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Floristic and ecological studies on the Roy Johnson Mitigation Wetlands, Douglas County, Wisconsin

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Summary: The study areas are 31.56 hectares of restored mitigation wetlands. The site consists of seven impoundment cells, one preexisting, representing shallow and deep marshes, which were reconstructed projects for U.S. Highway 2, and State Highway 13, both within the Lake Superior watershed. The seven cells constructed on the site, yielded 17.88 hectares of combined shallow and deep marsh. In addition, there are 4.45 hectares of wet meadow along shallow marsh fringes. The vegetation goals were met by botanical meander searches in which at least 50% of the species would meet classifications of obligate (OBL), and/or facultative wetland (FACW). A total of 104 species was found in the three seasons of monitoring. In 1997, 82 species were found in all cells. A total of 63 species was found in 1999 in all cells. Twenty-four of the species found by Dr. John Jackson (Wisconsin Department of Transportation) were present in the two years of sampling of 104 total species. The vegetative objective of having 50% of the species being obligate or facultative wetland was met both in 1997 and 1999 monitoring activities.

Keywords: Meander search, wetland mitigation, shallow and deep marsh, floristics, wetland ecology, flora of Wisconsin

The Wisconsin Department of Transportation (DOT), through its Bureau of Environmental Services and under the guidance and direction of Dr. John Jackson, Ph.D., has developed and implemented a statewide program of wetland mitigation banks throughout Wisconsins' major watersheds. Recognizing that construction of highways, airports and other transportation related facilities tends to impact the states' wetlands, the Department determined to offset these impacts through a coordinated effort featuring the restoration of prior drained/converted wetlands and the construction of new wetlands, in the respective watersheds where transportation impacts have occurred or likely will occur.

Survey areas

Eight wetland mitigation sites were studied. Locations can be pinpointed by use of a U.S.G.S. map, and/or Highway map of Wisconsin.

This research paper is the second in a series of papers developed to address the botany of eight wetland mitigation sites in northwestern Wisconsin.

1) Kimmes-Tobin Wetlands: from Superior, go south on state 35, to County C, then west to Hilpiper Road. Douglas County.

2) Roy Johnson Wetland: from Superior on State Highway 13, near town of Brule. On State 13, find Brule River State Forest Boundary, Section 33 on Highway 13. Douglas County.

3) Branca Wetland: in Crystal Lake township on sections 25 & 26 of T35N-R14W. Barron County.

4, 5) Strom and Nelson Wetlands: located near Grantsburg on Crosstown Road, in the SE¼ of the SE¼ of Section 20, T38N, R18W. Burnell County.

6) Eitenmiller Wetland: near the town of Thornapple in Sections 13 & 14 of T34N, R7W. Near U.S. Highway 8, just off of Highway 27 on County P. Rusk County.

7) Weirgor Core 48 Wetland: on McFarland Road, the old wetland core parallels railroad tracks. Sawyer County.

8) 53 Core 13 Wetland: from Superior, on State Highway 13, after 13 leaves U.S. 53 and U.S. 2, and passes on overpass, outside of Superior. Douglas County.

Region of study

Wisconsin is located in the northern United States, between Lake Superior and Michigan and the Mississippi River, with a total of 56,066 square miles. Glaciers have sculpted and shaped the landscape of the state. In the north it scraped the tops of hills leaving rich earth deposits with approximately 15,000 small lakes.

Wisconsin was originally very rich in wetlands. Many of these wetlands have been destroyed by development such as urban development, farming and the construction of highways. According to Curtis (1959), and Cottam & Loucks (1965), all of the wetlands referred to in this study, were found in the boreal forest or the northern mesic forest, prior to the time of settlement of Wisconsin in the 1800's. *Abies balsamea* and *Picea glauca* dominated the boreal forest, and *Acer saccharum*, *Tsuga canadensis*, and *Betula alleghaniensis* dominated the northern mesic forests.

In the case of the Roy Johnson Wetlands, this site was constructed on farm fields originally cleared and drained through cultivation of surface ditches. It was established as a wetland bank primarily to replace impacts associated with reconstruction projects for U.S. Highway 2 and State Highway 13, both within the Lake Superior Watershed. The wetland is located in Douglas County on Highway 13 and Balsam Bend Road in the W½ of the S¼ of Section 33, T49N, R10W, Cloverland Township near the village of Brule. The site can be pinpointed on the Wisconsin Department of Transportation Annual Report, 1997, U.S.G.S. Cloverland and Oulu Quadrangle, 1961 and 1984, State of Wisconsin Division of Highways, and on the geological and natural history surveys.

Much of the mitigation area is open and grassy. These wetlands are classified on the Wisconsin Wetland Inventory maps as T3/SK3. They are bordered by broad leaved deciduous forests and scrub/shrub complexes. From this site the water flows north about two miles to the Brule River, then approximately three miles to its destination at Lake Superior. Depth to groundwater is approximately 90 feet.

Design

The design consists of the construction of seven impoundment cells and the berm of a preexisting cell, which was repaired by Mr. Roy Johnson several years ago to provide a water source for his cattle as well as indigenous wildlife. Low maintenance features are facilitated by the clayey nature of the soil. The berms were broadened and slopes flattened to aid in the control of the muskrats, and spillways were constructed of rock riprap to decrease the potential for erosion.

Soils

The site has been classified by the Soil Conservation Service as a combination of Ontonagon-Rudyard Complex and Ontonagon Silty Clay Loam. Both have clayey lacustrine deposits. The Ontonagon-Rudyard Complex has intermixed areas of moderately well drained Ontonagon soil and somewhat poorly-drained Rudyard soil. There are palustrine, wet soil lands across State Highway 13 adjacent to the south end of the mitigation site, resulting at present in a slight contributory flow via culverts under the road.

Hydrology

The site is part of the Lake Superior lowland and once was on the bottom of Glacial Lake Duluth, hence the accumulation of red clay. Since the lowering of the water level with the melting of the glacier, the present drainage pattern is one of streams flowing northward in a linear arrangement. The common situation, as in the Johnson site, a youthful landform state occurs with lack of developed interfluvial drainage networks. The existing south to north flow was accentuated with the efforts of Mr. Johnson in ditching the site in order to develop his farm fields. Thus, the site qualifies as a wetland restoration area. Precipitation records (Tab. 1) were obtained through the courtesy of the Wisconsin Department of Natural Resources Ranger Station in Brule which is located just 16 km to the southeast. Average annual rainfall for this area is 31.37 inches with 27.37 being evaporated.

Table 1: Brule Precipitation Record 1997 and 1999.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1997	3.21	0.17	1.51	0.99	1.06	3.31	1.15	2.43	1.17	1.54	1.38	0.48	23.40
1999	2.01	1.41	0.57	3.93	3.07	9.14	10.58	6.84	4.10	1.78	1.25	0.56	45.24

In 1994 Dr. Donald Davidson and Richard Gitar started studies on wetland mitigation sites in northwestern Wisconsin, responding positively to the invitation by the former District 8 Office, State of Wisconsin's Department of Transportation, to conduct an extensive series of wetland mitigation studies, during the period of 1994 to 1999.

It has long by argued by various environmental regulatory agencies that constructed wetlands have less relative value than restored, prior converted wetlands, and that both are of less value to the natural and human environments than wetlands existing in their natural state. Therefore, when impacts to existing wetlands are quantified, a 1-for-1, 1½-for-1, 2-for-1, etc. ratio of compensatory replacement from mitigation bank sites may not provide true compensation for the functions of the lost wetlands environment. These botanical studies were undertaken to evaluate the short-term success (or failure) of colonization by wetland species, and to provide an initial benchmark for any future, long-term evaluation aimed at addressing the significance and relative value of such sites. Assuming that proper hydrology is achieved and maintained, hydrophytic vegetation should appear through succession. As an objective the seven created cells should yield 17.88 hectares of combined shallow marsh and deep marsh, with 4.45 hectares of wet meadow along shallow marsh fringes. This condition shall be deemed to be met by botanical meander searches in which at least 50% of the species are classed as obligate and facultative wetland (Reed 1988).

The monitoring of the site was done by determining the qualitative abundance of the vegetation. Using visual dominance, the plant and community types were recorded and compared with a plant species list which was adapted by Dr. John Jackson, Department of Transportation, Office of Environmental Analysis, in consultation with the Department of Natural Resources from a list by John Curtis of prevalent species of an emergent aquatic plant community. Species present were identified based on a meander search of the site. The vegetative goal for five years of monitoring is to have greater than 50% of the native plant species present to be classified as obligate or facultative wetland species from the DOT list. Diverse vegetation is the goal for the constructed areas.

The indicator of diversity for this project is to have at least half of the plants as follows. The shallow and deep marsh areas are represented by the taxa *Alisma triviale*, *Eleocharis* sp., *Sagittaria* (*S. latifolia* or *S. rigida*), *Bolboschoenus fluviatilis*, *Schoenoplectus* (*S. acutus*, *S. tabernaemontani*), *Typha* (*T. angustifolia*, *T. latifolia* or *T. glauca*) and *Lemna* (*L. minor* or *L. trisulca*). *Potamogeton* species may be anticipated in deep marsh and *Carex lacustris* in shallower water. In wet meadows (or shallow fringe areas), the genera *Carex* (could include: *C. stricta*, *C. lacustris*, *C. scoparia*, etc.), *Glyceria* (could include *G. canadensis*, *G. striata*, *G. grandis*), *Echinochloa* (could include *E. walteri*, *E. crus-galli*), *Polygonum* (could include *P. lapathifolium*, *P. pensylvanicum*, etc.), *Aster* sp. and *Solidago* sp. (obligate or facultative wet species) should be represented. *Calamagrostis candensis* may also be anticipated. If a mixture of the above taxa is establishing on the site rather than the dominance of one taxon, vegetational community diversity can be expected.

Methods

The first year of monitoring was conducted on the Roy Johnson Wetland Site in 1996. The site consists of seven impoundment cells representing shallow and deep marshes.

Monitoring took place in mid-August during the peak of the growing season. The methodology used is a modification of the method described by Millar (1973). Each impoundment cell was viewed as a separate entity. The cell to be monitored was first viewed from the highest point possible (usually one of the berms). From this point, the cell was categorized by its total plant species cover using a three point system as follows:

Closed: plant species coverage is sufficient to occlude from view all or almost all the water or soil within the cell.

Semi-open: plant species coverage is not sufficient to occlude from view all the water or soil within the cell. The cell has visible water and/or soil, and emergent plant species are present.

Open: all soil or water is visible within the cell and no emergent plant species are present.

Next, all plant species within the cell were identified and recorded. First the cell perimeter (transition zone between wetland and upland), and then the transition zone between any standing water and the underground was walked, followed by the center of the cell, if no open water exists. Any unknown plant species were collected and later identified in the Dr. John Thomson Herbarium, U.W. Superior [SUWS]. After all plant species were recorded, each was rated by its relative cover within the cell using a five point system as follows:

Abundant (A): the plant species has an areal coverage within the cell of 50% or greater, with regular occurrence.

Common (C): the plant species has an areal coverage within the cell between 10% and 50%, with regular occurrence.

Fairly Common (FC): the plant species has an areal coverage within the cell between 1% and 10%, with regular occurrence.

Occasional (OC): the plant species has an areal coverage within the cell of less than 1%, but more than one individual or group was sighted within the cell.

Rare (R): the plant species has an areal coverage within the cell of less than 1%, and only one individual or group was sighted within the cell.

Results

In 1997, a total of 84 plant species was recorded for all cells in the Roy Johnson Wetland Site. Of these species, 37 (44%) were obligate – OBL, 19 (23%) facultative wetland – FACW, 16 (19%) facultative – FAC, and 12 (14%) facultative upland – FACU (Reed 1988). No upland species were recorded.

Table 2 lists the number of species found in each cell. Cell D (the largest in area) had the greatest diversity with 46 plant species. All seven cells were categorized as being semi-open. Six plant taxa were found in all seven cells: *Alisma triviale* (OBL), *Bidens* sp. (OBL), *Eleocharis ovata* (OBL), *Phleum pratense* (FACU), *Polygonum hydropiperoides* (OBL), and *Rorippa* sp. (OBL). Of these, *Phleum pratense* would be considered undesirable because of its non-native, invasive wetland status (FACU). The presence of this species is a result of the seed mix used on the berms encroaching to the edge of the wetland cells. In addition, five other plant species were located in six of the cells. However, only one of these, *Plantago major* (FAC), is undesirable and probably due to preexistence, but not pre-settlement.

In 1999, a total of 63 plant species were recorded for all cells in the Johnson site. Of these species, 35 (54%) were obligate, 18 (29%) facultative wetland, 4 (6%) facultative, 6 (10%) facultative upland, and 1 (1%) upland.

Table 3, Roy Johnson Plant Species List 1999, lists the species found, indicator status according to Reed (1988), cells present, and occurrence (relative cover) within each cell. All seven cells A–G were recorded as being semi-open.

A master species lists was compiled for 1997 and 1999. In the master species list 104 species were found in the two years of monitoring (tab. 4). Twenty-four of these are representatives of wetland species indicating wetland health, created by the Department of Transportation ecologist, Dr. John Jackson. Six *Carex* spp., four *Juncus* spp., ten *Polygonum* spp., two *Scirpus* spp., two *Schoenoplectus* spp., and one *Bolboschoenus* sp. were found, and three *Trifolium* spp. were present.

Table 2: Roy Johnson Plant Species List 1997. The species found, indicator status, cells present, and occurrence (relative cover) within each cell (WIDOT 1997).

Species	IND	A	B	C	D	E	F	G	Cells Total
Acer rubrum	FAC					R			1
Agrostis hyemalis	FAC							OC	1
Agrostis perennans	FAC	C			OC				2
*Alisma triviale**	[OBL]	OC	OC	FC	OC	OC	OC	FC	7
Anemone canadensis	FACW							OC	1
Angelica atropurpurea	OBL							OC	1
Aster sp.*	FACW	OC							1
Betula papyrifera	FACU				R				1
Bidens sp.	(OBL)	OC	OC	OC	OC	OC	R	OC	7
*Bolboschoenus fluviatilis**	OBL		OC	OC					2
Brachyactis ciliata subsp. *angusta*	FAC				OC				1
*Calamagrostis canadensis**	OBL		OC					OC	2
Callitriche sp.	OBL			OC					1
*Carex rostrata**	OBL	OC		OC	OC				3
*Carex scoparia**	FACW	FC	OC	OC	FC	OC		FC	6
*Carex vulpinoidea**	OBL	OC	OC		OC	OC		FC	5
Carex sp.*	(FACW)	FC	FC					C	3
Chenopodium album	FAC		OC	OC					2
Cirsium arvense	FACU		OC					OC	2
Crataegus sp.	(FAC)			OC					1
*Echinochloa crus-galli**	FACW	R	OC	OC	R			OC	5
*Eleocharis ovata**	OBL	FC	FC	C	C	OC	C	FC	7
Elytrigia repens	[FACU]	FC		FC	FC				3
Epilobium palustre	OBL		OC					R	2
Equisetum arvense	FAC	OC	OC	OC	OC				4
Equisetum sylvaticum	FACW				OC				1
Festuca rubra	FAC		OC	FC	FC		FC		4
Fragaria sp.	(FAC)	R			OC				2
Galium trifidum	FACW							OC	1
*Glyceria grandis**	OBL	FC	OC	OC	OC				4
Gnaphalium uliginosum	(FACW)	OC		OC	OC			OC	4
Hieracium sp.	(FACU)				R				1
Hypericum canadense	FACW		FC	C	C	OC	FC		5
Impatiens capensis	FACW						FC		1
Juncus effusus	OBL		OC						1
Juncus tenuis	FAC	OC		OC	OC		OC		4
Latuca sp.	(FAC)							R	1
*Lemna minor**	OBL		OC		OC	OC		C	4
Lotus corniculatus	FAC	R	OC						2
Lycopus americanus	OBL	OC			OC				2
Lycopus × sp.	(OBL)	OC							1
Lysimachia ciliata	FACW	OC	OC	OC	FC	OC	R		6
Mentha arvensis	FACW		OC						1
Nuphar variegata	(OBL)							OC	1

Continuation tab. 2

Species	IND	A	B	C	D	E	F	G	Cells Total
Phalaris arundinacea	FACW		FC		OC			FC	3
Phleum pratense	FACU	OC	OC	OC	OC	OC	OC	OC	7
Plantago major	FAC	OC	OC	OC	OC	OC	OC		6
Poa sp.	(FAC)		OC						1
Polygonum achoreum	(FAC)	R							1
*Polygonum amphibium**	OBL							OC	1
Polygonum hydropiper	OBL		OC	OC					2
*Polygonum hydropiperoides**	OBL	OC	OC	OC	FC	OC	OC	OC	7
*Polygonum punctatum**	OBL	FC					R		2
*Polygonum sagittatum**	OBL							C	1
*Potamogeton foliosus**	OBL	FC		OC	OC				3
*Potamogeton natans**	OBL	OC		OC	OC				3
Prunella vulgaris	FAC	OC	OC	OC	OC	OC			5
Ranunculus acris	FACW	R	OC		R	R			4
Ranunculus pensylvanicus	OBL			R				FC	2
Ranunculus sp.	(FACW)	OC							1
Rorippa sp.	(OBL)	OC	OC	OC	OC	OC	OC	OC	7
Rosa sp.	(FACU)	OC							1
Rubus idaeus	FACU							OC	1
Rumex orbiculatus	OBL		OC	OC	OC	OC			4
Rumex sp.	(FACW)	OC			OC				2
*Sagittaria latifolia**	OBL		OC	OC	OC			C	4
*Sagittaria rigida**	OBL	OC							1
Salix sp.	(FACW)	OC	OC	OC	OC			OC	5
*Schoenoplectus tabernaemontani**	OBL		OC	OC	OC	OC		OC	5
Scirpus atrovirens	OBL	OC			OC				2
Scirpus cyperinus	OBL	C	OC	OC	FC	OC		C	6
Sium suave	OBL	OC							1
Solidago sp.	(FACU)		OC					OC	2
Sparganium sp.	(OBL)		OC	OC					2
Spiraea tomentosa	FACW				OC			OC	2
Stachys palustris	OBL				R			OC	2
Taraxacum officinale	FACU		OC						1
Trifolium arvense	(FACU)		OC			OC			2
Trifolium pratense	FACU		OC	OC	OC		R		4
Trifolium sp.	(FACU)	OC	OC						2
*Typha latifolia**	OBL							FC	1
Typha sp.*	(OBL)	FC	FC	C	C	FC	C		6
TOTAL SPECIES		42	41	36	46	20	14	35	84

C=Common; FC =Fairly Common; OC=Occasional; R=Rare. [ ] Denote the species has had a nomenclature change (following Gleason & Cronquist 1991). ( ) Denote the indicator status listed as the most likely one (species not determined or listed in Reed 1988). * Species are listed by Dr. John Jackson, Wisconsin DOT in mitigation plan. Updated scientific names have been checked following Wetter et. al. (2001).

Table 3: Roy Johnson Plant Species List, 1999. The species found, indicator status, cells present, and occurrence (relative cover) within each cell. (WIDOT 2000).

Species	IND	A	B	C	D	E	F	G	Total Cells
*Alisma triviale**	[OBL]	OC	OC	OC	OC	OC	OC	FC	7
Anemone canadensis	FACW							OC	1
Angelica atropurpurea	OBL							OC	1
Aster novae-angliae	FACW		OC		OC	OC			3
Bidens cernuus	OBL	OC	OC			R	OC	OC	5
Brassica sp.	(UPL)	OC							1
*Calamagrostis canadensis**	OBL							OC	1
Carex lacustris	OBL	OC	OC		OC				3
*Carex rostrata**	OBL	OC		OC	OC				3
Carex stricta	OBL					OC			1
*Carex vulpinoidea**	OBL	OC	FC	FC	OC			FC	5
Carex sp.*	(FACW)					OC			1
Cirsium sp	(FACU)		R			OC			2
Cyperus sp.	(FACW)		O						1
Eleocharis ovata	OBL	OC	OC	OC	OC	OC	OC	FC	7
Erigeron strigosus	FAC	R	OC	OC	OC	OC	OC		6
Glyceria grandis	OBL	OC							1
Helianthus giganteus	FACW				R				1
Hieracium sp.	(FACU)			R					1
Hypericum canadense	FACW	OC							1
Hypericum majus	FACW		OC						1
Impatiens capensis	FACW							OC	1
Juncus brevicaudatus	OBL			OC					1
Juncus effusus	OBL			OC		OC	OC	OC	4
Juncus filiformis	FACW		OC	OC					2
Lactuca sp.	(FAC)			R					1
*Lemna minor**	OBL	FC	C		OC	OC		C	5
Lotus corniculatus	FAC	OC	OC			OC			3
Lycopus americanus	FACW	OC	FC		OC				3
Lysimachia ciliata	FACW	OC	OC	OC	OC	OC		OC	6
Myriophyllum sp.	(OBL)		FC						1
Nuphar variegata	(OBL)							OC	1
Phalaris arundinacea	FACW			OC	OC				2
Phleum pratense	FACU	R	OC		OC		OC	OC	5
*Polygonum hydropiperoides**	OBL			OC	OC		OC	OC	4
*Polygonum lapathifolium**	FACW				OC				1
Polygonum pensylvanicum	OBL	OC							1
Polygonum persicaria	FACW	OC							1
*Polygonum sagittatum**	OBL				OC				1
Polygonum sp.	(FACW)				OC				1
*Potamogeton foliosus**	OBL	OC	OC	FC	FC		OC	OC	6
*Potamogeton natans**	OBL	OC	FC		OC	FC	OC		5
Ranunculus pensylvanicus	OBL							FC	1
Ranunculus sp.	(FACW)				R				1

Continuation tab. 3

Species	IND	A	B	C	D	E	F	G	Total Cells
Rorippa sp.	(OBL)				OC	OC		OC	3
Rosa sp.	(FACU)	OC	OC		OC	R			4
Rumex sp.	(FACW)	OC	OC	OC	OC				4
*Sagittaria rigida**	OBL		R	OC		OC			3
Salix sp.	(FACW)	OC	OC	OC		OC			4
Schoenoplectus pungens	OBL		OC						1
Schoenoplectus tabernaemontani	OBL	FC	OC	FC	OC	FC	OC	OC	7
Scirpus cyperinus	OBL	FC	FC	OC	FC	FC	FC	C	7
Scutellaria lateriflora	OBL				R				1
Sium suave	OBL		R	OC					2
Solidago sp.	(FACU)	OC		OC		OC			3
Sparganium americanum	OBL	OC							1
Spiraea alba	FACW	R				OC		OC	3
Stachys palustris	OBL		OC						1
Trifolium sp.	(FACU)		OC						1
Trillium sp.	(FAC)			R					1
Typha angustifolia	OBL		OC	OC		OC			3
*Typha latifolia**	OBL	C	C	C	C	C		FC	6
Typha sp.*	(OBL)						F		1
TOTAL SPECIES		28	31	24	27	20	13	23	63

C=Common; FC =Fairly Common; OC=Occasional; R=Rare. Underlined species were also found in the 1997 survey. [ ] Denote the species has had a nomenclature change (following Gleason & Cronquist 1991). ( ) Denote the indicator status listed as the most likely one (species not determined or listed in Reed 1988). * Species are listed by Dr. John Jackson, Wisconsin DOT in mitigation plan. Updated scientific names have been checked following Wetter et. al. (2001).

Table 4: Master species list 1997 & 1999.

Acer rubrum
Agrostis hyemalis
Agrostis perennans
*Alisma triviale**
Anemone canadensis
Angelica atropurpurea
Brachyactis ciliata subsp. *angusta* INT
Aster novae-angliae
Aster sp.*
Betula papyrifera
Bidens cernuus
Bidens sp.
*Bolboschoenus fluviatilis**
Brassica sp.
*Calamagrostis canadensis**
Callitriche sp.
Carex lacustris
*Carex rostrata**
*Carex scoparia**
Carex stricta
*Carex vulpinoidea**
Carex sp.*
Chenopodium album INT
Cirsium arvense
Cirsium sp.
Crataegus sp.
Cyperus sp.
*Echinochloa crus-galli** INT
*Eleocharis ovata**
Elytrigia repens INT
Epilobium palustre SC
Equisetum arvense
Equisetum sylvaticum
Erigeron strigosus
Festuca rubra INT
Fragaria sp.
Galium trifidum
Glyceria grandis
Gnaphalium uliginosum INT
Helianthus giganteus
Hieracium sp.
Hypericum canadense
Hypericum majus
Impatiens capensis
Juncus brevicaudatus >

Continuation tab. 4

Juncus filiformis
Juncus tenuis
Lactuca sp.
*Lemna minor**
Lotus corniculatus INT
Lycopus americanus
Lysimachia ciliata
Mentha arvensis
Myriophyllum sp.
Nuphar variegata
Phalaris arundinacea INT
Phleum pratense INT
Plantago major INT
Poa sp.
Polygonum achoreum
*Polygonum amphibium**
*Polygonum hydropiper** INT
*Polygonum hydropiperoides**
*Polygonum lapathifolium**
Polygonum pensylvanicum
Polygonum persicaria INT
*Polygonum punctatum**
*Polygonum sagittatum**
Polygonum sp.
*Potamogeton foliosus**
*Potamogeton natans**
Prunella vulgaris
Ranunculus acris INT
Ranunculus pensylvanicus
Ranunculus sp.
Rorippa sp.
Rosa sp.
Rubus idaeus
Rumex orbiculatus
Rumex sp.
*Sagittaria latifolia**
*Sagittaria rigida**
Salix sp.
Schoenoplectus pungens
Schoenoplectus tabernaemontani
Scirpus atrovirens
Scirpus cyperinus
Scutellaria lateriflora
Sium suave
Solidago sp.
Sparganium americanum
Sparganium sp.
Sphagnum sp.
Spiraea alba
Spiraea tomentosa
Stachys palustris
Taraxacum officinale INT
Trifolium arvense INT
*Trifolium pratense** INT
Trifolium sp.
Trillium sp.
Typha angustifolia INT
*Typha latifolia**
Typha sp.*

INT introduced species
SC special concern species
* cited in mitigation plan by Dr. John Jackson, Wisconsin DOT.

Discussion

In 1999, cell A had a total of 25 (40% of total species) plant species present. *Typha latifolia* was common. Three other species were recorded as fairly common: *Lemna minor*, *Scirpus cyperinus*, and *Schoenoplectus tabernaemontani*. Five taxa were only found in this cell and no other, including *Brassica* sp., *Glyceria grandis*, *Hypericum canadense*, *Polygonum persicaria*, and *Sparganium americanum*. This is interesting because hydrologically cell A is upstream of the remainder of the site.

Cell B was the most diverse of the cells, with 30 plant species present (48% of total species present). *Typha latifolia* was recorded as common. Five other species were fairly common within this cell: *Carex vulpinoidea*, *Lycopus americanus*, *Myriophyllum* sp., *Potamogeton natans*, and *Scirpus cyperinus*. Only two taxa were exclusive to this cell: *Hypericum majus* and *Myriophyllum* sp.

Cell C had 24 plant species present (38%), of which *Typha latifolia* was common. Three additional plant species were recorded as fairly common: *Carex vulpinoidea*, *Potamogeton foliosus*, and *Schoenoplectus tabernaemontani*. Four taxa were exclusive to this cell: *Juncus brevicaudatus*, *Lactuca* sp., *Polygonum pensylvanicum*, and *Trillium* sp. However, both, *Lactuca* and *Trillium* were recorded as rare.

Cell D had a total of 26 plant species present (41%). Only *Typha* was recorded as common. *Potamogeton foliosus* and *Scirpus cyperinus* were fairly common. Five taxa were exclusive to this cell: *Cyperus* sp., *Helianthus giganteus*, *Polygonum lapathifolium*, *Scuttellaria lateriflora*, and *Trifolium* sp.

Cell E had 19 plant species present (30%). Again, only *Typha latifolia* was common. Three plant species were recorded as fairly common: *Potamogeton natans*, *Scirpus cyperinus* and *Schoenoplectus tabernaemontani*. Only taxa, *Carex stricta* and *Hieracium* sp., were exclusive to this cell.

Cell F was the least diverse cell with 14 plant species present (22%). No taxa were common, and only two were recorded as fairly common: *Scirpus cyperinus*, and *Typha* sp. The *Typha* plants were stunted because of low water levels, and therefore did not grow to maturity (did not flower). Three taxa were exclusive to this cell: *Polygonum* sp., *Ranunculus* sp., and *Typha* sp. That is interesting because Cell F is hydrologically isolated from the rest of the cells.

Cell G was the second most diverse cell with a total of 29 plant species present (46%). Two plant species were common in this cell: *Lemna minor*, and *Scirpus cyperinus*. Six species were recorded as fairly common: *Alisma triviale*, *Carex vulpinoidea*, *Eleocharis ovata*, *Polygonum sagittatum*, *Ranunculus pensylvanicus*, and *Typha latifolia*. Seven taxa were exclusive to this cell: *Anemone canadensis*, *Angelica atropurpurea*, *Calamagrostis canadensis*, *Carex* sp., *Impatiens capensis*, *Nuphar variegata*, and *Ranunculus pensylvanicus*.

Conclusion

The vegetation objective was to have 50% or more of the plant species to be obligate or facultative wetland. This objective was met in the 1997 season, since 67% of the recorded species were either obligate or facultative wetland. In addition, 30% recorded species are listed by Dr. John Jackson in the monitoring plan. In 1997 it was the consultants observations that the site will probably develop in similar fashion to that of the Branca and Nelson Wetland Restoration Sites as described in the Wisconsin Department of Transportation (2000) 2nd biennial report. It has to be noticed that the first year after construction of a wetland restoration, the site is generally quite devoid of vegetation. In the following years, vegetation increases in both, diversity and coverage. Thus in the second year a significantly higher coverage of vegetation is expected at the Roy Johnson Wetland Site.

By 1999, the vegetation objective of this wetland was to have 50% or more of the plant species be obligate or facultative wetland. This objective was met in 1997, and continues to be met, since 83% of the recorded plant species are obligate (34) or facultative wetland (18) for a total of 52 species being either OBL or FACW.

The controlling requirement of a wetlands existence is the presence of hydrology, which in turn controls the presence or absence of hydrophytic vegetation. That hydrophytic vegetation dominates this site and in broad diversity is testament to the fact that the site is a wetland.

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