Wetland Assessment

Summer 2013

Water Horsetail

Big Bluestem

Reed Canary Grass

High-bush Cranberry

Giant Goldenrod

Marsh Milkweed

Nannyberry

Narrow–leaved Cattail

Results

Butternut Valley Scientific and Natural Area
Wetland ID #15

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Rapid Floristic Quality Assessment (Rapid FQA)

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- Metric Summary and Community Assessment
- Overall Assessment
- Rapid FQA Output Sheet Description
- Biologic Condition and Gradient Tier Description

Plant Photos Credit : Wetland Plants and Plant Communities of Minnesota and Wisconsin, By Steve D. Eggers and Donald M. Reed Second Edition, U.S. Army Corps of Engineers, St. Paul District.

Blue Earth County contracted with wetland scientists from Stantec to evaluate a sample of wetlands in the county in the summer of 2013. This packet contains wetland assessment data collected for one of those sites. The data is used to evaluate specific wetland functions and public values as required by the Minnesota Wetland Conservation Act (WCA).

The WCA directs the Board of Water and Soil Resources (BWSR) to determine the methods that must be used to evaluate wetland functions. These methods provide a systematic way for those with experience and training in wetland science to document observations based on best professional judgment.

The BWSR-approved wetland assessment methods used for this evaluation were:

- Minnesota Routine Assessment Method (MnRAM), Version 3.4
  Minnesota Board of Water and Soil Resources:
  http://www.bwsr.state.mn.us/wetlands/mnram/index.html

- Rapid Floristic Qualitative Assessment (Rapid FQA) method
  Minnesota Pollution Control Agency:
  http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/wetlands/floristic-quality-assessment.html

When looking at the results keep in mind that the MnRAM numeric rankings used are based on ideal, pre-European-settlement condition as a baseline. In urban or agricultural watersheds such as those found in Blue Earth County, few wetland basins fall into the High category. Use care when/if comparing results with other wetlands. Only wetlands with similar plant community types should be compared.

Blue Earth Count Wetland Protection and Management Plan

Ultimately, people, not the assessments, will decide what combination of wetland functions are the most important. Blue Earth County will be working with partners, citizens and stakeholders to develop a Comprehensive Wetland Protection and Management Plan in 2014. Both existing and potentially restorable wetlands will be considered in the plan. The results from this and other wetland assessments will help all involved with plan development have a better understanding of existing wetlands in the county so planners have a baseline of possibilities and reasonable expectations for future wetland projects and programs.

Thank you for your time and interest in wetlands!

BLUE EARTH COUNTY

Stantec

CLEAN WATER LAND & LEGACY AMENDMENT

Data Sheets

Map and Photos

Rapid FQA Data Form

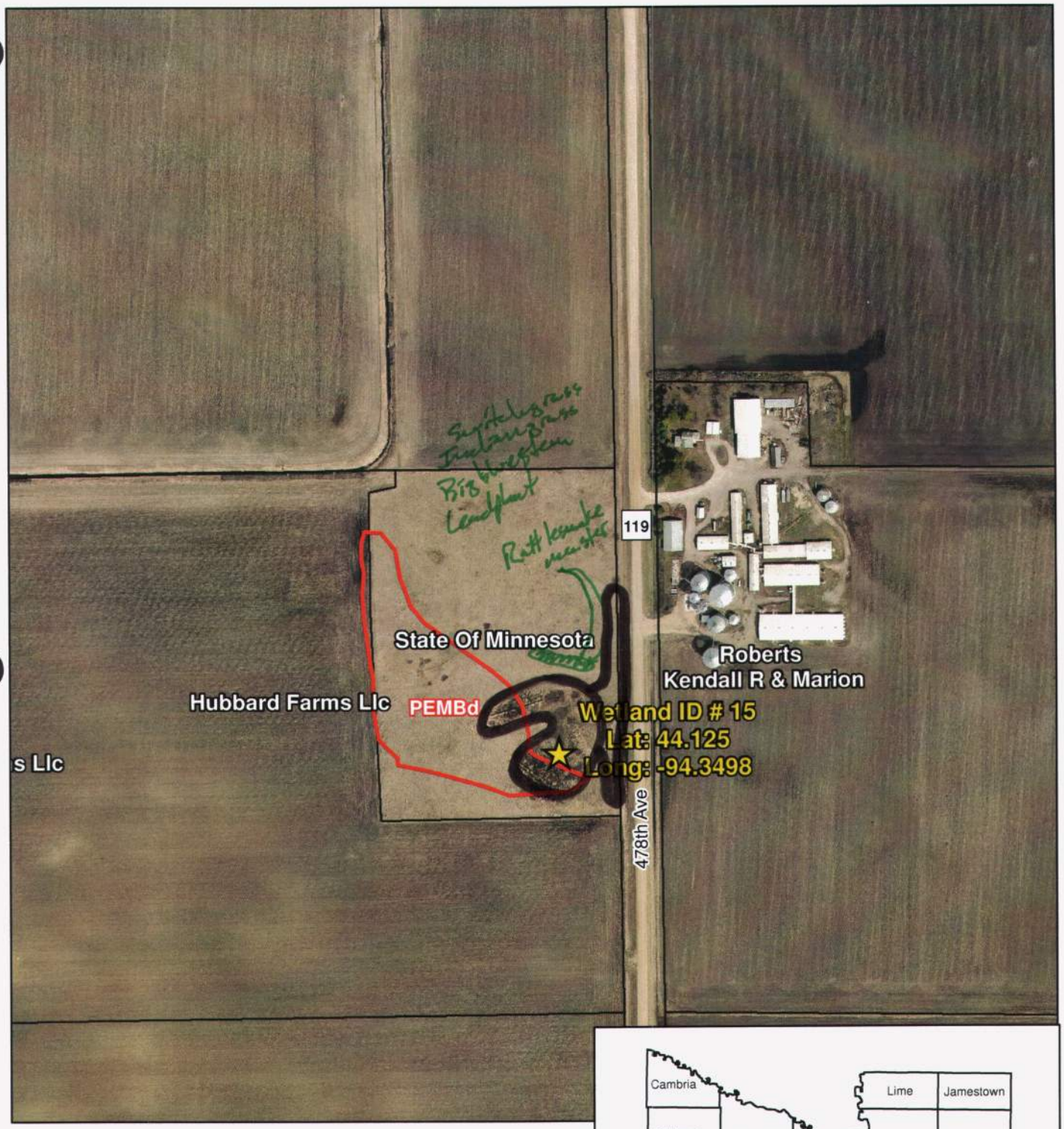
MnRAM Site Response Record

Rapid FQA guidance documents can be found on the MPCA website:
http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/wetlands/floristic-quality-assessment.html

MnRAM guidance documents can be found on the BWSR website:
http://www.bwsr.state.mn.us/wetlands/mnram/index.html

Wetland 15 - Butternut Valley SNA

Marsh dove Blue



Wetland To Assess

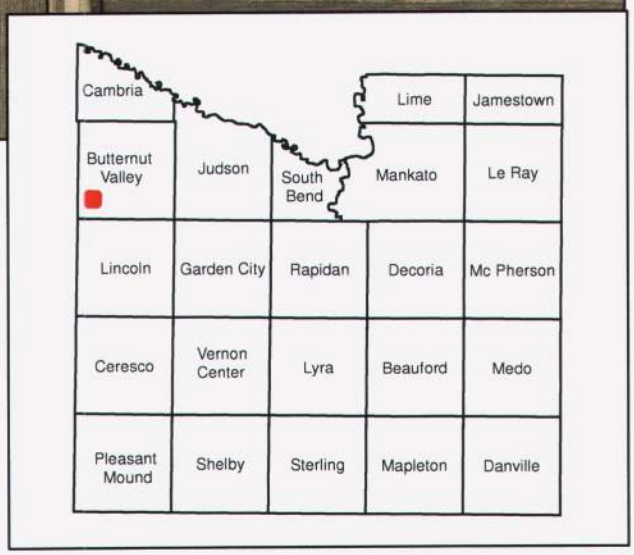
Parcel

NWI Wetland

N

0 500 1,000 Feet

2013 County Aerial Photo



~~Pondweed~~ #26 Next week

(2) Spiraea alba
(4) Cordgrass
(3) RCG
(2) ~~Dogbane~~ J. hemp
(2) Max. sunflower
(2) Bigbluestem
(2) Prairie rose
(1) Strawberry
(3) Carex sp.
(2) Hemlock
(1) C. thistle
(2) Ironweed
(2) Aster
(2) Salix interior
(1) Bf. iris
(1) Polyg. amph.
(1) Germ allep.
(1) Swamp milkweed
(1) Cottonwood seedling
(2) Calam. canadensis (Bluejoint)
(1) Salix cf discolor (c)

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Rapid FQA Data Form

Biological Monitoring
Floristic Quality Assessment (FQA)

General Information

Site/AA name: 15	Date: 9-5-2013	Surveyors name: Mark
Remarks: Wet prairie		

Community Information

Eggers & Reed Plant Community Type	% of AA	Start Time	End Time	Total Time
#1) Wet Meadow Prairie	100	4:00	4:40	40 min
#2)		Species Tally (# of spp. observed during final 10 min)		
#3)		Base	Add 1	Add 2	Add 3

Cover Classes
7 >95 - 100%
6 >75 - 95%
5 >50 - 75%
4 >25 - 50%
3 >5 - 25%
2 >1 - 5%
1 >0 - 1%

Species Checklist (circle community space when species is present in community, record cover class in circle following meander)

Aquatic Stratum (true aquatic plants that are submergent or have floating leaves)

Community # 1 2 3

- _ _ _ Brasenia schreberi
- _ _ _ Ceratophyllum demersum
- _ _ _ Elodea canadensis
- _ _ _ Lemna minor
- _ _ _ Lemna trisulca
- _ _ _ Najas flexilis
- _ _ _ Nelumbo lutea
- _ _ _ Nuphar lutea ssp. variegata
- _ _ _ Nymphaea odorata
- _ _ _ Polygonum amphibium
- _ _ _ Potamogeton amplifolius
- _ _ _ Potamogeton crispus
- _ _ _ Potamogeton natans
- _ _ _ Potamogeton zosteriformis
- _ _ _ Ranunculus flabellaris
- _ _ _ Ranunculus longirostris
- _ _ _ Ranunculus trichophyllus var. trichophyllus
- _ _ _ Spirodela polyrrhiza
- _ _ _ Stuckenia pectinatus
- _ _ _ Utricularia macrorhiza
- _ _ _ Vallisneria americana
- _ _ _ Wolfia columbiana

Tree Stratum (woody plants with typical max growth ≥ 3" DBH)

Community # 1 2 3

- _ _ _ Abies balsamea
- _ _ _ Acer negundo
- _ _ _ Acer rubrum var. rubrum
- _ _ _ Acer saccharinum
- _ _ _ Betula alleghaniensis var. alleghaniensis
- _ _ _ Betula papyrifera var. papyrifera
- _ _ _ Celtis occidentalis var. occidentalis
- _ _ _ Fraxinus nigra
- _ _ _ Fraxinus pennsylvanica
- _ _ _ Larix laricina
- _ _ _ Ostrya virginiana var. virginiana
- _ _ _ Picea glauca
- _ _ _ Picea mariana
- _ _ _ Pinus strobus
- _ _ _ Populus balsamifera ssp. balsamifera
- (1) _ _ Populus deltoides ssp. monilifera seedling
- _ _ _ Populus tremuloides
- _ _ _ Quercus macrocarpa var. macrocarpa
- _ _ _ Quercus rubra
- _ _ _ Salix amygdaloides
- _ _ _ Salix nigra
- _ _ _ Salix X rubens
- _ _ _ Sorbus americana
- _ _ _ Thuja occidentalis
- _ _ _ Tilia americana var. americana
- _ _ _ Ulmus americana

Shrub Stratum (woody plants with typical max growth < 3" DBH and > 1m tall)

Community # 1 2 3

- _ _ _ Acer spicatum
- _ _ _ Alnus incana ssp. rugosa
- _ _ _ Amorpha fruticosa
- _ _ _ Betula pumila var. glandulifera
- _ _ _ Cornus racemosa
- _ _ _ Cornus sericea ssp. sericea
- _ _ _ Dasiphora floribunda
- _ _ _ Frangula alnus
- _ _ _ Ilex verticillata
- (2) Rosa setigera
- _ _ _ Myrica gale
- _ _ _ Physocarpus opulifolius
- _ _ _ Rhamnus alnifolia
- _ _ _ Rhamnus cathartica
- _ _ _ Ribes americanum
- _ _ _ Rubus idaeus ssp. strigosus
- _ _ _ Salix bebbiana
- _ _ _ Salix candida
- (1) _ _ Salix discolor
- (2) _ _ Salix interior
- _ _ _ Salix petiolaris
- _ _ _ Sambucus nigra ssp. canadensis
- (2) _ _ Spiraea alba
- _ _ _ Spiraea tomentosa var. rosea
- _ _ _ Staphylea trifolia
- _ _ _ Toxicodendron vernix
- _ _ _ Viburnum lentago
- _ _ _ Viburnum opulus var. americanum

Woody Vine Stratum (all woody vines)

Community # 1 2 3

- _ _ _ Clematis virginiana
- _ _ _ Menispermum canadense
- _ _ _ Parthenocissus vitacea
- _ _ _ Solanum dulcamara var. dulcamara
- _ _ _ Vitis riparia

Herb Stratum (all non-aquatic herbaceous plants and woody plants with typical max growth < 1m tall)

Community # 1 2 3

- _ _ _ Achillea millefolium
- _ _ _ Acorus americanus
- _ _ _ Adiantum pedatum
- _ _ _ Agrostis gigantea
- _ _ _ Alisma subcordatum
- _ _ _ Alisma triviale
- _ _ _ Alliaria petiolata
- _ _ _ Ambrosia artemisiifolia
- _ _ _ Ambrosia trifida var. trifida
- _ _ _ Amphicarpaea bracteata
- _ _ _ Andromeda polifolia var. glaucophylla
- (2) _ _ Andropogon gerardii
- _ _ _ Anemone canadensis
- _ _ _ Anemone quinquefolia var. bifolia
- _ _ _ Angelica atropurpurea
- (2) _ _ Apocynum cannabinum
- _ _ _ Aralia nudicaulis
- _ _ _ Argentina anserina
- _ _ _ Arisaema triphyllum
- (1) _ _ Asclepias incarnata ssp. incarnata
- _ _ _ Athyrium filix-femina ssp. angustum
- _ _ _ Beckmannia syzigachne
- _ _ _ Bidens cernua
- _ _ _ Boehmeria cylindrica

Herb Stratum *Continued* (all non-aquatic herbaceous plants and woody plants < 1m tall)

Community # 1 2 3

- _ _ _ Botrychium virginianum
- _ _ _ Bromus ciliatus var. ciliatus
- _ _ _ Bromus inermis
- (2) _ _ Calamagrostis canadensis
- _ _ _ Calamagrostis stricta ssp. stricta
- _ _ _ Calla palustris
- _ _ _ Caltha palustris var. palustris
- _ _ _ Calystegia sepium
- _ _ _ Campanula aparinoides
- _ _ _ Carex aquatilis var. aquatilis
- _ _ _ Carex atherodes
- _ _ _ Carex comosa
- (3) _ _ Carex ~~interior~~ tribuloides
- _ _ _ Carex intumescens
- _ _ _ Carex lacustris
- _ _ _ Carex lasiocarpa var. americana
- _ _ _ Carex oligosperma
- _ _ _ Carex pellita
- _ _ _ Carex stipata var. stipata
- _ _ _ Carex stricta
- _ _ _ Carex utriculata
- _ _ _ Carex vulpinoidea
- _ _ _ Chamaedaphne calyculata var. angustifolia
- _ _ _ Chamerion angustifolium ssp. circumvagum
- _ _ _ Chelone glabra
- _ _ _ Cicuta bulbifera
- (2) _ _ Cicuta maculata
- _ _ _ Circaea alpina ssp. alpina
- _ _ _ Circaea lutetiana ssp. canadensis
- (1) _ _ Cirsium arvense
- _ _ _ Cirsium muticum
- _ _ _ Clintonia borealis
- _ _ _ Comarum palustre
- _ _ _ Conyza canadensis var. canadensis
- _ _ _ Coptis trifolia
- _ _ _ Cornus canadensis
- _ _ _ Cryptotaenia canadensis
- _ _ _ Cyperus esculentus var. leptostachyus
- _ _ _ Cypripedium reginae
- _ _ _ Dioscorea villosa
- _ _ _ Doellingeria umbellata
- _ _ _ Drosera rotundifolia var. rotundifolia
- _ _ _ Dryopteris carthusiana
- _ _ _ Dryopteris cristata
- _ _ _ Dulichium arundinaceum
- _ _ _ Echinochloa crus-galli
- _ _ _ Echinocystis lobata
- _ _ _ Eleocharis obtusa
- _ _ _ Eleocharis palustris
- _ _ _ Elymus virginicus
- _ _ _ Epilobium leptophyllum
- _ _ _ Equisetum arvense
- _ _ _ Equisetum fluviatile
- _ _ _ Eupatorium maculatum
- _ _ _ Eupatorium perfoliatum var. perfoliatum
- _ _ _ Euthamia graminifolia
- (1) _ _ Fragaria virginiana
- _ _ _ Galium aparine
- _ _ _ Gaultheria hispidula
- _ _ _ Gentiana andrewsii
- _ _ _ Geranium maculatum
- _ _ _ Glyceria borealis
- _ _ _ Glyceria canadensis
- (1) _ _ Geum allepicum

Community # 1 2 3

- _ _ _ Glyceria grandis var. grandis
- _ _ _ Glyceria striata
- _ _ _ Gymnocarpium dryopteris
- _ _ _ Hackelia virginiana
- _ _ _ Helenium autumnale var. autumnale
- _ _ _ Helianthus giganteus
- (2) _ _ Helianthus ~~grosseserratus~~ maxi
- _ _ _ Heracleum maximum
- _ _ _ Heuchera richardsonii
- _ _ _ Hordeum jubatum ssp. jubatum
- _ _ _ Hydrophyllum virginianum
- _ _ _ Hypoxis hirsuta
- _ _ _ Impatiens capensis
- (1) _ _ Iris versicolor
- _ _ _ Kalmia polifolia
- _ _ _ Lactuca serriola
- _ _ _ Laportea canadensis
- _ _ _ Lathyrus palustris
- _ _ _ Lathyrus venosus
- _ _ _ Ledum groenlandicum
- _ _ _ Leersia oryzoides
- _ _ _ Liatris pycnostachya var. pycnostachya
- _ _ _ Linnaea borealis ssp. americana
- _ _ _ Lobelia kalmii
- _ _ _ Lobelia siphilitica var. ludoviciana
- _ _ _ Lobelia spicata
- _ _ _ Lycopus americanus
- _ _ _ Lycopus uniflorus
- _ _ _ Lysimachia ciliata
- _ _ _ Lysimachia thyrsiflora
- _ _ _ Lythrum salicaria
- _ _ _ Maianthemum canadense
- _ _ _ Maianthemum stellatum
- _ _ _ Maianthemum trifolium
- _ _ _ Matteuccia struthiopteris
- _ _ _ Mentha arvensis
- _ _ _ Menyanthes trifoliata
- _ _ _ Mertensia virginica
- _ _ _ Mimulus ringens var. ringens
- _ _ _ Mitella nuda
- _ _ _ Monotropa uniflora
- _ _ _ Muhlenbergia richardsonis
- _ _ _ Oligoneuron riddellii
- _ _ _ Onoclea sensibilis
- _ _ _ Orthilia secunda
- _ _ _ Osmorhiza claytonii
- _ _ _ Osmunda cinnamomea var. cinnamomea
- _ _ _ Osmunda regalis var. spectabilis
- _ _ _ Panicum virgatum var. virgatum
- _ _ _ Parnassia glauca
- _ _ _ Parnassia palustris
- _ _ _ Pedicularis lanceolata
- _ _ _ Penthorum sedoides
- _ _ _ Petasites frigidus var. palmatus
- (3) _ _ Phalaris arundinacea
- _ _ _ Phragmites australis
- _ _ _ Physostegia virginiana ssp. virginiana
- _ _ _ Pilea pumila var. pumila
- _ _ _ Poa palustris
- _ _ _ Poa pratensis ssp. pratensis
- (1) _ _ Polygonum amphibium
- _ _ _ Polygonum lapathifolium

Community # 1 2 3

- _ _ _ Polygonum pensylvanicum
- _ _ _ Polygonum sagittatum
- _ _ _ Pontederia cordata
- _ _ _ Potentilla norvegica ssp. monspeliensis
- _ _ _ Prenanthes racemosa
- _ _ _ Pycnanthemum virginianum
- _ _ _ Rubus pubescens var. pubescens
- _ _ _ Rudbeckia hirta var. pulcherrima
- _ _ _ Rudbeckia laciniata var. laciniata
- _ _ _ Rumex crispus ssp. crispus
- _ _ _ Rumex orbiculatus
- _ _ _ Sagittaria latifolia
- _ _ _ Sagittaria rigida
- _ _ _ Sanguinaria canadensis
- _ _ _ Sarracenia purpurea ssp. purpurea
- _ _ _ Saxifraga pensylvanica
- _ _ _ Scheuchzeria palustris ssp. americana
- _ _ _ Schoenoplectus acutus var. acutus
- _ _ _ Schoenoplectus fluviatilis
- _ _ _ Schoenoplectus pungens
- _ _ _ Schoenoplectus tabernaemontani
- _ _ _ Scirpus cyperinus
- _ _ _ Scolochloa festucacea
- _ _ _ Scutellaria galericulata
- _ _ _ Scutellaria lateriflora
- _ _ _ Sicyos angulatus
- _ _ _ Sium suave
- _ _ _ Solidago canadensis
- _ _ _ Solidago gigantea
- _ _ _ Solidago uliginosa var. uliginosa
- _ _ _ Sonchus arvensis
- _ _ _ Sorghastrum nutans
- _ _ _ Sparganium eurycarpum
- (4) _ _ Spartina pectinata
- _ _ _ Stachys palustris
- _ _ _ Stellaria longifolia
- _ _ _ Streptopus lanceolatus var. longipes
- (2) _ _ Symphyotrichum lanceolatum
- _ _ _ Symphyotrichum lateriflorum
- _ _ _ Symphyotrichum novae-angliae
- _ _ _ Symphyotrichum puniceum
- _ _ _ Symplocarpus foetidus
- _ _ _ Taraxacum officinale
- _ _ _ Thalictrum dasycarpum
- _ _ _ Thelypteris palustris var. pubescens
- _ _ _ Toxicodendron rydbergii
- _ _ _ Triadenum fraseri
- _ _ _ Trientalis borealis ssp. borealis
- _ _ _ Trillium cernuum
- _ _ _ Typha angustifolia
- _ _ _ Typha latifolia
- _ _ _ Typha X glauca
- _ _ _ Urtica dioica ssp. gracilis
- _ _ _ Vaccinium angustifolium
- _ _ _ Vaccinium macrocarpon
- _ _ _ Vaccinium oxycoccos
- _ _ _ Verbena hastata
- (2) _ _ Vernonia fasciculata
- _ _ _ Veronicastrum virginicum
- _ _ _ Xanthium strumarium
- _ _ _ Zizania palustris
- _ _ _ Zizia aurea

Wetland #15

MnRAM: Site Response Record

For Wetland: 015

Location: 07-000-00-00-001

BEC Wetland Assessment

Plant Community: Wet to Wet-Mesic Prairi

Cowardin Classification: PEMB

Circular 39: Type 2

4	*Listed, rare, special species?*	Yes
5	*Rare community or habitat?*	No
6	*Pre-European-settlement condition?*	No

Hydrogeomorphology / topography:

7 Depressional/Isolated

8-1	*Maximum water depth*	0 inches
8-2	*% inundated*	0%
9	*Immediate drainage--local WS*	40 acres
10	*Esimated size/existing site:*	*(see #66)*

11-Upland Soil	Webster Silty Clay Loam and Nicollet Clay Loam
11-Wetland Soil	Glencoe Silty clay Loam and Webster Clay Loam

12	*Outlet for flood control*	A
13	*Outlet for hydro regime*	A
14	*Dominant upland land use*	B
15	*Wetland soil condition*	A
16	*Vegetation (% cover)*	100%
17	*Emerg. veg flood resistance*	B
18	*Sediment delivery*	A
19	*Upland soils (soil group)*	C
20	*Stormwater runoff*	C
21	*Subwatershed wetland density*	A
22	*Channels/sheet flow*	A
23	*Adjacent buffer width*	100 feet

Adjacent area management

24-A	*Full*	70%
24-B	*Manicured*	0%
24-C	*Bare*	30%

Adjacent area diversity/structure

25-A	*Native*	70%
25-B	*Mixed*	0%
25-C	*Sparse*	30%

Adjacent area slope

26-A	*Gentle*	100%
26-B	*Moderate*	0%
26-C	*Steep*	0%

27	*Downstream sens./WQ protect.*	C
28	*Nutrient loading*	A
29	*Shoreline wetland?*	No

Shoreline Wetland

30	*Rooted veg., % cover*	0%
31	*Wetland in-water width*	0 feet
32	*Emerg. veg. erosion resistance*	
33	*Erosion potential of site*	
34	*Upslope veg./bank protection*	
35	*Rare wildlife?*	No
36	*Scare/Rare/S1/S2 community*	Yes
37	*Vegetative cover*	NA
38	*Veg. community interspersion*	NA
39	*Wetland detritus*	A
40	*Interspersion on landscape*	C
41	*Wildlife barriers*	A

Amphibian-breeding potential

42	*Hydroperiod adequacy*	Inadequate
43	*Fish presence*	A
44	*Overwintering habitat*	
45	*Wildlife species (list)*	
46	*Fish habitat quality*	NA
47	*Fish species (list)*	
48	*Unique/rare opportunity*	Yes
49	*Wetland visibility*	B
50	*Proximity to population*	No
51	*Public ownership*	A
52	*Public access*	B
53	*Human influence on wetland*	A
54	*Human influence on viewshed*	B
55	*Spatial buffer*	C
56	*Recreational activity potential*	B
57	*Commercial crop--hydro impact*	NA

Groundwater-specific questions

58	*Wetland soils*	Recharge
59	*Subwatershed land use*	Discharge
60	*Wetland size/soil group*	Recharge
61	*Wetland hydroperiod*	Discharge
62	*Inlet/Outlet configuration*	Discharge
63	*Upland topo relief*	Recharge

Additional information

64	*Restoration potential*	Yes
65	*LO affected by restoration*	A
66	*Existing size*	3
	Restorable size	0
	Potential new wetland	0
67	*Average width of pot. buffer*	50 feet
68	*Ease of potential restoration*	A
69	*Hydrologic alterations*	Ditching
70	*Potential wetland type*	2
71	*Stormwater sensitivity*	Exceptiona
72	*Additional treatment needs*	A

Watershed Minnesota (Mankato)

WS# 28 Service Area: 9

For functional ratings, please run the Summary tab report.

This report printed on: 5/12/2014

Minnesota
Routine Assessment Method

MnRAM

MnRAM Site Assessment Report*

Wetland Functional Assessment Summary*

Wetland Functional Assessment Description

*MnRAM Assessment Reports automatically generated by BWSR MnRAM program using field data inputs.

MnRAM guidance documents can be found on the BWSR website:
http://www.bwsr.state.mn.us/wetlands/mnram/index.html

MnRAM Site Assessment Report

Wetland: 015 **Project: BEC Wetland Assessment**

BLUE EARTH County, Minnesota (Mankato) Watershed, Corps Bank Service Area #9

Assessment Purpose: Planning

A site visit was made to this wetland on 9/5/2013 by Stantec_Meyer. Site conditions were Normal. This wetland is estimated to cover 3 acres.

This report reflects conditions on the ground at the date of the assessment and, unless noted or implicit in the standard questions, does not reflect speculation on the future or past conditions.

This wetland is located in Butternut Valley Township.

General Features

Hydrogeomorphology

The maximum water depth at this site is 0 inches, with 0 percent inundated. Although there was no standing water at the time of the site visit, the existence of water in the soil below indicates wetland hydrology is present. With an immedidate drainage area of 40 acres. [Ratio could not be calculated; Percent Inundated is zero.]

As a Depressional/Isolated wetland, this site has no discernable inlets or outlets. As such, t is valued for its ability to store water, especially if located lower in the watershed. If it does not already have invasive species in the plant community, its lack of connection to upstream sites with such species may protect it.

Soils

The soils in the immediate wetland area are primarily Glencoe Silty clay Loam and Webster Clay Loam. The adjacent upland, to about 500 feet, is Webster Silty Clay Loam and Nicollet Clay Loam.

Vegetation and Upland Buffer

The extent of vegetation in this wetland is about 100 percent and the naturalized buffer width averages 100 feet. Vegetated buffers around wetlands provide multiple benefits including wildlife habitat, erosion protection, and a reduction in surface water runoff.

This buffer not only provides an excellent buffer for wetland water quality, it also serves as an important resources for wildlife habitat.

Special Features

C DNR designated scientific and natural area (Aesthetics/Recreation/Education/Cultural functional rating is Exceptional).

D Rare natural community. A wetland native plant community mapped (or determined to be eligible for mapping) in the Natural Heritage Information System OR a wetland native plant community contained within an area mapped (or determined to be eligible for mapping) in the NHIS as a Site of Outstanding or High Biological Diversity. Ratings for Vegetative Diversity/Integrity and Wildlife Habitat are Exceptional.

I Plant species: naturally occurring, persistent populations that are listed federally or by the State to be Endangered or Threatened or a species of special concern. This brings the Vegetative Diversity/Integrity functional rating to Exceptional and warrants additional consideration.

Vegetative Communities

The following plant communities were observed:

(See Appendix A for details on the Dominant Species per plant community)

Wet To Wet- Mesic Prairie Type 2, PEMB. This community had a vegetative index of high and comprised 100 percent of the entire area.

The highest rated community was the Wet To Wet- Mesic Prairie community rated at 2. Averaging all the communities together, the Vegetative Diversity and Integrity of this wetland is Exceptional. A more accurate look uses a weighted average; using this method, this site shows a Exceptional Vegetative Diversity and Integrity.

One or all three of the following are present: 1) highly diverse wetlands with virtually no non-native species, 2) rare or critically impaired wetland communities in the watershed, or 3) the presence or previous sighting of rare, threatened, or endangered plant species. Regardless of the quality or quantity of other communities, the presence of one of these will move the ranking of the entire site.

Functional Ratings

Function	*Rating*	*Comment*
Vegetative Diversity	Exceptional	One or all three of the following are present: 1) highly diverse wetlands with virtually no non-native species, 2) rare or critically impaired wetland communities in the watershed, or 3) the presence or previous sighting of rare, threatened, or endangered plant species.
Additional stormwater treatment needs	Exceptional	Placeholder for Exceptional additional stormwater treatment
Maintenance of Hydrologic Regime	High	Due either to careful human management or lack of alteration of the outlet or watershed conditions, the wetland maintains a hydrologic regime similar to the original wetland type. This stability supports characteristic vegetative communities and is closely associated with flood attenuation, water quality, and groundwater interaction.
Flood/Stormwater/Attenuation	High	The wetland provides ample flood storage and/or flood wave attenuation. Outlet configuration is restricted (or unaltered) and undisturbed wetland soils, and dense emergent vegetation without channels allow the wetland to retard flood water. A high proportion of impervious surfaces in the subwatershed, large runoff volumes, clayey upland soils, and few wetlands present within the subwatershed may position any wetland to be a good attenuator of excess water.

Downstream Water Quality	Moderate	This wetland has some ability and opportunity to protect downstream resources. The ability of the wetland to remove sediment from stormwater is determined by emergent vegetation and overland flow characteristics. A high nutrient removal rating indicates dense vegetation and sheet flow to maximize nutrient uptake and residence time within the wetland. The opportunity for a wetland to protect a valuable water resource diminishes with distance from the wetland so wetlands with valuable waters within 0.5 miles downstream have the greatest opportunity to provide protection, as do those that receive more (and less-treated) runoff.
Maintenance of Wetland Water Quality	Exceptional	The exceptional rating for this wetland's water quality may be related as much to its position in the landscape and to downstream needs as to its current condition.
Shoreline Protection	Not Applicable	The site does not fringe a deepwater habitat, lake, or is not within any type of watercourse.
Maintenance of Characteristic Wildlife Habitat Structure	Exceptional	The site is known to be used by rare or state or federally-listed wildlife species OR has a scarce or rare wetland plant community and a high vegetative community quality rating. In either case, the wetland is exceptional for local priorities or under state or federal guidelines.
Maintenance of Characteristic Fish Habitat	Not Applicable	The site is too isolated or does not remain wet enough to support a population of fish or to allow for even temporary use as a refuge.
Maintenance of Characteristic Amphibian Habitat	Not Applicable	Wetland never or rarely contains standing water and is not inundated longenough most years to allow amphibians to successfully breed.
Aesthetics/Recreation /Education/Cultural	Exceptional	The site provides a unique or rare educational, cultural, or recreational opportunity. May be part of an outdoor learning park focused on wetland study with a public or private school environmental program, a wild rice area, or a pristine-reference site for another assessment tool. Designated SNA sites, wilderness areas, or archealogic or historic sites are exceptional, as well.
Wetland restoration potential	Moderate	This site has potential as a restoration site, although some barriers would need to be overcome: private owners would need to agree on an easement, the site has potential for new wetland credit with protective buffers, workable restoration engineering, and a good likelihood of restoration success.
Wetland Sensitivity to Stormwater and Urban Development	High	This wetland is highly sensitivity to stormwater; Shrub-carrs, alder thickets, diverse fresh wet meadows dominated by native species, diverse shallow and deep marshes, and diverse shallow, open water communities.

Appendix A: Dominant Species By Plant Community

	Wetland Type	Plant Community	Dominant Species	Percent Cover
PEMB	Type 2	Wet To Wet- Mesic Prairie		

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
015	Depressional/Isolated (no discernable inlets or outlets)	0.88	0.83	0.62	1.20	0.00
		High	High	Moderate	Exceptional	Not Applicable

							Additional Information		
Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Wetland Restoration Potential	Wetland Sensitivity to Stormwater and Urban Development	Additional Stormwater Treatment Needs
015	2.00	0.00	0.00	2.00	0.00	Combination Discharge, Recharge	0.62	1.00	1.20
	Exceptional	Not Applicable	Not Applicable	Exceptional	Not Applicable		Moderate	High	Exceptional

Wetland Community Summary

		Vegetative Diversity/Integrity							
		Community							
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
015	07-000-00-00-001	PEMB	Type 2	Wet to Wet-Mesic Prairie	100	1	2.00	2.00	2.00
							Exceptional	Exceptional	Exceptional
					100		2.00	2.00	2.00

MnRAM Output Sheet Guidance

Wetland Functional Assessment Summary and Wetland Community Summary

Guidance for understanding the wetland functions shown on the MnRAM summary sheet is described in more detail on the following pages. The descriptions are from the Minnesota Board of Water and Soil Resources (BWSR) **Comprehensive General Guidance for Minnesota Routine Assessment Method (MnRAM) Evaluating Wetland Function, Version 3.4.** The full guidance document can be viewed at the BWSR website:

http://www.bwsr.state.mn.us/wetlands/mnram/index.html

Functional Ratings

MnRAM was developed using the concept of ideal theoretical, pre-European-settlement wetland condition as the baseline. In highly urban or agricultural watersheds, few basins may fall into the High category. Local authorities will need to take this into account when establishing a scale for management decisions.

Each wetland function is rated with a numeric index according to the formulas or decision trees accompanying this methodology. The scoring system is from 0.001 to 1.0 signifying low to high, respectively; in the instances where an exceptional rating applies, a score of 2 accentuates the rarity. For yes-no questions, yes receives a score of 1 and no receives a score of zero. Each wetland function then receives an index score with ratings as follows:

Functional Ratings	Question Score	Functional Index Score
Exceptional	2.0	1.01 - 2.00
High	1.0	0.66 - 1.00
Medium	0.5	0.33 - 0.65
Low	0.1	0.001 - 0.32
Not Applicable	N/A	0.0

MnRAM includes numeric as well as general ratings. The numeric ratings are based on standardized formulas to achieve consistency among users and are, in effect, placeholders for the general rating categories of exceptional, high, medium, and low. Great care should be taken when interpreting the results. In particular, the general and numeric ratings should not be summed or averaged across different functions (or for different wetlands). Mixing the ratings of disparate functions (or different wetlands) can be misleading if not meaningless. The primary intent of MnRAM is to provide a function-by-function rating for individual wetlands (or plant communities).

Wetland Functional Assessment Summary

Wetland Name
Unique number for each wetland assigned by county staff during the process of identifying sites for the project.

Hydrogeomorphology
Hydrogeomorphology describes the position of a wetland in the landscape (geomorphic setting), dominant sources of water, and the flow and fluctuation of water once in the wetland.

Maintenance of Characteristic Hydrologic Regime
A wetland's hydrologic regime or hydroperiod is the seasonal pattern of the wetland water level that is like a hydrologic signature of each wetland type. It defines the rise and fall of a wetland's surface and subsurface water. The constancy of the seasonal patterns from year to year ensures a reasonable stability for the wetland. The ability of the wetland to maintain a hydrologic regime characteristic of the wetland type is evaluated based upon wetland soil and vegetation characteristics, land use within the wetland, land use within the upland watershed contributing to the wetland, and wetland outlet configuration. Maintenance of the hydrologic regime is important for maintaining a characteristic vegetative community, and is closely associated with other functions including flood attenuation, water quality and groundwater interaction. MnRAM measures the degree of human alteration of the wetland hydrology, either by outlet control or by altering immediate watershed conditions.

Flood and Stormwater Storage/Attenuation
A wetland's ability to provide flood storage and/or flood wave attenuation is dependent on many characteristics of the wetland and contributing watershed. Characteristics of the subwatershed that affect the wetland's ability to provide flood storage and attenuation include: soil types, land use and resulting stormwater runoff volume, sediment delivery from the subwatershed, and the abundance of wetlands and water bodies in the subwatershed.

Wetland characteristics which affect the wetland's ability to store and or attenuate stormwater include: condition of wetland soils; presence, extent, and type of wetland vegetation; presence and connectivity of channels; and most importantly outlet configuration.

Higher rated wetlands will have an unaltered or restricted outlet, undisturbed wetland soils, dense emergent vegetation without channels, a high proportion of impervious surfaces in the subwatershed, large runoff volumes, clayey upland soils, and few wetlands present within the subwatershed.

Downstream Water Quality Protection
This rates the wetland's ability and opportunity to protect valuable downstream resources. Valuable downstream resources include recreational waters (i.e. lakes, streams, rivers, creeks, etc) and potable water supplies. The level of functioning is determined based on runoff characteristics, sedimentation processes, nutrient cycling, and the presence and location of significant downstream water resources.

Runoff characteristics that are evaluated include: land use and soils in the upstream watershed, the stormwater delivery system to the wetland, and sediment delivery characteristics. The ability of the wetland to remove sediment from stormwater is determined by emergent vegetation and overland flow characteristics. A high nutrient removal rating indicates dense vegetation and sheet flow to maximize nutrient uptake and residence time within the wetland.

The opportunity for a wetland to protect a valuable water resource diminishes with distance from the wetland so wetlands with valuable waters within 0.5 miles downstream have the greatest opportunity to provide protection, as do those that receive more (and less-treated) runoff.

Functional Index for Downstream Water Quality Protection
Three major processes make up equal portions of the Downstream Water Quality Protection function with a measure of opportunity to protect downstream resources; each process is comprised of two to four observable parameters.

1. **Rate, Quantity, and Quality of Runoff to the Wetland**: this is characterized by the conditions in the upstream watershed; both land use and soils, that affect the sediment and nutrient loads to the wetland, and by the existing storm water delivery system to the wetland.

2. **Sedimentation**: this is characterized by the presence of flow-through emergent vegetation density and by the overland flow characteristics within the wetland. A wetland with primarily sheet flow through the wetland and dense emergent vegetation density will allow sediment to drop out more effectively than a wetland with channel flow and no vegetation.

3. **Nutrient Uptake**: this is characterized by the outlet configuration and vegetative characteristics. A wetland with long water retention times has more capacity to remove nutrients from the water column via physical and biological processes. Vegetation slows floodwaters by creating frictional drag in proportion to stem density which allows sediment particles to settle out, thereby improving the water quality for downstream uses.

4. **Downstream Sensitivity**: if the wetland contributes to the maintenance of water quality within one-half mile of a recreational water body or potable water supply source downstream, it operates at a higher functioning level than a similar wetland farther from or without significant downstream water resources.

Maintenance of Wetland Water Quality

The sustainability of a wetland is partially driven by the quality and quantity of stormwater runoff entering the wetland. The ability of the wetland to sustain its characteristics is evaluated based on characteristics of the contributing subwatershed and indicators within the wetland.

Subwatershed conditions which affect the wetland‘s sustainability in relation to water quality impacts include: upland land use; sediment delivery characteristics to the wetland; stormwater runoff volumes and rates; and the extent, condition, and width of upland buffer.

Indicators of nutrient loading to the wetland indicate that a diverse wetland may not be sustainable. Indicators that a wetland has been affected by nutrient loading include the presence of monotypic vegetation and/or algal blooms.

Shoreline Protection

Shoreline protection is evaluated only for those wetlands adjacent to lakes, streams, or deepwater habitats. The function is rated based on the wetlands opportunity to protect the shoreline; i.e. wetlands located in areas frequently experiencing large waves and high currents have the best opportunity to protect

the shore. In addition, shore areas composed of sands and loams with little vegetation or shallow-rooted vegetation will benefit the most from shoreline wetlands. The wetland width, vegetative cover, and resistance of the vegetation to erosive forces determine the wetland's ability to protect the shoreline.

Maintenance of Characteristic Wildlife Habitat Structure

The ability of a wetland to support various wildlife species is difficult to determine due to the specific requirements of the many wildlife species that utilize wetlands. This function determines the value of a wetland for wildlife in a more general sense, and not based on any specific species.

The characteristics evaluated to determine the wildlife habitat function include: vegetative quality, outlet characteristics (which control hydrologic regime), upland land use, wetland soil type and conditions, water quality of storm water runoff entering the wetland, upland buffer extent, condition, and diversity; the interspersion of wetlands in the area; barriers to wildlife movement; wetland size; vegetative and community interspersion within the wetland; and amphibian breeding potential and overwintering habitat.

Maintenance of Characteristic Fish Habitat

The ability of the wetland to support native fish populations is determined by structural factors within the wetland as well as water quality contributions from upland factors. Wetlands rated High are lacustrine or riverine and provide spawning/nursery habitat, or refuge for native species (included but not limited to game fish). Wetlands rated Low for fish habitat do not have a direct hydrologic connection to a waterbody with a native fishery or have poor water quality.

Note: In MnRAM if the wetland is part of, or directly adjacent to, a State or Federal fish and wildlife refuge or fish and wildlife management area, and water fowl protection area, then Wildlife and/or Fish Habitat functional rating is Exceptional.

Maintenance of Characteristic Amphibian Habitat - Frogs, Toads and Salamanders

The characteristic ability of a wetland to support various amphibian species is difficult to determine due to the specific requirements of the many amphibian species that depend on wetlands. This function determines the value of a wetland for amphibians in general, not based on specific species. An adequate wetland hydroperiod and the presence or absence of predatory fish are considered to be limiting variables for this function. In general, wetlands must remain inundated until early to mid-June to allow the larval stages to metamorphose into adults. Because many amphibians are partly terrestrial, the characteristics evaluated to determine the amphibian habitat function include numerous hydrology and terrestrial measures. The characteristics evaluated include: upland land use, upland buffer width, water quality of storm water runoff entering the wetland, barriers to wildlife movement, and amphibian breeding potential and overwintering habitat.

An adequate wetland hydroperiod is considered to be the primary limiting variable for this functional index. If the hydroperiod is insufficient for breeding, the wetland rating for amphibian use will be Not Sufficient. The status of predatory fish in the wetland is a secondary limiting factor to the final rating.

Amphibians' ability to use a particular wetland for over wintering is a contributing factor in rating the wetland's functional index. Because most amphibians are partly terrestrial, the extent of upland buffer habitat surrounding the wetland is an important habitat component and is weighted by a factor of two.

Unnatural fluctuations in water depth in wetlands from conducted storm water runoff can impair reproductive success in amphibians, which often attach their eggs to stems of wetland vegetation, e.g., salamanders, tree frogs, green frogs, and wood frogs. Extreme water level fluctuations during winter may also cause mortality in overwintering reptiles and amphibians. The presence of barriers is included because access to and from the wetland by amphibians is an important factor in habitat quality.

Aesthetic / Recreation / Education / Cultural / Science

The aesthetics/recreation/education/cultural and science function and value of each wetland is evaluated based on the wetland's visibility, accessibility, evidence of recreational uses, evidence of human influences (e.g. noise and air pollution) and any known educational or cultural purposes. Accessibility of the wetland is key to its aesthetic or educational appreciation. While dependent on accessibility, a wetland's functional level could be evaluated by the view it provides observers. Distinct contrast between the wetland and surrounding upland may increase its perceived importance. Also, diversity of wetland types or vegetation communities may increase its functional level as compared to monotypic open water or vegetation.

Commercial Uses

This question considers the nature of any commercially-valuable use of the wetland and requires the assessor to consider how such use may be a detriment to the sustainability of the wetland. Some row crops can be planted in Type 1 wetlands after spring flooding has ceased and still have adequate time to grow to maturity. This non-wetland-dependent agricultural use of wetlands may include hay, pasture/grazing, or row crops such as soybeans or corn. Wetland-dependent crops include wild rice and cranberries, which rely on the wetland hydrology for part of their life cycle.

Sustainable uses of the wetland would not require modifying a natural wetland. Products in this category would include collection of botanical products, wet native grass seed, floral decorations, wild rice, black spruce, white cedar, and tamarack. Sustainable uses may require modification of the natural hydrology, such as for wetland-dependent crops (rice, cranberries). Haying and grazing can be less intrusive agricultural activities utilized more or less casually when hydrologic conditions permit; light pasture and occasional haying would be considered more or less sustainable. Like peat-mining, cropping is an unsustainable use of the wetland as it is results in severe alterations of wetland characteristics (soil, vegetation, hydrology).

Groundwater Interaction

The ground water interaction function is the most difficult to assess. Here the most likely type of ground water interaction is determined, i.e. recharge or discharge, or a combination. In many cases, a wetland will exhibit both recharge and discharge characteristics, however one is usually more dominant. Several wetland and watershed characteristics are evaluated to determine the likely interaction including: wetland soil type, upland land use, upland soil types and wetland size, wetland hydroperiod, wetland outlet characteristics, and topographic relief.

The purpose of this function is strictly to determine the likelihood of the appropriate ground-water interaction based on observable characteristics of the wetland and watershed. The significance of ground water as a component of the wetland water budget is the most difficult functional characteristic to determine without large quantities of detailed hydrologic and geologic information.

Wherever ground water recharge is indicated as the primary interaction and the wetland lies within a sensitive ground water area, a contribution area to a public water supply, or a wellhead protection area, it should be recorded as Exceptional for the ground water/wetland function.

Wetland Restoration Potential

The potential for wetland restoration is determined based on the ease with which the wetland could be restored, the number of landowners within the historic wetland basin, the size of the potential restoration area, the potential for establishing buffer areas or water quality ponding, and the extent and type of hydrologic alteration. Each variable uses the High, Medium, Low rating rather than raw numbers—see MnRAM for individual ranges.

Wetland Sensitivity to Stormwater Input and Urban Development

The sensitivity of the wetland to stormwater and urban development is determined based on guidance within the *Storm-Water and Wetlands: Planning and Evaluation Guidelines for Addressing Potential Impacts of Urban Storm-Water and Snow-Melt Runoff on Wetlands*, State of Minnesota Storm-Water Advisory Group, June 1997.

Additional Stormwater Treatment Needs

This rates the sustainability of the wetland with regard to stormwater discharges to the wetland. The need for additional stormwater treatment prior to discharge to the wetland is rated based on the overall rating for Maintenance of Wetland Water Quality. If a wetland is severely degraded by stormwater inputs, the rating will be low, since a diverse, high quality wetland will not be sustainable.

Wetland Community Summary

Vegetative Diversity/Integrity

The functional rating is based primarily on the diversity of vegetation within the wetland in comparison to an undisturbed condition for that wetland type. An “exceptional” rating results from one of the following conditions: 1) highly diverse wetlands with virtually no non-native species, 2) rare or critically impaired wetland communities in the watershed, or 3) the presence or previous sighting of rare, threatened, or endangered plant species. A high rating indicates the presence of diverse, native wetland species and a lack of non-native or invasive species. Wetlands that rate low are primarily dominated by non-native and/or invasive species.

Community
Cowardin Classification and Circular 39 - Plant Community

Circular 39- Plant Community

The *Wetlands of the United States* was published in 1959 by the U.S. Fish and Wildlife Service and is commonly referred to as "Circular 39". The Circular 39 Classification System was the first method that the U.S. Fish and Wildlife Service used to classify wetland basins in the U.S. It is composed of 20 wetland types of which eight are found in Minnesota.

TYPE 1: SEASONALLY FLOODED BASIN, FLOODPLAIN FOREST
Soil is covered with water or is waterlogged during variable seasonal periods, but usually is well-drained during much of the growing season. This wetland type is found both in upland depressions and in overflow bottomlands. In uplands, basins or flats may be filled with water during periods of heavy rain or melting snow.

Vegetation varies greatly according to season and duration of flooding: from bottomland hardwoods to herbaceous plants. Where the water has receded early in the growing season, smartweeds, wild millet, fall panicum, chufa, various amaranths and other plants (i.e. marsh elder, ragweed, and cockleburs) are likely to occur. Shallow basins that are submerged only very temporarily usually develop little or no wetland vegetation.

TYPE 2: WET MEADOW, FRESH WET MEADOW, WET TO WET-MESIC PRAIRIE, SEDGE MEADOW, AND CALCAREOUS FEN
Soil is usually without standing water during most of the growing season, but is waterlogged within at least a few inches of the surface. Meadows may fill shallow basins, sloughs, or farmland sags, or these meadows may border shallow marshes on the landward side. Vegetation includes grasses, sedges, rushes and various broad-leaved plants. Common representative plants are *Carex* sp. (sedges), *Juncus* sp. (rushes), redtop, reed grasses, manna grasses, prairie cordgrass, and mints. Other wetland plant community types include low prairies, sedge meadows, and calcareous fens.

TYPE 3: SHALLOW MARSH

Soil is usually waterlogged early during the growing season and may often be covered with as much as 6 inches or more of water. These marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes on the landward side. These are common as seep areas on irrigated lands. Vegetation includes grasses, bulrushes, spikerushes, and various other marsh plants such as cattails, arrowhead, pickerelweed, and smartweeds. Common representatives are reed, whitetop, rice cutgrass, *Carex*, and giant burreed.

TYPE 4: DEEP MARSH

Soil is usually covered with 6 inches to 3 feet or more of water during the growing season. These deep marshes may completely fill shallow lake basins, potholes, limestone sinks and sloughs, or they may border open water in such depressions. Vegetation includes cattails, reeds, bulrushes, spikerushes and wild rice. In open areas, pondweeds, naiads, coontail, watermilfoils, waterweeds, duckweed, water lilies, or spatterdocks may occur.

TYPE 5: SHALLOW OPEN WATER

Shallow ponds and reservoirs are included in this type. Water is usually less than 10 feet deep and is fringed by a border of emergent vegetation similar to open areas of Type 4. Vegetation (mainly at water depths less than 6 feet), includes pondweeds, naiads, wild celery, coontail, watermilfoils, muskgrass, waterlilies, and spatterdocks.

TYPE 6: SHRUB SWAMP; SHRUB CARR, ALDER THICKET

The soil is usually waterlogged during the growing season and is often covered with as much as 6 inches of water. Shrub swamps occur mostly along sluggish streams and occasionally on flood plains. Vegetation includes alders, willows, buttonbush, and dogwoods.

TYPE 7: WOODED SWAMPS; HARDWOOD SWAMP, CONIFEROUS SWAMP

The soil is waterlogged at least to within a few inches of the surface during the growing season and is often covered with as much as 1 foot of water. Wooded swamps occur mostly along sluggish streams, on old riverine oxbows, on floodplains, on flat uplands, and in very shallow lake basins. Forest vegetation includes tamarack, white cedar, black spruce, balsam fir, red maple, and black ash. Northern evergreen swamps usually have a thick ground covering of mosses. Deciduous swamps frequently support beds of duckweeds, smartweeds, and other herbs.

TYPE 8: BOGS; CONIFEROUS BOGS, OPEN BOGS

The soil is usually waterlogged and supports a spongy covering of mosses. Bogs occur mostly in shallow lake basins, on flat uplands and along sluggish streams. Vegetation is woody or herbaceous or both. Typical plants are heath shrubs, sphagnum moss, and sedges. In the North, leatherleaf, Labrador-tea, cranberries, *Carex*, and cottongrass are often present. Scattered, often stunted, black spruce, and tamarack may occur in northern bogs.

Cowardin Classification – National Wetlands Inventory

This methodology was used to classify wetlands for the National Wetlands Inventory maps beginning in the late 1970's and early 1980's. The hierarchical structure progresses from Systems and Subsystems at the most general levels to Classes, Subclasses, and Dominance Types at the most specific levels.

SYSTEM

The term System refers to a complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors. The primary systems found in the Minnesota are Palustrine, Lacustrine, and Riverine.

L: Lacustrine (lakes and deep ponds) - Lacustrine Systems include wetlands and deepwater habitats with all of the following three characteristics:

1. Situated in a topographic depression or a dammed river channel;
2. Lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30 percent areal coverage;
3. Total area exceeds 8 hectares (20 acres).

Basins or catchments less than 8 hectares in size are included if they have at least one of the following characteristics:

1. A wave-formed or bedrock feature forms all or part of the shoreline boundary; or
2. The catchment has, at low water, a depth greater than two meters (6.6 feet) in the deepest part of the basin.

P: Palustrine (shallow ponds, marshes, swamps and sloughs) - Palustrine Systems include all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens.

R: Riverine (rivers, creeks and streams) - Riverine Systems are contained in natural or artificial channels periodically or continuously containing flowing water. Upland islands or Palustrine wetlands may occur in the channel, but they are not part of the Riverine System.

SUBSYSTEM

The term Subsystem refers to a further subdivision of Systems into more specific categories. The Palustrine System has no subsystems associated with it while Lacustrine Systems have two Subsystems and Riverine Systems have four). Each Subsystem is unique for the System to which it applies.

L1: Limnetic - Extends outward from Littoral boundary and includes deep water habitats within the Lacustrine System.
L2: Littoral - Extends from shoreward boundary to 2 meters (6 feet) below annual low water or to the maximum extent of non-persistent emergents, if these grow at greater than 2 meters.
R2: Lower Perennial
R3: Upper Perennial
R4: Intermittent

CLASS, SUBCLASS

The wetland Class is the highest taxonomic unit below the Subsystem level. The Class code describes the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Life forms (e.g. trees, shrubs, emergents) are used to define classes because they are easily recognizable, do not change distribution rapidly, and have traditionally been used to classify wetlands. Finer differences in life forms are recognized at the Subclass level.

Mixed classes are used as sparingly as possible, under two main conditions: (1) The wetland contains two or more distinct cover types each encompassing at least 30 percent areal coverage of the highest life form, but is too small in size to allow separate delineation of each cover type; and (2) The wetland contains 2 or more classes or subclasses each comprising at least 30 percent areal coverage so evenly interspersed that separate delineation is not possible at the scale used for classification. Mixed subclasses are also allowed and follow the same rules for mixed classes.

AB: Aquatic Bed - Includes wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years.
Subclasses include: AB1 = Algal, AB2 = Aquatic Moss, AB3 = Rooted Vascular, AB4 = Floating Vascular, AB5 = Unknown Submergent, and AB6 = Unknown Surface.
EM: Emergent - Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years.
Subclasses include: EM1 = Persistent (plants that normally remain standing at least until the beginning of the next growing season), and EM2 = Nonpersistent (plants which fall to the surface of the substrate or below the surface of the water at the end of the growing season).
FO: Forested - Woody vegetation greater than 6 meters (20 feet) tall. Subclass determination is based on which type represents more than 50 percent of the areal canopy coverage during the leaf-on period and Subclasses include: FO1 = Broad-leaved Deciduous, FO2 = Needle-leaved Deciduous, FO3 = Broad-leaved Evergreen, FO4 = Needle-leaved Evergreen, FO5 = Dead, FO6 = Deciduous, and FO7 = Evergreen.
SS: Scrub/Shrub - Woody vegetation less than 6 meters (20 feet) tall. The species include true shrubs, young trees (saplings) or trees that are small or stunted because of environmental conditions.
Subclass determination is based on which type represents more than 50 percent of the areal canopy coverage during the leaf-on period and include: SS1 = Broad-leaved Deciduous, SS2 = Needle-leaved Deciduous, SS3 = Broad-leaved Evergreen, SS4 = Needle-leaved Evergreen, SS5 = Dead, SS6 = Deciduous (used if deciduous woody vegetation cannot be identified on aerial photography as either Broad-leaved or Needle-leaved), and SS7 = Evergreen (used if evergreen woody vegetation cannot be identified on aerial photography as either Broad-leaved or Needle-leaved).
UB: Unconsolidated Bottom - Includes all wetlands and deepwater habitats with at least 25 percent cover of particles smaller than stones (less than 6-7 cm.), and a vegetative cover less than 30 percent.

WATER REGIME

Precise description of hydrologic characteristics requires detailed knowledge of the duration and timing of surface inundation, both yearly and long-term, as well as an understanding of groundwater fluctuations. Because such information is seldom available, the water regimes that, in part, determine characteristic wetland and deepwater plant and animal communities are described here in only general terms.

A: Temporarily Flooded - Surface water present for brief periods during the growing season, but the water table usually lies well below the soil surface. Plants that grow both in uplands and wetlands are characteristic of this water regime. The temporarily flooded regime also includes wetlands where water is present for variable periods without detectable seasonal periodicity. Weeks, months, or even years may intervene between periods of inundation. The dominant plant communities under this regime may change as soil moisture conditions change.
B: Saturated - The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.
C: Seasonally Flooded - Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. When surface water is absent, the water table is often near the land surface. The water table after flooding ceases is highly variable, extending from saturated to a water table well below the ground surface.
F: Semi-permanently Flooded - Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.
G: Intermittently Exposed - Surface water is present throughout the year except in years of extreme drought.
H: Permanently Flooded - Water covers the land surface throughout the year in all years. Vegetation is composed of obligate hydrophytes.

Special Modifiers

Many wetlands and deepwater habitats are human-made and natural ones have been modified to some degree by the activities of humans or beavers. Since the nature of these modifications often greatly influences the character of such habitats, special modifying terms have been included here to emphasize their importance.

b: Beaver – Created or modified by a beaver dam.
d: Partly Drained – The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes. Drained areas are not considered wetland if they can no longer support hydrophytes.
f: Farmed – The soil surface has been mechanically or physically altered for production of crops, but hydrophytes will become reestablished if farming is discontinued.
h: Diked/Impounded – Created or modified by a barrier or dam which purposefully or unintentionally obstructs the outflow of water. Both humans-made and beaver dams are included.
r: Artificial – Refers to substrates classified as Rock Bottom, Unconsolidated Bottom, Rocky Shore, and Unconsolidated Shore that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials such as discarded automobiles, tires, or concrete.
s: Spoil – Refers to the placement of spoil materials which have resulted in the establishment of wetland.
x: Excavated – Lies within a basin or channel excavated by humans.

Wetland Proportion

Percentage of each community type in the wetland area assessed.

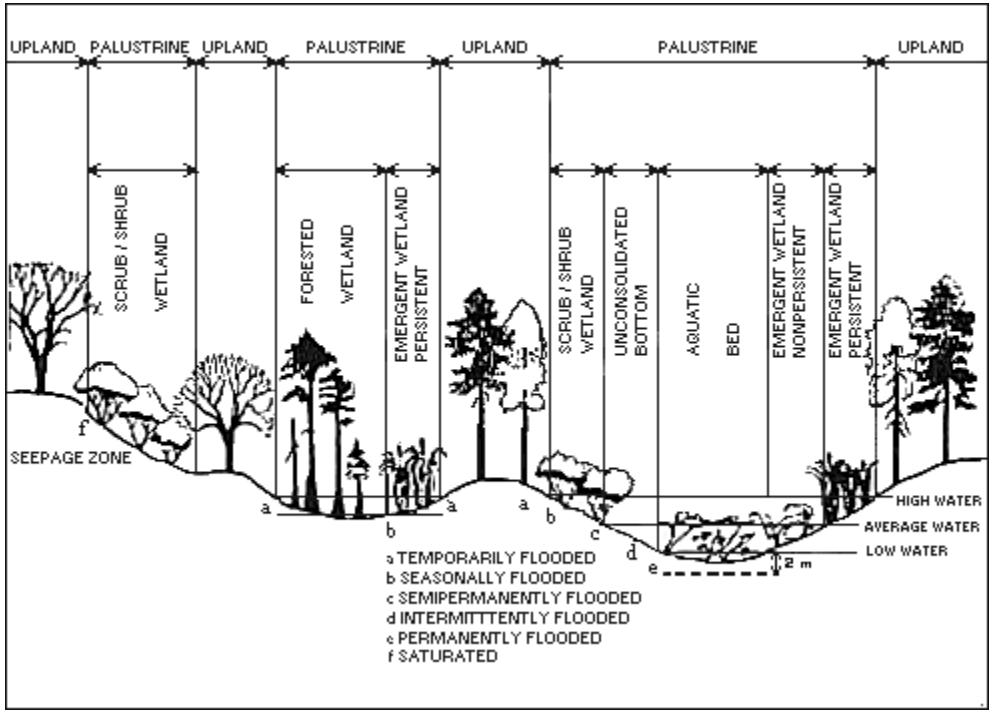
Individual Community Rating

Highest - Average Wetland Rating - Weighted Average Wetland Rating

Palustrine System - Cowardin Classification - National Wetlands Inventory

Definition. The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. It also includes wetlands lacking such vegetation, but with all of the following three characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; and (3) water depth in the deepest part of basin less than 2 m at low water.

Limits. The Palustrine System is bounded by upland or by any of the other four Systems.



Description. The Palustrine System was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie, which are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Palustrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers. The erosive forces of wind and water are of minor importance except during severe floods.

The emergent vegetation adjacent to rivers and lakes is often referred to as "the shore zone" or the "zone of emergent vegetation", and is generally considered separately from the river or lake. There are often great similarities between wetlands lying adjacent to lakes or rivers and isolated wetlands of the same class in basins without open water.

Subsystems. None.

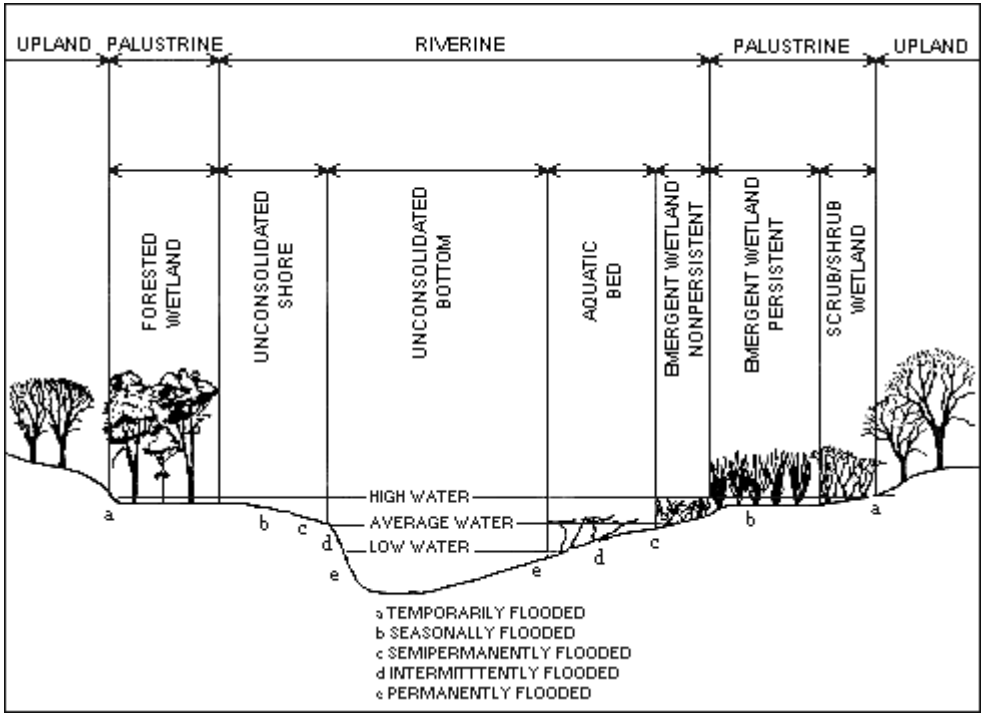
Classes. Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Unconsolidated Shore, Moss-Lichen Wetland, Emergent Wetland, Scrub-Shrub Wetland, and Forested Wetland.

Riverine System - Cowardin Classification - National Wetlands Inventory

Definition. The Riverine System includes all wetlands and deepwater habitats contained within a channel, with the exception of wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. A channel is an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water.

Limits. The Riverine System is bounded on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. In braided streams, the system is bounded by the banks forming the outer limits of the depression within which the braiding occurs. Springs discharging into a channel are considered part of the Riverine System.

Description. Water is usually, but not always, flowing in the Riverine System. Upland islands or Palustrine wetlands may occur in the channel, but they are not included in the Riverine System. Palustrine Moss-Lichen Wetlands, Emergent Wetlands, Scrub-Shrub Wetlands, and Forested Wetlands may occur adjacent to the Riverine System, often on a floodplain.



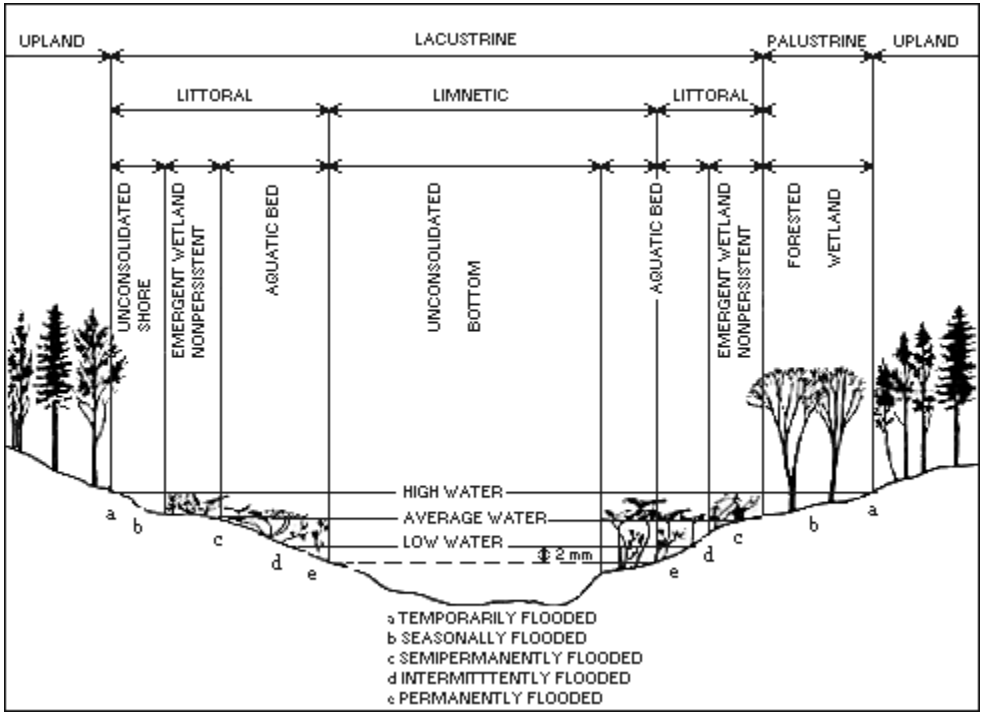
Subsystems. The Riverine System in Minnesota is divided into three Subsystems: the Lower Perennial, the Upper Perennial, and the Intermittent. Each is defined in terms of water permanence, gradient, water velocity, substrate, and the extent of floodplain development. The Subsystems have characteristic flora and fauna. All Subsystems are not necessarily present in all rivers, and the order of occurrence may be other than that given below.

- ***Lower Perennial.*** -- The gradient is low and water velocity is slow, and some water flows throughout the year. The substrate consists mainly of sand and mud. Oxygen deficits may sometimes occur, the fauna is composed mostly of species that reach their maximum abundance in still water. ***Upper Perennial.*** -- The gradient is high and velocity of the water is fast, and some water flows throughout the year. The substrate consists of rock, cobbles, or gravel with occasional patches of sand. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water.
- ***Intermittent.*** -- In this Subsystem, the channel contains flowing water for only part of the year. When the water is not flowing, it may remain in isolated pools or surface water may be absent.

Classes. Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Streambed, Rocky Shore, Unconsolidated Shore, and Emergent Wetland (nonpersistent).

Lacustrine System (Lakes) - Cowardin Classification - National Wetlands Inventory

Definition. The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; and (3) total area exceeds 8 ha (20 acres). Similar wetland and deepwater habitats totaling less than 8 ha are also included in the Lacustrine System if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 2 m (6.6 feet) at low water.



Limits. The Lacustrine System is bounded by upland or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Lacustrine Systems formed by damming a river channel are bounded by a contour approximating the normal spillway elevation or normal pool elevation, except where Palustrine wetlands extend lakeward of that boundary. Where a river enters a lake, the extension of the Lacustrine shoreline forms the Riverine-Lacustrine boundary.

Description. The Lacustrine System includes permanently flooded lakes and reservoirs (e.g., Lake Superior), intermittent lakes (e.g., playa lakes). Typically, there are extensive areas of deep water and there is considerable wave action. Islands of Palustrine wetland may lie within the boundaries of the Lacustrine System.

Subsystems.

- ***Limnetic.*** -- All deepwater habitats within the Lacustrine System; many small Lacustrine Systems have no Limnetic Subsystem.
- ***Littoral.*** -- All wetland habitats in the Lacustrine System. Extends from the shoreward boundary of the system to a depth of 2 m (6.6 feet) below low water or to the maximum extent of nonpersistent emergents, if these grow at depths greater than 2 m.

Classes. Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Rocky Shore, Unconsolidated Shore, and Emergent Wetland (nonpersistent).

Rapid Floristic Quality Assessment

R a p i d F Q A

Plant Community Assessment

Metric Summary and Community Assessment

Overall Assessment

Rapid FQA Output Sheet Description

Biologic Condition and Gradient Tier Description

Rapid FQA guidance documents can be found on the MPCA website:
http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/wetlands/floristic-quality-assessment.html

Community #1

Eggers & Reed Plant Community Type: Wet Prairie
Percent of AA Occupied by Type: 100

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	C	p	pC
1	Populus deltoides ssp. monilifera	Cottonwood	1	> 0 - 1%	0.5	Native	Tree	1	0.0051	0.0051
2	Salix discolor	Pussy willow	1	> 0 - 1%	0.5	Native	Shrub	3	0.0051	0.0153
3	Andropogon gerardii	Big bluestem	2	> 1 - 5%	3	Native	Herb	4	0.0306	0.1224
4	Apocynum cannabinum	American hemp	2	> 1 - 5%	3	Native	Herb	3	0.0306	0.0918
5	Salix interior	Sandbar willow	2	> 1 - 5%	3	Native	Shrub	2	0.0306	0.0612
6	Spiraea alba	White meadowsweet	2	> 1 - 5%	3	Native	Shrub	5	0.0306	0.1531
7	Asclepias incarnata ssp. incarnata	Swamp milkweed	1	> 0 - 1%	0.5	Native	Herb	4	0.0051	0.0204
8	Calamagrostis canadensis	Bluejoint	2	> 1 - 5%	3	Native	Herb	4	0.0306	0.1224
9	Carex interior	Interior sedge	3	> 5 - 25%	15	Native	Herb	7	0.1531	1.0714
10	Cicuta maculata	Spotted water hemlock	2	> 1 - 5%	3	Native	Herb	5	0.0306	0.1531
11	Cirsium arvense	Canada thistle	1	> 0 - 1%	0.5	Introduced	Herb	0	0.0051	0
12	Fragaria virginiana	Common strawberry	1	> 0 - 1%	0.5	Native	Herb	2	0.0051	0.0102
13	Helianthus grosseserratus	Sawtooth sunflower	2	> 1 - 5%	3	Native	Herb	3	0.0306	0.0918
14	Iris versicolor	Northern blue flag	1	> 0 - 1%	0.5	Native	Herb	4	0.0051	0.0204
15	Phalaris arundinacea	Reed canary grass	3	> 5 - 25%	15	Introduced	Herb	0	0.1531	0
16	Polygonum amphibium	Water smartweed	1	> 0 - 1%	0.5	Native	Aquatic, Herb	4	0.0051	0.0204
17	Spartina pectinata	Prairie cordgrass	4	> 25 - 50%	37.5	Native	Herb	5	0.3827	1.9133
18	Symphyotrichum lanceolatum	Eastern panicled aster	2	> 1 - 5%	3	Native	Herb	5	0.0306	0.1531
19	Vernonia fasciculata	Bunched ironweed	2	> 1 - 5%	3	Native	Herb	5	0.0306	0.1531

Metric Summary & Community Assessments

	Community #1
Community Type	Wet Prairie
wC	4.2
BCG Tier	2

Additional Metrics	
Native Species Richness	17
Introduced Species Richness	2
Mean C	3.5
FQI	14.3
Total Midpoint % Cover	98
Total Introduced Spp. Cover	15.5
Proportion of Introduced Cover	0.16

Overall Assessment

Community #	Community Type	*wC*	BCG Tier	Proportion of AA	Proportion x BCG Tier
1	Wet Prairie	4.2	2	1	2

Wheighted Average BCG Tier for AA **2**

Rapid Floristic Quality Assessment Output Sheets

Summary and Glossary

The **Rapid Floristic Quality Assessment (RFQA**) is a vegetation-based ecological assessment approach that can be used for wetland quality monitoring and assessment. RFQA is based on the Coefficient of Conservatism (C).

Community is the range of plants that make up a specific kind of wetland. The different community types are explained below. Each Assessment Area (AA), (i.e. wetland being evaluated) can contain up to 3 different plant community types.

Eggers & Reed Plant Community Types:

Shallow Open Water

Shallow, open water plant communities generally have water depths of less than 6.6 feet (2 meters). Submergent, floating and floating-leaved aquatic vegetation including pondweeds, water-lilies, water milfoil, coontail and duckweeds characterize this wetland type. Size can vary from a one-quarter acre pond, to a long oxbow of a river, or shallow bay of a lake. The presence or absence of floating vegetation depends upon the effects of the season, wind, availability of nutrients, and aquatic weed control efforts. Shallow, open water communities differ from deep and shallow marshes in that they are seldom, if ever, drawn down. As a result, persistent, emergent aquatic vegetation cannot become established.

Deep Marsh

Deep marsh plant communities have standing water depths of between 6 inches and 3 or more feet during the growing season. Herbaceous emergent, floating, floating-leaved and submergent vegetation compose this community, with the major dominance by cattails, bulrushes, pickerelweed, giant bur-reed, common reed, wild rice, pondweeds and/or water-lilies.

Shallow Marsh

Shallow marsh plant communities have soils that are saturated, or inundated by standing water up to 6 inches in depth, throughout most of the growing season. Herbaceous emergent vegetation such as cattails, bulrushes, arrowheads and lake sedges characterize this community. Floating and floating-leaved vegetation are typically reduced and the submergent vegetation is absent.

Fresh Meadow

Fresh (wet) meadows are dominated by grasses and by forbs growing on saturated soils. The forbs and grasses of these meadows tend to be less competitive, more nutrient demanding, and often shorter-lived species, therefore, fresh (wet) meadows may represent younger communities that indicate recent disturbances of other inland fresh meadows by drainage, siltation, cultivation, pasturing, peat fires and/or temporary flooding. Once established, the forbs and grasses of the fresh (wet) meadow community may persist for extended periods of time. Many fresh (wet) meadows are dominated by reed canary grass, a very aggressive, invasive species that can form near monotypes persisting for decades.

Wet Prairie

Prairies are open, herbaceous plant communities dominated by native grass and grass-like species. These communities are similar to fresh (wet) meadows, but are dominated by native grasses and forbs associated with prairies such as prairie cord-grass, big bluestem, switchgrass and sawtooth sunflower. Prior to European settlement, vast expanses of prairie existed in southern Minnesota. Prairies evolved with fire and fire is essential to maintenance of prairies. Without periodic burns, prairies become subject to invasion by woody vegetation. European settlement brought two things to the prairie: the plow and fire suppression. Once the prairie sod was broken, and the wet prairies were drained, the deep, black soils proved to be among the most productive farmland in the world. More than 99 percent of prairies in Minnesota were destroyed by the conversion to agricultural use.

Shrub-Carr Swamps

Shrub-carrs are composed of tall, deciduous shrubs growing on saturated to seasonally flooded soils. Dominant shrubs are typically willows, red-osier dogwood, silky dogwood or gray dogwood. Groundlayer species include some of the ferns, forbs, grasses and sedges of sedge meadow and fresh (wet) meadow communities.

Hardwood Swamp

Hardwood swamps are dominated by deciduous hardwood trees with soils that are saturated during much of the growing season, and may be temporarily inundated by as much as a foot of standing water. Dominant trees include black ash, red maple, yellow birch, balsam poplar, quaking aspen and silver maple. Vernal pools often occur in wooded swamps. These consist of depressions within upland forests that are ponded early in the growing season, and then dry down for the majority of the growing season. The herb layer may be sparse to absent given the alternating periods of ponding and drawdown.

Floodplain Forest

Floodplain forests are wetlands dominated by mature, deciduous hardwood trees growing on alluvial soils associated with riverine systems. The soils are inundated during flood events, but are usually somewhat well-drained for much of the growing season. The most characteristic feature of floodplains is the alluvial soil that is constantly being deposited in some locations and eroded away in others. Dominant hardwoods include silver maple, green ash, river birch, swamp white oak, plains cottonwood, American elm and black willow. The shrub layer is typically sparse to lacking because of frequent flooding. Woody vines are more prevalent in floodplain forests than any other forested wetland community. Examples include wild grape, Virginia creeper and moonseed. The herbaceous groundlayer can be sparse and include jewelweed, nettles and certain sedges.

Cover Class (CC) is an estimation of aerial cover for each plant documented. There are 7 classes and each class has a range of values. The table illustrates the cover classes, their respective ranges and the **midpoint CC**.

Cover Class	Cover Class Range	Midpoint
7	95 – 100%	97.5%
6	75 – 95%	85%
5	50 – 75%	62.5%
4	25 – 50%	37.5%
3	5 – 25%	15%
2	1 – 5%	3%
1	0 – 1%	0.5%

Native Status is indicating if the species is native to Minnesota or has been introduced. Introduced species are are non-native to the place or area where it is considered introduced.

Rapid FQA Stratum is the vegetative layer that the specific plant is found in. There are five stratums.

Stratum	Definition
Aquatic	True aquatic plants that are submergent or have floating leaves
Tree	Woody plants with typical maximum growth ≥ 3" DBH (diameter at breast height)
Shrub	Woody plants with typical maximum growth < 3" DBH
Woody Vine	All woody vines
Herb	All non-aquatic herbaceous plants and woody plants with typical maximum growth < 3.3 ft tall

The Coefficient of Conservatism (C) is a numerical rating of 0 to 10 that expresses an individual species' relative fidelity, or conservatism, to specific natural habitats. They are assigned to each native species by an expert panel of botanists using best professional judgment. Non-native species are not assigned C-values as they were not present during the evolution of native species, though they may be included in index calculations with a value of 0. High values indicate that the species is restricted to a very narrow range of habitats. For example, the white lady's slipper is found in only two types of plant communities in Minnesota and so it has a **C** of 10. Conversely, low values indicate low conservatism to specific natural habitats. Species with low values tend to be more universal in their distributions, tolerating a broader range of environmental conditions including human impacts. Box elder, which has a **C** of 1 is a natural component of floodplain forests; however, it can be found in other habitats, including disturbed lands, throughout the region.

p (proportional abundance) and **pC (proportional abundance x the C-value)** are used to calculate the abundance **weighted coefficient of conservatism (wC)**.

wC is the primary assessment metric because it incorporates species abundance. It takes several steps to calculate this number. The number calculated is an indicator of wetland condition because it accounts for varying degrees of human impacts.

Biological Condition Gradient (BCG) describes biological condition according to tiers that range from conditions that are equivalent to those found prior to European settlement– to conditions that are found at sites that are severely impacted. A five tier BCG model specific to wetland vegetation has been developed for the Rapid FQA. See table on next page for description of each tier.

Wheighted Average BCG Tier for AA is the tier given for the overall wetland evaluated. This value is calculated by multiplying each community BCG tier by its proportional extent and then summing the values.

For more information:

http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/wetlands/floristic-quality-assessment.html

Biological Condition Gradient (BCG) Tier Description and Results of Blue Earth County Wetland Assessment

BCG Tier	MnRAM Vegetation Quality Category	Plant Community Summary Description	Number of Wetlands in BEC Wetland Assessment
1	Exceptional	The plant community is relatively undisturbed such that it represents pre-European settlement conditions. A few non-native species may be present but do not cause displacement of native ones.	2
2	High	The plant community is similar to the natural community with minor changes in the abundance and distribution. Multiple native dominant plants typically present with invasive species comprising < 20%.	6
3	Medium	Moderate changes in the plant community. Sensitive and rare plants replaced with more tolerant ones. Native species reduced with invasive species comprising 20-50%.	40
4	Low	Large to extreme changes in the plant community. Extent of native species is reduced to isolated pockets with invasive species comprising >50%. If in a forested community >50% of the canopy may be dead and/or no tree regeneration.	27
5		Plant life only marginally supported or soil largely devoid of wetland vegetation due to ongoing severe human impacts.	0
			75