Percent Native Wetland Species	100.00
Percent Cover Native Wetland Species	100

Dominance

Percent Total Aerial Coverage	95
50%	47.5
20%	19

SITE NAME:
REFERENCE COMMUNITY: Prairie
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (107)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE)	Origin	Duration	Form		W	Dominant (77)
Herbaceous 5'	1	ratpin	10	9.35	*Ratibida pinnata*	*pinnate prairie coneflower*	0	Native	perennial	forb		x	x
	2	zizaur	5	4.67	*Zizia aurea*	*golden alexanders*	FAC	Native	perennial	forb		0	x
	3	monpun	15	14.02	*Monarda punctata*	*horsemint, spotted bee balm*	UPL	Native		0	0	5	x
	4	monfis	5	4.67	*Monarda fistulosa*	*bee balm, wild bergamot*	FACU	Native	perennial	forb		3	x
	5	cirarv	1	0.93	*Cirsium arvense*	*Canada thistle, creeping thistle, field*	FACU	Introduced	perennial	forb		3	
	6	dalpur	1	0.93	*Dalea purpurea*	*purple prairie-clover*	0	Native		0	0	x	
	7	rudhir	20	18.69	*Rudbeckia hirta*	*black-eyed Susan*	FACU	Native		0	0	3	x
	8	verhas	5	4.67	*Verbena hastata*	*blue vervain, simpler's-joy, swamp*	FACW	Native	biennial/perennial	forb		-3	x
	9	censto	1	0.93	*Centaurea stoebe*	*spotted knapweed*	UPL	Introduced	biennial/perennial	forb		5	
	10	sonarv	1	0.93	*Sonchus arvensis*	*field sow-thistle*	FACU	Introduced	perennial	forb		3	
	11	taroff	1	0.93	*Taraxacum officinale*	*common dandelion*	FACU	Introduced	perennial	forb		3	
	12	phaaru	1	0.93	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass		-3	
	13	agrsto	1	0.93	*Agrostis stolonifera*	*creeping bent grass, creeping tickle*	FACW	Introduced	perennial	grass		-3	
	14	solcan	1	0.93	*Solidago canadensis*	*Canadian goldenrod*	FACU	Native	perennial	forb		3	
	15	plamaj	2	1.87	*Plantago major*	*common plantain*	FAC / FACU	Introduced	perennial	forb		x	
	16	cirvul	1	0.93	*Cirsium vulgare*	*bull thistle, common thistle*	FACU	Introduced	biennial	forb		3	
	17	ambart	1	0.93	*Ambrosia artemisiifolia*	*short ragweed*	FACU	Native	annual	forb		3	
	18	aceneg	1	0.93	*Acer negundo*	*box elder*	FAC	Native	perennial	tree		0	
	19	poapra	2	1.87	*Poa pratensis*	*Kentucky bluegrass*	FAC / FACU	Introduced	perennial	grass		x	
	20	broine	5	4.67	*Bromus inermis*	*Smooth brome*	FACU / UPL	Introduced	perennial	grass		x	x
	21	elycan	2	1.87	*Elymus canadensis*	*Canada wild-rye, Great Plains wild-*	FACU	Native	perennial	grass		3	
	22	eristr	2	1.87	*Erigeron strigosus*	*rough fleabane*	FACU	Native	annual	forb		3	
	23	trirep	2	1.87	*Trifolium repens*	*white clover*	FACU	Introduced	perennial	forb		3	
	24	tripra	1	0.93	*Trifolium pratense*	*red clover*	FACU	Introduced	perennial	forb		3	
	25	daucar	1	0.93	*Daucus carota*	*Queen Anne's-lace*	UPL	Introduced	biennial	forb		5	
	26	helhel	1	0.93	*Heliopsis helianthoides*	*false sunflower, ox-eye, sunflower-*	FACU	Native	perennial	forb		3	
	27	horjub	1	0.93	*Hordeum jubatum*	*foxtail barley, squirrel-tail grass*	FAC	Introduced	perennial	grass		0	
	28	symlat	1	0.93	*Symphyotrichum lateriflorum*	*calico aster, goblet aster, side-*	FACW / FAC	Native	perennial	forb		x	
	29	medsat	1	0.93	*Medicago sativa*	*alfalfa*	FACU / UPL	Introduced	perennial	forb		x	
	30	eupcor	1	0.93	*Euphorbia corollata*	*flowering spurge*	0	Native	perennial	forb		x	
	31	lotcor	1	0.93	*Lotus corniculatus*	*bird's-foot trefoil*	FACU	Introduced	perennial	forb		3	
	32	sornut	2	1.87	*Sorghastrum nutans*	*yellow Indian grass*	FACU	Native	perennial	grass		3	
	33	ambtri	1	0.93	*Ambrosia trifida*	*giant ragweed*	FAC	Native	annual	forb		0	
	34	melalb	2	1.87	*Melilotus albus*	*white sweet-clover*	0	Introduced	annual/biennial	forb		x	
	35	ascsyr	1	0.93	*Asclepias syriaca*	*common milkweed*	FACU / UPL	Native	perennial	forb		x	
	36	medlup	1	0.93	*Medicago lupulina*	*black medick*	FACU	Introduced	annual/biennial	forb		3	
	37	potnor	1	0.93	*Potentilla norvegica*	*Norwegian cinquefoil*	FAC	Native	annual/perennial	forb		0	
	38	cenpul	1	0.93	*Centaurium pulchellum*	*branching centaury, showy centaury*	FACU / FAC	Introduced	annual	forb		x	
	39	elyrep	1	0.93	*Elymus repens*	*quackgrass*	FACU	Introduced	perennial	grass		3	
	40	eutgra	1	0.93	*Euthamia graminifolia*	*grass-leaved goldenrod*	FACW / FAC	Native	perennial	forb		x	
	41	meloff	1	0.93	*Melilotus officinalis*	*yellow sweet-clover*	FACU	Introduced	annual/biennial	forb		3	
	42	alopra	1	0.93	*Alopecurus pratensis*	*meadow foxtail*	FACW / FAC	Introduced	perennial	grass		x	

Species Richness:

Total Species	42
Native Species	20
Non-Native Species	22
Proportion Native Cover	47.62
Percent Cover Native	71.96
Percent Cover Non-Native	28.04

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	3.00
Unweighted FQI	13.42
Weighted Mean C (wC)	3.60
Weighted FQI (wFQIn)	16.09

Floristic Quality Metrics: All Species

Unweighted Mean C	1.43
Unweighted FQIa	9.26
Weighted Mean C (wCa)	2.59
Weighted FQI (wFQIa)	16.78

Wetland Species:

Mean W	2.07
Native Wetland Species	5
Percent Native Wetland Species	11.90
Percent Cover Native Wetland Species	12

Dominance

Percent Total Aerial Coverage	107
50%	53.5
20%	21.4

SITE NAME:
REFERENCE COMMUNITY: Shady Woodland Planting
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (96)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE) (83)	Origin	Duration	Form	W	Dominant
Herbaceous 5'	1	aceneg	65	67.71	*Acer negundo*	*box elder*	FAC	Native	perennial	tree	0	x
	2	samcan	2	2.08	*Sambucus canadensis*	*elderberry*	FACU	Native	perennial	shrub	3	
	3	corfoe	3	3.13	*Cornus foemina*	*gray dogwood*	FAC	Native	perennial	shrub	0	
	4	setpum	2	2.08	*Setaria pumila*	*pigeon grass, yellow foxtail*	FAC	Introduced	annual	grass	0	
	5	agafoe	1	1.04	*Agastache foeniculum*	*blue giant hyssop, fragrant giant*	0	Native	perennial	forb	x	
	6	elyhys	1	1.04	*Elymus hystrix*	*bottlebrush grass, eastern*	FACU	Native	perennial	grass	3	
	7	parqui	1	1.04	*Parthenocissus quinquefolia*	*Virginia creeper, woodbine*	FACU	Native	perennial	vine	3	
	8	solcan	1	1.04	*Solidago canadensis*	*Canadian goldenrod*	FACU	Native	perennial	forb	3	
	9	impcap	4	4.17	*Impatiens capensis*	*orange jewelweed*	FACW	Native	annual	forb	-3	
	10	phaaru	1	1.04	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass	-3	
	11	urtdio	1	1.04	*Urtica dioica*	*stinging nettle*	FACW / FAC	Native	perennial	forb	x	
	12	trirep	1	1.04	*Trifolium repens*	*white clover*	FACU	Introduced	perennial	forb	3	
	13	fravir	1	1.04	*Fragaria virginiana*	*wild strawberry*	FACU	Native	perennial	forb	3	
	14	erehie	1	1.04	*Erechtites hieraciifolius*	*fireweed*	0	Native	annual	forb	x	
	15	arcmin	1	1.04	*Arctium minus*	*common burdock, lesser burdock*	FACU	Introduced	biennial	forb	3	
	16	ascsyr	1	1.04	*Asclepias syriaca*	*common milkweed*	FACU / UPL	Native	perennial	forb	x	
	17	broine	1	1.04	*Bromus inermis*	*Smooth brome*	FACU / UPL	Introduced	perennial	grass	x	
	18	vertha	1	1.04	*Verbascum thapsus*	*common mullein*	UPL	Introduced	biennial	forb	5	
	19	daucar	1	1.04	*Daucus carota*	*Queen Anne's-lace*	UPL	Introduced	biennial	forb	5	
	20	ambart	1	1.04	*Ambrosia artemisiifolia*	*short ragweed*	FACU	Native	annual	forb	3	
	21	echcru	1	1.04	*Echinochloa crus-galli*	*barnyard grass, large barnyard grass*	FACW / FAC	Introduced	annual	grass	x	
	22	plamaj	1	1.04	*Plantago major*	*common plantain*	FAC / FACU	Introduced	perennial	forb	x	
	23	taroff	1	1.04	*Taraxacum officinale*	*common dandelion*	FACU	Introduced	perennial	forb	3	
	24	sonarv	1	1.04	*Sonchus arvensis*	*field sow-thistle*	FACU	Introduced	perennial	forb	3	
	25	medlup	1	1.04	*Medicago lupulina*	*black medick*	FACU	Introduced	annual/bien nial	forb	3	
	26											
	27											
	28											
	29											

Species Richness:	
Total Species	25
Native Species	13
Non-Native Species	12
Proportion Native Cover	52.00
Percent Cover Native	86.46
Percent Cover Non-Native	13.54

Floristic Quality Metrics: Native Species Only	
Unweighted Mean C	2.31
Unweighted FQI	8.32
Weighted Mean C (wC)	0.52
Weighted FQI (wFQIn)	1.87

Floristic Quality Metrics: All Species	
Unweighted Mean C	1.20
Unweighted FQIa	6.00
Weighted Mean C (wCa)	0.45
Weighted FQI (wFQIa)	2.24

Wetland Species:	
Mean W	2.06
Native Wetland Species	3
Percent Native Wetland Species	12.00
Percent Cover Native Wetland Species	75

Dominance	
Percent Total Aerial Coverage	96
50%	48
20%	19.2

SITE NAME:
REFERENCE COMMUNITY: **Invasive Species Control Area**
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

5 0

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	ENTER COVER	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE)	Origin	Duration	Form	W	Dominant
Herbaceous 5'	1	phraus	2	*Phragmites australis*	*common reed grass*	FACW	Introduced	perennial	grass	-3	
	2	censto	1	*Centaurea stoebe*	*spotted knapweed*	UPL	Introduced	biennial/perennial	forb	5	
	3	phaaru	2	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass	-3	

SITE NAME:
REFERENCE COMMUNITY: Emergent/Wet Meadow Planting
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover (126)	Relative Cover (100)	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE) (105)	Origin	Duration	Form	W	Dominant
Herbaceous 5'	1	carsco	20	15.87	*Carex scoparia*	*broom sedge*	FACW	Native	perennial	sedge	-3	x
	2	schtab	2	1.59	*Schoenoplectus tabernaemontani*	*soft-stem bulrush*	OBL	Native	perennial	sedge	-5	
	3	corser	1	0.79	*Cornus sericea*	*red osier dogwood*	FACW	Native	perennial	shrub	-3	
	4	agrgig	10	7.94	*Agrostis gigantea*	*redtop*	FACW	Introduced	perennial	grass	-3	x
	5	junten	3	2.38	*Juncus tenuis*	*path rush*	FAC	Native	perennial	rush	0	
	6	phaaru	1	0.79	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass	-3	
	7	aceneg	1	0.79	*Acer negundo*	*box elder*	FAC	Native	perennial	tree	0	
	8	calcan	5	3.97	*Calamagrostis canadensis*	*blue-joint grass*	OBL	Native	perennial	grass	-5	
	9	eupper	2	1.59	*Eupatorium perfoliatum*	*boneset*	OBL / FACW	Native	perennial	forb	x	
	10	lycame	2	1.59	*Lycopus americanus*	*common water-horehound*	OBL	Native	perennial	forb	-5	
	11	elepal	5	3.97	*Eleocharis palustris*	*common spike-rush, marsh spike-rush*	OBL	Native	perennial	sedge	-5	
	12	spaame	10	7.94	*Sparganium americanum*	*American bur-reed*	OBL	Native	perennial	aquatic	-5	x
	13	alitri	1	0.79	*Alisma triviale*	*northern water-plantain*	OBL	Native	perennial	semi-aquatic	-5	
	14	symlan	1	0.79	*Symphyotrichum lanceolatum*	*lance-leaved panicled aster*	FAC / FACW	Native	perennial	forb	x	
	15	bidcer	2	1.59	*Bidens cernua*	*nodding beggar-ticks*	OBL	Native	annual	forb	-5	
	16	cypesc	2	1.59	*Cyperus esculentus*	*field nut sedge*	FACW	Native		0 0	-3	
	17	solcan	1	0.79	*Solidago canadensis*	*Canadian goldenrod*	FACU	Native	perennial	forb	3	
	18	ransce	1	0.79	*Ranunculus sceleratus*	*celery-leaf buttercup*	OBL	Native	annual/perennial	forb	-5	
	19	stapal	3	2.38	*Stachys palustris*	*hedge-nettle, marsh hedge-nettle,*	OBL	Native	perennial	forb	-5	
	20	echcru	1	0.79	*Echinochloa crus-galli*	*barnyard grass, large barnyard grass*	FACW / FAC	Introduced	annual	grass	x	
	21	lemmin	25	19.84	*Lemna minor*	*common duckweed*	OBL	Native	perennial	aquatic	-5	x
	22	bidfro	1	0.79	*Bidens frondosa*	*common beggar-ticks*	FACW	Native	annual	forb	-3	
	23	carhys	1	0.79	*Carex hystericina*	*bottlebrush sedge, porcupine sedge*	OBL	Native	perennial	sedge	-5	
	24	equarv	1	0.79	*Equisetum arvense*	*field horsetail*	FAC	Native	perennial	fern ally	0	
	25	juneff	3	2.38	*Juncus effusus*	*common rush, soft rush*	OBL	Native	perennial	rush	-5	
	26	schpun	3	2.38	*Schoenoplectus pungens*	*common three-square bulrush*	OBL	Native	perennial	sedge	-5	
	27	saglat	1	0.79	*Sagittaria latifolia*	*broad-leaved arrowhead*	OBL	Native	perennial	semi-aquatic	-5	
	28	typgla	1	0.79	*Typha X glauca*	*hybrid cat-tail, white cat-tail*	OBL	Introduced	perennial	semi-aquatic	-5	
	29	perhyd	3	2.38	*Persicaria hydropiper*	*marsh-pepper smartweed, water-*	OBL	Introduced	annual	forb	-5	
	30	caraqu	1	0.79	*Carex aquatilis*	*water sedge*	OBL	Native		0 0	-5	
	31	permac	1	0.79	*Persicaria maculosa*	*heart's-ease, spotted lady's-thumb*	FACW / FAC	Introduced	annual	0	x	
	32	juncan	1	0.79	*Juncus canadensis*	*Canadian rush*	OBL	Native	perennial	rush	-5	
	33	mimrin	1	0.79	*Mimulus ringens*	*monkey-flower*	OBL	Native		0 0	-5	
	34	scicyp	1	0.79	*Scirpus cyperinus*	*wool-grass*	OBL	Native	perennial	sedge	-5	
	35	iriver	1	0.79	*Iris versicolor*	*northern blue flag*	OBL	Native	perennial	forb	-5	
	36	impcap	1	0.79	*Impatiens capensis*	*orange jewelweed*	FACW	Native	annual	forb	-3	
	37	rubida	1	0.79	*Rubus idaeus*	*wild red raspberry*	FACU / FAC*	Native	perennial	shrub	x	
	38	cirarv	1	0.79	*Cirsium arvense*	*Canada thistle, creeping thistle, field*	FACU	Introduced	perennial	forb	3	
	39	lytsal	1	0.79	*Lythrum salicaria*	*purple loosestrife*	OBL	Introduced	perennial	forb	-5	
	40	soldul	1	0.79	*Solanum dulcamara*	*bittersweet nightshade*	FAC	Introduced	perennial	vine	0	
	41	phraus	1	0.79	*Phragmites australis*	*common reed grass*	FACW	Introduced	perennial	grass	-3	
	42	ascinc	1	0.79	*Asclepias incarnata*	*swamp milkweed*	OBL	Native	perennial	forb	-5	

Species Richness:

Total Species	46
Native Species	32
Non-Native Species	14
Proportion Native Cover	69.57
Percent Cover Native	83.33
Percent Cover Non-Native	16.67

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	3.81
Unweighted FQI	21.57
Weighted Mean C (wC)	4.36
Weighted FQI (wFQIn)	24.67

Floristic Quality Metrics: All Species

Unweighted Mean C	2.65
Unweighted FQIa	17.99
Weighted Mean C (wCa)	3.63
Weighted FQI (wFQIa)	24.65

Wetland Species:

Mean W	-3.59
Native Wetland Species	28
Percent Native Wetland Species	60.87
Percent Cover Native Wetland Species	79

Dominance

Percent Total Aerial Coverage	126
50%	63
20%	25.2

SITE NAME:
REFERENCE COMMUNITY: Entire Site
COUNTY:
PLOT NUMBER
ECOREGION:
SURVEYORS:
SURVEY DATE:

122.18889 100.00 51

	MINUTES	ENTER SPECIES CODE (i.e.Carex stricta= CARSTR)	Absolute Cover	Relative Cover	*Latin Name*	Common Name	Wetland Indicator Status (MW/NCNE)	Origin	Duration	Form		W	Dominant
Herbaceous 5'	1	abibal	0.11	0.09	*Abies balsamea*	*balsam fir*	FACW / FAC	Native	perennial	tree		x	
	2	aceneg	15.22	12.46	*Acer negundo*	*box elder*	FAC	Native	perennial	tree		0	x
	3	acerub	0.11	0.09	*Acer rubrum*	*red maple*	FAC	Native	perennial	tree		0	
	4	agafoe	0.11	0.09	*Agastache foeniculum*	*blue giant hyssop, fragrant giant*	0	Native	perennial	forb		x	
	5	agapau	0.11	0.09	*Agalinis paupercula*	*small-flowered false foxglove,*	OBL	Native	annual	forb		-5	
	6	agealt	0.22	0.18	*Ageratina altissima*	*white snakeroot*	FACU	Native	perennial	forb		3	
	7	agrsto	1.56	1.27	*Agrostis stolonifera*	*creeping bent grass, creeping tickle*	FACW	Introduced	perennial	grass		-3	
	8	alitri	0.67	0.55	*Alisma triviale*	*northern water-plantain*	OBL	Native	perennial	semi-aquatic		-5	
	9	alninc	0.33	0.27	*Alnus incana*	*speckled alder, tag alder*	FACW	Native	perennial	shrub		-3	
	10	alopra	0.11	0.09	*Alopecurus pratensis*	*meadow foxtail*	FACW / FAC	Introduced	perennial	grass		x	
	11	ambart	0.22	0.18	*Ambrosia artemisiifolia*	*short ragweed*	FACU	Native	annual	forb		3	
	12	ambtri	0.11	0.09	*Ambrosia trifida*	*giant ragweed*	FAC	Native	annual	forb		0	
	13	antcot	0.11	0.09	*Anthemis cotula*	*dog-fennel, mayweed, stinking*	FACU	Introduced	annual	forb		3	
	14	arcmin	0.44	0.36	*Arctium minus*	*common burdock, lesser burdock*	FACU	Introduced	biennial	forb		3	
	15	ascinc	0.33	0.27	*Asclepias incarnata*	*swamp milkweed*	OBL	Native	perennial	forb		-5	
	16	ascsyr	0.22	0.18	*Asclepias syriaca*	*common milkweed*	FACU / UPL	Native	perennial	forb		x	
	17	avesat	0.11	0.09	*Avena sativa*	*oats*	UPL	Introduced	annual	grass		5	
	18	bidcer	0.22	0.18	*Bidens cernua*	*nodding beggar-ticks*	OBL	Native	annual	forb		-5	
	19	bidfro	0.44	0.36	*Bidens frondosa*	*common beggar-ticks*	FACW	Native	annual	forb		-3	
	20	broine	0.67	0.55	*Bromus inermis*	*Smooth brome*	FACU / UPL	Introduced	perennial	grass		x	
	21	calcan	4.22	3.46	*Calamagrostis canadensis*	*blue-joint grass*	OBL	Native	perennial	grass		-5	x
	22	camapa	0.11	0.09	*Campanula aparinoides*	*marsh bellflower*	OBL	Native	perennial	forb		-5	
	23	caraqu	3.56	2.91	*Carex aquatilis*	*water sedge*	OBL	Native		0	0	-5	x
	24	carcom	0.22	0.18	*Carex comosa*	*bristly sedge*	OBL	Native	perennial	sedge		-5	
	25	carhys	0.11	0.09	*Carex hystericina*	*bottlebrush sedge, porcupine sedge*	OBL	Native	perennial	sedge		-5	
	26	carlac	0.78	0.64	*Carex lacustris*	*common lake sedge*	OBL	Native	perennial	sedge		-5	
	27	carluc	0.11	0.09	*Carex lucorum*	*Blue Ridge sedge, long-beaked oak*	0	Native	perennial	sedge		x	
	28	carsco	2.56	2.09	*Carex scoparia*	*broom sedge*	FACW	Native	perennial	sedge		-3	x
	29	carstr	0.11	0.09	*Carex stricta*	*tussock sedge*	OBL	Native	perennial	sedge		-5	
	30	cenpul	0.11	0.09	*Centaurium pulchellum*	*branching centaury, showy centaury*	FACU / FAC	Introduced	annual	forb		x	
	31	censto	0.20	0.16	*Centaurea stoebe*	*spotted knapweed*	UPL	Introduced	biennial/perennial	forb		5	
	32	cerdem	2.78	2.27	*Ceratophyllum demersum*	*coon's-tail, hornwort*	OBL	Native	perennial	aquatic		-5	x
	33	cicbul	0.22	0.18	*Cicuta bulbifera*	*bulblet water-hemlock*	OBL	Native	perennial	forb		-5	
	34	cicmac	0.33	0.27	*Cicuta maculata*	*spotted water-hemlock*	OBL	Native	perennial	forb		-5	
	35	cirarv	0.22	0.18	*Cirsium arvense*	*Canada thistle, creeping thistle, field*	FACU	Introduced	perennial	forb		3	
	36	cirvul	0.11	0.09	*Cirsium vulgare*	*bull thistle, common thistle*	FACU	Introduced	biennial	forb		3	
	37	coramo	0.11	0.09	*Cornus amomum*	*silky dogwood*	FACW	Native	perennial	shrub		-3	
	38	corfoe	0.33	0.27	*Cornus foemina*	*gray dogwood*	FAC	Native	perennial	shrub		0	
	39	corser	1.44	1.18	*Cornus sericea*	*red osier dogwood*	FACW	Native	perennial	shrub		-3	
	40	cypesc	0.33	0.27	*Cyperus esculentus*	*field nut sedge*	FACW	Native		0	0	-3	
	41	dalpur	0.11	0.09	*Dalea purpurea*	*purple prairie-clover*	0	Native		0	0	x	
	42	daucar	0.22	0.18	*Daucus carota*	*Queen Anne's-lace*	UPL	Introduced	biennial	forb		5	
	43	echcru	0.22	0.18	*Echinochloa crus-galli*	*barnyard grass, large barnyard grass*	FACW / FAC	Introduced	annual	grass		x	
	44	elepal	1.11	0.91	*Eleocharis palustris*	*common spike-rush, marsh spike-rush*	OBL	Native	perennial	sedge		-5	
	45	elocan	14.00	11.46	*Elodea canadensis*	*Canadian waterweed, common*	OBL	Native	perennial	aquatic		-5	x
	46	elycan	0.33	0.27	*Elymus canadensis*	*Canada wild-rye, Great Plains wild-*	FACU	Native	perennial	grass		3	
	47	elyhys	0.11	0.09	*Elymus hystrix*	*bottlebrush grass, eastern*	FACU	Native	perennial	grass		3	
	48	elyrep	0.11	0.09	*Elymus repens*	*quackgrass*	FACU	Introduced	perennial	grass		3	
	49	elyvir	0.11	0.09	*Elymus virginicus*	*Virginia wild-rye*	FACW	Native	perennial	grass		-3	
	50	equarv	0.33	0.27	*Equisetum arvense*	*field horsetail*	FAC	Native	perennial	fern ally		0	
	51	equhye	0.11	0.09	*Equisetum hyemale*	*0*	FACW / FAC	Native	perennial	fern ally		x	
	52	erehie	0.11	0.09	*Erechtites hieraciifolius*	*fireweed*	0	Native	annual	forb		x	
	53	eristr	0.22	0.18	*Erigeron strigosus*	*rough fleabane*	FACU	Native	annual	forb		3	
	54	eupcor	0.11	0.09	*Euphorbia corollata*	*flowering spurge*	0	Native	perennial	forb		x	
	55	eupper	0.56	0.45	*Eupatorium perfoliatum*	*boneset*	OBL / FACW	Native	perennial	forb		x	
	56	eutgra	0.22	0.18	*Euthamia graminifolia*	*grass-leaved goldenrod*	FACW / FAC	Native	perennial	forb		x	
	57	eutmac	0.11	0.09	*Eutrochium maculatum*	*spotted Joe-Pye-weed*	OBL	Native	perennial	forb		-5	
	58	fraaln	0.11	0.09	*Frangula alnus*	*glossy buckthorn*	FACW / FAC	Introduced	perennial	shrub		x	
	59	frapen	1.11	0.91	*Fraxinus pennsylvanica*	*green ash, red ash*	FACW	Native	perennial	tree		-3	
	60	fravir	0.33	0.27	*Fragaria virginiana*	*wild strawberry*	FACU	Native	perennial	forb		3	
	61	glygra	0.33	0.27	*Glyceria grandis*	*American manna grass*	OBL	Native	perennial	grass		-5	
	62	glystr	0.33	0.27	*Glyceria striata*	*fowl manna grass*	OBL	Native	perennial	grass		-5	
	63	helhel	0.11	0.09	*Heliopsis helianthoides*	*false sunflower, ox-eye, sunflower-*	FACU	Native	perennial	forb		3	
	64	hetdub	1.11	0.91	*Heteranthera dubia*	*water star-grass*	OBL	Native	perennial	aquatic		-5	
	65	horjub	0.22	0.18	*Hordeum jubatum*	*foxtail barley, squirrel-tail grass*	FAC	Introduced	perennial	grass		0	
	66	ilever	0.22	0.18	*Ilex verticillata*	*common winterberry*	FACW	Native	perennial	shrub		-3	
	67	impcap	1.11	0.91	*Impatiens capensis*	*orange jewelweed*	FACW	Native	annual	forb		-3	
	68	iriver	0.56	0.45	*Iris versicolor*	*northern blue flag*	OBL	Native	perennial	forb		-5	
	69	junbal	0.89	0.73	*Juncus balticus*	*Baltic rush*	OBL	Native	perennial	rush		-5	
	70	junbre	1.33	1.09	*Juncus brevicaudatus*	*narrow-panicle rush*	OBL	Native	perennial	rush		-5	
	71	juncan	0.11	0.09	*Juncus canadensis*	*Canadian rush*	OBL	Native	perennial	rush		-5	
	72	juneff	0.33	0.27	*Juncus effusus*	*common rush, soft rush*	OBL	Native	perennial	rush		-5	
	73	junnod	0.33	0.27	*Juncus nodosus*	*joint rush*	OBL	Native	perennial	rush		-5	
	74	junten	2.11	1.73	*Juncus tenuis*	*path rush*	FAC	Native	perennial	rush		0	
	75	larlar	0.11	0.09	*Larix laricina*	*larch, tamarack*	FACW	Native	perennial	tree		-3	
	76	latjap	0.11	0.09	*Lathyrus japonicus*	*beach pea*	FACU	Native	perennial	forb		3	
	77	leeory	0.89	0.73	*Leersia oryzoides*	*rice cutgrass*	OBL	Native	perennial	grass		-5	
	78	lemmin	3.11	2.55	*Lemna minor*	*common duckweed*	OBL	Native	perennial	aquatic		-5	x
	79	lobcar	0.22	0.18	*Lobelia cardinalis*	*cardinal-flower*	OBL	Native		0	0	-5	
	80	lotcor	0.11	0.09	*Lotus corniculatus*	*bird's-foot trefoil*	FACU	Introduced	perennial	forb		3	
	81	ludpal	0.33	0.27	*Ludwigia palustris*	*marsh purslane, marsh seed-box,*	OBL	Native	perennial	forb		-5	
	82	lycame	0.56	0.45	*Lycopus americanus*	*common water-horehound*	OBL	Native	perennial	forb		-5	
	83	lytsal	0.70	0.57	*Lythrum salicaria*	*purple loosestrife*	OBL	Introduced	perennial	forb		-5	
	84	medlup	0.22	0.18	*Medicago lupulina*	*black medick*	FACU	Introduced	annual/biennial	forb		3	
	85	medsat	0.11	0.09	*Medicago sativa*	*alfalfa*	FACU / UPL	Introduced	perennial	forb		x	
	86	melalb	0.22	0.18	*Melilotus albus*	*white sweet-clover*	0	Introduced	annual/biennial	forb		x	
	87	meloff	0.11	0.09	*Melilotus officinalis*	*yellow sweet-clover*	FACU	Introduced	annual/biennial	forb		3	
	88	mencan	0.44	0.36	*Mentha canadensis*	*field mint, wild mint*	0	Native	perennial	forb		x	
	89	mimrin	0.56	0.45	*Mimulus ringens*	*monkey-flower*	OBL	Native		0	0	-5	
	90	monfis	0.56	0.45	*Monarda fistulosa*	*bee balm, wild bergamot*	FACU	Native	perennial	forb		3	
	91	monpun	1.67	1.36	*Monarda punctata*	*horsemint, spotted bee balm*	UPL	Native		0	0	5	
	92	myrsib	0.56	0.45	*Myriophyllum sibiricum*	*common water-milfoil, short-spike*	OBL	Native	perennial	aquatic		-5	
	93	najfle	0.67	0.55	*Najas flexilis*	*Nodding water-nymph*	OBL	Native	annual	aquatic		-5	
	94	nupvar	0.33	0.27	*Nuphar variegata*	*bull-head pond-lily*	OBL	Native	perennial	aquatic		-5	

Species Richness:

Total Species	163
Native Species	127
Non-Native Species	36
Proportion Native Cover	77.91
Percent Cover Native	91.39
Percent Cover Non-Native	8.61

Floristic Quality Metrics: Native Species Only

Unweighted Mean C	4.38
Unweighted FQI	49.34
Weighted Mean C (wC)	7.79
Weighted FQI (wFQIn)	87.75

Floristic Quality Metrics: All Species

Unweighted Mean C	3.50
Unweighted FQIa	44.66
Weighted Mean C (wCa)	3.25
Weighted FQI (wFQIa)	41.49

Wetland Species:

Mean W	-1.89
Native Wetland Species	88
Percent Native Wetland Species	53.99
Percent Cover Native Wetland Species	79

Dominance

Percent Total Aerial Coverage	122
50%	61.09444444
20%	24.43777778

95	nymodo	0.11	0.09	*Nymphaea odorata*	*fragrant water-lily*	OBL	Native	perennial	aquatic		-5	
96	onosen	0.11	0.09	*Onoclea sensibilis*	*sensitive fern*	FACW	Native	perennial	fern		-3	
97	osmcin	0.11	0.09	*Osmunda cinnamomea*	*cinnamon fern*	0	Native	perennial	fern		x	
98	osmreg	0.11	0.09	*Osmunda regalis*	*royal fern*	0	Native	perennial	fern		x	
99	oxastr	0.56	0.45	*Oxalis stricta*	*common yellow oxalis*	FACU	Native	perennial	forb		3	
100	parqui	0.89	0.73	*Parthenocissus quinquefolia*	*Virginia creeper, woodbine*	FACU	Native	perennial	vine		3	
	pedcan	0.11	0.09	*Pedicularis canadensis*	*Canadian lousewort, wood-betony*	FACU	Native		0	0	3	
	perhyd	0.33	0.27	*Persicaria hydropiper*	*marsh-pepper smartweed, water-*	OBL	Introduced	annual	forb		-5	
	permac	0.11	0.09	*Persicaria maculosa*	*heart's-ease, spotted lady's-thumb*	FACW / FAC	Introduced	annual		0	x	
	pervir	0.11	0.09	*Persicaria virginiana*	*jumpseed, woodland knotweed*	FAC	Native		0	forb	0	
	phaaru	0.78	0.64	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass		-3	
	phaaru	0.20	0.16	*Phalaris arundinacea*	*reed canary grass*	FACW	Introduced	perennial	grass		-3	
	phraus	0.70	0.57	*Phragmites australis*	*common reed grass*	FACW	Introduced	perennial	grass		-3	
	phyvir	0.22	0.18	*Physostegia virginiana*	*obedience plant*	FACW	Native		0	0	-3	
	plamaj	0.33	0.27	*Plantago major*	*common plantain*	FAC / FACU	Introduced	perennial	forb		x	
	poapra	0.22	0.18	*Poa pratensis*	*Kentucky bluegrass*	FAC / FACU	Introduced	perennial	grass		x	
	popdel	3.33	2.73	*Populus deltoides*	*eastern cottonwood*	FAC	Native	perennial	tree		0	x
	potans	0.22	0.18	*Potentilla anserina*	*silver-weed*	FACW	Native		0	0	-3	
	potnat	1.33	1.09	*Potamogeton natans*	*common pondweed*	OBL	Native	perennial	aquatic		-5	
	potnod	0.89	0.73	*Potamogeton nodosus*	*long-leaf pondweed, long-leaved*	OBL	Native	perennial	aquatic		-5	
	potnor	0.11	0.09	*Potentilla norvegica*	*Norwegian cinquefoil*	FAC	Native	annual/perennial	forb		0	
	potper	0.22	0.18	*Potamogeton perfoliatus*	*perfoliate pondweed*	OBL	Native		0	0	-5	
	potric	0.89	0.73	*Potamogeton richardsonii*	*Richardson's pondweed*	OBL	Native	perennial	aquatic		-5	
	potzos	0.89	0.73	*Potamogeton zosteriformis*	*flat-stem pondweed, flat-stemmed*	OBL	Native	perennial	aquatic		-5	
	quebic	0.11	0.09	*Quercus bicolor*	*swamp white oak*	FACW	Native	perennial	tree		-3	
	quemac	0.11	0.09	*Quercus macrocarpa*	*bur oak*	FAC / FACU	Native	perennial	tree		x	
	ransce	0.11	0.09	*Ranunculus sceleratus*	*celery-leaf buttercup*	OBL	Native	annual/perennial	forb		-5	
	ratpin	1.11	0.91	*Ratibida pinnata*	*pinnate prairie coneflower*	0	Native	perennial	forb		x	
	ribame	0.11	0.09	*Ribes americanum*	*American black currant*	FACW	Native	perennial	shrub		-3	
	rosbla	0.11	0.09	*Rosa blanda*	*smooth rose, wild rose*	FACU	Native	perennial	shrub		3	
	rubida	0.44	0.36	*Rubus idaeus*	*wild red raspberry*	FACU / FAC*	Native	perennial	shrub		x	
	rudhir	2.33	1.91	*Rudbeckia hirta*	*black-eyed Susan*	FACU	Native		0	0	3	x
	saglat	0.67	0.55	*Sagittaria latifolia*	*broad-leaved arrowhead*	OBL	Native	perennial	semi-aquatic		-5	
	salamy	0.11	0.09	*Salix amygdaloides*	*peach-leaved willow*	FACW	Native	perennial	tree		-3	
	salbeb	0.11	0.09	*Salix bebbiana*	*Bebb's willow*	FACW	Native	perennial	tree		-3	
	salnig	0.11	0.09	*Salix nigra*	*black willow*	OBL	Native	perennial	tree		-5	
	samcan	1.44	1.18	*Sambucus canadensis*	*elderberry*	FACU	Native	perennial	shrub		3	
	schpun	1.00	0.82	*Schoenoplectus pungens*	*common three-square bulrush*	OBL	Native	perennial	sedge		-5	
	schtab	6.33	5.18	*Schoenoplectus tabernaemontani*	*soft-stem bulrush*	OBL	Native	perennial	sedge		-5	x
	sciatr	0.67	0.55	*Scirpus atrovirens*	*dark-green bulrush*	OBL	Native	perennial	sedge		-5	
	scicyp	0.11	0.09	*Scirpus cyperinus*	*wool-grass*	OBL	Native	perennial	sedge		-5	
	setpum	0.22	0.18	*Setaria pumila*	*pigeon grass, yellow foxtail*	FAC	Introduced	annual	grass		0	
	siusua	0.33	0.27	*Sium suave*	*hemlock water-parsnip, common*	OBL	Native	(annual/)perennial	forb		-5	
	solcan	0.78	0.64	*Solidago canadensis*	*Canadian goldenrod*	FACU	Native	perennial	forb		3	
	soldul	0.11	0.09	*Solanum dulcamara*	*bittersweet nightshade*	FAC	Introduced	perennial	vine		0	
	solgig	0.33	0.27	*Solidago gigantea*	*giant goldenrod*	FACW	Native	perennial	forb		-3	
	sonarv	0.22	0.18	*Sonchus arvensis*	*field sow-thistle*	FACU	Introduced	perennial	forb		3	
	sornut	0.22	0.18	*Sorghastrum nutans*	*yellow Indian grass*	FACU	Native	perennial	grass		3	
	spaame	4.00	3.27	*Sparganium americanum*	*American bur-reed*	OBL	Native	perennial	aquatic		-5	x
	spapec	0.22	0.18	*Spartina pectinata*	*prairie cord grass*	FACW	Native	perennial	grass		-3	
	spialb	0.33	0.27	*Spiraea alba*	*white meadowsweet*	FACW	Native	perennial	shrub		-3	
	stapal	0.44	0.36	*Stachys palustris*	*hedge-nettle, marsh hedge-nettle,*	OBL	Native	perennial	forb		-5	
	stupec	2.00	1.64	*Stuckenia pectinata*	*comb pondweed, sago pondweed*	OBL	Native	perennial	aquatic		-5	
	symlan	0.22	0.18	*Symphyotrichum lanceolatum*	*lance-leaved panicled aster*	FAC / FACW	Native	perennial	forb		x	
	symlat	0.11	0.09	*Symphyotrichum lateriflorum*	*calico aster, goblet aster, side-*	FACW / FAC	Native	perennial	forb		x	
	taroff	0.22	0.18	*Taraxacum officinale*	*common dandelion*	FACU	Introduced	perennial	forb		3	
	thuocc	0.22	0.18	*Thuja occidentalis*	*northern white-cedar*	FACW	Native	perennial	tree		-3	
	tripra	0.11	0.09	*Trifolium pratense*	*red clover*	FACU	Introduced	perennial	forb		3	
	trirep	0.33	0.27	*Trifolium repens*	*white clover*	FACU	Introduced	perennial	forb		3	
	tsucan	0.11	0.09	*Tsuga canadensis*	*northern hemlock*	FACU	Native	perennial	tree		3	
	typgla	0.50	0.41	*Typha X glauca*	*hybrid cat-tail, white cat-tail*	OBL	Introduced	perennial	semi-aquatic		-5	
	ulmrub	0.11	0.09	*Ulmus rubra*	*red elm, slippery elm*	FAC	Native	perennial	tree		0	
	urtdio	0.33	0.27	*Urtica dioica*	*stinging nettle*	FACW / FAC	Native	perennial	forb		x	
	utrvul	0.56	0.45	*Utricularia vulgaris*	*Common bladderwort*	OBL	Native	perennial	aquatic		-5	
	valame	0.56	0.45	*Vallisneria americana*	*American eelgrass, water-celery*	OBL	Native	perennial	aquatic		-5	
	verhas	0.67	0.55	*Verbena hastata*	*blue vervain, simpler's-joy, swamp*	FACW	Native	biennial/perennial	forb		-3	
	vertha	0.11	0.09	*Verbascum thapsus*	*common mullein*	UPL	Introduced	biennial	forb		5	
	vitrip	0.44	0.36	*Vitis riparia*	*river bank grape*	FACW / FAC	Native	perennial	vine		x	
	zizaur	0.67	0.55	*Zizia aurea*	*golden alexanders*	FAC	Native	perennial	forb		0	

B

APPENDIX B

Timed-Meander Sampling Protocol

Timed-Meander Sampling Protocol for Wetland Floristic Quality Assessment

Wisconsin Department of Natural Resources

INTRODUCTION

This standard operating procedure (SOP) describes the methods used by the Wisconsin Department of Natural Resources to conduct timed-meander surveys of wetland plant communities to determine wetland plant community condition. This SOP should be used in conjunction with the Floristic Quality Assessment Methodology for Wisconsin (Bernthal 2003). This SOP is based on and modified from procedures first developed and employed by the Lake Superior Research Institute (LSRI) (LSRI 2013). Possible uses for this protocol include Natural Heritage Inventory (NHI) surveys of State Natural Area wetland plant communities, FQA Benchmark Project surveys, water quality standards compliance surveys, wetland restoration site monitoring and wetland assessments for regulatory purposes.

DESCRIPTION

In this method, wetland types are first identified using aerial photographs and/or site investigations of the potential wetland(s) to be sampled. Assessment Areas (AAs) composed of relatively homogenous vegetation, are defined prior to sampling but can be modified after the survey based upon the conditions and features encountered during the survey. Natural communities, as defined by the NHI natural community classification, serve as the foundational unit of sampling (Table 1). When multiple types are present at a site, multiple Assessment Areas must be defined. Assign a wetland AA to the natural plant community type that it most closely resembles. If the AA's plant assemblage does not match any Natural Heritage Inventory community the dominant vegetation type (e.g., herbaceous, shrub, forested) may be noted. Table 1 contains a crosswalk to the Eggers and Reed classification system (2014).

Timed-meander start locations should begin far enough from the edge of a community type or from an anthropogenic disturbance (i.e., roadway, residential development, etc.) to avoid including transition zones from other plant communities in the survey. However, if the assessment area is surrounded by roadways, residential development, or other anthropogenic disturbance the timed-meander start location may be located at the edge of the disturbance. The survey consists of a search for all plant species present within a pre- or post- defined Assessment Area and an estimate of abundance and percent areal cover for each species at the end of the search period. The search takes place during timed intervals documented by the time keeper. The timer is paused when surveyors need to divert their attention from the search for any reason, such as conferring on an identification, documenting a rare species, or investigating an area with a plant composition different from the target community. The total time spent searching is an indication of search effort. All plant species are recorded when first observed and search intervals are documented on the Field Sheet. After all search intervals are complete, abundance and percent areal cover over the entire Assessment Area is estimated for each plant species, and notes on disturbance and other observations are documented.

The assessment areas must have homogeneous representation of wetland plants associated with each wetland community type. If a different wetland community type is encountered during a timed-meander survey of a given targeted community type, the timer is paused and the size of the new plant community is evaluated. If the new type is greater than 900 m^2 (30m x

30m) (9688 ft^2, 98ft x 98ft or approximately 0.09 hectare (0.25 acre), then the area is excluded from the Assessment Area and the search remains paused until the surveyors return to the targeted plant community. If necessary, the new community would need to be evaluated by a separate survey. If the new type is less than 900 m^2 in size, the search is resumed and the small pocket can be treated as an inclusion within the primary wetland type.

Invasive plant species and anthropogenic disturbances should be observed during the walk to and from the Assessment Area, and noted in comments on the Timed-Meander Survey Field Sheet. Additional condition assessment tools may also be used to evaluate the wetland's health. For regulatory decisions, the Condition Assessment in Section 3 of the Wisconsin Rapid Wetland Assessment Methodology version 2 (Trochlell 2014) should be used. A Disturbance Factor Checklist is used for rating disturbance levels for the FQA Benchmark Project surveys. For future wetland condition surveys the Disturbance Factors Checklist or a modification of it will be used to assess stressors that may be causing an impairment to the wetland.

Table 1: Examples of Wetland NHI Natural Communities and Crosswalk to Eggers and Reed (2014).[1]

NHI Natural community	Eggers and Reed (2014)	Dominant vegetation type
Submergent Marsh	Shallow Open Water Communities	Aquatic Herbaceous
Emergent Marsh	Shallow Water Marsh	Herbaceous
Northern Sedge Meadow	Sedge Meadow	Herbaceous
Southern Sedge Meadow	Sedge Meadow	Herbaceous
Wet-mesic Prairie	Wet/Wet-mesic Prairie	Herbaceous
Calcareous Fen	Calcareous Fen	Herbaceous
Boreal Rich Fen	N/A	Herbaceous
Central Poor Fen	N/A	Herbaceous
Ephemeral pond	Seasonally Flooded Basin	Herbaceous
Open Bog	Open Bog	Herbaceous/Low Shrub
Alder Thicket	Alder Thicket	Shrub
Shrub-carr	Shrub Carr	Shrub
Black Spruce Swamp	Coniferous Bog	Forested
Northern Wet-mesic Forest	Coniferous Swamp	Forested
Floodplain Forest	Floodplain Forest	Forested
Southern Hardwood Swamp	Hardwood Swamp	Forested

[1] Additional wetland community types, e.g., muskeg, interdunal, etc., may be surveyed. For a detailed description of each Natural Community, please refer to "Wisconsin's Natural Communities" on the WDNR NHI website.

DEFINITIONS

Assessment Area (AA): Discrete, homogenous area of a target plant community that is to be thoroughly sampled during the timed meander survey. Large wetlands/wetland complexes may contain multiple wetland assessment areas.

EO - Element Occurrence: In the Natural Heritage Inventory, a population of a species or an example of a natural community or natural feature naturally occurring at a specific, ecologically appropriate location.

Search: Locating, identifying and documenting plant species presence, while mentally noting percent cover. Previously un-documented plant species are continuously added until the search interval is paused or ends.

Search Interval: A pre-defined time interval, maintained by the time keeper. The search time may be paused whenever the active search for additional species stops for various reasons, including taking time to work out difficult identifications, documenting rare species, adjusting the Assessment Area or other reasons.

REFERENCES

Bernthal, Thomas W. 2003. Development of a Floristic Quality Assessment Methodology for Wisconsin**.**

Eggers, S.D. and D.M. Reed. 2014. Wetland Plants and Plant Communities of Minnesota and Wisconsin, Version 3.1. US. Army Corps of Engineers, S. Paul District, St. Paul, MN.

Lake Superior Research Institute (LSRI). 2013. Timed-meander Sampling Protocol for Forested and Non-forested Wetland Floristic Quality Assessment. University of Wisconsin-Superior. Superior, WI.

Trochlell, Patricia A. 2014. Wisconsin Rapid Wetland Assessment Methodology, version 2.

EQUIPMENT LIST

- ♦ Clipboard
- ♦ Compass
- ♦ Digital Camera
- ♦ Field Guides
- ♦ GPS Unit
- ♦ Digital watch with countdown timer
- ♦ Hand Lens (10X objective)
- ♦ Maps
- ♦ Markers
- ♦ Pencils (and sharpener/extra lead)
- ♦ Plant Collection Bags (i.e., Ziploc® Big Bags)
- ♦ Weather-Proof Datasheets

PROCEDURE

1. Upon arrival at the site, the survey team of two or more people must completely fill out the top portion of the WDNR Timed Meander Survey Sheet (Field Sheet) in Attachment 1 or other form for the Assessment Area (AA) to be surveyed. Use the Natural Heritage Inventory (NHI) Natural Community Descriptions to determine the appropriate plant community classification for the AA to be surveyed. If the survey involves an existing NHI Element Occurrence note the EO code. If the plant assemblage does not appear to match a natural community, note the dominant vegetation type from Table 1.

2. Start locations on the AA must begin at a point clearly within the target community type, away from transitional areas or anthropogenic disturbance (i.e., roadway, residential development, logging, ditching, etc.). The exception to this is that if an AA is immediately adjacent to an anthropogenic disturbance, then the start location may be located near the edge of this disturbance.

3. Travel to the AA start location and record any disturbance (e.g., invasive plants, logging, ditches) encountered while traveling to the survey start-up point on side 2 of the Field Sheet. This can also be completed at the end of the survey after the entire AA has been surveyed.

4. Take a waypoint at the survey start point using a handheld GPS unit. Record the starting point on the Field Sheet in decimal degrees. Indicate whether the GPS is set to a tracking function. This will create a record of survey locations over the course of the search.

5. Designate a lead observer and a data recorder for each survey; the observer will conduct the taxonomic identification and the recorder will complete the survey Field Sheet and operate the timer.

6. Set the countdown timer on the watch for 5 minutes. Start the stop watch and begin timing the first, 5-minute interval of the timed-meander survey. Standing at the start point, record all plants (ideally to species) that can be seen from the four cardinal directions before moving forward in search of new species. Upon reaching the end of a 5 minute interval, the timekeeper should instruct other observer(s) to stop searching until the next time interval begins.

7. Record plants using the full species name. Because there are numerous and often conflicting resources for accepted plant names (USDA Plants, Flora of North America, various state herbaria lists etc.), it is important to limit confusion caused by using multiple names for the same species. Therefore, this protocol follows the Wisconsin State Herbarium's list of vascular flora, which has recently been updated to reflect the most recent taxonomic information and is available online. The State Herbarium nomenclature should be used for conducting plant surveys in Wisconsin whenever possible.

8. Record on the Field Sheet and collect all unknown, uncertain, and/or difficult-to-identify plant species, which will later be keyed or identified by experts (or eliminated from the analysis if identification is not possible).

9. Advance the search from the start point once the initial plants from the area surrounding the start point are recorded. Proceed walking through the site, taking care to identify all species encountered and making sure to investigate all vegetation layers. The search must always stay within the targeted plant community type for the duration of the survey, with one exception:

    a. If a different plant community type is encountered during the search, stop the watch to pause the elapsed time and evaluate the size of the community. If the new community type is less than 900 m^2 (30m x 30m or 0.09 hectares, 9688 ft^2 (98 ft x 98 ft) or 0.25 acres) the timed meander survey can continue through that community type.

    b. If the new community type is greater than 900 m^2, pause the survey until the surveyors have returned to the target plant community.

10. After each 5 minute time interval, the recorder should note on the Field Sheet the time interval in which those plant species were observed (i.e. 0-5 minutes, 5-10 minutes, 10-15 minutes, etc.). At the end of each time interval the observers may wish to briefly confer over any unknown species before resuming the next time interval. This reduces the number of unknown species for later office determination.

11. If an interruption of the process is necessary (e.g., intensive consulting with field guides and conferring with other surveyors over a difficult identification, bathroom breaks, difficult terrain, or vegetation encountered), stop the timer to pause the interval, eliminating these interruptions from the elapsed search time.

12. Pause the search if a rare, threatened, and/or endangered species is observed. Record the plant species on the Field Sheet, the location of the plant using the handheld GPS, take a digital photo of the species, and note associated species and other relevant information needed for the NHI Rare Plant Form. Collect a specimen if authorized and warranted. Resume the stop watch after all field recording is noted.

13. Typically a minimum of 30 minutes of total search time is needed to thoroughly search an AA. Stop the search when:
    a. A pre-defined area has been completely searched. For some uses of this SOP a search of an entire pre-defined area may be required, regardless of the time it takes, even if no new species are observed in a search interval, OR
    b. After 30 minutes of search time, one or no new species is found during the most recent 5 minute interval, OR
    c. After 30 minutes of search time, the number of species observed in the most recent 5 minute interval is less than 5% of the running total of recorded species (including unknowns). For example, if, after the 10^{th} five-minute interval (50 minutes of elapsed search time), 100 species have been observed, and 4 or fewer species were observed in the 10^{th} 5-minute interval, the survey should be ended. The justification for ending is that the survey has reached the point of

diminishing returns and has likely captured 90-95% of the species richness, and has likely captured 100% of the dominant and common species.

d. The search may end earlier than 30 minutes only if the entire AA has been thoroughly searched and no species were found in the final interval.

14. After the last search interval is completed take a waypoint at the survey end point using a handheld GPS unit. Record the waypoint on the Field Sheet in decimal degrees.

15. Once the species list is complete assign each species a percent cover based on an ocular estimate of the percent of the AA covered by the canopy of that species (see Figures 1 and 2). Estimate to the nearest whole number. For species that cover 1% or less, use 1.

16. For each species, assign an abundance code based upon the class categories listed in Table 2 below. Abundance estimates give a qualitative estimate of relative frequency and can be used to make comparisons with historically gathered site data. They also provide valuable data to compare species with small areal percent cover.

17. Record other data on the Field Sheet, including soil texture and pH on side 1, if taken. Animal species observed and other observations are recorded on side 2.

Table 2. Abundance Classification

Symbol	Abundance Code	Description
A	Abundant	The dominant plants throughout the site
C	Common	Locally abundant or frequently encountered
O	Occasional	Occasionally encountered, or locally common but absent or infrequent across much of site
U	Uncommon	Infrequently encountered
R	Rare	Very few plants seen

Figure 1: Comparison chart for visual percentage estimation. NPS US Dept. of the Interior, Damage Assessment Handbook, 2002.

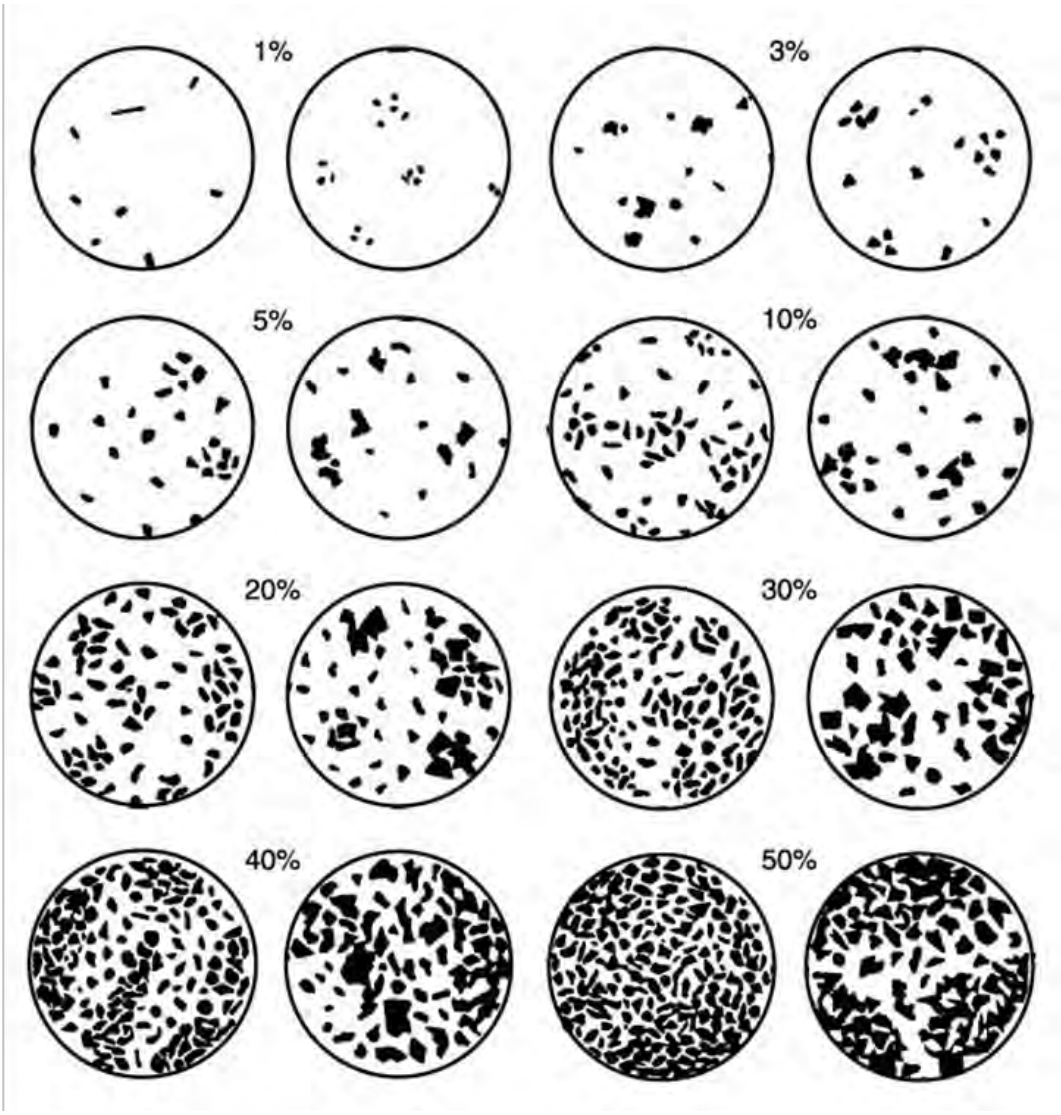
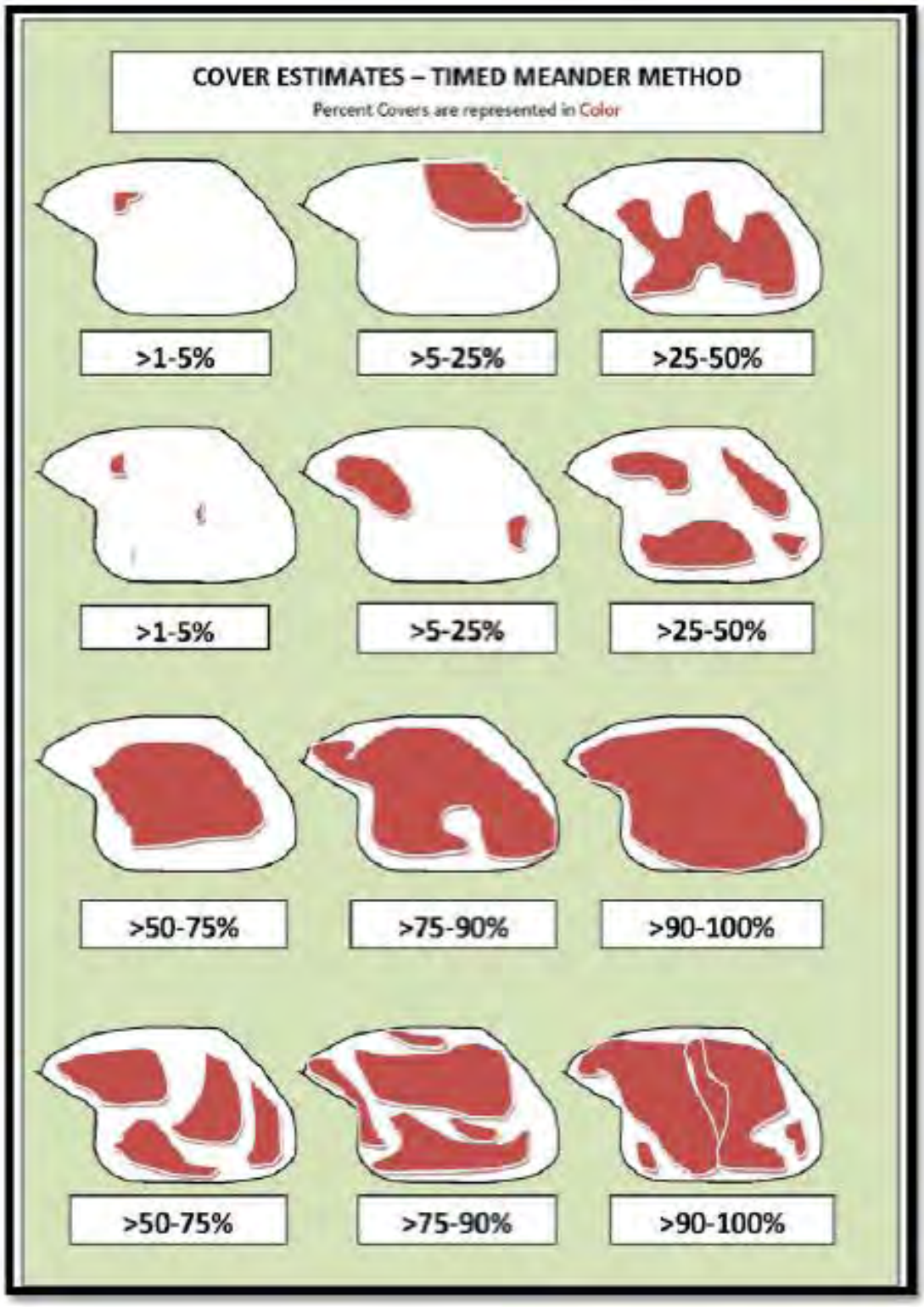


Figure 2: Cover estimates for timed meander method. LSRI 2013.



Attachment 1: WDNR Timed-Meander Survey Field Sheet, next page

WDNR Timed Meander Survey Field Sheet

Observers_____ Date_____

Property_____ Site Name_____ County_____

Access _____

Community Type _____ EOID (if existing EO) _____

GPS Used _____Start point (Dec Deg)_____ End point (Dec Deg)_____ Track Taken? Y N

Total Elapsed Search Time _____(mins) Soils & pH_____

Time		Species	%	AC	Notes	Time		Species	%	AC	Notes
0	1						36				
	2						37				
	3						38				
	4						39				
	5						40				
	6						41				
	7						42				
	8						43				
	9						44				
	10						45				
	11						46				
	12						47				
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	28						63				
	29						64				
	30						65				
	31						66				
	32						67				
	33						68				
	34						69				
	35						70				

Estimate % areal cover and abundance code for each species
AC: Abundance codes: A (abundant), C (common), O (occasional), U (uncommon), R (rare)

WDNR Timed Meander Survey Field Sheet

Time		Species	%	AC	Notes
	71				
	72				
	73				
	74				
	75				
	76				
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	110				
	111				
	112				

Wetland Observation Notes
Waypoint #
Waypoint #
Waypoint #
Waypoint #
Waypoint #
Waypoint #
Animal Observations
Structural Notes
Invasive Species (note distance to AA if observed outside the AA)
Anthropogenic Disturbances
Other Notes

Estimate % areal cover and abundance code for each species
Abundance codes: A (abundant), C (common), O (occasional), U (uncommon), R (rare)

C

APPENDIX C

Photo Log

Wet Mesic Forest Facing NE

Shrub Carr Facing NE

Emergent Aquatic - Wild Rice Facing N

Emergent Aquatic - Wild Rice Facing W

Wet Mesic Forest Facing NE

Wet Mesic Forest Facing SW

Emergent Aquatic Facing W

Northern Sedge Meadow Facing NW

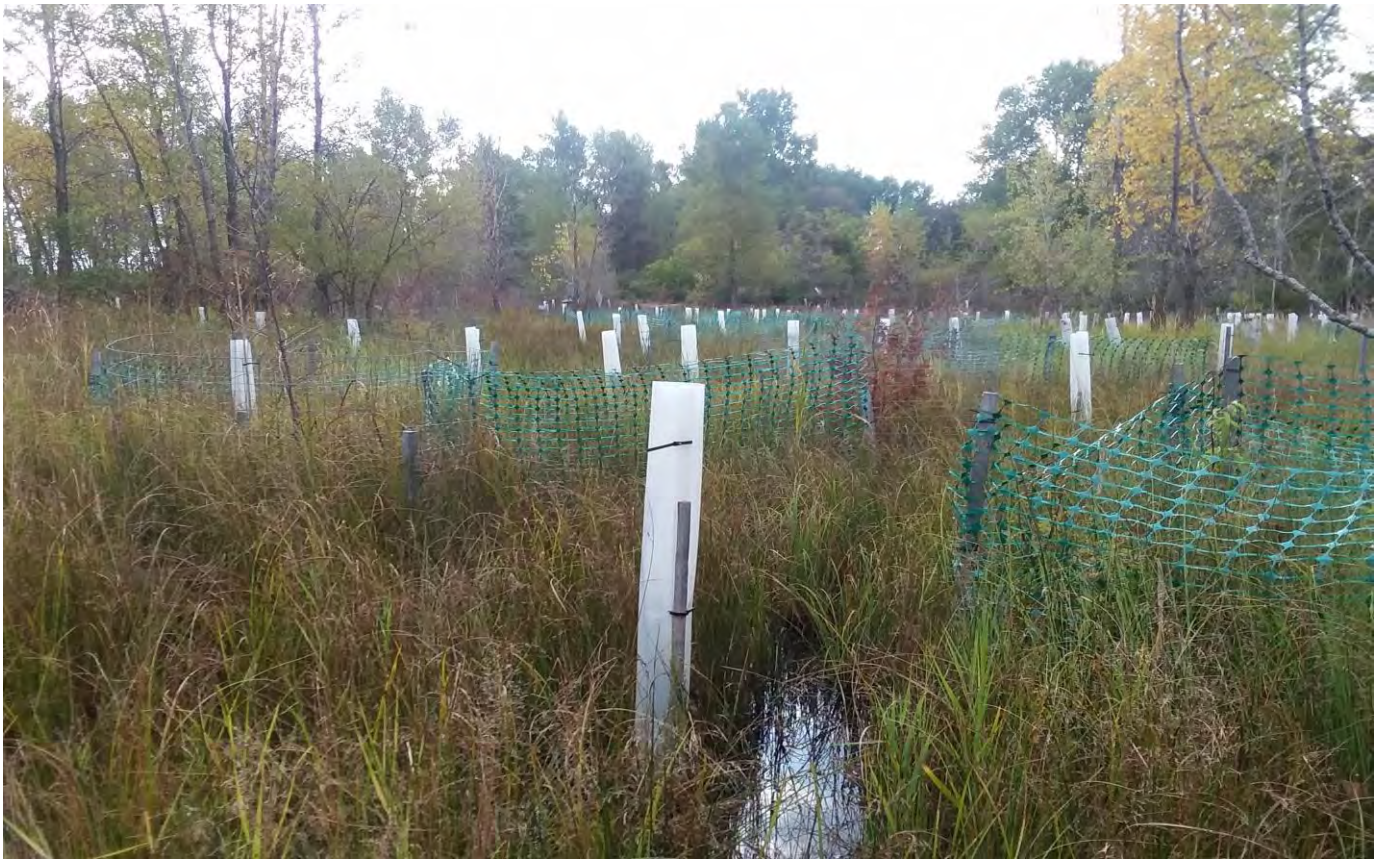
Shrub Carr Facing N

Wet Mesic Forest Facing E

Shrub Carr Facing E

Wet Mesic Forest Facing N

Wet Mesic Forest Facing NW



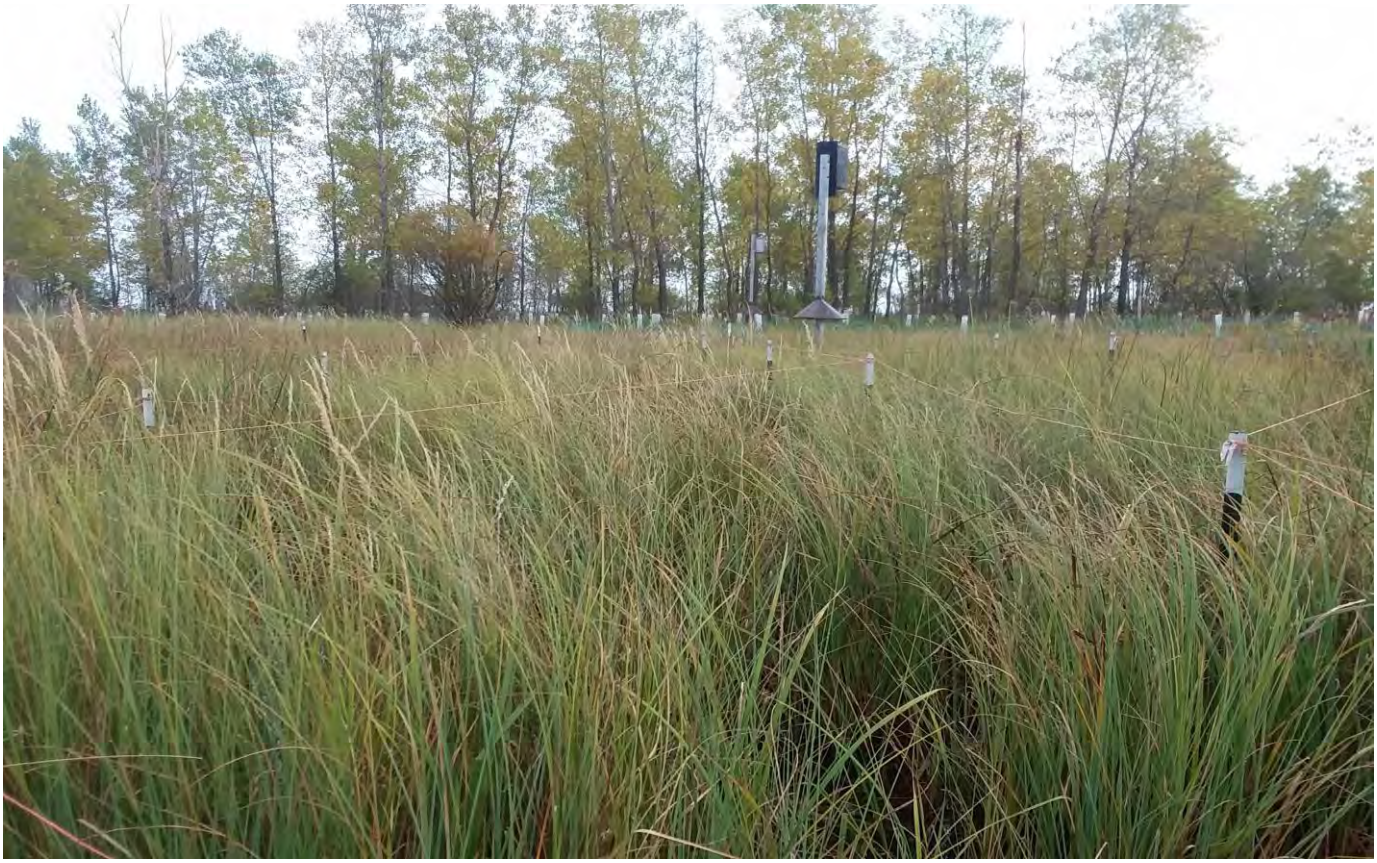
Wet Mesic Forest Facing SE

Wet Mesic Forest Facing NE

Shrub Carr Facing SW

Northern Sedge Meadow Facing NE

Emergent Aquatic Facing NW



Northern Sedge Meadow Facing E

Emergent Aquatic Facing N

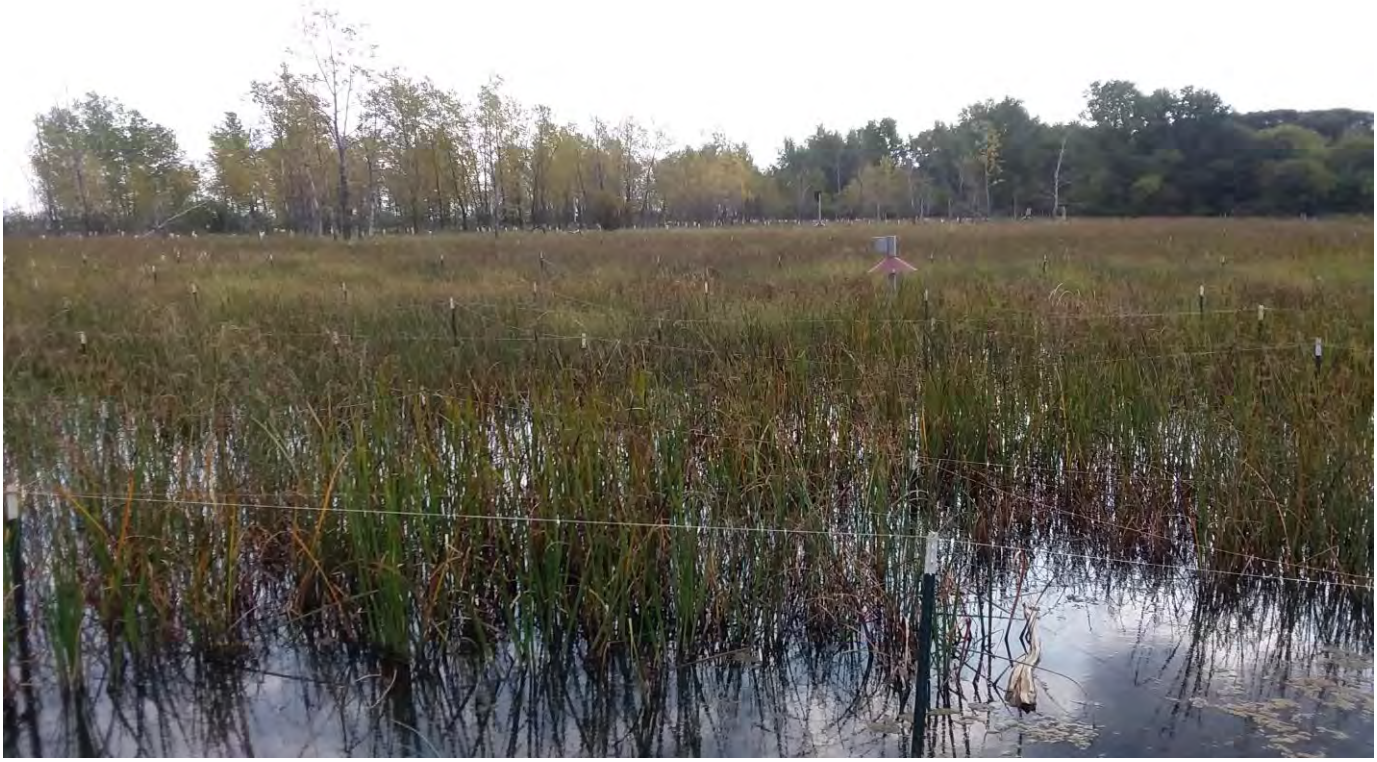
Emergent Aquatic Facing W

Emergent Aquatic - Wild Ricec Facing W

Emergent Aquatic - Wild Rice Facing SW

Emergent Aquatic Facing N

Emergent - Aquatic - Wild Rice Facing NE



Emergent Aquatic Facing SE

Emergent Aquatic Facing S

Emergent Aquatic Facing SE

Emergent Aquatic Facing S

Wet Mesic Forest Facing SE

Shrub Carr Facing SW

Shrub Carr Facing N

Wet Mesic Forest Facing NE

Wet Mesic Forest Facing SE

Invasive Species Control Area Facing W

Emergent/Wet Meadow Planting Facing S

Emergent/Wet Meadow Planting Facing N

Emergent/Wet Meadow Planting Facing NW

Prairie Facing E

Prairie Facing W

Emergent Aquatic Facing N

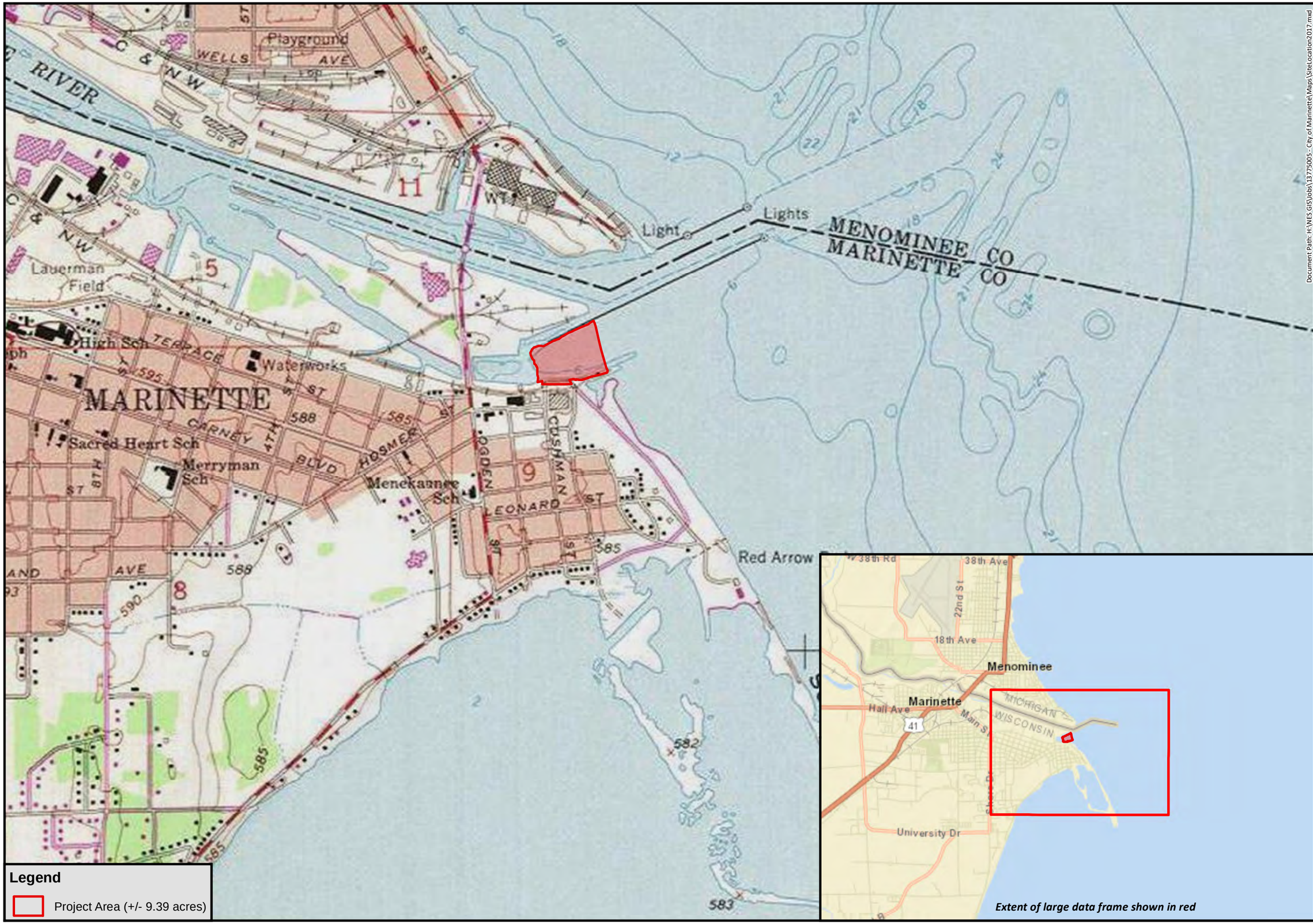
Mesic to Wet Mesic Prairie Facing SW

Shrub Carr Facing E

Northern Sedge Meadow Facing SW

Northern Sedge Meadow Facing NW

Photo 46 Facing E



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Robert E. Lee & Associates, Inc.

Engineering, Surveying, Environmental Services

Figure 1
Site Location

1/19/2018

Lower Menominee River Area of Concern
Menekaunee Harbor Restoration Project
City of Marinette-Grant/Proj. No. GL-00E01312-0
REL Project No. 13775005
Marinette, Marinette County, WI

Located in parts of:
Section 4 & 9
T30N, R24E
City of Marinette
Marinette County
Wisconsin

Legend

Plant Community Zones

- Emergent Aquatic (1.00 acres)
- Emergent Aquatic - Wild Rice (1.07 acres)
- Emergent / Wet Meadow Planting (0.06 acres)
- Ephemeral Pool (0.05 acres)
- Mesic to Wet Mesic Prairie (0.32 acres)
- Northern Sedge Meadow (0.82 acres)
- Open Water (4.07 acres)
- Prairie (0.32 acres)
- Shady Woodland Planting (0.22 acres)
- Shrub Carr (0.51 acres)
- Submergent Aquatic (0.03 acres)
- Wet Mesic Forest (1.22 acres)

Habitat Improvements

- Bat House
- Brush Pile
- Fish Sticks
- Log Structure
- Half Log Structure
- Rock Pile
- Osprey Nesting Platform
- Screech Owl Nest Box
- Snag Tree
- Forster's Tern Nesting Platform
- Tree Swallow Nest Box
- Wood Duck Box
- Woody Debris

Other

- Existing Trail
- Wood Chip Trail
- Sample Plots
- Existing Trees
- Existing Tree Areas
- Enhancement Zone
- Rework Zone
- Invasive Species Control Area (+/- 7.08 acres)
- Meander Path

Lower Menominee River Area of Concern - Menekaunee Harbor Restoration Project
City of Marinette-Grant/Proj. No. GL-00E01312-0
REL Project No. 13775005
City of Marinette, Marinette County, Wisconsin

DATE: 1/19/2018
JOB: 13775005
DRAWN: PFO

FIGURE 2
PLANT COMMUNITY ZONES
AND HABITAT STRUCTURES

0 30 60 Feet
N

Source: Robert E. Lee & Associates, Inc.
Marinette County

Robert E. Lee & Associates, Inc.
Engineering, Surveying and Environmental Services
1250 Centennial Centre Boulevard, Hobart, WI 54155
Phone: (920) 662-9641 FAX: (920) 662-9141
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