

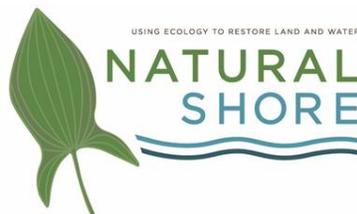
Deep Lake

Shore Restoration and Management Plan



Prepared for:
North Oaks Home Owners Association
100 Village Center Drive, Suite 240
North Oaks, MN 55127

Prepared by:
Natural Shore Technologies
1480 County Road 90
Independence, MN 55359



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INTRODUCTION

The North Oaks Homeowner Association (NOHOA) retained the services of Natural Shore Technologies to conduct an assessment of the Deep Lake shoreline and to create a shore restoration and management plan (SRMP). This work is intended to build upon previous studies completed by the Vadnais Lake Area Water Management Organization (VLAWMO) and the Ramsey County Soil & Water Conservation District to direct future shoreline management efforts.

The previous studies included a Sustainable Lake Management Plan and Shoreline Vegetation Survey, both conducted in 2018. These surveys serve as a base of information and knowledge to further develop this SRMP. The Sustainable Lake Management Plan presents a history of Deep Lake and the Shoreline Vegetation Survey provides a snapshot of plant species present on the shore.

This SRMP defines current shoreland health and identifies the opportunities and management strategies in order to achieve a high quality shoreland restoration. An emphasis is placed on buckthorn presence because it is the most widespread and impactful invasive species along the Deep Lake shoreline. This plan recommends strategies that will improve the diversity and health of the shoreland plant communities, enhance wildlife habitat at the critical interface between the aquatic and upland plant zones, and contribute to the enjoyment of resident experiences as they hike the lakeside trail system.

Specifically, this SRMP focuses on buckthorn presence and abundance in relation to existing plant communities. Together, these layers of information help to form priorities for future restoration projects and management activities along the Deep Lake shoreland.

NATURAL HISTORY/BACKGROUND

North Oaks has experienced a history of changing landscapes that began with conversion of native ecosystems into agricultural land, slowly transitioning into a mix of residential development and open space. Within North Oaks is a chain of lakes that has long provided drinking water to treatment facilities in St. Paul. Fluctuating lake levels due to varying pumping rates have caused shoreline erosion on many of the lakes within the chain.

Deep Lake is actually a relatively shallow body of water in the middle of the North Oaks chain of lakes. It is on the northern boundary of the VLAWMO watershed area. The lake is mostly surrounded by low density residential development and undeveloped forest and marshland. Previously, the MN DNR broadly classified the shoreline as northern mixed cattail marsh surrounded by northern wet meadow and southern dry-mesic oak forest. Over time, these areas have become muddled with the increasing encroachment of invasive species such as buckthorn, reed canary grass, garlic mustard, and purple loosestrife. While remnants of these plant communities still exist, they are in varying states of quality. This variation is dependent on the distribution of invasive species and also the encroachment of aggressive native species.

OVERALL SURVEY GOALS

The goal of this SRMP is to provide practical management recommendations that will work to improve the overall ecological quality of the Deep Lake shoreline. Controlling invasive species, introducing native plant species, and implementing long term monitoring and management strategies will significantly improve the ecological function of the critical interface between aquatic and upland habitats. This improvement in habitat will benefit birds, insects, mammals, amphibians, and other aquatic species. In addition, healthy native plant communities will improve the aesthetic and visual appeal for residents using the Deep Lake walking trail.

METHODS

Natural Shore Technologies conducted a plant survey in September of 2021. In particular, the study area centered on the shoreland buffer located between the walking path and open water. The survey detailed buckthorn presence and abundance, characterized existing native plant communities, and noted other invasive plant species. The shoreline was divided into individual segments that exhibited similar plant community types.

Field Survey Data Collected

Native Plant Community Characterization - Dominant native species, as well as invasive species, were noted within three distinct forest layers: canopy, understory, and herbaceous. The species observed helped create a characterization of the native plant community.

Canopy - large, mature trees

Understory - shrubs and young trees

Herbaceous - ground layer plants

Invasive species - buckthorn, reed canary grass, purple loosestrife, oriental bittersweet, phragmites, etc.

Native Plant Diversity Ranking

- 1 Very low quality/extremely degraded
- 2 Low quality/highly degraded
- 3 Medium quality/moderately degraded
- 4 High quality/minimally degraded

Buckthorn abundance ranking

0	Absent	
1	Very low cover	1-25% cover
2	Low cover	26-50% cover
3	Moderate cover	51-75% cover
4	High cover	76-100% cover

Buckthorn abundance examples - The following images are representative of the various buckthorn rankings found along the Deep Lake shoreline.

Rank 0: absent



Rank 1: 1-25% buckthorn cover



Rank 2: 26-50% buckthorn cover



Rank 3: 51-75% buckthorn cover



4: 76-100% buckthorn cover



Segment Lengths – Linear feet of a particular section of shoreline that exhibits similar plant communities and levels of buckthorn.

SURVEY RESULTS

Over two miles of shoreline were surveyed and separated into 27 individual segments that exhibited similar plant communities. Native plant communities are classified by their species makeup, hydrology, soils and landscapes on which they grow. Utilizing the native plant community characteristics, preliminary plant community classifications were assigned to each segment. Survey data was then analyzed to prioritize restoration strategies to improve shoreline habitat and diversity.

Three distinct plant communities were initially identified and briefly explained below. The MNDNR's *Field Guide to Native Plant Communities of Minnesota Eastern Broadleaf Forest Province* provides detailed descriptions of the various community classifications. These detailed descriptions have been included in the Appendices of this report. Northern mixed cattail marsh (MRn83, Appendix E) was also observed in transitional areas between shallow aquatic communities and wet meadows. However, emergent plant communities were not the focus of this study and therefore not included.

Plant Community Classifications

MHs37 - Southern dry-mesic oak forest: Dry-mesic hardwood forests occurring most often on thin, wind-deposited silt on crests and upper slopes dominated by northern red oak, white oak, and basswood (Appendix C).

WMn82a - Willow-dogwood shrub swamp: Open wetlands with abundant broad-leaved graminoids, and shrub cover typically greater than 25%. Shrubs that may be abundant include willows, red-osier dogwood, speckled alder, and occasionally bog birch (Appendix D).

WMn82b - Sedge meadow: Open wetlands with abundant broad-leaved graminoids, and shrub cover typically less than 25%. The invasive species common reed grass (*Phragmites australis australis*) and reed canary grass (*Phalaris arundinacea*) have become increasingly abundant in this community type over the past decades; reducing species diversity in many occurrences (Appendix D).

Figure 1 - Plant community distribution

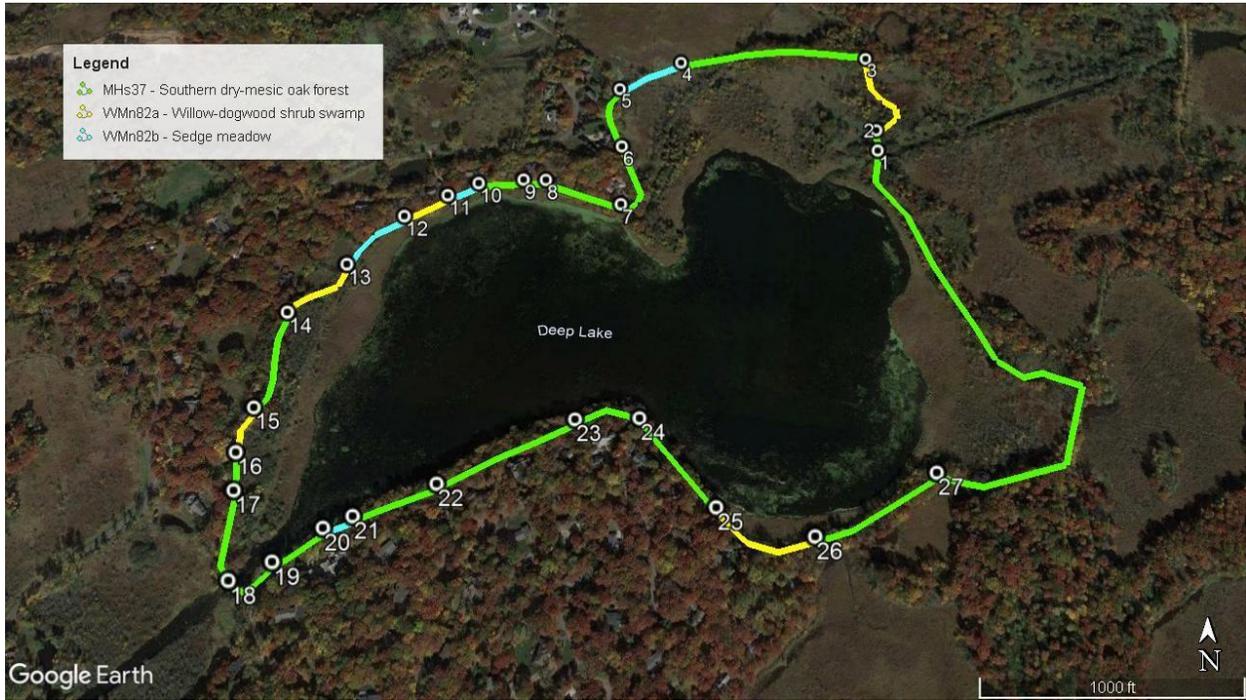


Figure 2 – Native plant diversity rankings



Figure 3 – Buckthorn abundance rankings



RESTORATION PRIORITIZATION

The results from the survey were analyzed to develop management recommendations. The buckthorn abundance rankings were compared to the native plant diversity rankings to determine which segments should be prioritized for management. Three categories of recommendations were created to guide initial management decisions (Table 1). Priority #1 is outlying areas with unique plant communities, very low buckthorn cover, and high plant diversity. Priority #2 are areas that exhibit high native plant diversity and low buckthorn abundance. Lastly, Priority #3 are areas with low native plant diversity and high buckthorn abundance. For planning purposes, Table 2 provides restoration cost ranges for high priority areas over a two-year time horizon. This information can be used for budgeting purposes. When applicable, NST staff can formulate detailed bids for specific segments under consideration. This will include buckthorn removal and methods to establish a diverse native plant community in its place. Tables 1 and 2 provide a solid framework for guiding future restoration efforts around Deep Lake.

Table 1 - Summary table with priority rankings for each shore segment.

Plant Community Classification	Segment	Plant Diversity Ranking (1-4)	Buckthorn Ranking (0-4)	Priority
MHs37 - Southern dry-mesic oak forest	1	1	3	3
	3	2	4	3
	5	1	2	3
	6	1	1	3
	7	4	1	1
	8	2	2	2
	9	2	1	2
	14	2	3	3
	16	2	3	3
	17	3	1	2
	18	2	2	2
	19	2	3	3
	21	4	2	2
	22	4	1	1
	23	1	0	1
24	2	2	2	
26	2	2	2	
27	3	2	2	
WMn82a - Willow-dogwood shrub swamp	2	3	2	2
	11	2	1	1
	13	3	1	1
	15	1	3	3
	25	2	4	3
WMn82b - Sedge meadow	4	1	1	1
	10	1	0	3
	12	1	0	3
	20	3	2	1

Table 2 - Restoration Priority #1 and associated cost estimates (buckthorn removal and replacement native plants/seed) - two-year time horizon.

Plant Community Classification	Segment	Cost Estimate	Recommended Timeline
MHs37 - Southern dry-mesic oak forest	7	\$3,000-6,000	2023
	22	\$3,000-6,000	2022
	23	\$5,000-8,000	2022
WMn82a - Willow-dogwood shrub swamp	11	\$5,000-8,000	2023
	13	\$5,000-8,000	2023
WMn82b - Sedge meadow	4	\$5,000-8,000	2023
	20	\$5,000-8,000	2022

NATURAL SHORE’S MAINTENANCE PROGRAM

Invasive buckthorn is the main concern affecting the ecological quality of native plant communities around Deep Lake. In particular, buckthorn is so successful because it has a longer growing season, grows rapidly, and tolerates a wide range of soil and light conditions. This provides buckthorn with a unique advantage over native plants as it outcompetes them for light, moisture, and nutrients. There are several different methods for controlling buckthorn. However, we have found that mechanical removal followed by a cut stump herbicide application works very well under most conditions. Buckthorn control is usually a multi-year process due to its high rate of seed production and long-term viability of seeds in the soil.

Monitoring and maintenance of the Deep Lake restoration is critical and ensures the long-term health, stability and resiliency of the shoreland. Monitoring is a valuable strategy for guiding the steps in the restoration process and fine tuning short and long term maintenance approaches. We focus on identifying invasive species, gauging cover, assessing the diversity of the native plant community, and evaluating establishment. Detailed notes are taken and these are shared with our clients.

REFERENCES

Deep Lake Shoreline Vegetation Survey, Vadnais Lake Area Management Organization, 2018
https://www.vlawmo.org/files/4815/4481/5795/DeepLake_Shoreline_Vegetation_Survey_Appendix_3.pdf

Deep Lake Sustainable Lake Management Plan, Ramsey County Soil & Water Conservation Division, Vadnais Lake Area Water Management Organization, 2018
https://www.vlawmo.org/files/9815/4776/2751/Deep_Lake_SLMP_Final.pdf

APPENDICES

Appendix A - Survey Data Collected 9/30/2021

Segment	Length (ft)	Photos	Buckthorn Cover	Quality (1 low - 4 high)	Notes/Plants
1	120	3634-35	60%	1	Buckthorn, white oak, red oak, black cherry, winterberry, gray dogwood. Near boardwalk
2	550	3636-39	50%	3	Higher priority (diversity plus boardwalk); difficult access for buckthorn removal due to boardwalk; aspen, glossy buckthorn, gray dogwood, red-osier dogwood, willow; lake sedge, sensitive fern
3	1000	3640-41	80%	2	Oak savannah (white, some red), basswood, aspen, cherry, honeysuckle
4	350	3642-44	5%	1	Reed canary grass (RCG) dominant, prickly ash, cattail; ties in with site #2
5	375	3645-47	30%	1	Cottonwood, box elder, common buckthorn, Virginia creeper, brome, garlic mustard, elm, lake sedge edge
6	400	3648-49	5%	1	Diane's Point; white oak, cottonwood, basswood, woodland sunflower, ash
7	375	3650-53	3%	4	Diane's Lakefront; poison ivy, basswood, white oak, red oak, sandbar willow, sumac, red-osier dogwood, Pennsylvania sedge, aster spp., Canada goldenrod; wet meadow-RCG, lake sedge, tussock, Canada blue-joint, sandbar willow; small patch of phragmites (pic 3653)

8	110	3654-55	50%	2	Common buckthorn, white oak, sumac; Canada goldenrod, woodland sunflower, leafy spurge
9	220	3656	20%	2	Common buckthorn, elm, basswood, white oak, sumac; RCG and purple loosestrife dominant
10	150	3657-58	0%	1	Wet meadow to path, could provide unique views; RCG and purple loosestrife; residential side buckthorn: 20%
11	225	3660-65	20%	2	Phragmites patch on south end (pic 65); aspen, basswood, maple, sumac, nannyberry, gray dogwood; RCG dominant; crack willow; Canada blue-joint, purple loosestrife; residential side: 5% buckthorn; buckthorn-high priority
12	350	3666	0%	1	Wet meadow-RCG, cattail, river bulrush, soft stem bulrush, purple loosestrife; cleared at some point; residential side: 0% buckthorn; could provide unique views
13	370	3667-69	10%	3	Aspen, crack willow, sandbar willow, buckthorn, red-osier dogwood, RCG, sensitive fern, sandbar willow, ash; Wet meadow-RCG-dom.-cat, lake sedge dominant, sensitive fern, red dogwood; residential side buckthorn: 20%
14	475	3670-79	70%	2	Cottonwood and ash dominant; black cherry, hackberry, red oak, aspen, burning bush, pagoda dogwood; residential side buckthorn: 0%; oriental bittersweet (pic 72-78); floodplain forest
15	215	3680	75%	1	Wet meadow: RCG with shrub-glossy buckthorn; red-osier dogwood, honeysuckle; residential buckthorn: <5%
16	175	3681	75%	2	Aspen dominant (aspen grove); elm, cranberry, black cherry, burning bush, cherry
17	380	3682-83	10%	3	White oak, cottonwood, sumac, buttonbush, pagoda dogwood, prairie cordgrass

18	205	3684-85	40%	2	Cottonwood, elm, willow, aspen, cherry, common buckthorn, RCG; parking area (high profile?)
19	230	3686-88	65%	2	Cottonwood, green ash, elm, walnut, red-osier dogwood; turf to edge
20	125	3689	20%	3	Wet meadow-lake sedge, RCG, Joe-pye weed; cottonwood, paper birch; turf to edge
21	360	3690-91	25%	4	High priority; birch, red oak, basswood, ironwood, black cherry; Pennsylvania sedge, fern, honeysuckle, buttonbush, serviceberry; good ground cover of Pennsylvania sedge
22	640	3692-93	<5%	4	Red oak dominant; ironwood, serviceberry, birch, basswood; good understory/ground layer; small buckthorn patch that would require low input to remove and significantly improve the reach
23	300	3696-97	0%	1	Turf ground layer; pruned trees; red oak dominant; white oak, maple, birch; Perfect for shore/emergent planting. Lacking emergents. Lacking understory.
24	500	98	50%	2	Red oak, cherry, common buckthorn, green ash, ironwood, white oak, winterberry, basswood, speckled alder, maple, cottonwood, birch
25	460	3702	80%		Lake sedge, sensitive fern, red-osier dogwood, wild yam (pics 3699-3701), elm, speckled alder, birch, aspen, sandbar willow, cranberry; residential side buckthorn: 80%
26	600	3713	50%	2	Red oak, basswood, elderberry, ironwood, box elder, aspen, white oak, birch; oriental bittersweet; Wet meadow (high quality)-lake sedge, RCG
27	2500	3703-05	50%	3	White oak, aspen, cherry, red oak, pagoda dogwood, glossy buckthorn, birch; Wet meadow (high quality)-Canada blue joint, tussock sedge

Appendix B - List of Plant Species Observed

Common names	Scientific names
American bittersweet	<i>Celastrus scandens</i>
American Common Reed	<i>Phragmites australis subsp. americanus</i>
American elm	<i>Ulmus americana</i>
American highbush cranberry	<i>Viburnum opulus var. americanum</i>
Aster spp.	
Basswood	<i>Tilia americana</i>
Black cherry	<i>Prunus serotina</i>
Black walnut	<i>Juglans nigra</i>
Box elder	<i>Acer negundo</i>
Buttonbush	<i>Cephalanthus occidentalis</i>
Canada bluejoint	<i>Calamagrostis canadensis</i>
Canada goldenrod	<i>Solidago canadensis</i>
Chokecherry	<i>Prunus virginiana</i>
Common buckthorn	<i>Rhamnus cathartica</i>
Cottonwood	<i>Populus deltoides</i>
Crack willow	<i>Salix X fragilis</i>
European Common Reed	<i>Phragmites australis subsp. australis</i>
Garlic mustard	<i>Alliaria petiolata</i>
Glossy buckthorn	<i>Frangula alnus</i>
Gray dogwood	<i>Cornus racemosa</i>
Green ash	<i>Fraxinus pennsylvanica</i>
Hackberry	<i>Celtis occidentalis</i>
Inland serviceberry	<i>Amelanchier interior</i>
Ironwood	<i>Ostrya virginiana</i>
Joe-pye weed	<i>Eutrochium maculatum</i>
Lake sedge	<i>Carex lacustris</i>
Leafy spurge	<i>Euphorbia virgata</i>
Nannyberry	<i>Viburnum lentago</i>
Narrow-leaf cattail	<i>Typha angustifolia</i>
Oriental bittersweet	<i>Celastrus orbiculatus</i>
Pagoda dogwood	<i>Cornus alternifolia</i>
Paper birch	<i>Betula papyrifera</i>
Pennsylvania sedge	<i>Carex pensylvanica</i>
Poison ivy	<i>Toxicodendron rydbergii</i>
Prairie cordgrass	<i>Spartina pectinata</i>
Prickly ash	<i>Zanthoxylum americanum</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Quaking aspen	<i>Populus tremuloides</i>

Red oak	<i>Quercus rubra</i>
Red-oiser dogwood	<i>Cornus sericea</i>
Reed canary grass	<i>Phalaris arundinacea</i>
River bulrush	<i>Bolboschoenus fluviatilis</i>
Sandbar willow	<i>Salix interior</i>
Sensitive fern	<i>Onoclea sensibilis</i>
Siberian elm	<i>Ulmus pumila</i>
Smooth brome	<i>Bromus inermis</i>
Smooth sumac	<i>Rhus glabra</i>
Softstem bulrush	<i>Schoenoplectus tabernaemontani</i>
Speckled alder	<i>Alnus incana</i>
Sugar maple	<i>Acer saccharum</i>
Tartarian honeysuckle	<i>Lonicera tatarica</i>
Tussock sedge	<i>Carex stricta</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>
White oak	<i>Quercus alba</i>
Wild yam	<i>Dioscorea villosa</i>
Winged burning bush	<i>Euonymus alatus</i>
Winterberry	<i>Ilex verticillata</i>
Woodland sunflower	<i>Helianthus strumosus</i>



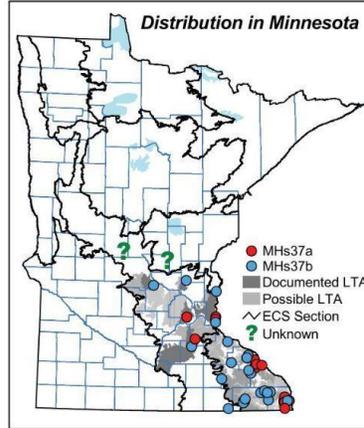
Southern Dry-Mesic Oak Forest

Dry-mesic hardwood forests occurring most often on thin, wind-deposited silt on crests and upper slopes of bedrock bluffs and less often on hummocky stagnation moraines in calcareous, partially sorted drift.

Vegetation Structure & Composition

Description is based on summary of vegetation data from 43 plots (relevés).

- **Ground-layer** cover varies from patchy to continuous (25–100%); important species include lady fern (*Athyrium filix-femina*), pointed-leaved tick trefoil (*Desmodium glutinosum*), Clayton's sweet cicely (*Osmorhiza claytonii*), common enchanter's nightshade (*Circaea lutetiana*), wild geranium (*Geranium maculatum*), hog peanut (*Amphicarpaea bracteata*), and white snakeroot (*Eupatorium rugosum*).
- **Shrub-layer** cover is patchy to interrupted (25–75%); common species include northern red oak and black cherry saplings, chokecherry (*Prunus virginiana*), American hazelnut (*Corylus americana*), Missouri gooseberry (*Ribes missouriense*), and pagoda dogwood (*Cornus alternifolia*).
- **Subcanopy** cover is patchy to interrupted (25–75%); important species include basswood, black cherry, northern red oak, white oak, and shagbark hickory.
- **Canopy** cover is interrupted to continuous (50–100%); the most common species are northern red oak, white oak, and basswood. Shagbark hickory is occasionally present in the PPL.



Landscape Setting & Soils

- **Loess-covered bedrock hills**—Common. Present mainly on crests and upper slopes of bedrock bluffs. Most common on north-facing aspects on steeper slopes but also present on west- or east-facing crests and middle to upper slopes. Parent material is a mantle of wind-deposited silt deeper than 30in (75cm) over older soils, with texture that reflects the composition of the underlying sedimentary bedrock. Depths to bedrock generally exceed 60in (150cm). The silt is typically stoneless, but the soil becomes very stony just above the bedrock. Soils have dark surface horizons, indicating former occupation of these sites by oak or aspen woodland. Soils are well drained, and the soil moisture regime is fresh. (Blufflands in PPL)
- **Stagnation moraines & till plains**—Rare. Present on hummocky stagnation moraines and rolling parts of till plains. Parent material is calcareous, partially sorted drift. The surface is generally loamy but soils become sandy and gravelly at depth. Soil surface horizons are dark, indicating former occupation of these sites by oak woodland or prairie. Soils are well drained, and the soil moisture regime is fresh. (Big Woods, St. Paul-Baldwin Plains and Moraines, and Oak Savanna in MIM; Rochester Plateau in PPL)

Natural History

In the past, catastrophic disturbances were rare in MHs37. An analysis of Public Land Survey records indicates that the rotation of catastrophic fires was in excess of 1,000 years, and the rotation of catastrophic windthrow was about 390 years. Events that resulted in partial loss of trees, especially light surface fires, were much more common, with an estimated rotation of about 20 years. Based on the historic composition and age structure of these forests, MHs37 had two growth stages separated by a long period of transition.



- **0–55 years**—Young forests recovering from fire or wind, dominated by northern red oak mixed with some white oak, basswood, and American elm.
- **55–95 years**—A transition period marked by a gradual decline in northern red oak and increases in basswood, white oak, American elm, and ironwood.
- **> 95 years**—Mature forests consisting of mixed stands of white oak, basswood, northern red oak, and American elm.

Similar Native Plant Community Classes

● **MHs38 Southern Mesic Oak-Basswood Forest**

MHs37 and MHs38 share many species and can be very similar. The ranges of the two classes overlap in east-central and southeastern Minnesota; MHs38 usually occurs on more mesic sites and is more likely to have abundant sugar maple in the canopy.

MHs37 Indicator Species	(freq%)		MHs38 Indicator Species	(freq%)	
	MHs37	MHs38		MHs37	MHs38
Shagbark hickory (C,U)	33	1	Bladdernut (<i>Staphylea trifolia</i>)	-	16
Clearweed (<i>Pilea</i> spp.)	28	3	Wild leek (<i>Allium tricoccum</i>)	2	27
Spinulose shield fern or Glandular wood fern*	26	3	Long-stalked sedge (<i>Carex pedunculata</i>)	2	27
Tall blackberries**	28	4	Blue beech (U)	2	23
Black raspberry (<i>Rubus occidentalis</i>)	30	5	Canada moonseed (<i>Menispermum canadense</i>)	2	21
Bracken (<i>Pteridium aquilinum</i>)	40	9	Nodding trillium (<i>Trillium cernuum</i>)	2	19
Woodland sunflower (<i>Helianthus strumosus</i>)	26	6	Sharp-lobed hepatica (<i>Anemone acutiloba</i>)	7	38
White snakeroot (<i>Eupatorium rugosum</i>)	65	19	Wild ginger (<i>Asarum canadense</i>)	14	43

* Spinulose shield fern or Glandular wood fern (*Dryopteris carthusiana* or *D. intermedia*) ** Tall blackberries (*Rubus allegheniensis* and similar *Rubus* spp.)

● **FDs38 Southern Dry-Mesic Oak-Hickory Woodland**

The range of FDs38 overlaps with MHs37 in the far southeastern part of Minnesota. FDs38 occurs on steep fire-prone slopes and is much more likely than MHs37 to contain species commonly found in prairies.

MHs37 Indicator Species	(freq%)		FDs38 Indicator Species	(freq%)	
	MHs37	FDs38		MHs37	FDs38
Spreading Jacob's ladder (<i>Polemonium reptans</i>)	47	-	Eastern red cedar (U)	-	29
Bloodroot (<i>Sanguinaria canadensis</i>)	40	-	Canadian black snakeroot (<i>Sanicula canadensis</i>)	-	29
Early meadow-rue (<i>Thalictrum dioicum</i>)	35	-	Wild bergamot (<i>Monarda fistulosa</i>)	-	24
Round-leaved dogwood (<i>Cornus rugosa</i>)	30	-	Heart-leaved alexanders (<i>Zizia aptera</i>)	-	24
American spikenard (<i>Aralia racemosa</i>)	30	-	Northern pin oak (U)	7	53
Virginia waterleaf (<i>Hydrophyllum virginianum</i>)	30	-	Greenbrier (<i>Smilax tamnoides</i>)	9	59
Maidenhair fern (<i>Adiantum pedatum</i>)	56	6	Quaking aspen (C,U)	5	35
Blue cohosh (<i>Caulophyllum thalictroides</i>)	47	6	Elim-leaved goldenrod (<i>Solidago ulmifolia</i>)	14	53

● **MHc36 Central Mesic Hardwood Forest (Eastern)**

MHc36 generally occurs north of MHs37, although the ranges of the two classes overlap in east-central Minnesota. MHc36 is more likely than MHs37 to occur on loamy rather than sandy or gravelly soils.

MHs37 Indicator Species	(freq%)		MHc36 Indicator Species	(freq%)	
	MHs37	MHc36		MHs37	MHc36
Spreading Jacob's ladder (<i>Polemonium reptans</i>)	47	-	Mountain rice grass (<i>Oryzopsis asperifolia</i>)	-	60
Box elder (U)	79	1	Large-flowered trillium (<i>Trillium grandiflorum</i>)	-	52
White snakeroot (<i>Eupatorium rugosum</i>)	65	1	Leatherwood (<i>Dicra palustris</i>)	-	38
Missouri gooseberry (<i>Ribes missouriense</i>)	63	2	Large-leaved aster (<i>Aster macrophyllus</i>)	2	77
Hackberry (C,U)	60	2	Rose twistedstalk (<i>Streptopus roseus</i>)	2	56
Cleavers (<i>Galium aparine</i>)	40	5	Long-stalked sedge (<i>Carex pedunculata</i>)	2	56
Wild grape (<i>Vitis riparia</i>)	79	10	Blue beech (U)	2	40
White oak (C,U)	67	11	Pale bellwort (<i>Uvularia sessilifolia</i>)	7	54

● **FDs37 Southern Dry-Mesic Oak (Maple) Woodland**

FDs37 can be similar to MHs37 but is more likely to occur on fine sand or sand-gravel soils than on loamy soils. FDs37 occurs on sites more affected by fire in the recent past and therefore is more likely than MHs37 to have open-grown trees in the canopy.

MHs37 Indicator Species	(freq%)		FDs37 Indicator Species	(freq%)	
	MHs37	FDs37		MHs37	FDs37
Maidenhair fern (<i>Adiantum pedatum</i>)	56	-	Mountain rice grass (<i>Oryzopsis asperifolia</i>)	-	42
Spreading Jacob's ladder (<i>Polemonium reptans</i>)	47	-	Large-leaved aster (<i>Aster macrophyllus</i>)	2	51
Gregarious black snakeroot (<i>Sanicula gregaria</i>)	58	4	Bush honeysuckle (<i>Diervilla lonicera</i>)	2	36
Bitternut hickory (C,U)	56	4	Red maple (C,U)	7	67
Sugar maple (C,U)	51	4	Pale bellwort (<i>Uvularia sessilifolia</i>)	7	62
White snakeroot (<i>Eupatorium rugosum</i>)	65	7	Quaking aspen (C,U)	5	29
Hackberry (C,U)	60	9	Spreading dogbane (<i>Apocynum androsaemifolium</i>)	7	40
Honeysuckle (<i>Cryptotaenia canadensis</i>)	72	13	Northern pin oak (C,U)	23	60

**Native Plant Community Types in Class****• MHs37a Red Oak - White Oak Forest**

Canopy is dominated by northern red oak, often with white oak and (in the PPL) shagbark hickory. Basswood and box elder are present in the subcanopy in most stands. Northern red oak, box elder, basswood, and black cherry are commonly present in the shrub layer with chokecherry, poison ivy (*Toxicodendron rydbergii*), prickly gooseberry (*Ribes cynosbati*), American hazelnut, and red raspberry (*Rubus idaeus*). MHs37a is distinguished from MHs37b by lower abundance of sugar maple. When present, round-leaved dogwood (*Cornus rugosa*), red-berried elder (*Sambucus racemosa*), American spikenard (*Aralia racemosa*), spinulose shield fern or glandular wood fern (*Dryopteris carthusiana* or *D. intermedia*), woodland sunflower (*Helianthus strumosus*), Canada mayflower (*Maianthemum canadense*), and wild lettuce (*Lactuca* spp.) also help to distinguish MHs37a from MHs37b. Documented in the PPL and MIM. Description is based on summary of vegetation data from 20 plots.

• MHs37b Red Oak - White Oak - (Sugar Maple) Forest

Canopy is most often dominated by northern red oak or white oak. Some stands may have abundant northern pin oak, bur oak, or white pine. Ironwood is common in the understory, with occasional sugar maple, black cherry, basswood, and other tree species. Bitternut hickory and black cherry are frequently present in the shrub layer with American hazelnut, chokecherry, Missouri gooseberry, prickly ash (*Zanthoxylum americanum*), and pagoda dogwood. Species that can help to distinguish MHs37b from MHs37a include sugar maple or green ash in the canopy or subcanopy, along with prickly ash, black raspberry (*Rubus occidentalis*), stinging nettle (*Urtica dioica*), wood nettle (*Laportea canadensis*), rugulose or yellow violet (*Viola canadensis* or *V. pubescens*), touch-me-not (*Impatiens* spp.), and starry sedge (*Carex rosea*). Documented in the PPL and MIM. Description is based on summary of vegetation data from 23 plots.



Scott County, MN

photo by D.S. Wovcha MN DNR



MHs37 Southern Dry-Mesic Oak Forest – Species Frequency & Cover

	freq%	cover		freq%	cover					
Forbs, Ferns & Fern Allies										
Lady fern (<i>Athyrium filix-femina</i>)	91	••	Virginia creeper (<i>Parthenocissus</i> spp.)	86	••					
Pointed-leaved tick trefoil (<i>Desmodium glutinosum</i>)	88	••	Wild grape (<i>Vitis riparia</i>)	79	••					
Clayton's sweet cicely (<i>Osmorhiza claytonii</i>)	86	••	Low Shrubs							
Common enchanter's nightshade (<i>Circaea luteotiana</i>)	81	••	Red raspberry (<i>Rubus idaeus</i>)	42	••					
Wild geranium (<i>Geranium maculatum</i>)	79	••	Black raspberry (<i>Rubus occidentalis</i>)	30	••					
Honeysuckle (<i>Cryptotaenia canadensis</i>)	72	••	Tall blackberries (<i>Rubus allegheniensis</i> and similar <i>Rubus</i> spp.)	28	••					
White avens (<i>Geum canadense</i>)	72	••	Shrubs							
Lopseed (<i>Phytolacca leptostachya</i>)	72	••	Chokecherry (<i>Prunus virginiana</i>)	79	••					
Hog peanut (<i>Amphicarpaea bracteata</i>)	70	••	American hazelnut (<i>Corylus americana</i>)	72	••					
White snakeroot (<i>Eupatorium rugosum</i>)	65	••	Missouri gooseberry (<i>Ribes missouriense</i>)	63	••					
Common false Solomon's seal (<i>Smilacina racemosa</i>)	65	••	Poison ivy (<i>Toxicodendron rydbergii</i>)	63	••					
Large-flowered bellwort (<i>Uvularia grandiflora</i>)	63	••	Pagoda dogwood (<i>Cornus alternifolia</i>)	58	••					
Gregarious black snakeroot (<i>Sanicula gregaria</i>)	58	••	Prickly gooseberry (<i>Ribes cynosbati</i>)	51	••					
Maidenhair fern (<i>Adiantum pedatum</i>)	56	••	Gray dogwood (<i>Cornus racemosa</i>)	42	••					
Wild sarsaparilla (<i>Aralia nudicaulis</i>)	56	••	Round-leaved dogwood (<i>Cornus rugosa</i>)	30	••					
Jack-in-the-pulpit (<i>Arisaema triphyllum</i>)	56	••	Nannyberry (<i>Viburnum lentago</i>)	26	••					
Sweet-scented bedstraw (<i>Galium triflorum</i>)	53	••	Trees							
Rattlesnake fern (<i>Botrychium virginianum</i>)	51	••	Trees		Canopy		Subcanopy		Shrub Layer	
Spreading Jacob's ladder (<i>Polemonium reptans</i>)	47	••	freq%	cover	freq%	cover	freq%	cover	freq%	cover
Blue cohosh (<i>Gaultherium thalictroides</i>)	47	••	Northern red oak	91	•••••	35	••	72	••	
Erect, Smooth, or Illinois carrion-flower*	44	••	White oak	67	•••••	30	••	28	••	
Wood anemone (<i>Anemone quinquefolia</i>)	42	••	Basswood	51	••	74	••	60	••	
Red baneberry (<i>Actaea rubra</i>)	42	••	American elm	40	•••	51	••	40	••	
Bracken (<i>Pteridium aquilinum</i>)	40	••	Sugar maple	35	••	49	••	28	••	
Cleavers (<i>Galium aparine</i>)	40	••	Black cherry	33	••	67	••	70	••	
Bloodroot (<i>Sanguinaria canadensis</i>)	40	••	Ironwood	30	••	56	••	35	••	
Early meadow-rue (<i>Thalictrum dioicum</i>)	35	••	Bur oak	30	•••	12	••	12	••	
Maryland black snakeroot (<i>Sanicula marilandica</i>)	35	••	Red elm	30	•••	51	••	51	••	
Zigzag goldenrod (<i>Solidago flexicaulis</i>)	33	••	Shagbark hickory	28	••	30	••	28	••	
Clearweed (<i>Pilea</i> spp.)	28	••	Northern pin oak	23	••••	-	-	-	-	
Grasses & Sedges						Hackberry	23	••	47	••
Starry sedge (<i>Carex rosea</i>)	37	••	Paper birch	21	••	-	-	-	-	
Pennsylvania sedge (<i>Carex pennsylvanica</i>)	35	••	Bitternut hickory	19	••	37	••	56	••	
Bland sedge (<i>Carex blanda</i>)	23	••	Box elder	14	••	56	••	67	••	

* Erect, Smooth, or Illinois carrion-flower (*Smilax ecirrata*, *S. herbacea*, or *S. illinoensis*)

WMn82

WET MEADOW/CARR SYSTEM
Northern Floristic Region

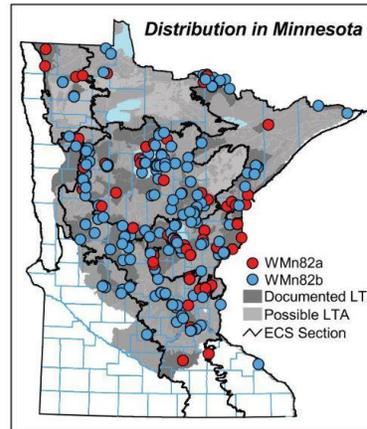
Northern Wet Meadow/Carr

Open wetlands dominated by dense cover of broad-leaved graminoids or tall shrubs. Present on mineral to sapric peat soils in basins and along streams.

Vegetation Structure & Composition

Description is based on summary of vegetation data from 293 plots (relevés) and moss data from 23 bryophyte plots.

- **Moss** cover most often is < 5% but can range to > 75%. Brown mosses are usually dominant, but *Sphagnum* can be dominant on some sites.
- **Graminoid** layer consists of dense stands of mostly broad-leaved graminoids, including bluejoint (*Calamagrostis canadensis*), lake sedge (*Carex lacustris*), tussock sedge (*C. stricta*), and beaked sedge (*C. utriculata*).
- **Forb** cover is variable, with tufted loosestrife (*Lysimachia thyrsiflora*), marsh bellflower (*Campanula aparinoides*), marsh skullcap (*Scutellaria galericulata*), and great water dock (*Rumex orbiculatus*) common, and small or three-cleft bedstraw (*Galium tinctorium* or *G. trifidum*), bulb-bearing water hemlock (*Cicuta bulbifera*), northern bugleweed (*Lycopus uniflorus*), linear-leaved, marsh, or downy willow-herb (*Epilobium leptophyllum*, *E. palustre*, or *E. strictum*), water smartweed (*Polygonum amphibium*), and northern marsh fern (*Thelypteris palustris*) occasional.
- **Shrub** cover is variable. Tall shrubs such as willows (*Salix* spp.), red-osier dogwood (*Cornus sericea*), and speckled alder (*Alnus incana*) can be dense, along with meadowsweet (*Spiraea alba*). Paper birch, black ash, red maple, American elm, and tamarack saplings are occasionally present in the shrub layer.
- **Trees** taller than 16ft (5m) are rarely present and if so, have low cover (< 25%).



Landscape Setting & Soils

WMn82 occurs in wetland basins on a variety of landforms. It is also associated with streams and drainageways, drained beaver ponds, shallow bays, and semifloating mats on lakes. Soils range from mineral or muck soil to sapric peat. Organic sediments are typically shallow but can be deep (> 15in [40cm]) in basins filled by sedimentary peat or where WMn82 has succeeded an Open Rich Peatland community following changes to the hydrology of the basin.

Natural History

WMn82 is subjected to moderate inundation following spring runoff and heavy rains, and periodic drawdowns during summer. Peak water levels are high enough and persistent enough to prevent trees (and often shrubs) from becoming established, although there may be little or no standing water much of the growing season. As a result of water-level fluctuations, the surface substrate alternates between aerobic and anaerobic conditions. Any organic matter that may accumulate over time is usually oxidized during drawdowns following drought or is removed by fire. Where deep peat is present in the community, it likely was formed previously on the site by a peat-producing community—such as a forested rich peatland—that was flooded by beaver activity and ultimately converted to a wet meadow. Deep peat may also develop from debris settling into basins with standing water, forming sedimentary peat. Because surface water in WMn82 is derived from runoff, stream flow, and groundwater sources, it has circumneutral pH (6.0–8.0) and high mineral and nutrient content. Although mosses are typically sparse in WMn82 because of alternating flooding and drawdown, moss cover can be relatively



high in settings where water levels have become stabilized. In these situations, it appears that *Sphagnum* can quickly invade the community, especially on floating mats that are completely above the water surface. The water chemistry in these sites can be rapidly converted by *Sphagnum* to rich fen or even poor fen conditions before characteristic wet meadow species, especially wide-leaved sedges, have been replaced by plants of rich or poor fens such as narrow-leaved sedges. The process of succession of WMn82 to rich or poor fens is readily reversed by return of higher or more variable water levels, such as from beaver activity or variation in precipitation.

Similar Native Plant Community Classes

● **OPn81 Northern Shrub Shore Fen**

OPn81 often has abundant broad-leaved graminoids and can appear similar to occurrences of WMn82 with abundant speckled alder (WMn82a). OPn81 typically occurs on deep peat, often along lakeshores, and is more likely to have high cover of leatherleaf (*Chamaedaphne calyculata*), bog birch (*Betula pumila*), or sweet gale (*Myrica gale*) in addition to speckled alder. WMn82 commonly occurs on mineral soil or shallow peat and is often situated away from lakeshores; WMn82 is more likely to have abundant willows and red-osier dogwood in addition to speckled alder.

WMn82 Indicator Species	(freq%)		OPn81 Indicator Species	(freq%)	
	WMn82	OPn81		WMn82	OPn81
Touch-me-not (<i>Impatiens</i> spp.)	54	2	Small cranberry (<i>Vaccinium oxycoccos</i>)	-	30
Labrador bedstraw (<i>Galium labradoricum</i>)	24	2	Bog rosemary (<i>Andromeda glaucophylla</i>)	-	19
Cut-leaved bugleweed (<i>Lycopus americanus</i>)	20	2	Round-leaved sundew (<i>Drosera rotundifolia</i>)	1	23
Mad dog skullcap (<i>Scutellaria lateriflora</i>)	20	2	Leatherleaf (<i>Chamaedaphne calyculata</i>)	6	88
Pussy willow (<i>Salix discolor</i>)	56	9	Black spruce (C,U)	3	40
Spotted Joe pye weed (<i>Eupatorium maculatum</i>)	54	9	Labrador tea (<i>Ledum groenlandicum</i>)	3	35
Bebb's willow (<i>Salix bebbiana</i>)	46	9	Tamarack (U)	4	37
Bulb-bearing water hemlock (<i>Cicuta bulbifera</i>)	54	16	Balsam willow (<i>Salix pyrifolia</i>)	9	49

● **FPn73 Northern Rich Alder Swamp**

FPn73 may resemble occurrences of WMn82 that have significant amounts of speckled alder (WMn82a). FPn73 is typically associated with other communities of the Forested Rich Peatland System and is more likely to have trees > 6ft (2m) tall, including paper birch, red maple, and black ash, and shade-tolerant swamp forest species in the ground layer.

WMn82 Indicator Species	(freq%)		FPn73 Indicator Species	(freq%)	
	WMn82	FPn73		WMn82	FPn73
Cut-leaved bugleweed (<i>Lycopus americanus</i>)	20	2	Starflower (<i>Trientalis borealis</i>)	1	50
Swamp milkweed (<i>Asclepias incarnata</i>)	16	2	Bunchberry (<i>Cornus canadensis</i>)	1	48
Water smartweed (<i>Polygonum amphibium</i>)	29	5	Canada mayflower (<i>Maianthemum canadense</i>)	1	43
Tussock sedge (<i>Carex stricta</i>)	47	11	Three-fruited bog sedge (<i>Carex trisperma</i>)	1	27
Slender willow (<i>Salix petiolaris</i>)	71	18	Lowbush or Velvet-leaved blueberry*	1	27
Beaked sedge (<i>Carex utriculata</i>)	27	9	Labrador tea (<i>Ledum groenlandicum</i>)	3	50
Bebb's willow (<i>Salix bebbiana</i>)	46	16	White cedar (C,U)	1	23
Bulb-bearing water hemlock (<i>Cicuta bulbifera</i>)	54	20	Balsam fir (C,U)	4	45

*Lowbush or Velvet-leaved blueberry (*Vaccinium angustifolium* or *V. myrtilloides*)

Native Plant Community Types in Class

● **WMn82a Willow - Dogwood Shrub Swamp**

Open wetlands with abundant broad-leaved graminoids, and shrub cover typically > 25%. Shrubs that may be abundant include willows, red-osier dogwood, speckled alder, and occasionally bog birch. Description is based on summary of vegetation data from 69 plots.

● **WMn82b Sedge Meadow**

Open wetlands with abundant broad-leaved graminoids, and shrub cover typically < 25%. The invasive species common reed grass (*Phragmites australis*) and reed canary grass (*Phalaris arundinacea*) have become increasingly abundant in this community type over the past several decades, reducing species diversity in many occurrences. WMn82b is divided into four subtypes, based on dominant graminoid species. Description is based on summary of vegetation data from 224 plots.

- WMn82b1 Bluejoint Subtype
- WMn82b2 Tussock Sedge Subtype
- WMn82b3 Beaked Sedge Subtype
- WMn82b4 Lake Sedge Subtype



photo by E.R. Rowe MN DNR



Becker County, MN



WMn82 Northern Wet Meadow/Carr — Species Frequency & Cover

	freq%	cover		freq%	cover
Grasses & Sedges					
Bluejoint (<i>Calamagrostis canadensis</i>)	80	●●●●	Sensitive fern (<i>Onoclea sensibilis</i>)	20	●
Lake sedge (<i>Carex lacustris</i>)	72	●●●●	Common mint (<i>Mentha arvensis</i>)	19	●
Tussock sedge (<i>Carex stricta</i>)	41	●●●●	Red-stemmed aster (<i>Aster puniceus</i>)	19	●
Beaked sedge (<i>Carex utriculata</i>)	33	●●●●	Marsh vetchling (<i>Lathyrus palustris</i>)	17	●
Fen wiregrass sedge (<i>Carex lasiocarpa</i>)	29	●●●●	Common marsh marigold (<i>Caltha palustris</i>)	17	●
Woolgrass (<i>Scirpus cyperinus</i>)	22	●●	Cut-leaved bugleweed (<i>Lycopus americanus</i>)	17	●
Aquatic sedge (<i>Carex aquatilis</i>)	11	●●●	Long-leaved chickweed (<i>Stellaria longifolia</i>)	13	●
Forbs, Ferns & Fern Allies					
Tufted loosestrife (<i>Lysimachia thyrsiflora</i>)	59	●●	Bog aster (<i>Aster borealis</i>)	12	●
Marsh bellflower (<i>Campanula aparinoides</i>)	58	●●	Mad dog skullcap (<i>Scutellaria lateriflora</i>)	12	●
Marsh skullcap (<i>Scutellaria galeniculata</i>)	53	●●	Giant goldenrod (<i>Solidago gigantea</i>)	12	●
Great water dock (<i>Rumex orbiculatus</i>)	52	●●	Big-leaf white violet or Northern white violet**	12	●
Three-o'leif or small bedstraw (<i>Galium trifidum</i> or <i>G. tinctorium</i>)	46	●●	Lesser-duckweed (<i>Lemna minor</i>)	12	●
Bull-bearing water hemlock (<i>Callitriche bulbifera</i>)	46	●●	Dwarf raspberry (<i>Rubus pubescens</i>)	11	●
Northern bugleweed (<i>Lycopus uniflorus</i>)	45	●●	Sweet flag (<i>Acorus calamus</i>)	11	●●
Linear-leaved, Marsh, or Downy willow-herb*	44	●●	Rough cinquefoil (<i>Potentilla norvegica</i>)	11	●
Water smartweed (<i>Polygonum amphibium</i>)	42	●●	Common boneset (<i>Eupatorium perfoliatum</i>)	11	●
Northern marsh tern (<i>Thelypeltis palustris</i>)	40	●●	Water horsetail (<i>Equisetum fluviatile</i>)	10	●
Touch-me-not (<i>Impatiens</i> spp.)	39	●●	Low Shrubs		
Marsh cinquefoil (<i>Potentilla palustris</i>)	38	●●	Red raspberry (<i>Rubus idaeus</i>)	13	●
Spotted Joe pye weed (<i>Eupatorium maculatum</i>)	34	●●	Tall Shrubs		
Broad-leaved cattail (<i>Typha latifolia</i>)	32	●●	Slender willow (<i>Salix petiolaris</i>)	42	●●●●
Arrow-leaved tearthumb (<i>Polygonum sagittatum</i>)	28	●●	Pussy willow (<i>Salix discolor</i>)	29	●●
Crested fern (<i>Dryopteris cristata</i>)	24	●●	Red-osier dogwood (<i>Cornus sericea</i>)	24	●●
Marsh St. John's wort (<i>Triadenum fraseri</i>)	23	●●	Speckled alder (<i>Alnus incana</i>)	24	●●●●
Swamp milkweed (<i>Asclepias incarnata</i>)	22	●●	Meadowsweet (<i>Spiraea alba</i>)	23	●●
Northern blue flag (<i>Iris versicolor</i>)	22	●●	Bebb's willow (<i>Salix bebbiana</i>)	20	●●
Broad-leaved arrowhead (<i>Sagittaria latifolia</i>)	22	●●	Bog birch (<i>Betula pumila</i>)	14	●●
Labrador bedstraw (<i>Galium labradoricum</i>)	21	●●	Tree Seedlings & Saplings (< 16ft)		
Bur marigold and Beggaricks (<i>Bidens</i> spp.†)	21	●●	Paper birch	8	●
			Black ash	7	●
			Red maple	5	●

*Linear-leaved, Marsh, or Downy willow-herb (*Epilobium leptophyllum*, *E. palustre*, or *E. strictum*) **Big-leaf white violet or Northern white violet (*Viola blanda* or *V. macloskeyi*)

MRn83

MARSH SYSTEM
Northern Floristic Region 

Northern Mixed Cattail Marsh

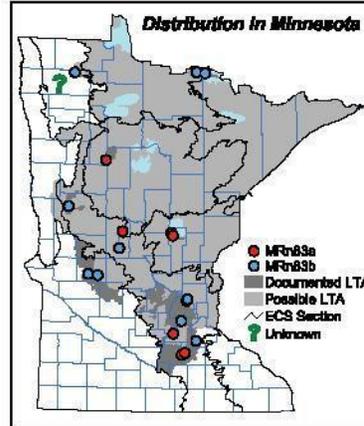
Emergent marsh communities, typically dominated by cattails. Present on floating mats along shorelines in lakes, ponds, and river backwaters or rooted in mineral soil in shallow wetland basins.

Vegetation Structure & Composition

Description is based on summary of field survey records and vascular plant data from 22 plots (relevés).

- **Floating-leaved and submergent aquatic plant** cover is sparse, with species such as duckweed (*Lemna* spp.) and greater duckweed (*Spirodela polyrhiza*) frequent, and common bladderwort (*Utricularia vulgaris*) and common coontail (*Ceratophyllum demersum*) occasionally present. Seasonally prolific, floating clones of the liverworts *Riccia fluitans* and *Ricciocarpos natans* may be present, becoming stranded during water-table drawdown.
- **Graminoid** cover is variable, with lake sedge (*Carex lacustris*) and bristly sedge (*C. comosa*) commonly present.
- **Forb** cover is strongly dominated by cattails (*Typha* spp.), usually with > 50% cover. Other common forbs include emergent species such as broad-leaved arrowhead (*Sagittaria latifolia*), marsh skullcap (*Scutellaria galericulata*), small or three-cleft bedstraw (*Galium tinctorium* or *G. trifidum*), and bur marigold and beggarticks (*Bidens* spp.).
- **Shrubs** are absent or very sparse.

• **Notes:** Vegetation is often composed of dense stands of cattails interspersed with pools of open water. Associated species are highly variable. MRn83 and other shallow-water wetlands throughout much of the state (particularly the agricultural region) have been invaded by dense stands of the non-native species narrow-leaved cattail (*Typha angustifolia*) and hybrid cattail (*T. x glauca*). Invasion and dominance of marshes by non-native cattail species is likely related to alterations in wetland hydrology, commonly from drain tiling, ditching, and impoundments; high levels of nutrient-rich runoff from agricultural fields; and salt-containing runoff from roads. Marshes dominated by non-native cattail species are considered to be low-quality or disturbed examples of MRn83. Marshes dominated by the native species broad-leaved cattail (*T. latifolia*) are considered higher-quality examples of MRn83 and are increasingly rare in Minnesota.



Landscape Setting & Soils

MRn83 occurs in shallow basins and depressions and along the shores of lakes, ponds, and river backwaters. Substrates range from muck or shallow, well-decomposed peat to floating peaty mats. Substrate surface is usually covered with plant litter, especially dead cattail stalks. MRn83 is often transitional between shallow aquatic communities and wet meadows.

Natural History

MRn83 develops in areas where standing water is present most of the year, providing conditions favorable for hydrophytic plants. Occurrences of the community with plants rooted in muck or peat substrates may succeed to shallow aquatic communities if the water table rises for prolonged periods, or to wet meadows if the water table drops or if silt or sedimentary peat accumulation causes the substrate surface to become elevated above the water surface. Floating mats, which rise and fall with changes in water level, are presumably successional stable but may be fragmented by strong

winds or beaver activity. Variation in species composition observed in the class is likely due to differences in water depth, the permanence of standing water, and variation in substrate. Fires during severe droughts can remove accumulated peat in fens or wet meadows, effectively lowering the growing surface and creating the wetter conditions that favor marsh over fen or wet meadow vegetation.

Similar Native Plant Community Classes

● **MRn93 Northern Bulrush-Spikerush Marsh**

MRn93 can be similar to MRn83 but occurs in deeper water and tends to be more affected by wave action. MRn93 is dominated by bulrushes (*Scirpus* spp.) and submergent aquatic species such as pondweeds (*Potamogeton* spp.) and water milfoil (*Myriophyllum* spp.), while MRn83 is dominated by cattails, with abundant sedges (*Carex* spp.) and forbs such as tufted loosestrife (*Lysimachia thyrsiflora*) and great water dock (*Rumex orbiculatus*).

MRn83 Indicator Species	(freq%)		MRn93 Indicator Species	(freq%)	
	MRn83	MRn93		MRn83	MRn93
Marsh cinquefoil (<i>Potentilla palustris</i>)	13	-	False nettle (<i>Boehmeria cylindrica</i>)	-	18
Linear-leaved, Marsh, or Downy willow-herb*	21	3	Northern manna grass (<i>Glyceria borealis</i>)	-	15
Common bladderwort (<i>Utricularia vulgaris</i>)	42	9	Common water plantain (<i>Alisma triviale</i>)	4	26
Great water dock (<i>Rumex orbiculatus</i>)	42	12	Three-way sedge (<i>Dulichium arundinaceum</i>)	4	18
Marsh bellflower (<i>Campanula aparinoides</i>)	38	12	Rice cut grass (<i>Leersia oryzoides</i>)	21	71
Northern marsh fern (<i>Thelypteris palustris</i>)	17	6	River bulrush (<i>Scirpus fluviatilis</i>)	13	41
Lake sedge (<i>Carex lacustris</i>)	50	18	Nodding smartweed (<i>Polygonum lapathifolium</i>)	8	24
Tufted loosestrife (<i>Lysimachia thyrsiflora</i>)	50	21	Water smartweed (<i>Polygonum amphibium</i>)	29	68

* Linear-leaved, Marsh, or Downy willow-herb (*Epilobium leptophyllum*, *E. palustre*, or *E. strictum*)

● **MRp83 Prairie Mixed Cattail Marsh**

MRp83 is very similar to MRn83, but by convention the range of MRp83 is limited to the Prairie Parkland Province, and the range of MRn83 is limited to the Eastern Broadleaf Forest and Laurentian Mixed Forest provinces. There are too few detailed records available to identify species differences between the classes. Collection of additional data and further analysis may result in revision of the floristic and geographic relationships between the two classes.

● **MRu94 Lake Superior Coastal Marsh**

MRu94 is similar to MRn83 but is restricted to estuaries and embayments near the mouths of rivers flowing into Lake Superior, where seiches cause regular fluctuations in water level. MRu94 generally has higher species diversity, while MRn83 is more likely to be strongly dominated by cattails.

Native Plant Community Types in Class

Although MRn83 has not been thoroughly sampled across its range in Minnesota, vegetation plot data and field observations indicate that the class can be divided into two community types based on dominant species.

● **MRn83a Cattail - Sedge Marsh (Northern)**

Emergent marshes typically dominated by cattails but with a significant component of graminoids including sedges (*Carex* spp.), woolgrass (*Scirpus cyperinus*), and bluejoint (*Calamagrostis canadensis*). MRn83a is more likely than MRn83b to be dominated by the native species broad-leaved cattail and is uncommon.

● **MRn83b Cattail Marsh (Northern)**

Emergent marshes dominated by nearly pure stands of cattails. If sedges and grasses are present, they are minor components. MRn83b is the most common of the two community types in this class and often is dominated by the non-native species narrow-leaved and hybrid cattail. Marshes dominated by pure stands of the native species broad-leaved cattail were likely more common in the past but are now rare across much of the range of the community.



photo by D.S. Wovcha MN DNR

Kandiyohi County, MN

MRn83 Northern Mixed Cattail Marsh — Species Frequency & Cover

	freq%	cover		freq%	cover
Grasses & Sedges					
Lake sedge (<i>Carex lacustris</i>)	45	•••	Unbranched bur reed (<i>Sparganium emersum</i>)	9	•
Bristly sedge (<i>Carex comosa</i>)	41	••	Emergent Forbs		
Red-stalked spikerush (<i>Eleocharis palustris</i>)	32	•	Broad-leaved arrowhead (<i>Sagittaria latifolia</i>)	64	•
Bluejoint (<i>Calamagrostis canadensis</i>)	27	•••	Marsh skullcap (<i>Scutellaria galericulata</i>)	64	•
Rice cut grass (<i>Leersia oryzoides</i>)	23	•	Three-cleft or small bedstraw (<i>Galium triflorum</i> or <i>G. tinctorium</i>)	59	•
Tall manna grass (<i>Glyceria grandis</i>)	23	•	Bur marigold and Beggarticks (<i>Bidens</i> spp.)	50	•
Soft stem bulrush (<i>Scirpus validus</i>)	18	••	Tufted loosestrife (<i>Lysimachia thysiflora</i>)	45	•
Fen wiregrass sedge (<i>Carex lasiocarpa</i>)	14	••	Bulb-bearing water hemlock (<i>Cicuta bulbifera</i>)	41	••
Wild rice (<i>Zizania palustris</i>)	14	••	Great water dock (<i>Rumex orbiculatus</i>)	41	•
Common reed grass (<i>Phragmites australis</i>)	14	••	Marsh bellflower (<i>Campanula aparinoides</i>)	41	•
Tussock sedge (<i>Carex stricta</i>)	14	••	Cleaverweed (<i>Pilea</i> spp.)	36	•
Cyperus sedge (<i>Carex pseudocyperus</i>)	14	••	Northern bugleweed (<i>Lycopus uniflorus</i>)	32	•
River bulrush (<i>Scirpus fluviatilis</i>)	14	••	Broad-leaved cattail (<i>Typha latifolia</i>)	32	•••
Beaked sedge (<i>Carex utriculata</i>)	14	••	Touch-me-not (<i>Impatiens</i> spp.)	32	••
Ovoid spikerush (<i>Eleocharis ovata</i>)	9	•	Giant bur reed (<i>Sparganium eurycarpum</i>)	27	•••
Lesser-panicked sedge (<i>Carex diandra</i>)	9	•	Water patsnip (<i>Slum suave</i>)	27	•
Aquatic sedge (<i>Carex aquatilis</i>)	9	•	Linear-leaved Marsh, or Downy willow-herb*	23	•
Fragrant cyperus (<i>Cyperus odoratus</i>)	9	•	Spotted water hemlock (<i>Cicuta maculata</i>)	23	•
Porcupine sedge (<i>Carex hystericina</i>)	9	•	Dotted smartweed (<i>Polygonum punctatum</i>)	18	•
Woolgrass (<i>Scirpus cyperinus</i>)	9	•	Sweet flag (<i>Acorus calamus</i>)	18	•••
Floating-Leaved & Submergent Forbs			Swamp milkweed (<i>Asclepias incarnata</i>)	18	•
Star-duckweed (<i>Lemna trisculata</i>)	64	••	Northern marsh fern (<i>Thelypteris palustris</i>)	18	•
Lesser-duckweed (<i>Lemna minor</i>)	59	••	Cut-leaved bugleweed (<i>Lycopus americanus</i>)	18	•
Greater duckweed (<i>Spirodela polyrrhiza</i>)	55	••	Marsh cinquefoil (<i>Potentilla palustris</i>)	14	•
Common bladderwort (<i>Utricularia vulgaris</i>)	45	••	Spotted Joe pye weed (<i>Eupatorium maculatum</i>)	14	•
Common coontail (<i>Ceratophyllum demersum</i>)	36	••	Marsh horsetail (<i>Equisetum palustre</i>)	9	•
Water smartweed (<i>Polygonum amphibium</i>)	32	••	Common mint (<i>Mentha arvensis</i>)	9	•
Flat-stemmed pondweed (<i>Potamogeton zosteriformis</i>)	14	•	Stinging nettle (<i>Urtica dioica</i>)	9	•
Common white water-lily (<i>Nymphaea odorata</i>)	14	•	Nodding smartweed (<i>Polygonum lapathifolium</i>)	9	•
Straight-leaved pondweed (<i>Potamogeton strictifolius</i>)	9	•	Lady's thumb (<i>Polygonum persicaria</i>)	9	•
Intermediate bladderwort (<i>Utricularia intermedia</i>)	9	•	Common water plantain (<i>Alisma triviale</i>)	5	•
Yellow pond lily (<i>Nuphar variegata</i>)	9	•	Shrubs		
			Red-osier dogwood (<i>Cornus sericea</i>)	9	••

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