Rapid Floristic Quality Assessment Manual

Minnesota Pollution Control Agency

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About this Version

This version of the Rapid Floristic Quality Assessment (FQA) manual replaces an earlier version released in December 2012. Updates include changing the assessment outcomes from numerical "Biological Condition Gradient (BCG) Tiers" to descriptive "Condition Categories" and updating plant species nomenclature to the US Army Corps of Engineers National Wetland Plant List. Both the Data Form and the Calculator have been updated accordingly to reflect these changes. All other aspects of the Rapid FQA—including the sampling protocol and assessment criteria—are unchanged.

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Cover Photo

A Shallow Marsh community dominated by *Carex lacustris* Willd. (lake sedge) in Cass county. Photo taken by Michael Bourdaghs.

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Contents

1 Introduction

The goal of Minnesota's 'no net loss' wetland policy is to "achieve a no net loss in quantity, quality and biological diversity of Minnesota's wetlands" (Minn. S. 103A 201). While no net loss is often referred to primarily in terms of wetland quantity (acres), the policy clearly includes aspects of wetland quality. Wetland quality monitoring and assessment approaches are therefore needed to measure whether no net loss goals are being met.

Nationwide, there has been a great interest in developing wetland monitoring and assessment techniques, particularly those that can be done quickly. These are known as Rapid Assessment Methods, or RAMs. RAMs are generally qualitative, where the user makes relatively simple on-site field observations to answer categorical questions, and the method can be done with no more than a half day in the field and a half day of office preparation (Fennessy et al. 2004). In this way, RAMs rely on coarse level information that can be quickly obtained, potentially in exchange for greater accuracy that more detailed (or quantitative) assessment approaches might provide. This degree of on-site/rapid/qualitative based assessment has been described as Level 2 in the U.S. Environmental Protection Agency's (US EPA) hierarchical monitoring and assessment classification, falling in between landscape scale/Geographic Information System (GIS)/remote sensing (Level 1) and on-site/intensive sampling/quantitative based (Level 3) monitoring and assessment (US EPA 2006).

RAMs have been developed to measure wetland functions (i.e., the goods and services that wetlands provide) as well as wetland condition (i.e., the deviation of a wetland from a natural or minimally impacted state). Examples include the Minnesota Routine Assessment Method (MnRAM; MN BWSR 2010) which evaluates a suite of different wetland functions and the Ohio (Mack 2001) and California (Collins et al. 2008) RAMs which focus on measuring wetland condition. While functional and condition assessment approaches have often been viewed as unrelated or competing methodologies, they rely on many of the same concepts and are complimentary (Stevenson and Hauer 2002). As evidence of this, both the MnRAM and ORAM have been used in regulatory applications in their respective states.

In addition to the RAMs, there has been much corresponding work to develop Level 3 wetland monitoring and assessment approaches. In Minnesota, these include a hydrogeomorphic (HGM) functional assessment approach for prairie potholes (Gilbert et al. 2006) and macroinvertebrate and vegetation Indices of Biological Integrity (IBIs) that assess depressional marsh condition (Gernes and Helgen 2002, Genet and Bourdaghs 2006, Genet and Bourdaghs 2007).

The Floristic Quality Assessment (FQA) is a vegetation based ecological condition assessment approach that has increasingly been used for wetland monitoring and assessment. FQA is based on the Coefficient of Conservatism (*C*), which is a numerical rating (0 – 10) of an individual plant species' fidelity to specific habitats and tolerance of disturbance–natural or anthropogenic (Swink and Wilhelm 1994). Species that have narrow habitat requirements and/or little tolerance to disturbance have high *C*-values and vice versa. *C*-values are typically assigned for state or regional floras by a group of local botanical experts using consistent guidance and relying on best professional judgment. *C*-values have been developed for many local floras including Minnesota's wetland flora (Milburn et al. 2007). FQA metrics are derived from on-site vegetation sampling data and the *C*-values. They have repeatedly been found to be responsive and reliable wetland condition indicators (Lopez and Fennessy 2002, Cohen et al. 2004, Mack 2004, Bourdaghs et al. 2006, Miller and Wardrop 2006, Rocchio 2007, Milburn et al. 2007) and one of the most frequently used class of metrics in wetland vegetation based monitoring and assessment methods (Mack and Kentula 2010). FQA is typically a considered a Level 3 assessment approach–requiring intensive vegetation sampling by highly trained botanical experts.

Recognizing these competing factors (i.e., the effectiveness of FQA vs. the expertise and intensive sampling barrier to broad usage), the MPCA began a project in 2008 to explore if RAM concepts could be successfully applied to the FQA. Through multiple field trials, a simplified vegetation sampling approach was developed

that relies on a plant species checklist and meander type sampling. The checklist has been limited to the more common and easier to identify species and the meander type sampling can be done rapidly and varies according to site complexity. In addition, data from numerous minimally impacted and severely impacted wetlands were used to develop quantitative assessment criteria that can be used to translate metric scores into meaningful wetland condition assessments. The result of the project is the Rapid FQA (Bourdaghs 2012).

The target Rapid FQA users are natural resource professionals that have a moderate (or greater) level of wetland botanical expertise in Minnesota. The Rapid FQA should be applicable for many wetland monitoring and assessment applications including:

- ambient and long term status and trend monitoring
- mitigation sequencing
- restoration monitoring and mitigation performance standards
- local and regional planning
- identifying candidate high quality preservation wetlands

This manual provides the basic knowledge and guidance to complete a Rapid FQA. The details behind the Rapid FQA–including how the sampling methods and assessment criteria were developed–are provided in: *Development of a Rapid Floristic Quality Assessment* (Bourdaghs 2012). The *C*-values for the wetland species of Minnesota are available from: *Floristic Quality Assessment for Minnesota Wetlands* (Milburn et al. 2007). All the FQA reports and associated data forms and files can be found at the MPCA FQA webpage.

2 Key Concepts and Components

The Rapid FQA incorporates a number of novel sampling approaches as well as a recently introduced assessment framework that may be new to most natural resource professionals that have experience sampling wetland vegetation or have done wetland monitoring and assessment. The user should understand the following key concepts and components before proceeding to do the Rapid FQA–as they are referred to frequently in the step-by-step instructions presented in Sections 3 (Rapid FQA Field Sampling Protocol) and 4 (Metric Calculations and Assessment) of this manual.

2.1 The Assessment Area

The Assessment Area (AA) is the wetland area that is being represented by the Rapid FQA sampling. The Rapid FQA sampling approach was designed with the flexibility to be able to sample the wide variety of wetlands that occur in Minnesota. Thus, AAs can vary in size and shape and according to the needs of the user (Figure 1). AAs can be defined as an entire wetland basin–but wetlands often don't occur as discrete basins. Where wetlands are more extensive, an AA can be established in a portion of a larger continuous wetland area. The key factor is that the AA is defined. Discrete breakpoints that can be used to define individual AAs include: upland boundaries; road crossings; constrictions; water control structures; beaver dams; and deep water habitats. Arbitrary AA boundaries can also be established in extensive wetland areas that are poorly defined by obvious breakpoints or when a project needs to only focus on a small area. While sampling trials indicated that AA size alone had no significant effect on Rapid FQA results (Bourdaghs 2012)–it is recommended that AA's not exceed 100 ha (or 250 acres) in size. Few trials have been conducted on AAs larger than this and it is unknown if the Rapid FQA continues to be accurate at this scale.

A

B

C

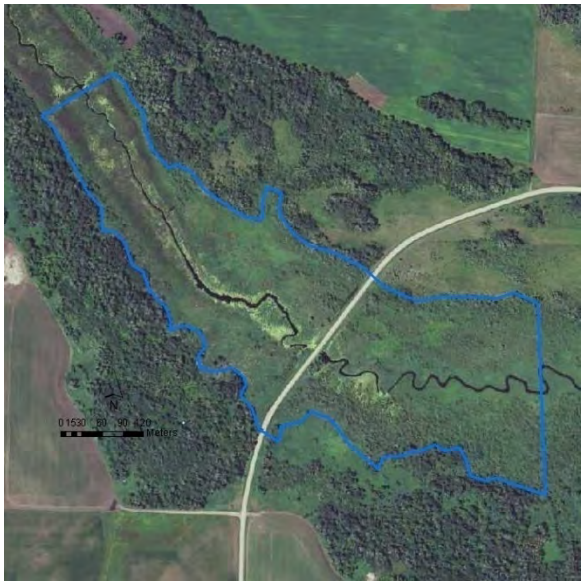

Figure 1. Example AAs (within blue boundaries). A) A relatively large (22.5 ha) depressional wetland with a clear upland boundary that defines the basin. B) Four depressional wetland basins ranging in size from 0.1 – 2.7 ha within a larger work area. Three of the basins are bounded by upland. The smallest basin (SW corner of work area) is cut off from previously adjoining wetland by a road bed. C) Riparian wetland adjacent to a low order stream. Arbitrary boundaries were established as contiguous wetland area extends well beyond the road crossing. The road and stream channel (deep water habitat) were not considered to be significant enough features to map.

2.2 Plant Communities

The natural and impact response ranges of FQA metrics vary significantly according to plant community types (Rooney and Rogers 2002, Milburn et al. 2007, Bourdaghs 2012). This is likely due to plant communities developing under different disturbance regimes. *C*-values are a measure of a species' tolerance to disturbance (both natural and anthropogenic) so FQA metrics will express these differences across community types. Because of this, plant community types should be the basic general sampling and assessment unit and classification is needed for any FQA use.

The Rapid FQA follows the classification system presented in *Wetland Plants and Wetland Plant Communities of Minnesota and Wisconsin* (Eggers and Reed 2011, Table 2)–with a few exceptions. In the Rapid FQA, the Sedge Meadow and Fresh (Wet) Meadow classes have been combined into a single Fresh Meadow type, and the Seasonally Flooded Basin class has been excluded due to insufficient available data to develop assessment criteria for the type (Bourdaghs 2012).

Table 1. Eggers and Reed (2011) plant community classes and brief class descriptions. Two classes have been slightly modified from the original classification. Fresh Meadow combines both the Eggers and Reed Sedge Meadow and Fresh (Wet) Meadow classes into a single class. The Seasonally Flooded Basin class is not being considered at this time.

Community class	Description
Shallow Open Water	Open water aquatic communities with submergent and floating leaved aquatic species
Deep Marsh	Emergent vegetation rooted within the substrate that is typically inundated with > 6" of water. Submergent and floating leaved aquatic species typically a major component of community
Shallow Marsh	Emergent vegetation on saturated soils or inundated with typically < 6" of water. May consist of a floating mat. Submergent and floating leaved aquatic species typically a minor component
Fresh Meadow	Graminoid dominated, soils typically saturated
Wet Prairie	Similar to Fresh Meadow but dominated by prairie grasses
Calcareous Fen	Soils calcareous peat (i.e., organic w/high pH) due to groundwater discharge with high levels of calcium/magnesium bicarbonates. Specialized calcareous indicator species (calciphiles) present-dominant
Sedge Mat	Graminoid dominated communities on circumneutral or slightly acidic peat soils. Often occurs as a floating mat and *Carex lasiocarpa* (wiregrass sedge) is often a dominant
Open Bog	Low shrub or graminoid dominated community on a mat of *Sphagnum* moss/acidic deep peat. Specialized acid tolerant (indicator) species dominant
Coniferous Bog	Forested community dominated by coniferous trees on a mat of Sphagnum moss/acidic deep peat. Specialized acid tolerant (indicator) species dominant
Shrub-Carr	Tall shrub community typically dominated by Willows (*Salix* spp.). Typical understory species composition similar to Fresh Meadow
Alder Thicket	Tall shrub community typically dominated by Alder (*Alnus incana* ssp. *rugosa*)
Hardwood Swamp	Forested community dominated by deciduous hardwood trees on saturated soils
Coniferous Swamp	Forested community dominated by coniferous trees on saturated soils. Soils typically circumneutral or slightly acidic
Floodplain Forest	Forested community dominated by deciduous trees on alluvial soils associated with riverine systems

When conducting a Rapid FQA, the plant communities need to be identified according to the Eggers and Reed (2011) classification and mapped within the AA (Figure 2). Sampling effort will occur (and data will be recorded) separately by type. Assessments will then be made for each community, as the assessment criteria are specific for each type. The community proportions from the mapping are then used to make the overall AA assessment.

Rapid FQA users should understand and be able to confidently determine Eggers and Reed (2011) community types in the field–as differences in interpretation can potentially cause large errors (Bourdaghs 2012, Appendix 6).

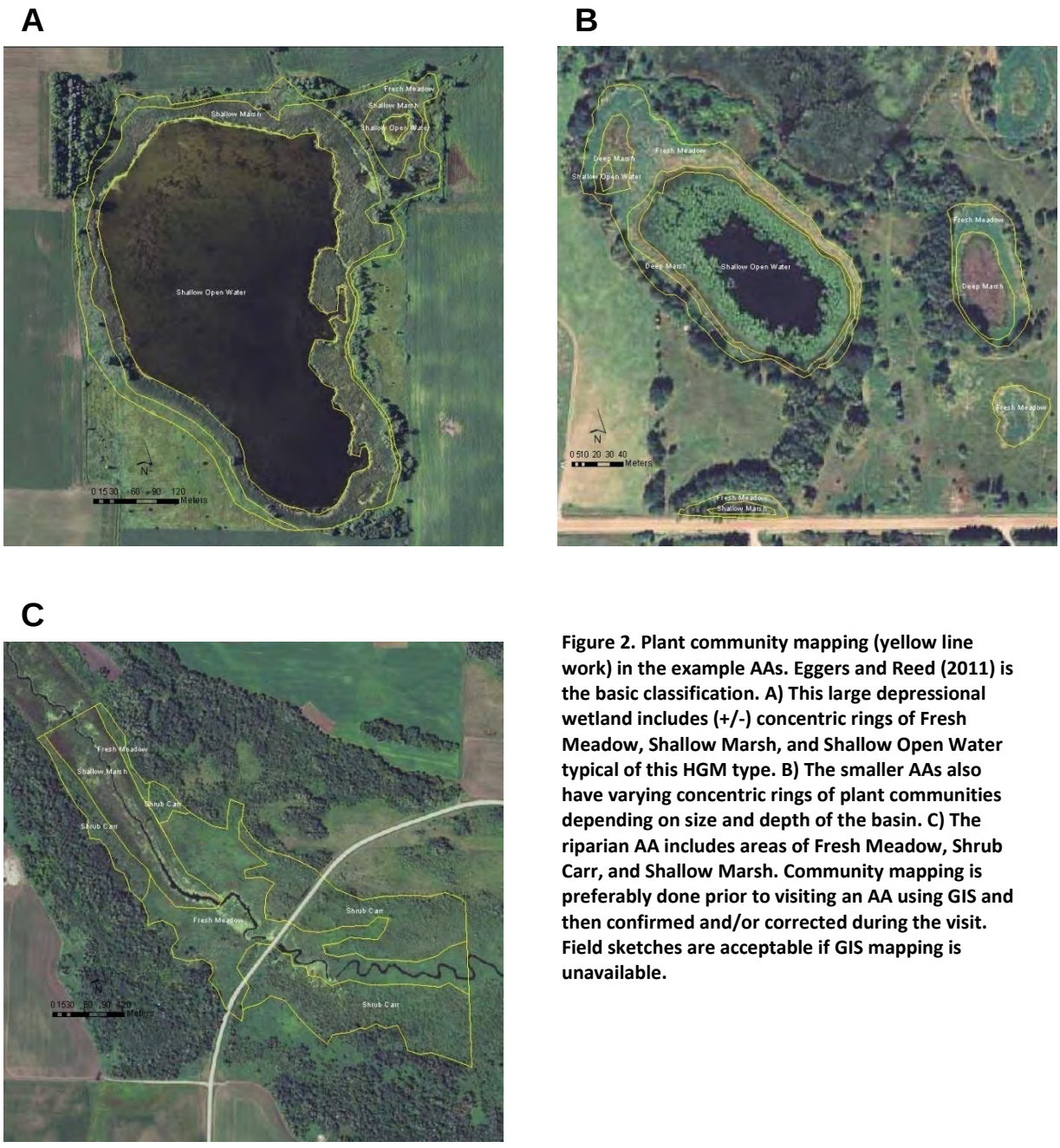

Figure 2. Plant community mapping (yellow line work) in the example AAs. Eggers and Reed (2011) is the basic classification. A) This large depressional wetland includes (+/-) concentric rings of Fresh Meadow, Shallow Marsh, and Shallow Open Water typical of this HGM type. B) The smaller AAs also have varying concentric rings of plant communities depending on size and depth of the basin. C) The riparian AA includes areas of Fresh Meadow, Shrub Carr, and Shallow Marsh. Community mapping is preferably done prior to visiting an AA using GIS and then confirmed and/or corrected during the visit. Field sketches are acceptable if GIS mapping is unavailable.

2.3 The Rapid Species List

A high level of botanical expertise is typically required to conduct detailed wetland vegetation surveys. In addition, a great deal of effort is often spent identifying the more difficult to identify species–either in the field or back in the office. In an effort to reduce the level of botanical expertise required and adapt the approach so that it falls within the spectrum of a RAM, the Rapid FQA focuses on only the more common and easier to identify species. To do this a 'Rapid Species List' has been created (Appendix 1). This was done by systematically rating all of the plant species that occur in Minnesota wetlands according to: 1) how frequently they occur 2) how distinct they are in appearance; and 3) whether or not they are dominant species. Ratings were completed by a panel of botanists following consistent guidance. The more common and/or easier to identify species were then selected for the Rapid Species List according to the ratings (Bourdaghs 2012).

The Rapid Species List is a central component of the Rapid FQA that not only reduces time in the field, but should also allow natural resource professionals with a moderate degree of wetland botanical expertise to conduct the method. The user should be able to identify and know the scientific names of most of the Rapid List Species that occur within the community types that they commonly work with, as the Rapid FQA sampling is limited to only those species on the Rapid Species List.

2.4 The Data Form

RAMs often rely on simplified data forms that contain the various checklists and categories necessary to facilitate ease of use in the field. This model has been followed for the Rapid FQA, where the data form is a single two sided sheet (Appendix 2). The majority of the data form is the Rapid Species List which essentially serves as a species checklist. When species are observed the user simply has to find the name and mark the data form instead of writing down plant names.

The top section of the form has space for general information. Each form has room for three community types that are recorded in numbered spaces. Typically, a single data form is needed to complete a Rapid FQA for an AA–though additional data forms can be used when AAs exceed three community types. The Rapid Species List is then organized by growth form/strata that (+/-) follow the US Army Corps of Engineers (US ACE) vertical strata used in wetland delineations (US ACE 2010a, US ACE 2010b, US ACE 2012):

- Aquatic Stratum – true aquatic plants that are submergent or have floating leaves
- Tree Stratum – woody plants with typical maximum growth ≥ 3" DBH
- Shrub Stratum – woody plants with typical maximum growth < 3" DBH
- Woody Vine Stratum – all woody vines
- Herb Stratum – all non-aquatic herbaceous plants (e.g., forbs and graminoids) and woody plants with typical maximum growth < 1m tall

Species are then listed alphabetically on the form by scientific name for each stratum. There are three spaces in front of each name that correspond to the communities present in the AA (recorded in the Community Information section). Species presence data is recorded by drawing a circle around the corresponding space when a given species is observed in a community. For example, if Community #1 record for an AA is Fresh Meadow–and *Calamagrostis canadensis* (Michx.) P. Beauv. (bluejoint) is observed while sampling in the Fresh Meadow–the leftmost space in front of *C. canadensis* would be circled. A circle is used so that a cover class can be recorded in the circle following the meander sampling for each species by community type.

2.5 Seasonal Sampling Period

The preferred Rapid FQA seasonal sampling period is generally June-September. During the sampling method trials FQA metrics were found to be stable (and thus returning reliable results) during this time (Bourdaghs 2012). This part of the growing season is typically when the majority of wetland plant species can be readily identified. Prior to June, most wetland plant species are not mature enough to identify during most years (in Minnesota). Likewise, following a hard frost in the fall many species senesce in most years. At both ends of the season plant identification becomes unreliable, affecting the accuracy of the Rapid FQA. Adjustments to the sampling period can be made due to year-year weather at the discretion of the user (e.g., warm spring, early frost).

2.6 Timed Meander Sampling

The Rapid FQA relies on a progressive timed meander sampling approach. In other words, sampling essentially consists of walking around the AA recording the 'Rapid Species' that are present for a specified amount of time–with additional time added to the meander according to the complexity of the site and the rate that new species are observed. The approach is 'plotless' requiring no equipment or predetermined

points. Sampling effort is measured in terms of time. The meander sampling approach provides great flexibility to meet the challenge of sampling AAs of varying size and complexity. Larger and/or more diverse AAs will tend to have longer timed meanders as more species are present and vice versa. The progressive timed meander also accounts for the speed at which the observer works. Advanced users may complete an AA within the minimum meander time; whereas, a less experienced user should be able to collect comparable data with additional time. Following the meander, areal cover is estimated by cover classes (Table 2) for the species observed by each community present in the AA.

The timed meander rules that guide how the meander proceeds and when it ends are specified in Sections 3.3 – 3.4. All users should be familiar with the timed meander rules prior to conducting a Rapid FQA.

Table 2. Cover classes, cover class ranges, and percent cover midpoints.

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%

2.7 Shoreline Sampling

Water depth and the presence of deep unconsolidated muck are often prohibitive to sampling the Shallow Open Water community type by foot. A shoreline sampling approach has been developed for the Rapid FQA adapted from rake-tow lake aquatic vegetation surveys typically done from boats (Bourdaghs 2012). The shoreline sampling consists of establishing three shoreline sampling stations at representative locations along the emergent vegetation/Shallow Open Water interface (Figure 3). At each station, aquatic species that are observed within visual range are recorded. In addition, aquatic species that are observed when a handheld garden cultivator tied to a 20' length or rope is tossed a retrieved through the Shallow Open Water community are recorded (Figure 4). Three retrieves are made per station: once perpendicular from the shore and both (+/-) 45° from perpendicular. Only aquatic species that are on the Rapid Species List (Appendix 1) are recorded. Areal cover estimates are then made for the community based on the observations from the three sampling stations.

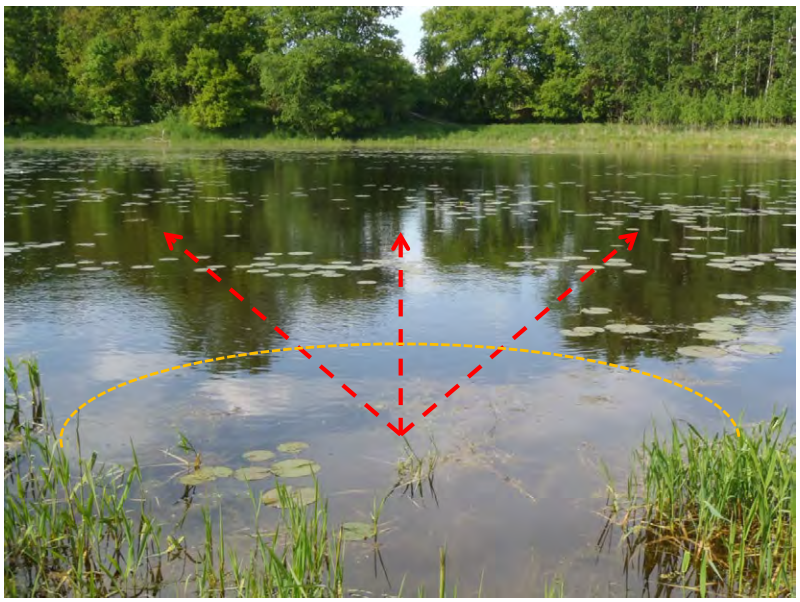

Figure 3. An example Shallow Open Water shoreline sampling station. Record all rapid aquatic species occurring within visual range (orange dashed line) and from three retrieves of the garden cultivator tows (red arrows). Three separate shoreline sampling stations are established at representative locations for sampling Shallow Open Water communities.

Figure 4. Handheld garden cultivator used for shoreline sampling (left) tied to a 20' length of rope with a loop tied on the end to prevent losing the cultivator. The tines are bent backwards to increase grip on aquatic vegetation. The cultivator is tossed and retrieved (above left) three times at each sampling station and aquatic rapid species are identified (above right).

2.8 Metrics

Field sampling is typically only one part of conducting a RAM. The other is calculating scores or metrics from the field data and making the assessment. A number of metrics can be derived from vegetation data and *C*-values–many variations of which (such as whether to include or exclude introduced species) have been introduced and discussed elsewhere (Milburn et al. 2007). The most prominent FQA metrics are the Mean *C* (the average Coefficient of Conservatism) and the *FQI* (the square root of the native species richness multiplied by the Mean *C*). While many different metric calculations can be made for the Rapid FQA, the primary assessment metric is the weighted Coefficient of Conservatism (*wC*)–which incorporates species abundance into the calculation. *wC* is the sum of each species' proportional abundance (*p*) for a community multiplied by its *C*-value:

$$wC = \sum pC$$

wC was chosen as the primary metric because sampling effort has no effect on *wC*–unlike species richness metrics (and subsequently the *FQI*) which increase with sampling effort (Rooney and Rogers 2002, Bourdaghs et al. 2006, Bourdaghs 2012). *wC* has also been found to be a more responsive indicator of wetland condition than Mean *C* (Bourdaghs 2012) due to sites often having similar species composition (but differing abundance distributions) at varying degrees of anthropogenic impacts (Table 3).

To support the increased computation involved with *wC* an Excel spreadsheet calculator has been developed where data can be entered and the metrics are calculated (Appendix 3). The Rapid FQA calculator is available on the MPCA FQA webpage.

Table 3. A hypothetical example illustrating metric calculations when two communities (Fresh Meadow #1 and #2) have the same species composition but different abundance distributions. The top table lists the scientific names of the species observed and their respective *C*-values (C) as well as the Cover Classes (CC); Midpoint % cover (Mid); proportional abundance (Midpoint % cover/Total Midpoint % cover); and the proportional abundance x the *C*-value (*pC*) used to calculate *wC* for both Fresh Meadow #1 and #2. The bottom table summarizes the metrics. Both Meadow #1 and #2 have the same species richness, Mean *C*, and *FQI* values. Meadow #1 has a low abundance of the non-native/invasive *Phalaris arundinacea* L. (Reed canary grass) and subsequently has a high *wC* score (4.3) compared to Meadow #2 which has a high abundance of *P. arundinacea* (1.0).

			Fresh Meadow #1					Fresh Meadow #2			
Scientific Name	***C***		**CC**	**Mid**	***p***	***pC***		**CC**	**Mid**	***p***	***pC***
Calamagrostis canadensis	4		5	62.5	0.5556	2.2222		3	15	0.1364	0.5455
Phalaris arundinacea	0		2	3	0.0267	0.0000		6	85	0.7727	0.0000
Carex stricta	5		4	37.5	0.3333	1.6667		2	3	0.0273	0.1364
Carex lacustris	5		2	3	0.0267	0.1333		1	0.5	0.0045	0.0227
Salix petiolaris	5		2	3	0.0267	0.1333		2	3	0.0273	0.1364
Solidago gigantea	3		1	0.5	0.0044	0.0133		1	0.5	0.0045	0.0136
Rubus idaeus ssp. *strigosus*	3		1	0.5	0.0044	0.0133		1	0.5	0.0045	0.0136
Lycopus uniflorus	5		1	0.5	0.0044	0.0222		1	0.5	0.0045	0.0227
Mentha arvensis	3		1	0.5	0.0044	0.0133		1	0.5	0.0045	0.0136
Typha latifolia	2		1	0.5	0.0044	0.0089		1	0.5	0.0045	0.0091
Impatiens capensis	2		1	0.5	0.0044	0.0089		1	0.5	0.0045	0.0091
Rumex orbiculatus	6		1	0.5	0.0044	0.0267		1	0.5	0.0045	0.0273

Metric	**Fresh Meadow #1**	**Fresh Meadow #2**
Native Spp. Richness	11	11
Introduced Richness	1	1
Mean *C*	3.6	3.6
FQI	11.9	11.9
wC	4.3	1.0
Total Midpoint % Cover	112.5	110
Introduced Spp. % Cover	3	85
Introduced Proportion	0.03	0.77

2.9 The Biological Condition Gradient

The final step in any type of wetland condition assessment is to convert metric results into a meaningful assessment which can then be used to inform management decisions. The Rapid FQA relies on a general model of biological response to anthropogenic impacts called the Biological Condition Gradient (BCG; US EPA 2005) as an underlying theoretical framework for the assessment criteria (Bourdaghs 2012). The BCG describes biological condition according to levels—or condition categories—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 level BCG model specific to wetland vegetation has been developed for the Rapid FQA (Table 4). While the BCG includes five levels, the Rapid FQA only describes the top four. The bottom

category represents a wetland condition where wetland vegetation is no longer supported (e.g., farmed wetland, storm water pond) and the Rapid FQA is not applicable. Assessment criteria have been determined for each community type (as each community type has different natural and response ranges) by calibrating *wC* scores to the condition categories using 725 vegetation samples primarily from the Minnesota Department of Natural Resources County Biological Survey and the MPCA (Bourdaghs 2012).

To complete a Rapid FQA, users will be required to place *wC* scores into the appropriate condition category using a table and then compute a composite condition category for the AA based on the proportions of each community in the AA. Instructions on how to do this are provided in Section 4 (Metric Calculations and Assessment). Users should be familiar with the wetland vegetation BCG (Table 4) as the final Rapid FQA assessment results will be expressed as condition category.

Table 4. The general wetland vegetation Biological Condition Gradient.

Condition Category	Description
Exceptional (1)	Community composition and structure as they exist (or likely existed) in the absence of measurable effects of anthropogenic stressors representing pre-European settlement conditions. Non-native taxa may be present at very low abundance and not causing displacement of native taxa.
Good (2)	Community structure similar to natural community. Some additional taxa present and/or there are minor changes in the abundance distribution from the expected natural range. Extent of expected native composition for the community type remains largely intact.
Fair (3)	Moderate changes in community structure. Sensitive taxa are replaced as the abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type diminished.
Poor (4)	Large to extreme changes in community structure resulting from large abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type reduced to isolated pockets and/or wholesale changes in composition.
Absent (5)	Plant life only marginally supported or soil/substrate largely devoid of hydrophytic vegetation due to ongoing severe anthropogenic impacts

3 Rapid FQA Sampling Protocol

The following section provides the step-by-step instructions to complete the Rapid FQA field sampling.

3.1 Map/Sketch the Approximate Boundaries of the AA and Plant Communities

The AA is the targeted wetland area that is being represented in the assessment and it should be defined. Individual plant communities are the basic Rapid FQA assessment unit and it will be necessary to determine relative proportions of the different community types within the AA to complete a Rapid FQA. It will be beneficial to define the AA and determine the community types present as best as possible prior to field sampling to plan potential meander starting points and pathways. The preferred method is to map AA and community polygons in GIS, using aerial photography, topographic maps, and National Wetlands Inventory (NWI) maps to guide interpretations (Figure 1, Figure 2). An acceptable method is to sketch AA and community boundaries on printed aerial photos/maps or create a rough AA/community sketch. Communities should follow Eggers and Reed (2011) types (Table 1).

3.2 Confirm and Correct AA and Community Types/Boundaries on Site

When first arriving at the AA effort should be spent doing an initial confirmation and (if necessary) correction of the AA boundaries and community types. Record any differences with the mapping done in Step 3.1 on a printed aerial photo or AA sketch. Following field sampling this information should be used to update any GIS

polygons. Record the community types in the numbered spaces provided on the data form (Appendix 2). Each data form has the capacity to record data for three community types in a single AA. If the AA has more than three community types, use an additional data form. Final confirmation and correction of the AA and communities can be done while doing the meander sampling to avoid the need to walk the AA multiple times.

3.3 Determine the Base Meander Time

The base meander time is the minimum amount of sampling time for an AA while doing a Rapid FQA timed meander. It varies according to the number of different communities present within the AA. Once the communities have been confirmed onsite–determine the base meander time according to the following rule:

- **30 minutes for the first community and add 20 minutes for each additional community**

For example, if the AA includes: Fresh Meadow, Shrub-Carr, and Shallow Marsh–the base meander time = 30 + 20 + 20 = 70 minutes.

3.4 Conduct the Composite Timed Meander

Timed meander sampling can now begin. All communities within the AA (except Shallow Open Water) are sampled in a single composite meander; however, data are recorded separately by community type. **Begin the meander in a representative area** (i.e., the most typical or predominant) of Community #1 and record the meander start time on the data form. Record the presence of plant species on the checklist provided on the data form (Appendix 2). This is done by circling the space in front of a species name that corresponds with the correct designated community number which the species is observed. **Only record species that are on the checklist and can be confidently identified during the time of sampling**. The same species can occur in multiple community types in a single AA (e.g., *Typha latifolia* L. [Broad-leaved cattail]) occurs in both the Shallow Marsh and Fresh Meadow communities in an AA and should be recorded as present in each community). Leave enough room within the circle to record a cover class (Section 3.6).

The meander path should move from community to community so that **approximately equal amounts of time are spent in each community** present in the AA. Mentally keep track of the approximate areal cover of each species per community type as the meander proceeds. The meander time can be paused to identify species, move to different locations in the AA, or conduct shoreline sampling (Section 3.5) and started again at the discretion of the observer.

The meander ends (or continues) based on the number of new Rapid Species observed near the end of the base meander time. **During the final 10 minutes of the base meander time begin keeping track of any new species encountered** in the Species Tally space provided on the data form. Proceed according to the following rules:

- **If < 3 new species are encountered during these 10 minutes, stop the meander at the end of the base meander time.**
- **If ≥ 3 new species are encountered during the last 10 minutes of the base meander time, continue the meander for an additional 10 minute time period.**
- **Continue adding 10 minute periods to the meander until < 3 new species are encountered in a time period. Once this occurs, the meander can be stopped.**

At small AAs the composite **meander may be stopped before the base meander time expires if the entire AA has been observed**.

Record the meander stop time and determine the total meander time in the space provided on the data form.

3.5 Conduct Shoreline Sampling (if Shallow Open Water Community Present)

If the Shallow Open Water community is present in the AA, establish three shoreline sampling stations along the emergent/aquatic vegetation interface at representative locations. Make species observations within visual range of the station and by tossing and retrieving the garden cultivator through the Shallow Open Water community three times at each station (Figure 3, Figure 4). Species presence is recorded in the same fashion as the meander sampling–a circle placed around the space corresponding to the species and designated community number. Shoreline sampling can be done concurrently with the meander sample (Section 3.4) so that walking the AA multiple times is avoided. The timed meander is paused when shoreline sampling is being conducted. Species encountered during the shoreline sampling do not count towards the species tally used to add time to the meander.

3.6 Make Areal Cover Estimations

Estimate the areal cover of each species observed by community type according to the cover classes (Table 2) provided on the data form (Appendix 2). This includes cover estimates for aquatic species that occur in the Shallow Open Water community (if present). Record the cover class of each species within the circle according to the corresponding community number.

The Rapid FQA field sampling is now complete. The steps in Section 4 (Metric Calculations and Assessment) can be completed back at the office.

4 Metric Calculations and Assessment

The following section provides the step-by-step instructions to calculate *wC* scores, make the community assessments, and the overall AA assessment.

4.1 Revise AA/Community Map/Sketch and Determine Community Proportions

To complete an overall Rapid FQA for the AA (Section 4.4) it will be necessary to determine the proportions of the AA occupied by each community. First, **revise the AA/community map/sketch based on the field observations**. Next, **calculate (or estimate) the percent of the AA occupied by each community type** and record these values on the data form (Appendix 2). If the AA and community polygons were mapped using GIS this can be calculated by dividing the area of the community by the total AA area and multiplying by 100. If a site sketch was made, estimate the percentage of each community in the AA based on the sketch.

4.2 Calculate *wC* Scores

The primary metric of the Rapid FQA is the abundance weighted Coefficient of Conservatism (*wC*). ***wC* requires several steps to calculate**. First, the community data needs to be arranged in a table with the species names in the rows and the following columns: the cover classes recorded for each species in the field; the midpoint percent cover that corresponds to each cover class (Table 2); and the corresponding *C*-value for each species (Appendix 1). Next, sum all of the midpoint percent cover values for the community to get a total cover estimate. Create a new column in the table and compute the proportional abundance (*p*) of each species by dividing the individual species midpoint percent cover by the total percent cover. Create another column in the table and multiply the *C*-value by the proportional abundance of each species. Finally, sum all

of these values for the community to get *wC*. An example of how to create the data table and calculate *wC* is provided in Table 3.

Repeat the *wC* calculation for each community type in the AA. Any other metrics calculated (e.g., Mean *C*, *FQI*) do not factor into the assessment, but may be used as supporting information. The Rapid FQA calculator provides an easy way to enter data and computes *wC* scores automatically (Appendix 3).

4.3 Determine the Community Assessments

Once *wC* scores have been calculated, **condition category assessments (Table 4) for each community are made by looking up *wC* scores in the assessment criteria table (Table 5)**. The condition category thresholds are specific for each community. If a *wC* score meets the Exceptional numerical criteria for a community, re-examine the data and sum the total midpoint percent cover of all introduced species. A community must also have < 1% total introduced species cover to be considered as Exceptional. If the community has > 1% introduced species cover (even though it has a *wC* score that meets the Exceptional numerical criteria) it is considered as the Good category. Determine the condition category of each community present in the AA. The Rapid FQA calculator also automatically determines community condition categories (Appendix 3).

Table 5. Condition category assessment criteria for all community types based on *wC*. Red type indicates that the threshold is preliminary due to < 10 samples available in the analysis pool to determine the threshold. An additional narrative criteria of the total introduced species cover being < 1% is required to meet the Exceptional category (i.e., an AA must score above the numeric threshold and meet the narrative requirement to be assessed as Exceptional).

	Community						
Condition Category	**Shallow Open Water**	**Deep Marsh**	**Shallow Marsh**	**Fresh Meadow**	**Wet Prairie**	**Calcareous Fen**	**Sedge Mat**
Exceptional			> 4.9*	> 4.2*	> 4.4*	> 6.4*	> 6.2*
Good	> 5.0	> 4.0	> 4.2	> 4.1	> 3.9	> 5.2	> 5.5
Fair	< 5.0	< 4.0	1.6 - 4.2	1.3 - 4.1	1.3 - 3.9	4.7 - 5.2	1.8 - 5.5
Poor			< 1.6	< 1.3	< 1.3	< 4.7	< 1.8

	Community						
Condition Category	**Open Bog**	**Coniferous Bog**	**Shrub-Carr**	**Alder Thicket**	**Hardwood Swamp**	**Coniferous Swamp**	**Floodplain Forest**
Exceptional	> 7.3*	> 7.3*	> 4.5*	> 3.9*	> 4.6*	> 5.6*	> 3.3*
Good	> 7.1	> 7.2	> 4.3	> 3.5	> 4.2	> 5.5	> 2.7
Fair	5.4 - 7.1	5.8 - 7.2	3.2 - 4.3	2.2 - 3.5	2.5 - 4.2	5.5 - 3.6	2.1 - 2.7
Poor	< 5.4	< 5.8	< 3.2	< 2.2	< 2.5	< 3.6	< 2.1

* Total introduced species cover < 1 percent

4.4 Make the Overall AA Assessment

Once the condition categories for the individual communities have been determined, **the overall AA assessment is made by taking the weighted average of the community condition categories**. This is done by multiplying each community numerical community category (Table 4) by its proportional extent and summing the values. Rounding to the nearest whole number will return the weighted average condition category for the AA. Again, the Rapid FQA calculator can compute the overall AA assessment when the vegetation and community proportion data have been entered (Appendix 3).

The Rapid FQA is now complete. A Rapid FQA example that includes an AA and community map; a timed meander; *wC* calculations; and an overall AA assessment is provided in Appendix 4.

5 Reporting

A standard reporting structure has not yet been established for the Rapid FQA. It is recommended, however, that the reporting of results contain the following elements:

- general information including the: AA identifier, date, surveyor name
- a site map/sketch showing AA and community boundaries
- vegetation data tables that include the species present and cover classes by community type
- a summary table of *wC* scores and condition categories by community type
- the overall AA assessment

The Rapid FQA calculator can be used to produce data tables and results summaries (Appendix 3). Narrative descriptions of the AA, communities, potential impacts, and interpretation of the assessment may also be insightful.

6 Adaptations

Like many vegetation sampling approaches, the goal of the Rapid FQA sampling is to accurately represent the species composition and the abundance distribution of a community. It follows that a sampling method that measures composition and abundance may also have potential to be used to produce Rapid FQA results. In other words, alternative sampling methods may produce data that are consistent with the Rapid FQA method–making the assessment criteria applicable. This was illustrated in the Rapid FQA meander and MN DNR relevé sampling comparability trial, where (overall) each method produced consistent results for the same locations. This result supported the use of MN DNR relevé data during the development of the assessment criteria (Bourdaghs 2012). Adapting sampling methods or applying data to the Rapid FQA assessment criteria that were collected using alternative methods may be useful to generate assessments from existing data or when other sampling methods are well established.

To adapt alternative methods or apply existing data to the Rapid FQA assessment criteria the sampling methods must meet the following general conditions:

- **Sampling is done by community types** that can be related to the Eggers and Reed (2011: Table 1) classification.
- **Sampling intensity is adequate to produce a 'representative' sample** (i.e., a generally accurate representation of the species composition and abundance distribution).
- **Species are identified at least to the level of the Rapid Species List** (i.e., increased species ID will be required for coarser approaches and data will need to be reduced for comprehensive species data).
- **Areal cover estimates are made.**

If these conditions are met, the resulting data should generally be comparable to what would be produced from the Rapid FQA field sampling protocol–producing accurate assessments when the criteria are applied. Appendix 5 provides an example of how to adapt an existing method (US ACE vegetation sampling for wetland delineation) to produce a Rapid FQA.

Similarly, FQA criteria are available (upon request) for data sets where all the species have been identified. These criteria were developed following the same approach and concurrently with the Rapid FQA criteria (Bourdaghs 2012). They are intended for users with a high level of botanical expertise that can confidently collect vegetation data above the level of the Rapid Species list. The only difference between the Rapid and comprehensive species criteria development was that all species were included in the computations and analyses. Conceptually, a full species based assessment provides increased accuracy compared to the Rapid FQA, as it draws from complete data. Please e-mail Michael Bourdaghs for the comprehensive species FQA criteria.

The Rapid FQA also has the potential to be used as the vegetation component in more comprehensive types of assessment methods–where vegetation is one of multiple components. Currently, the Rapid FQA could be substituted as an alternative vegetation component in the MnRAM (MN BWSR 2010). The BCG condition categories (Table 4) are generally equivalent to the four MnRAM Vegetation Integrity and Diversity ratings allowing direct input of Rapid FQA community assessment results into the MnRAM. Incorporating the Rapid FQA into the MnRAM is discussed in Appendix 6.

7 Limitations

While the Rapid FQA is presented as an improved wetland rapid assessment approach that has broad flexibility and applicability, users should be aware that some limitations exist. Foremost is that the Rapid FQA is designed as a RAM–it relies on coarser level information to provide a wetland quality assessment within a reasonable timeframe that can be used by natural resource professionals with a moderate level of botanical expertise. In many scenarios this level of information may be sufficient; however, there may be cases where more detailed information is desirable. Other specific limitations to the Rapid FQA include (some of which have been previously discussed but are being reinforced here):

- **Users should have at least a moderate level of botanical expertise in Minnesota wetlands**. The Rapid FQA requires the user to be able to identify (by site) most of the species on the Rapid Species in the wetland types that they normally work in. This may take a year or more of experience identifying Minnesota's wetland flora to be able to do.
- **Sampling outside of the preferred sampling period may cause inaccurate results**. This may be due to not being able to identify species and/or the true cover of dominant species becomes less apparent very early in the growing season or following senescence.
- **It may be possible that the dominant species occurring in a community is not on the Rapid Species List**. While species that can be dominant components of Minnesota's wetland plant communities were favored to be selected for the Rapid Species List, occasionally a community may be encountered where the dominant species is not on the list. If this occurs, proceed with the Rapid FQA as directed–ignoring the dominant species. This species should be noted in the remarks (particularly if it can be identified). The assessment criteria were developed with at least several samples where the dominant species was not on the Rapid Species List, so this situation has been somewhat factored in to the process.
- **The Rapid FQA covers most of the wetland community types in Minnesota–but not all**. Due to a lack of available data, assessment criteria were not developed for the Seasonally Flooded Basin community type (Eggers and Reed 2011). Vernal pool wetlands were also not included for similar reasons and that vegetation is often not a prominent feature in this wetland type.
- **Community interpretation inconsistencies can cause large errors.** The Rapid FQA relies on the observer to interpret community type and extent. AAs that have: many or a mosaic of communities; communities that are in transition from one type to another; and/or broad transition zones between types can be very difficult to interpret. Differences in community interpretation between users can cause large differences in Rapid FQA outcomes (Bourdaghs 2012). In these cases making more detailed field notes and sketch/map annotation may be warranted to further document community interpretations.
- **Communities can be interpreted as former types–but only under certain conditions.** Wetlands are dynamic systems where community types can change due to changing conditions. Typically, community types should be interpreted as they currently exist when doing a Rapid FQA. Depending on the context, however, it may be appropriate to assess a community as a former type–as wholesale changes in type can result from severe anthropogenic impacts. If evidence of a former community is present *and* there is clear evidence of an anthropogenic impact, the community may be assessed as a former type–even though it no longer meets the definition of that type. For example, if an AA is currently dominated by Shallow Marsh vegetation yet standing dead *Larix*

laricina (Du Roi) K. Koch (tamarack) trees are present and there is evidence that the site was flooded due to a human activity–the AA may be assessed as a (severely impacted) Coniferous Swamp. If the same current conditions were true (i.e., Shallow Marsh vegetation and dead standing trees), but the disturbance was caused by beaver–the AA may more appropriately be assessed as a Shallow Marsh as the disturbance was natural.

- **Some sampling variability exists.** A number of sources of variation exist that can affect the Rapid FQA including: the natural variability of vegetation; the sampling location (i.e., meander starting point and path); and sampling error (e.g., species identification and cover estimate errors). These sources of variation are common to all vegetation sampling approaches. A limited repeatability trial (where the same AAs were sampled multiple times) indicated that the Rapid FQA returns consistent assessment outcomes the majority of the time (≥ 79%) when all of these factors are considered simultaneously (Bourdaghs 2012). While this trial indicated that the Rapid FQA has a moderately high degree of consistency, these sources of variability can cause inaccurate results.
- **The assessment criteria for some of the community types are preliminary.** The assessment criteria were developed from a large number of community samples (725; Bourdaghs 2012). There were some cases, however, where there was limited data available (< 10 samples) or none available for a data analysis group in a community to determine a threshold. In these cases, criteria for condition categories with no data were not created or were considered preliminary when only limited data were available. Criteria developed with limited data are indicated with red type in the assessment criteria table (Table 5). Future Rapid FQA development efforts will focus on gathering more data to clarify these thresholds.

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Appendix 1-Rapid Species List

The Rapid Species List with selected attributes. Species nomenclature (i.e., scientific and common names) is consistent with the US Army Corps of Engineers National Wetland Plant List. The National Wetland Indicator (NWI) status for each species is included by Corps regions in Minnesota: Great Plains (GP), Mid-West (MW), and North Central-Northeast (NCNE). The Minnesota Native status and *C*-value from each species is from Milburn et al. 2007. The Rapid FQA Stratum is the typical Corps vertical stratum at full growth and is used to generally organize groups of species on the Rapid FQA data form.

Scientific Name	Common Name	MN Native Status	*C*	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Abies balsamea	Balsam Fir	Native	4	FAC	FACW	FAC	Tree
Acer negundo	Ash-Leaf Maple	Native	1	FAC	FAC	FAC	Tree
Acer rubrum	Red Maple	Native	3	FAC	FAC	FAC	Tree
Acer saccharinum	Silver Maple	Native	3	FAC	FACW	FACW	Tree
Acer spicatum	Mountain Maple	Native	5	FACU	FACU	FACU	Shrub
Achillea millefolium	Common Yarrow	Native	1	FACU	FACU	FACU	Herb
Acorus americanus	Several-Vein Sweetflag	Native	7	OBL	OBL	OBL	Herb
Adiantum pedatum	Northern Maidenhair	Native	7	FAC	FACU	FACU	Herb
Agrostis gigantea	Black Bent	Introduced	0	FACW	FACW	FACW	Herb
Alisma subcordatum	American Water-Plantain	Native	4	OBL	OBL	OBL	Herb
Alisma triviale	Northern Water-Plantain	Native	4	OBL	OBL	OBL	Herb
Alliaria petiolata	Garlic-Mustard	Introduced	0	FACU	FAC	FACU	Herb
Alnus incana	Speckled Alder	Native	3	FACW	FACW	FACW	Shrub
Ambrosia artemisiifolia	Annual Ragweed	Native	0	FACU	FACU	FACU	Herb
Ambrosia trifida	Great Ragweed	Native	0	FAC	FAC	FAC	Herb
Amorpha fruticosa	False Indigo-Bush	Native	4	FACW	FACW	FACW	Shrub
Amphicarpaea bracteata	American Hog-Peanut	Native	2	FACU	FAC	FAC	Herb
Andromeda polifolia	Bog-Rosemary	Native	9	OBL	OBL	OBL	Herb
Andropogon gerardii	Big Bluestem	Native	4	FACU	FAC	FACU	Herb
Anemone canadensis	Round-Leaf Thimbleweed	Native	3	FACW	FACW	FACW	Herb
Anemone quinquefolia	Nightcaps	Native	5	FAC	FAC	FACU	Herb
Angelica atropurpurea	Purple-Stem Angelica	Native	6		OBL	OBL	Herb
Apocynum cannabinum	Indian-Hemp	Native	3	FAC	FAC	FAC	Herb
Aralia nudicaulis	Wild Sarsaparilla	Native	4	FACU	FACU	FACU	Herb
Arisaema triphyllum	Jack-in-the-Pulpit	Native	4	FAC	FACW	FAC	Herb
Asclepias incarnata	Swamp Milkweed	Native	4	FACW	OBL	OBL	Herb

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Athyrium angustum	Northern Lady Fern	Native	4	FAC	FAC	FAC	Herb
Beckmannia syzigachne	American Slough Grass	Native	4	OBL	OBL	OBL	Herb
Betula alleghaniensis	Yellow Birch	Native	7	FACU	FAC	FAC	Tree
Betula papyrifera	Paper Birch	Native	3	FACU	FACU	FACU	Tree
Betula pumila	Bog Birch	Native	7	OBL	OBL	OBL	Shrub
Bidens cernua	Nodding Burr-Marigold	Native	3	OBL	OBL	OBL	Herb
Boehmeria cylindrica	Small-Spike False Nettle	Native	5	FACW	OBL	OBL	Herb
Botrypus virginianus	Rattlesnake Fern	Native	6	FACU	FACU	FACU	Herb
Brasenia schreberi	Watershield	Native	7	OBL	OBL	OBL	Aquatic
Bromus ciliatus	Fringed Brome	Native	6	FAC	FACW	FACW	Herb
Bromus inermis	Smooth Brome	Introduced	0	UPL	FACU	UPL	Herb
Calamagrostis canadensis	Bluejoint	Native	4	FACW	OBL	OBL	Herb
Calamagrostis stricta	Slim-Stem Reed Grass	Native	7	FACW	FACW	FACW	Herb
Calla palustris	Water-Dragon	Native	8	OBL	OBL	OBL	Herb
Caltha palustris	Yellow Marsh-Marigold	Native	6	OBL	OBL	OBL	Herb
Calystegia sepium	Hedge False Bindweed	Native	1	FAC	FAC	FAC	Herb
Campanula aparinoides	Marsh Bellflower	Native	5	OBL	OBL	OBL	Herb
Carex aquatilis	Leafy Tussock Sedge	Native	7	OBL	OBL	OBL	Herb
Carex atherodes	Wheat Sedge	Native	5	OBL	OBL	OBL	Herb
Carex comosa	Bearded Sedge	Native	4	OBL	OBL	OBL	Herb
Carex interior	Inland Sedge	Native	7	OBL	OBL	OBL	Herb
Carex intumescens	Greater Bladder Sedge	Native	5	OBL	FACW	FACW	Herb
Carex lacustris	Lakebank Sedge	Native	5	OBL	OBL	OBL	Herb
Carex lasiocarpa	Woolly-Fruit Sedge	Native	7	OBL	OBL	OBL	Herb
Carex oligosperma	Few-Seed Sedge	Native	8	OBL	OBL	OBL	Herb
Carex pellita	Woolly Sedge	Native	4	OBL	OBL	OBL	Herb
Carex stipata	Stalk-Grain Sedge	Native	3	OBL	OBL	OBL	Herb
Carex stricta	Uptight Sedge	Native	5	OBL	OBL	OBL	Herb
Carex utriculata	Northwest Territory Sedge	Native	7	OBL	OBL	OBL	Herb
Carex vulpinoidea	Common Fox Sedge	Native	3	FACW	FACW	OBL	Herb
Celtis occidentalis	Common Hackberry	Native	3	FACU	FAC	FAC	Tree
Ceratophyllum demersum	Coon's-Tail	Native	2	OBL	OBL	OBL	Aquatic
Chamaedaphne calyculata	Leatherleaf	Native	8	OBL	OBL	OBL	Herb
Chamaenerion angustifolium	Narrow-Leaf Fireweed	Native	3	FAC	FAC	FAC	Herb

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Chelone glabra	White Turtlehead	Native	7	OBL	OBL	OBL	Herb
Cicuta bulbifera	Bulblet-Bearing Water-Hemlock	Native	7	OBL	OBL	OBL	Herb
Cicuta maculata	Spotted Water-Hemlock	Native	5	OBL	OBL	OBL	Herb
Circaea alpina	Small Enchanter's-Nightshade	Native	6	FACW	FACW	FACW	Herb
Circaea canadensis	Broad-Leaf Enchanter's-Nightshade	Native	2	FACU	FACU	FACU	Herb
Cirsium arvense	Canadian Thistle	Introduced	0	FACU	FACU	FACU	Herb
Cirsium muticum	Swamp Thistle	Native	6	FACW	OBL	OBL	Herb
Clematis virginiana	Devil's-Darning-Needles	Native	4	FAC	FAC	FAC	Woody Vine
Clintonia borealis	Yellow Bluebead-Lily	Native	7	FAC	FAC	FAC	Herb
Comarum palustre	Purple Marshlocks	Native	7	OBL	OBL	OBL	Herb
Coptis trifolia	Three-Leaf Goldthread	Native	7	FACW	FACW	FACW	Herb
Cornus alba	Red Osier	Native	3	FACW	FACW	FACW	Shrub
Cornus canadensis	Canadian Bunchberry	Native	6	FACU	FAC	FAC	Herb
Cornus racemosa	Gray Dogwood	Native	2	FAC	FAC	FAC	Shrub
Cryptotaenia canadensis	Canadian Honewort	Native	3	FAC	FAC	FAC	Herb
Cyperus esculentus	Chufa	Introduced	0	FACW	FACW	FACW	Herb
Cypripedium reginae	Showy Lady's-Slipper	Native	8	FACW	FACW	FACW	Herb
Dasiphora fruticosa	Golden-Hardhack	Native	7	FACW	FACW	FACW	Shrub
Dioscorea villosa	Wild Yam	Native	4	FAC	FAC	FAC	Herb
Doellingeria umbellata	Parasol White-Top	Native	5	OBL	FACW	FACW	Herb
Drosera rotundifolia	Round-Leaf Sundew	Native	8	OBL	OBL	OBL	Herb
Dryopteris carthusiana	Spinulose Wood Fern	Native	6	FACW	FACW	FACW	Herb
Dryopteris cristata	Crested Wood Fern	Native	7	OBL	OBL	OBL	Herb
Dulichium arundinaceum	Three-Way Sedge	Native	8	OBL	OBL	OBL	Herb
Echinochloa crus-galli	Large Barnyard Grass	Introduced	0	FAC	FACW	FAC	Herb
Echinocystis lobata	Wild Cucumber	Native	2	FAC	FACW	FACW	Herb
Eleocharis obtusa	Blunt Spike-Rush	Native	3	OBL	OBL	OBL	Herb
Eleocharis palustris	Common Spike-Rush	Native	5	OBL	OBL	OBL	Herb
Elodea canadensis	Canadian Waterweed	Native	4	OBL	OBL	OBL	Aquatic
Elymus virginicus	Virginia Wild Rye	Native	4	FAC	FACW	FACW	Herb
Epilobium leptophyllum	Bog Willowherb	Native	7	OBL	OBL	OBL	Herb
Equisetum arvense	Field Horsetail	Native	1	FAC	FAC	FAC	Herb
Equisetum fluviatile	Water Horsetail	Native	7	OBL	OBL	OBL	Herb
Erigeron canadensis	Canadian Horseweed	Native	0	FACU	FACU	FACU	Herb

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Eupatorium perfoliatum	Common Boneset	Native	4	FACW	OBL	FACW	Herb
Euthamia graminifolia	Flat-Top Goldentop	Native	4	FACW	FACW	FAC	Herb
Eutrochium maculatum	Spotted Trumpetweed	Native	4	OBL	OBL	OBL	Herb
Fragaria virginiana	Virginia Strawberry	Native	2	FACU	FACU	FACU	Herb
Frangula alnus	Glossy False Buckthorn	Introduced	0	FAC	FACW	FAC	Shrub
Fraxinus nigra	Black Ash	Native	6	FACW	FACW	FACW	Tree
Fraxinus pennsylvanica	Green Ash	Native	2	FAC	FACW	FACW	Tree
Galium aparine	Sticky-Willy	Native	1	FACU	FACU	FACU	Herb
Gaultheria hispidula	Creeping-Snowberry	Native	8	FACW	FACW	FACW	Herb
Gentiana andrewsii	Closed Bottle Gentian	Native	6	FAC	FACW	FACW	Herb
Geranium maculatum	Spotted Crane's-Bill	Native	4	FACU	FACU	FACU	Herb
Glyceria borealis	Small Floating Manna Grass	Native	8	OBL	OBL	OBL	Herb
Glyceria canadensis	Rattlesnake Manna Grass	Native	7	OBL	OBL	OBL	Herb
Glyceria grandis	American Manna Grass	Native	6	OBL	OBL	OBL	Herb
Glyceria striata	Fowl Manna Grass	Native	4	OBL	OBL	OBL	Herb
Gymnocarpium dryopteris	Northern Oak Fern	Native	6	FACU	FAC	FACU	Herb
Hackelia virginiana	Beggar's-Lice	Native	1	FACU	FACU	FACU	Herb
Helenium autumnale	Fall Sneezeweed	Native	4	FACW	FACW	FACW	Herb
Helianthus giganteus	Giant Sunflower	Native	4	FAC	FACW	FACW	Herb
Helianthus grosseserratus	Saw-Tooth Sunflower	Native	3	FACW	FACW	FACW	Herb
Heracleum maximum	American Cow-Parsnip	Native	4	FAC	FACW	FACW	Herb
Heuchera richardsonii	Richardson's Alumroot	Native	7	FACU	FACU	FACU	Herb
Hordeum jubatum	Fox-Tail Barley	Native	0	FACW	FAC	FAC	Herb
Hydrophyllum virginianum	Shawnee-Salad	Native	3	FAC	FAC	FAC	Herb
Hypericum fraseri	Fraser's St. John's-Wort	Native	6	OBL	OBL	OBL	Herb
Hypoxis hirsuta	Eastern Yellow Star-Grass	Native	8	FACW	FAC	FAC	Herb
Ilex verticillata	Common Winterberry	Native	6		FACW	FACW	Shrub
Impatiens capensis	Spotted Touch-Me-Not	Native	2	FACW	FACW	FACW	Herb
Iris versicolor	Harlequin Blueflag	Native	4	OBL	OBL	OBL	Herb
Kalmia polifolia	Bog-Laurel	Native	9		OBL	OBL	Herb
Lactuca serriola	Prickly Lettuce	Introduced	0	FAC	FACU	FACU	Herb
Laportea canadensis	Canadian Wood-Nettle	Native	3	FAC	FACW	FACW	Herb
Larix laricina	American Larch	Native	7	FACW	FACW	FACW	Tree
Lathyrus palustris	Marsh Vetchling	Native	6	FACW	FACW	FACW	Herb

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Lathyrus venosus	Veiny Vetchling	Native	6	FAC	FAC	FAC	Herb
Leersia oryzoides	Rice Cut Grass	Native	3	OBL	OBL	OBL	Herb
Lemna minor	Common Duckweed	Native	5	OBL	OBL	OBL	Aquatic
Lemna trisulca	Ivy-Leaf Duckweed	Native	5	OBL	OBL	OBL	Aquatic
Liatris pycnostachya	Cat-Tail Gayfeather	Native	7	FAC	FAC	FAC	Herb
Linnaea borealis	American Twinflower	Native	7	FACU	FAC	FAC	Herb
Lobelia kalmii	Brook Lobelia	Native	9	OBL	OBL	OBL	Herb
Lobelia siphilitica	Great Blue Lobelia	Native	5	OBL	OBL	FACW	Herb
Lobelia spicata	Pale-Spike Lobelia	Native	7	FAC	FAC	FAC	Herb
Lycopus americanus	Cut-Leaf Water-Horehound	Native	4	OBL	OBL	OBL	Herb
Lycopus uniflorus	Northern Water-Horehound	Native	5	OBL	OBL	OBL	Herb
Lysimachia ciliata	Fringed Yellow-Loosestrife	Native	5	FACW	FACW	FACW	Herb
Lysimachia thyrsiflora	Tufted Yellow-Loosestrife	Native	6	OBL	OBL	OBL	Herb
Lythrum salicaria	Purple Loosestrife	Introduced	0	OBL	OBL	OBL	Herb
Maianthemum canadense	False Lily-of-the-Valley	Native	5	FACU	FAC	FACU	Herb
Maianthemum stellatum	Starry False Solomon's-Seal	Native	5	FACU	FAC	FAC	Herb
Maianthemum trifolium	Three-Leaf False Solomon's-Seal	Native	9	OBL	OBL	OBL	Herb
Matteuccia struthiopteris	Ostrich Fern	Native	5	FACW	FACW	FAC	Herb
Menispermum canadense	Canadian Moonseed	Native	4	FACU	FAC	FAC	Woody Vine
Mentha arvensis	American Wild Mint	Native	3	FACW	FACW	FACW	Herb
Menyanthes trifoliata	Buck-Bean	Native	9	OBL	OBL	OBL	Herb
Mertensia virginica	Virginia Bluebells	Native	6		FACW	FAC	Herb
Micranthes pensylvanica	Eastern Swamp Pseudosaxifrage	Native	7	FACW	OBL	OBL	Herb
Mimulus ringens	Allegheny Monkey-Flower	Native	5	OBL	OBL	OBL	Herb
Mitella nuda	Bare-Stem Bishop's-Cap	Native	7	OBL	FACW	FACW	Herb
Monotropa uniflora	One-Flower Indian-Pipe	Native	6	UPL	FACU	FACU	Herb
Muhlenbergia richardsonis	Matted Muhly	Native	8	FAC	FAC	FACW	Herb
Myrica gale	Sweetgale	Native	8	OBL	OBL	OBL	Shrub
Nabalus racemosus	Purple Rattlesnake-Root	Native	9	FACU	FACW	FACW	Herb
Najas flexilis	Wavy Waternymph	Native	5	OBL	OBL	OBL	Aquatic
Nelumbo lutea	American Lotus	Native	8	OBL	OBL	OBL	Aquatic
Nuphar variegata		Native	6	OBL	OBL	OBL	Aquatic
Nymphaea odorata	American White Water-Lily	Native	6	OBL	OBL	OBL	Aquatic
Onoclea sensibilis	Sensitive Fern	Native	4	FACW	FACW	FACW	Herb

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Orthilia secunda	Sidebells	Native	7	FACU	FAC	FAC	Herb
Osmorhiza claytonii	Hairy Sweet-Cicely	Native	3	FACU	FACU	FACU	Herb
Osmunda spectabilis	Royal Fern	Native	7	OBL	OBL	OBL	Herb
Osmundastrum cinnamomeum	Cinnamon Fern	Native	7	FACW	FACW	FACW	Herb
Ostrya virginiana	Eastern Hop-Hornbeam	Native	4	FACU	FACU	FACU	Tree
Panicum virgatum	Wand Panic Grass	Native	2	FAC	FAC	FAC	Herb
Parnassia glauca	Fen Grass-of-Parnassus	Native	9	OBL	OBL	OBL	Herb
Parnassia palustris	Marsh Grass-of-Parnassus	Native	8	OBL	OBL	OBL	Herb
Parthenocissus inserta	Thicket-Creeper	Native	2	FAC	FACU	FACU	Woody Vine
Pedicularis lanceolata	Swamp Lousewort	Native	8	OBL	OBL	FACW	Herb
Penthorum sedoides	Ditch-Stonecrop	Native	3	OBL	OBL	OBL	Herb
Persicaria amphibia	Water Smartweed	Native	4	OBL	OBL	OBL	Aquatic, Herb
Persicaria lapathifolia	Dock-Leaf Smartweed	Native	2	OBL	FACW	FACW	Herb
Persicaria pensylvanica	Pinkweed	Native	1	FACW	FACW	FACW	Herb
Persicaria sagittata	Arrow-Leaf Tearthumb	Native	4	OBL	OBL	OBL	Herb
Petasites frigidus	Arctic Sweet-Colt's-Foot	Native	6	FAC	FACW	FACW	Herb
Phalaris arundinacea	Reed Canary Grass	Introduced	0	FACW	FACW	FACW	Herb
Phragmites australis	Common Reed	Native	1	FACW	FACW	FACW	Herb
Physocarpus opulifolius	Atlantic Ninebark	Native	5	FACU	FACW	FACW	Shrub
Physostegia virginiana	Obedient-Plant	Native	6	FACW	FACW	FACW	Herb
Picea glauca	White Spruce	Native	5	FACU	FACU	FACU	Tree
Picea mariana	Black Spruce	Native	7	FACW	FACW	FACW	Tree
Pilea pumila	Canadian Clearweed	Native	3	FAC	FACW	FACW	Herb
Pinus strobus	Eastern White Pine	Native	5	FACU	FACU	FACU	Tree
Poa palustris	Fowl Blue Grass	Native	5	FACW	FACW	FACW	Herb
Poa pratensis	Kentucky Blue Grass	Introduced	0	FACU	FAC	FACU	Herb
Pontederia cordata	Pickerelweed	Native	8	OBL	OBL	OBL	Herb
Populus balsamifera	Balsam Poplar	Native	4	FACW	FACW	FACW	Tree
Populus deltoides	Eastern Cottonwood	Native	1	FAC	FAC	FAC	Tree
Populus tremuloides	Quaking Aspen	Native	2	FAC	FAC	FAC*	Tree
Potamogeton amplifolius	Large-Leaf Pondweed	Native	7	OBL	OBL	OBL	Aquatic
Potamogeton crispus	Curly Pondweed	Introduced	0	OBL	OBL	OBL	Aquatic
Potamogeton natans	Broad-Leaf Pondweed	Native	5	OBL	OBL	OBL	Aquatic
Potamogeton zosteriformis	Flat-Stem Pondweed	Native	6	OBL	OBL	OBL	Aquatic

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Potentilla anserina	Silverweed	Native	4	FACW	FACW	FACW	Herb
Potentilla norvegica	Norwegian Cinquefoil	Native	1	FAC	FAC	FAC	Herb
Pycnanthemum virginianum	Virginia Mountain-Mint	Native	6	FAC	FACW	FACW	Herb
Quercus macrocarpa	Burr Oak	Native	5	FACU	FAC	FACU	Tree
Quercus rubra	Northern Red Oak	Native	5	FACU	FACU	FACU	Tree
Ranunculus flabellaris	Greater Yellow Water Buttercup	Native	6	OBL	OBL	OBL	Aquatic
Ranunculus longirostris	Long-Beak Water-Crowfoot	Native	7	OBL	OBL	OBL	Aquatic
Ranunculus trichophyllus	Thread-Leaf Water-Crowfoot	Native	7	OBL	OBL	OBL	Aquatic
Rhamnus alnifolia	Alder-Leaf Buckthorn	Native	7	FACW	OBL	OBL	Shrub
Rhamnus cathartica	European Buckthorn	Introduced	0	FACU	FAC	FAC	Shrub
Rhododendron groenlandicum	Rusty Labrador-Tea	Native	8	FACW	OBL	OBL	Herb
Ribes americanum	Wild Black Currant	Native	4	FACW	FACW	FACW	Shrub
Rubus idaeus	Common Red Raspberry	Native	3	FACU	FACU	FAC*	Shrub
Rubus pubescens	Dwarf Red Raspberry	Native	6	FACW	FACW	FACW	Herb
Rudbeckia hirta	Black-Eyed-Susan	Native	3	FACU	FACU	FACU	Herb
Rudbeckia laciniata	Green-Head Coneflower	Native	4	FAC	FACW	FACW	Herb
Rumex britannica	Greater Water Dock	Native	6	OBL	OBL	OBL	Herb
Rumex crispus	Curly Dock	Introduced	0	FAC	FAC	FAC	Herb
Sagittaria latifolia	Duck-Potato	Native	3	OBL	OBL	OBL	Herb
Sagittaria rigida	Sessile-Fruit Arrowhead	Native	7	OBL	OBL	OBL	Herb
Salix amygdaloides	Peach-Leaf Willow	Native	5	FACW	FACW	FACW	Tree
Salix bebbiana	Gray Willow	Native	6	FACW	FACW	FACW	Shrub
Salix candida	Sage Willow	Native	9	OBL	OBL	OBL	Shrub
Salix discolor	Pussy Willow	Native	3	FACW	FACW	FACW	Shrub
Salix interior	Sandbar Willow	Native	2	FACW	FACW	FACW	Shrub
Salix nigra	Black Willow	Native	4	FACW	OBL	OBL	Tree
Salix petiolaris	Meadow Willow	Native	5	OBL	OBL	FACW	Shrub
Salix X *fragilis*		Introduced		FAC	FAC	FAC	Tree
Sambucus nigra	Black Elder	Native	3	FAC	FACW	FACW	Shrub
Sanguinaria canadensis	Bloodroot	Native	6	UPL	FACU	FACU	Herb
Sarracenia purpurea	Purple Pitcherplant	Native	9	OBL	OBL	OBL	Herb
Scheuchzeria palustris	Rannoch-Rush	Native	9	OBL	OBL	OBL	Herb
Schoenoplectus acutus	Hard-Stem Club-Rush	Native	6	OBL	OBL	OBL	Herb
Schoenoplectus fluviatilis	River Club-Rush	Native	4	OBL	OBL	OBL	Herb

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Schoenoplectus pungens	Three-Square	Native	6	OBL	OBL	OBL	Herb
Schoenoplectus tabernaemontani	Soft-Stem Club-Rush	Native	4	OBL	OBL	OBL	Herb
Scirpus cyperinus	Cottongrass Bulrush	Native	3	OBL	OBL	OBL	Herb
Scolochloa festucacea	Common River Grass	Native	7	OBL	OBL	OBL	Herb
Scutellaria galericulata	Hooded Skullcap	Native	5	OBL	OBL	OBL	Herb
Scutellaria lateriflora	Mad Dog Skullcap	Native	5	FACW	OBL	OBL	Herb
Sicyos angulatus	One-Seed Burr-Cucumber	Native	2	FACW	FACW	FACW	Herb
Sium suave	Hemlock Water-Parsnip	Native	5	OBL	OBL	OBL	Herb
Solanum dulcamara	Climbing Nightshade	Introduced	0	FACU	FAC	FAC	Woody Vine
Solidago canadensis	Canadian Goldenrod	Native	1	FACU	FACU	FACU	Herb
Solidago gigantea	Late Goldenrod	Native	3	FAC	FACW	FACW	Herb
Solidago riddellii	Riddell's Goldenrod	Native	8	OBL	OBL	OBL	Herb
Solidago uliginosa	Bog Goldenrod	Native	9	OBL	OBL	OBL	Herb
Sonchus arvensis	Field Sow-Thistle	Introduced	0	FAC	FACU	FACU	Herb
Sorbus americana	American Mountain-Ash	Native	5		FAC	FAC	Tree
Sorghastrum nutans	Yellow Indian Grass	Native	5	FACU	FACU	FACU	Herb
Sparganium eurycarpum	Broad-Fruit Burr-Reed	Native	5	OBL	OBL	OBL	Herb
Spartina pectinata	Freshwater Cord Grass	Native	5	FACW	FACW	FACW	Herb
Spiraea alba	White Meadowsweet	Native	5	FACW	FACW	FACW	Shrub
Spiraea tomentosa	Steeplebush	Native	7	FACW	FACW	FACW	Shrub
Spirodela polyrhiza	Common Duckmeat	Native	5	OBL	OBL	OBL	Aquatic
Stachys pilosa	Hairy Hedge-Nettle	Native	4	FACW	FACW	FACW	Herb
Staphylea trifolia	American Bladdernut	Native	6	FAC	FAC	FAC	Shrub
Stellaria longifolia	Long-Leaf Starwort	Native	6	FACW	FACW	FACW	Herb
Streptopus lanceolatus	Lance-Leaf Twistedstalk	Native	7	FAC	FAC	FACU	Herb
Stuckenia pectinata	Sago False Pondweed	Native	3	OBL	OBL	OBL	Aquatic
Symphyotrichum lanceolatum	White Panicled American-Aster	Native	5	FACW	FAC	FACW	Herb
Symphyotrichum lateriflorum	Farewell-Summer	Native	4	FACW	FACW	FAC	Herb
Symphyotrichum novae-angliae	New England American-Aster	Native	3	FACW	FACW	FACW	Herb
Symphyotrichum puniceum	Purple-Stem American-Aster	Native	6	OBL	OBL	OBL	Herb
Symplocarpus foetidus	Skunk-Cabbage	Native	8	OBL	OBL	OBL	Herb
Taraxacum officinale	Common Dandelion	Introduced	0	FACU	FACU	FACU	Herb
Thalictrum dasycarpum	Purple Meadow-Rue	Native	4	FAC	FACW	FACW	Herb
Thelypteris palustris	Eastern Marsh Fern	Native	7	OBL	OBL	FACW	Herb

Scientific Name	Common Name	MN Native Status	C	NWI-GP	NWI-MW	NWI-NCNE	Rapid FQA Stratum
Thuja occidentalis	Eastern Arborvitae	Native	7	FACW	FACW	FACW	Tree
Tilia americana	American Basswood	Native	5	FACU	FACU	FACU	Tree
Toxicodendron rydbergii	Western Poison Ivy	Native	1	FACU	FAC	FAC	Herb
Toxicodendron vernix	Poison-Sumac	Native	7		OBL	OBL	Shrub
Trientalis borealis	Maystar	Native	6	FAC	FAC	FAC	Herb
Trillium cernuum	Whip-Poor-Will-Flower	Native	7	FAC	FAC	FAC	Herb
Typha angustifolia	Narrow-Leaf Cat-Tail	Introduced	0	OBL	OBL	OBL	Herb
Typha latifolia	Broad-Leaf Cat-Tail	Native	2	OBL	OBL	OBL	Herb
Typha X glauca		Introduced	0	OBL	OBL	OBL	Herb
Ulmus americana	American Elm	Native	3	FAC	FACW	FACW	Tree
Urtica dioica	Stinging Nettle	Native	1	FAC	FACW	FAC	Herb
Utricularia macrorhiza	Greater Bladderwort	Native	5	OBL	OBL	OBL	Aquatic
Vaccinium angustifolium	Late Lowbush Blueberry	Native	5	FACU	FACU	FACU	Herb
Vaccinium macrocarpon	Large Cranberry	Native	9	OBL	OBL	OBL	Herb
Vaccinium oxycoccos	Small Cranberry	Native	8	OBL	OBL	OBL	Herb
Vallisneria americana	American Eel-Grass	Native	6	OBL	OBL	OBL	Aquatic
Verbena hastata	Simpler's-Joy	Native	6	FACW	FACW	FACW	Herb
Vernonia fasciculata	Prairie Ironweed	Native	5	FAC	FACW	FACW	Herb
Veronicastrum virginicum	Culver's-Root	Native	6	FAC	FAC	FAC	Herb
Viburnum lentago	Nanny-Berry	Native	4	FACU	FAC	FAC	Shrub
Viburnum opulus	Highbush-Cranberry	Native	5	FAC	FAC	FACW	Shrub
Vitis riparia	River-Bank Grape	Native	2	FAC	FACW	FAC	Woody Vine
Wolffia columbiana	Columbian Watermeal	Native	5	OBL	OBL	OBL	Aquatic
Xanthium strumarium	Rough Cockleburr	Native	0	FAC	FAC	FAC	Herb
Zizania palustris	Northern Wild Rice	Native	8	OBL	OBL	OBL	Herb
Zizia aurea	Golden Alexanders	Native	6	FAC	FAC	FAC	Herb

Appendix 2-Rapid FQA Data Form

Continued on next page.

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:	Date:	Surveyors name:
Remarks:		

Community Information

Eggers & Reed Plant Community Type — **% of AA**

#1) _____ _____
#2) _____ _____
#3) _____ _____

Start Time	End Time	Total Time

Species Tally (# of spp. observed during final 10 min)

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		Community # 1 2 3		Community # 1 2 3	
_ _ _	Brasenia schreberi	_ _ _	Nymphaea odorata	_ _ _	Ranunculus trichophyllus
_ _ _	Ceratophyllum demersum	_ _ _	Persicaria amphibia	_ _ _	Spirodela polyrhiza
_ _ _	Elodea canadensis	_ _ _	Potamogeton amplifolius	_ _ _	Stuckenia pectinata
_ _ _	Lemna minor	_ _ _	Potamogeton crispus	_ _ _	Utricularia macrorhiza
_ _ _	Lemna trisulca	_ _ _	Potamogeton natans	_ _ _	Vallisneria americana
_ _ _	Najas flexilis	_ _ _	Potamogeton zosteriformis	_ _ _	Wolffia columbiana
_ _ _	Nelumbo lutea	_ _ _	Ranunculus flabellaris		
_ _ _	Nuphar variegata	_ _ _	Ranunculus longirostris		

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

Community # 1 2 3		Community # 1 2 3		Community # 1 2 3	
_ _ _	Abies balsamea	_ _ _	Larix laricina	_ _ _	Quercus rubra
_ _ _	Acer negundo	_ _ _	Ostrya virginiana	_ _ _	Salix amygdaloides
_ _ _	Acer rubrum	_ _ _	Picea glauca	_ _ _	Salix nigra
_ _ _	Acer saccharinum	_ _ _	Picea mariana	_ _ _	Salix X fragilis
_ _ _	Betula alleghaniensis	_ _ _	Pinus strobus	_ _ _	Sorbus americana
_ _ _	Betula papyrifera	_ _ _	Populus balsamifera	_ _ _	Thuja occidentalis
_ _ _	Celtis occidentalis	_ _ _	Populus deltoides	_ _ _	Tilia americana
_ _ _	Fraxinus nigra	_ _ _	Populus tremuloides	_ _ _	Ulmus americana
_ _ _	Fraxinus pennsylvanica	_ _ _	Quercus macrocarpa		

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

Community # 1 2 3		Community # 1 2 3		Community # 1 2 3	
_ _ _	Acer spicatum	_ _ _	Myrica gale	_ _ _	Salix interior
_ _ _	Alnus incana	_ _ _	Physocarpus opulifolius	_ _ _	Salix petiolaris
_ _ _	Amorpha fruticosa	_ _ _	Rhamnus alnifolia	_ _ _	Sambucus nigra
_ _ _	Betula pumila	_ _ _	Rhamnus cathartica	_ _ _	Spiraea alba
_ _ _	Cornus alba	_ _ _	Ribes americanum	_ _ _	Spiraea tomentosa
_ _ _	Cornus racemosa	_ _ _	Rubus idaeus	_ _ _	Staphylea trifolia
_ _ _	Dasiphora fruticosa	_ _ _	Salix bebbiana	_ _ _	Toxicodendron vernix
_ _ _	Frangula alnus	_ _ _	Salix candida	_ _ _	Viburnum lentago
_ _ _	Ilex verticillata	_ _ _	Salix discolor	_ _ _	Viburnum opulus

Woody Vine Stratum (all woody vines)

Community # 1 2 3		Community # 1 2 3		Community # 1 2 3	
_ _ _	Clematis virginiana	_ _ _	Parthenocissus inserta	_ _ _	Vitis riparia
_ _ _	Menispermum canadense	_ _ _	Solanum dulcamara		

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

Community # 1 2 3		Community # 1 2 3		Community # 1 2 3	
_ _ _	Achillea millefolium	_ _ _	Ambrosia artemisiifolia	_ _ _	Angelica atropurpurea
_ _ _	Acorus americanus	_ _ _	Ambrosia trifida	_ _ _	Apocynum cannabinum
_ _ _	Adiantum pedatum	_ _ _	Amphicarpaea bracteata	_ _ _	Aralia nudicaulis
_ _ _	Agrostis gigantea	_ _ _	Andromeda polifolia	_ _ _	Arisaema triphyllum
_ _ _	Alisma subcordatum	_ _ _	Andropogon gerardii	_ _ _	Asclepias incarnata
_ _ _	Alisma triviale	_ _ _	Anemone canadensis	_ _ _	Athyrium angustum
_ _ _	Alliaria petiolata	_ _ _	Anemone quinquefolia	_ _ _	Beckmannia syzigachne

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

Community # 1 2 3		Community # 1 2 3		Community # 1 2 3	
_ _ _	Bidens cernua	_ _ _	Glyceria borealis	_ _ _	Pilea pumila
_ _ _	Boehmeria cylindrica	_ _ _	Glyceria canadensis	_ _ _	Poa palustris
_ _ _	Botrypus virginianus	_ _ _	Glyceria grandis	_ _ _	Poa pratensis
_ _ _	Bromus ciliatus	_ _ _	Glyceria striata	_ _ _	Pontederia cordata
_ _ _	Bromus inermis	_ _ _	Gymnocarpium dryopteris	_ _ _	Potentilla anserina
_ _ _	Calamagrostis canadensis	_ _ _	Hackelia virginiana	_ _ _	Potentilla norvegica
_ _ _	Calamagrostis stricta	_ _ _	Helenium autumnale	_ _ _	Pycnanthemum virginianum
_ _ _	Calla palustris	_ _ _	Helianthus giganteus	_ _ _	Rhododendron groenlandicum
_ _ _	Caltha palustris	_ _ _	Helianthus grosseserratus	_ _ _	Rubus pubescens
_ _ _	Calystegia sepium	_ _ _	Heracleum maximum	_ _ _	Rudbeckia hirta
_ _ _	Campanula aparinoides	_ _ _	Heuchera richardsonii	_ _ _	Rudbeckia laciniata
_ _ _	Carex aquatilis	_ _ _	Hordeum jubatum	_ _ _	Rumex britannica
_ _ _	Carex atherodes	_ _ _	Hydrophyllum virginianum	_ _ _	Rumex crispus
_ _ _	Carex comosa	_ _ _	Hypericum fraseri	_ _ _	Sagittaria latifolia
_ _ _	Carex interior	_ _ _	Hypoxis hirsuta	_ _ _	Sagittaria rigida
_ _ _	Carex intumescens	_ _ _	Impatiens capensis	_ _ _	Sanguinaria canadensis
_ _ _	Carex lacustris	_ _ _	Iris versicolor	_ _ _	Sarracenia purpurea
_ _ _	Carex lasiocarpa	_ _ _	Kalmia polifolia	_ _ _	Scheuchzeria palustris
_ _ _	Carex oligosperma	_ _ _	Lactuca serriola	_ _ _	Schoenoplectus acutus
_ _ _	Carex pellita	_ _ _	Laportea canadensis	_ _ _	Schoenoplectus fluviatilis
_ _ _	Carex stipata	_ _ _	Lathyrus palustris	_ _ _	Schoenoplectus pungens
_ _ _	Carex stricta	_ _ _	Lathyrus venosus	_ _ _	Schoenoplectus tabernaemontani
_ _ _	Carex utriculata	_ _ _	Leersia oryzoides	_ _ _	Scirpus cyperinus
_ _ _	Carex vulpinoidea	_ _ _	Liatris pycnostachya	_ _ _	Scolochloa festucacea
_ _ _	Chamaedaphne calyculata	_ _ _	Linnaea borealis	_ _ _	Scutellaria galericulata
_ _ _	Chamaenerion angustifolium	_ _ _	Lobelia kalmii	_ _ _	Scutellaria lateriflora
_ _ _	Chelone glabra	_ _ _	Lobelia siphilitica	_ _ _	Sicyos angulatus
_ _ _	Cicuta bulbifera	_ _ _	Lobelia spicata	_ _ _	Sium suave
_ _ _	Cicuta maculata	_ _ _	Lycopus americanus	_ _ _	Solidago canadensis
_ _ _	Circaea alpina	_ _ _	Lycopus uniflorus	_ _ _	Solidago gigantea
_ _ _	Circaea canadensis	_ _ _	Lysimachia ciliata	_ _ _	Solidago riddellii
_ _ _	Cirsium arvense	_ _ _	Lysimachia thyrsiflora	_ _ _	Solidago uliginosa
_ _ _	Cirsium muticum	_ _ _	Lythrum salicaria	_ _ _	Sonchus arvensis
_ _ _	Clintonia borealis	_ _ _	Maianthemum canadense	_ _ _	Sorghastrum nutans
_ _ _	Comarum palustre	_ _ _	Maianthemum stellatum	_ _ _	Sparganium eurycarpum
_ _ _	Coptis trifolia	_ _ _	Maianthemum trifolium	_ _ _	Spartina pectinata
_ _ _	Cornus canadensis	_ _ _	Matteuccia struthiopteris	_ _ _	Stachys pilosa
_ _ _	Cryptotaenia canadensis	_ _ _	Mentha arvensis	_ _ _	Stellaria longifolia
_ _ _	Cyperus esculentus	_ _ _	Menyanthes trifoliata	_ _ _	Streptopus lanceolatus
_ _ _	Cypripedium reginae	_ _ _	Mertensia virginica	_ _ _	Symphyotrichum lanceolatum
_ _ _	Dioscorea villosa	_ _ _	Micranthes pensylvanica	_ _ _	Symphyotrichum lateriflorum
_ _ _	Doellingeria umbellata	_ _ _	Mimulus ringens	_ _ _	Symphyotrichum novae-angliae
_ _ _	Drosera rotundifolia	_ _ _	Mitella nuda	_ _ _	Symphyotrichum puniceum
_ _ _	Dryopteris carthusiana	_ _ _	Monotropa uniflora	_ _ _	Symplocarpus foetidus
_ _ _	Dryopteris cristata	_ _ _	Muhlenbergia richardsonis	_ _ _	Taraxacum officinale
_ _ _	Dulichium arundinaceum	_ _ _	Nabalus racemosus	_ _ _	Thalictrum dasycarpum
_ _ _	Echinochloa crus-galli	_ _ _	Onoclea sensibilis	_ _ _	Thelypteris palustris
_ _ _	Echinocystis lobata	_ _ _	Orthilia secunda	_ _ _	Toxicodendron rydbergii
_ _ _	Eleocharis obtusa	_ _ _	Osmorhiza claytonii	_ _ _	Trientalis borealis
_ _ _	Eleocharis palustris	_ _ _	Osmunda spectabilis	_ _ _	Trillium cernuum
_ _ _	Elymus virginicus	_ _ _	Osmundastrum cinnamomeum	_ _ _	Typha angustifolia
_ _ _	Epilobium leptophyllum	_ _ _	Panicum virgatum	_ _ _	Typha latifolia
_ _ _	Equisetum arvense	_ _ _	Parnassia glauca	_ _ _	Typha X glauca
_ _ _	Equisetum fluviatile	_ _ _	Parnassia palustris	_ _ _	Urtica dioica
_ _ _	Erigeron canadensis	_ _ _	Pedicularis lanceolata	_ _ _	Vaccinium angustifolium
_ _ _	Eupatorium perfoliatum	_ _ _	Penthorum sedoides	_ _ _	Vaccinium macrocarpon
_ _ _	Euthamia graminifolia	_ _ _	Persicaria lapathifolia	_ _ _	Vaccinium oxycoccos
_ _ _	Eutrochium maculatum	_ _ _	Persicaria pensylvanica	_ _ _	Verbena hastata
_ _ _	Fragaria virginiana	_ _ _	Persicaria sagittata	_ _ _	Vernonia fasciculata
_ _ _	Galium aparine	_ _ _	Petasites frigidus	_ _ _	Veronicastrum virginicum
_ _ _	Gaultheria hispidula	_ _ _	Phalaris arundinacea	_ _ _	Xanthium strumarium
_ _ _	Gentiana andrew sii	_ _ _	Phragmites australis	_ _ _	Zizania palustris
_ _ _	Geranium maculatum	_ _ _	Physostegia virginiana	_ _ _	Zizia aurea

Appendix 3-Rapid FQA Calculator

Overview

The Rapid FQA calculator is an Excel spreadsheet created to provide users with a tool to quickly enter data, calculate *wC* scores, derive condition category assessments, and be used for reporting. The calculator is designed to process a single Assessment Area (AA) containing up to three different plant community types. Additional copies should be made for additional AA's. The calculator is organized by Worksheets (tabs) to enter data, calculate metrics, and make the assessment. Species nomenclature has been updated to the US Army Corps National Wetland Plant List for Minnesota.

Instructions

1) **Enter community information (green highlighted):** Enter the Eggers and Reed plant community type for community Worksheets 1-3 using the drop-down list provided and enter the estimated percent extent they occupy in the AA (Section 4.1)
2) **Enter vegetation data (blue highlighted):** For each community, enter the *Scientific Names* and *Cover Classes* of the observed species using the drop down lists provided. Data can be typed in but only correct values will be allowed. There is space for 60 species per community. Leaving extra rows blank doesn't affect the calculator. When a record is entered the remaining columns in the row automatically populate:
    - *Common Name*: The common name for the species (Appendix 1)
    - *CC Range*: The Cover Class (CC) percent cover range (Table 2)
    - *Midpoint CC*: The midpoint percent cover for each cover class (Table2)
    - *Native Status*: The Minnesota native status of the species (Appendix 1)
    - *NWI-GP:* National Wetland Indicator status—Great Plains region
    - *NWI-MW:* National Wetland Indicator status—Midwest region
    - *NWI-NCNE:* National Wetland Indicator status—North Central-Northeast region
    - *Rapid FQA Stratum*: The typical growth form/strata of the species (Appendix 1)
    - *C*: *C*-value of the species (Appendix 1)
    - *p*: Relative cover (Midpoint CC/Total Midpoint % Cover)
    - *pC*: Relative cover times the *C*-value (p x *C*)
3) **View results:** Once the data have been entered, the calculator automatically computes metrics and makes the assessment (Sections 4.2-4.4). Metric results and individual community assessments are found on the **Metrics** Worksheet. *wC* is the primary metric (Section 2.8), but additional metrics are provided for supporting information. See Section 2.9 for condition category narrative descriptions. The **AA-Assessment** Worksheet provides the overall AA assessment (Section 4.4).

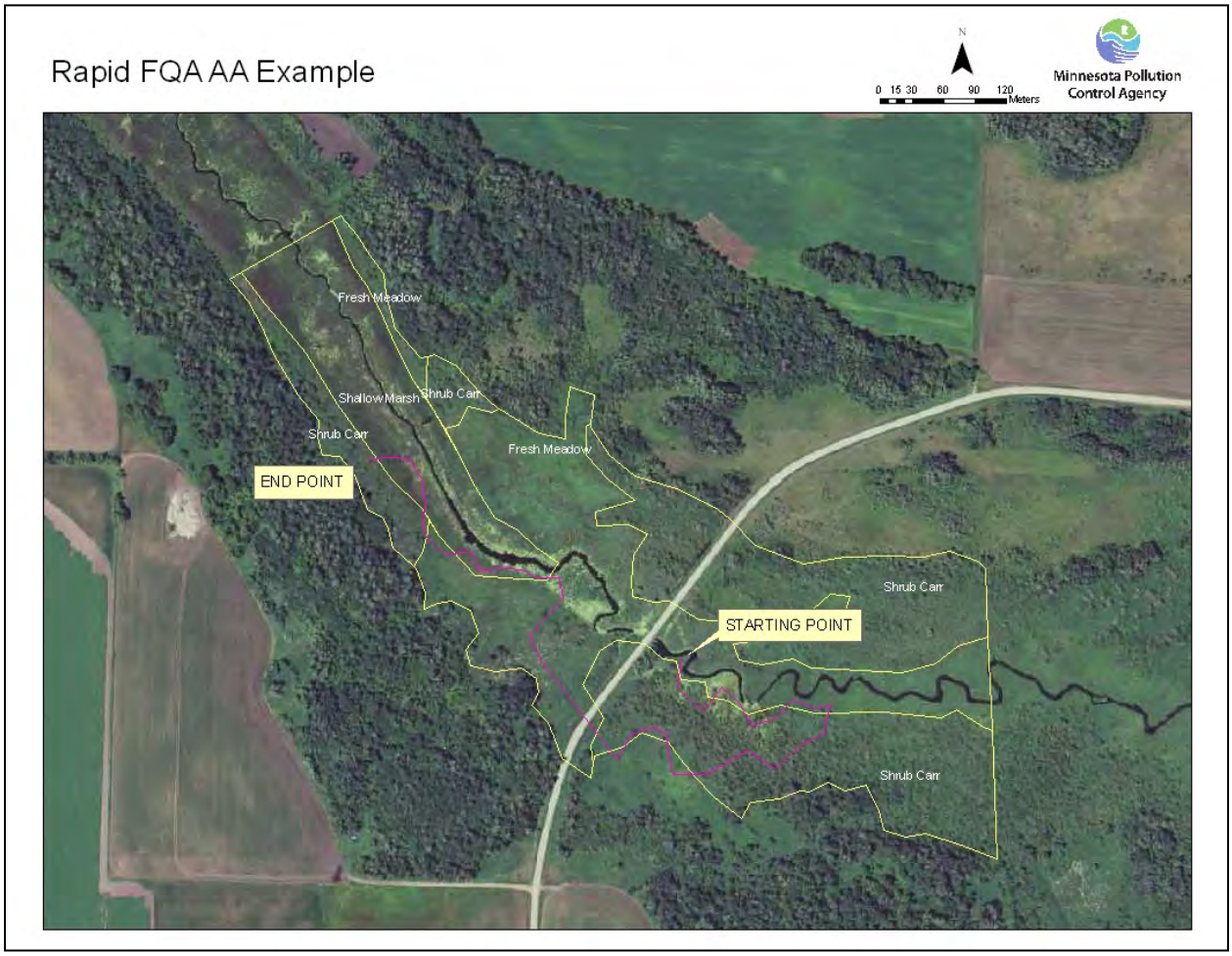
Appendix 4-Worked Example

A Rapid FQA example according to Sections 3 and 4 of this manual.

Field Sampling (Section 3)

Steps 1 and 2

Below is the final site map for the example. Prior to sampling, AA and community polygons (yellow line-work) were drawn in a GIS based on aerial photos, topographic maps, and NWI interpretation (Section 3.1). The base photography is 2010 1m resolution FSA. The community types follow those described in Table 1. When first arriving at the site community types were confirmed and boundaries were corrected throughout field sampling (Section 3.2). After field sampling, the polygons were revised based on the field observations (Section 4.1).



Step 3

There are three community types within this AA: Shrub-Carr, Fresh Meadow, and Shallow Marsh. The base meander time is then: 30 minutes + 20 minutes + 20 minutes = 70 minutes (Section 3.3).

Step 4

The meander path is provided in the AA map (magenta). Species listed on the data sheet (i.e., the rapid species; Appendix 4) were recorded as the meander proceeded. The meander started in the Fresh Meadow and continued east crossing into the Shrub-Carr. The path then crossed through the Shrub-Carr heading west

and the upland boundary of the AA was confirmed. The meander was then paused for a few minutes as the observer headed northwest across the road into a different area of the AA. The meander finished by working through the Fresh Meadow and Shallow Marsh in the northwestern portion of the AA. Five rapid species were observed during the final 10 minutes of the base meander time, so an additional 10 minute meander time period was added. During this period, only two more rapid species were observed so the meander was stopped. The meander covered all three communities in the AA with approximately equal time in each type (Section 3.4).

Step 5

During Step 2, it was determined that the stream channel was deep water habitat, not a Shallow Open Water wetland community. Step 5 was not necessary.

Step 6

Areal cover was estimated for each rapid species occurring in each community according to the cover classes in Table 2. Field sampling was now complete with a total field time at the AA of about 120 minutes.

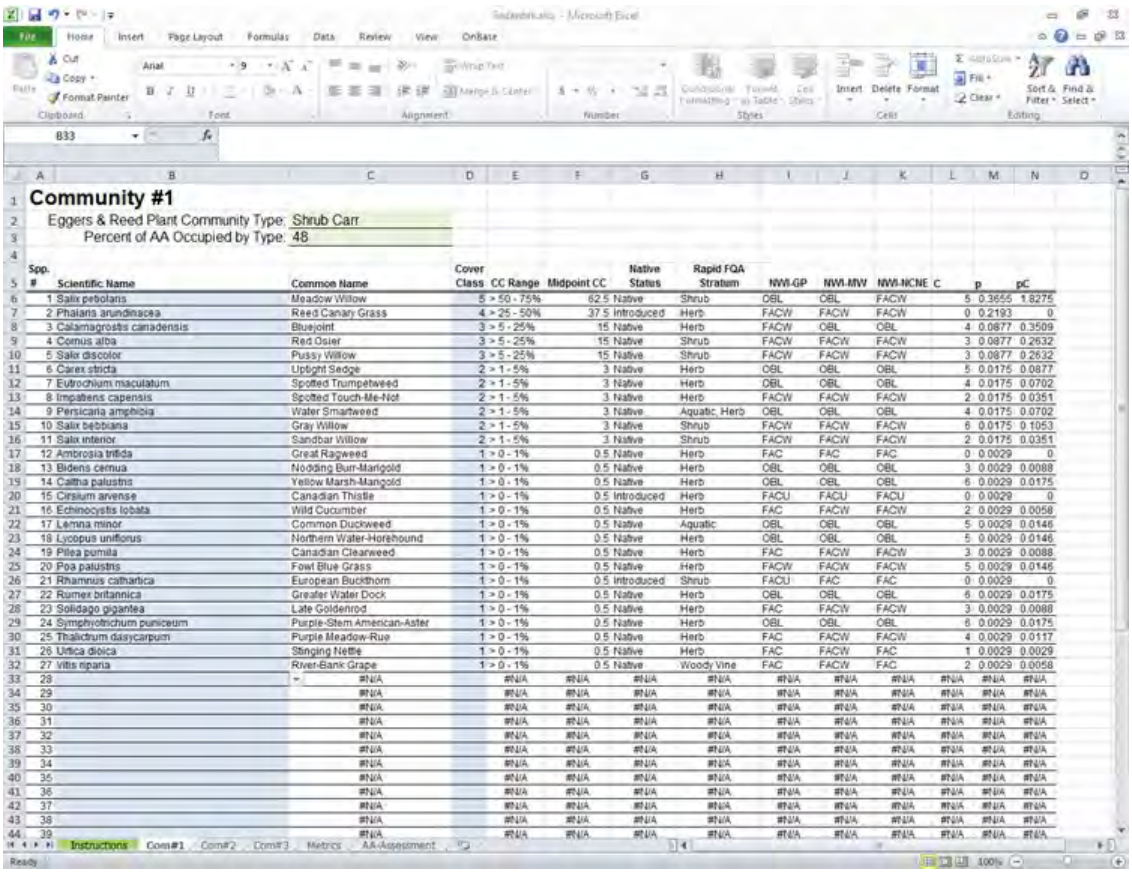
Data and assessment (Section 4)

Step 1

After field sampling, the polygons were revised based on the field observations (Section 4.1). The percent of the AA occupied by each community was then calculated and entered for each community in the Rapid FQA Calculator.

Step 2

Field data (scientific names and cover classes/CC) were entered into the Rapid FQA Calculator by community type to calculate *wC* (see below). The CC ranges and Midpoint percent Cover came from Table 2. Species attributes (Minnesota Native Status, NWI, and C-values) came from the Rapid Species List (Appendix 1). The Total Midpoint percent Cover, and Total Introduced Spp. Cover was then calculated for each community. Next the proportional cover (p) for each species was calculated by dividing the species' midpoint percent cover by the total cover. Each species C-value was then multiplied by its proportional abundance (pC). Finally, these values were summed to produce *wC* for each community type.



Community #1

Eggers & Reed Plant Community Type: Shrub Carr

Percent of AA Occupied by Type: 48

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix petiolaris	Meadow Willow	5	> 50 - 75%	62.5	Native	Shrub	OBL	OBL	FACW	5	0.3655	1.8275
2	Phalaris arundinacea	Reed Canary Grass	4	> 25 - 50%	37.5	Introduced	Herb	FACW	FACW	FACW	0	0.2193	0
3	Calamagrostis canadensis	Bluejoint	3	> 5 - 25%	15	Native	Herb	FACW	OBL	OBL	4	0.0877	0.3509
4	Cornus alba	Red Osier	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.0877	0.2632
5	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.0877	0.2632
6	Carex stricta	Upright Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0175	0.0877
7	Eutrochium maculatum	Spotted Trumpetweed	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	4	0.0175	0.0702
8	Impatiens capensis	Spotted Touch-Me-Not	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	2	0.0175	0.0351
9	Persicaria amphibia	Water Smartweed	2	> 1 - 5%	3	Native	Aquatic, Herb	OBL	OBL	OBL	4	0.0175	0.0702
10	Salix bebbiana	Gray Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	6	0.0175	0.1053
11	Salix interior	Sandbar Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	2	0.0175	0.0351
12	Ambrosia trifida	Great Ragweed	1	> 0 - 1%	0.5	Native	Herb	FAC	FAC	FAC	0	0.0029	0
13	Bidens cernua	Nodding Burr-Marigold	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	3	0.0029	0.0088
14	Caltha palustris	Yellow Marsh-Marigold	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	6	0.0029	0.0175
15	Cirsium arvense	Canadian Thistle	1	> 0 - 1%	0.5	Introduced	Herb	FACU	FACU	FACU	0	0.0029	0
16	Echinocystis lobata	Wild Cucumber	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FACW	2	0.0029	0.0058
17	Lemna minor	Common Duckweed	1	> 0 - 1%	0.5	Native	Aquatic	OBL	OBL	OBL	5	0.0029	0.0146
18	Lycopus uniflorus	Northern Water-Horehound	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	5	0.0029	0.0146
19	Pilea pumila	Canadian Clearweed	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FACW	3	0.0029	0.0088
20	Poa palustris	Fowl Blue Grass	1	> 0 - 1%	0.5	Native	Herb	FACW	FACW	FACW	5	0.0029	0.0146
21	Rhamnus cathartica	European Buckthorn	1	> 0 - 1%	0.5	Introduced	Shrub	FACU	FAC	FAC	0	0.0029	0
22	Rumex britannica	Greater Water Dock	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	6	0.0029	0.0175
23	Solidago gigantea	Late Goldenrod	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FACW	3	0.0029	0.0088
24	Symphyotrichum puniceum	Purple-Stem American-Aster	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	6	0.0029	0.0175
25	Thalictrum dasycarpum	Purple Meadow-Rue	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FACW	4	0.0029	0.0117
26	Urtica dioica	Stinging Nettle	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FAC	1	0.0029	0.0029
27	Vitis riparia	River-Bank Grape	1	> 0 - 1%	0.5	Native	Woody Vine	FAC	FACW	FAC	2	0.0029	0.0058
28		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
29		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
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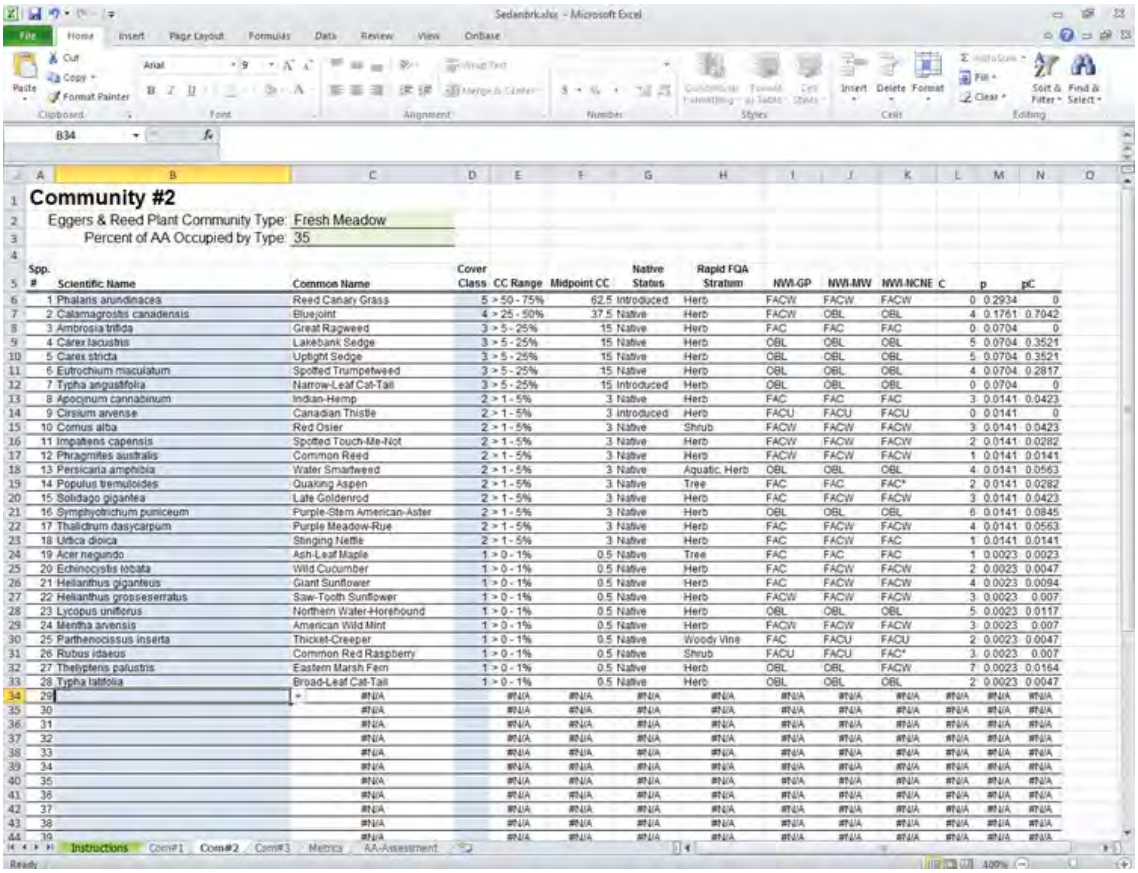
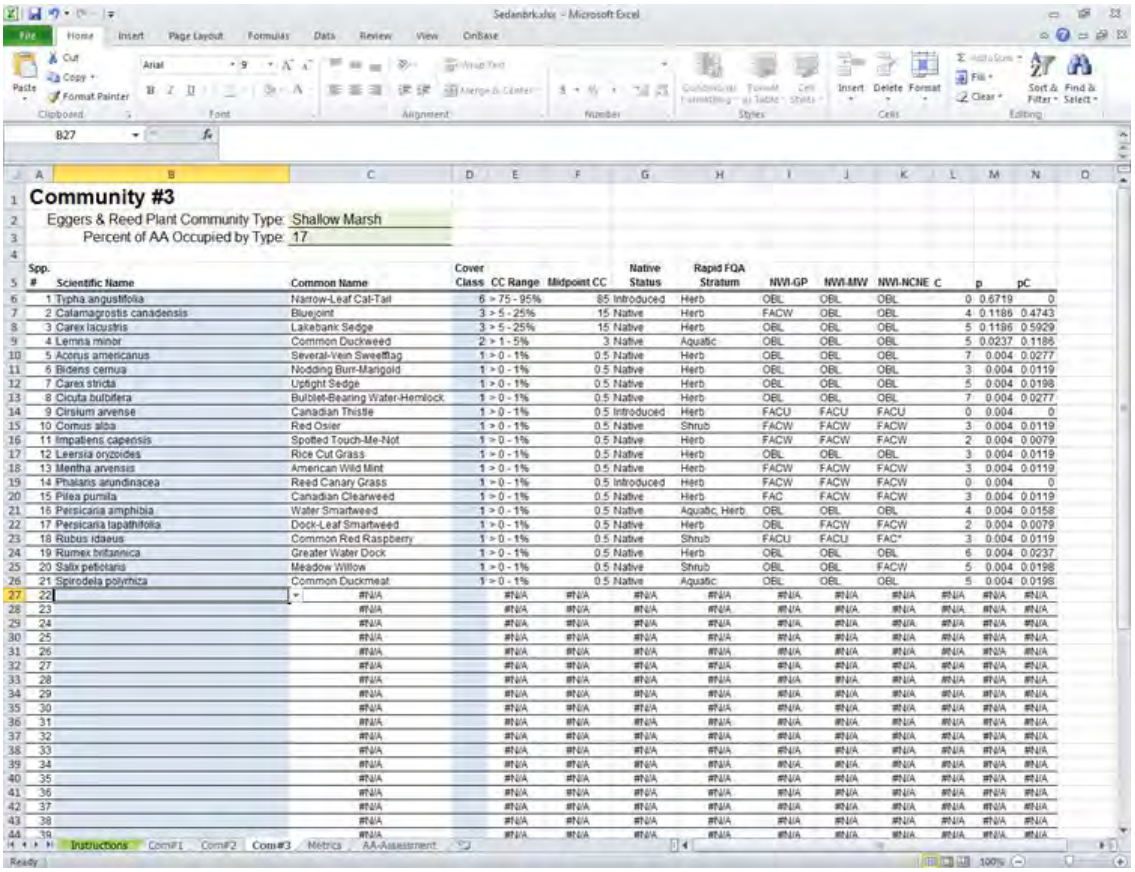


Community #2

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: 35

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACW	FACW	FACW	0	0.2934	0
2	Calamagrostis canadensis	Bluejoint	4	> 25 - 50%	37.5	Native	Herb	FACW	OBL	OBL	4	0.1761	0.7042
3	Ambrosia trifida	Great Ragweed	3	> 5 - 25%	15	Native	Herb	FAC	FAC	FAC	0	0.0704	0
4	Carex lacustris	Lakebank Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.0704	0.3521
5	Carex stricta	Upright Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.0704	0.3521
6	Eutrochium maculatum	Spotted Trumpetweed	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	4	0.0704	0.2817
7	Typha angustifolia	Narrow-Leaf Cat-Tail	3	> 5 - 25%	15	Introduced	Herb	OBL	OBL	OBL	0	0.0704	0
8	Apocynum cannabinum	Indian-Hemp	2	> 1 - 5%	3	Native	Herb	FAC	FAC	FAC	3	0.0141	0.0423
9	Cirsium arvense	Canadian Thistle	2	> 1 - 5%	3	Introduced	Herb	FACU	FACU	FACU	0	0.0141	0
10	Cornus alba	Red Osier	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0141	0.0423
11	Impatiens capensis	Spotted Touch-Me-Not	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	2	0.0141	0.0282
12	Phragmites australis	Common Reed	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	1	0.0141	0.0141
13	Persicaria amphibia	Water Smartweed	2	> 1 - 5%	3	Native	Aquatic, Herb	OBL	OBL	OBL	4	0.0141	0.0563
14	Populus tremuloides	Quaking Aspen	2	> 1 - 5%	3	Native	Tree	FAC	FAC	FAC*	2	0.0141	0.0282
15	Solidago gigantea	Late Goldenrod	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	3	0.0141	0.0423
16	Symphyotrichum puniceum	Purple-Stem American-Aster	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	6	0.0141	0.0845
17	Thalictrum dasycarpum	Purple Meadow-Rue	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	4	0.0141	0.0563
18	Urtica dioica	Stinging Nettle	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FAC	1	0.0141	0.0141
19	Acer negundo	Ash-Leaf Maple	1	> 0 - 1%	0.5	Native	Tree	FAC	FAC	FAC	1	0.0023	0.0023
20	Echinocystis lobata	Wild Cucumber	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FACW	2	0.0023	0.0047
21	Helianthus giganteus	Giant Sunflower	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FACW	4	0.0023	0.0094
22	Helianthus grosseserratus	Saw-Tooth Sunflower	1	> 0 - 1%	0.5	Native	Herb	FACW	FACW	FACW	3	0.0023	0.007
23	Lycopus uniflorus	Northern Water-Horehound	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	5	0.0023	0.0117
24	Mentha arvensis	American Wild Mint	1	> 0 - 1%	0.5	Native	Herb	FACW	FACW	FACW	3	0.0023	0.007
25	Parthenocissus inserta	Thicket-Creeper	1	> 0 - 1%	0.5	Native	Woody Vine	FAC	FACU	FACU	2	0.0023	0.0047
26	Rubus idaeus	Common Red Raspberry	1	> 0 - 1%	0.5	Native	Shrub	FACU	FACU	FAC*	3	0.0023	0.007
27	Thelypteris palustris	Eastern Marsh Fern	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	FACW	7	0.0023	0.0164
28	Typha latifolia	Broad-Leaf Cat-Tail	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	2	0.0023	0.0047
29		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A



Community #3

Eggers & Reed Plant Community Type: Shallow Marsh

Percent of AA Occupied by Type: 17

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Typha angustifolia	Narrow-Leaf Cat-Tail	6	> 75 - 95%	85	Introduced	Herb	OBL	OBL	OBL	0	0.6719	0
2	Calamagrostis canadensis	Bluejoint	3	> 5 - 25%	15	Native	Herb	FACW	OBL	OBL	4	0.1186	0.4743
3	Carex lacustris	Lakebank Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.1186	0.5929
4	Lemna minor	Common Duckweed	2	> 1 - 5%	3	Native	Aquatic	OBL	OBL	OBL	5	0.0237	0.1186
5	Acorus americanus	Several-Vein Sweetflag	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	7	0.004	0.0277
6	Bidens cernua	Nodding Burr-Marigold	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	3	0.004	0.0119
7	Carex stricta	Uptight Sedge	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	5	0.004	0.0198
8	Cicuta bulbifera	Bulblet-Bearing Water-Hemlock	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	7	0.004	0.0277
9	Cirsium arvense	Canadian Thistle	1	> 0 - 1%	0.5	Introduced	Herb	FACU	FACU	FACU	0	0.004	0
10	Cornus alba	Red Osier	1	> 0 - 1%	0.5	Native	Shrub	FACW	FACW	FACW	3	0.004	0.0119
11	Impatiens capensis	Spotted Touch-Me-Not	1	> 0 - 1%	0.5	Native	Herb	FACW	FACW	FACW	2	0.004	0.0079
12	Leersia oryzoides	Rice Cut Grass	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	3	0.004	0.0119
13	Mentha arvensis	American Wild Mint	1	> 0 - 1%	0.5	Native	Herb	FACW	FACW	FACW	3	0.004	0.0119
14	Phalaris arundinacea	Reed Canary Grass	1	> 0 - 1%	0.5	Introduced	Herb	FACW	FACW	FACW	0	0.004	0
15	Pilea pumila	Canadian Clearweed	1	> 0 - 1%	0.5	Native	Herb	FAC	FACW	FACW	3	0.004	0.0119
16	Persicaria amphibia	Water Smartweed	1	> 0 - 1%	0.5	Native	Aquatic, Herb	OBL	OBL	OBL	4	0.004	0.0158
17	Persicaria lapathifolia	Dock-Leaf Smartweed	1	> 0 - 1%	0.5	Native	Herb	OBL	FACW	FACW	2	0.004	0.0079
18	Rubus idaeus	Common Red Raspberry	1	> 0 - 1%	0.5	Native	Shrub	FACU	FACU	FAC*	3	0.004	0.0119
19	Rumex britannica	Greater Water Dock	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	6	0.004	0.0237
20	Salix petiolaris	Meadow Willow	1	> 0 - 1%	0.5	Native	Shrub	OBL	OBL	FACW	5	0.004	0.0198
21	Spirodela polyrhiza	Common Duckmeat	1	> 0 - 1%	0.5	Native	Aquatic	OBL	OBL	OBL	5	0.004	0.0198
22		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
29		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
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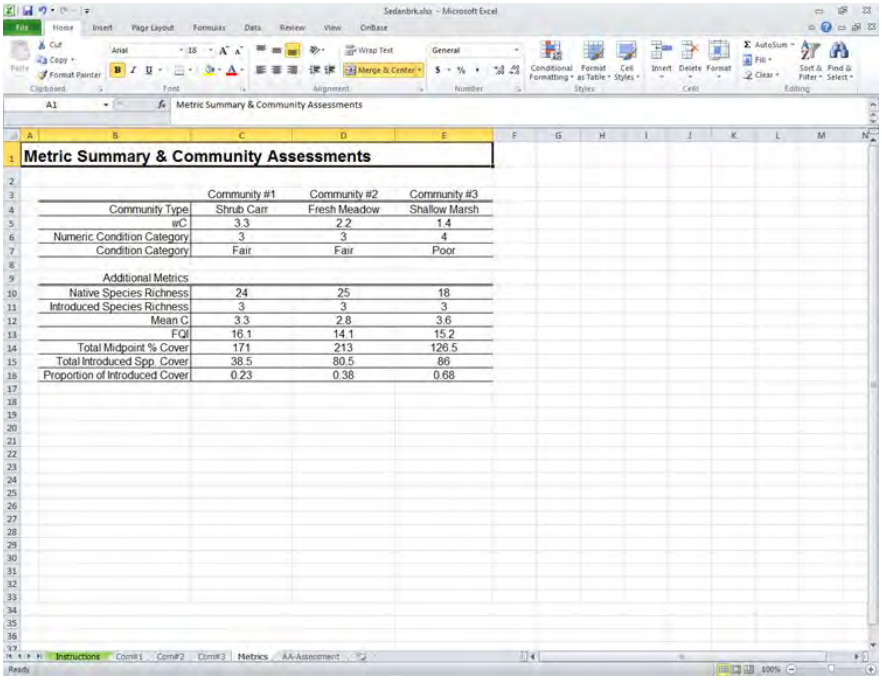
35		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Step 3

The *wC* values were then compared to the condition category thresholds in Table 7 to determine the condition for each community (Section 4.3). The Rapid FQA Calculator does this automatically.

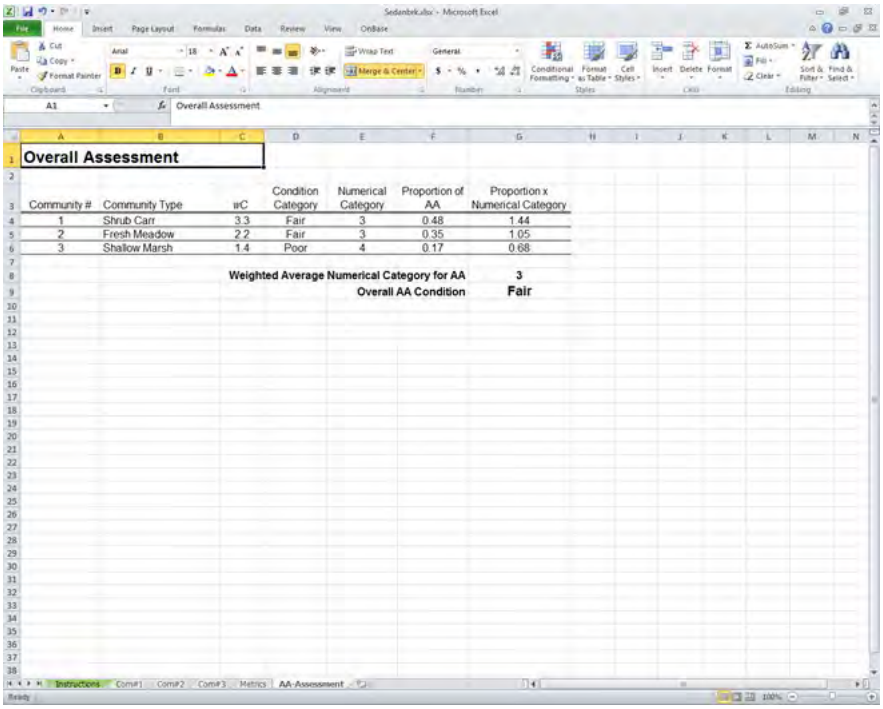


Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Shrub Carr	Fresh Meadow	Shallow Marsh
wC	3.3	2.2	1.4
Numeric Condition Category	3	3	4
Condition Category	Fair	Fair	Poor
Additional Metrics			
Native Species Richness	24	25	18
Introduced Species Richness	3	3	3
Mean C	3.3	2.8	3.6
FQI	16.1	14.1	15.2
Total Midpoint % Cover	171	213	126.5
Total Introduced Spp. Cover	38.5	80.5	86
Proportion of Introduced Cover	0.23	0.38	0.68

Step 4

The final step was to calculate the weighted average of the community condition categories for the AA based on the mapped relative extent of the three communities present. Again, the Rapid FQA Calculator does this calculation.



Overall Assessment

Community #	Community Type	wC	Condition Category	Numerical Category	Proportion of AA	Proportion x Numerical Category
1	Shrub Carr	3.3	Fair	3	0.48	1.44
2	Fresh Meadow	2.2	Fair	3	0.35	1.05
3	Shallow Marsh	1.4	Poor	4	0.17	0.68
			Weighted Average Numerical Category for AA			3
			Overall AA Condition			Fair

Appendix 5-Adapting US ACE Methods for the Rapid FQA

The US Army Corps of Engineers (US ACE) has established vegetation sampling guidelines for wetland determinations/delineations through the 1987 Corps of Engineers Wetlands Delineation Manual (US ACE 1987) and the more recently published regional supplements for the Midwest (US ACE 2010a), Great Plains (US ACE 2010b), and Northcentral/Northeast (US ACE 2012) regions. The goal of the vegetation sampling in a wetland delineation is to characterize the vegetation sufficiently to apply hydrophytic vegetation indicators (i.e., Rapid test for hydrophytic vegetation, Dominance Test, etc.) to determine if a site supports a prevalence of hydrophytic vegetation.

In summary, the US ACE recommends that hydrophytic vegetation determinations should be based on samples taken within representative locations by vegetation unit (i.e., plant communities). This can be done within a community as a whole, but locating one or more sampling plots at representative locations by community type is preferred. Plot size depends on the prevalent structural type of the vegetation present (i.e., trees, shrubs, herbaceous plants, etc.). Establishing nested circular plots of varying size by structural type are recommended. Vertical vegetation strata (tree, shrub, woody vine, herb) are sampled separately. Species are identified and absolute areal cover is estimated by strata. Dominant species are determined in each stratum using the 50/20 rule (though qualitative assessments of dominant species are adequate in relatively simple plant communities). Once the dominants have been determined–no further species identification is required to make the hydrophytic vegetation determination unless the site does not pass Indicators 1 (Rapid Test for Hydrophytic Vegetation) and 2 (Dominance Test). If this occurs, the next step is Indicator 3 (Prevalence Index), which requires that a minimum of 80% of the total vegetative cover on the plot (summed across all strata) is correctly identified to the species level and those species have an assigned indicator status.

For routine wetland determinations, the recommended US ACE vegetation sampling procedure meets three of the four general conditions to complete a Rapid FQA (Section 6: Adaptations):

- The sampling is done by community type.
- It is a representative sample (if plots are sized and placed according to the guidance).
- Areal cover estimates are made.

The remaining general condition to adapt alternative sampling methods for the Rapid FQA requires that species be identified to the level of the Rapid Species List (Appendix 1). USACE guidance focuses on identifying only the dominant species (as determined by the 50/20 rule). Both in training and practice, however, delineators are encouraged to identify all the species in sampling plots to the extent possible given the skills of the delineator and the condition of the vegetation. If the level of species identification meets (or exceeds) the Rapid Species List during US ACE sampling–the resulting data may be applicable to complete a Rapid FQA in addition to making a hydrophytic vegetation determination.

General Guidance

The following provides step-by-step guidance on how to adapt US ACE standard vegetation sampling to also return a Rapid FQA.

- **Define the AA and community types:** This should be done according to sections 3.1-3.2 of this manual.
- **Establish vegetation sampling plots:** This should be done according to US ACE guidance provided in the 1987 Delineation Manual (US ACE 1987) and the appropriate regional supplement (US ACE 2010a, US ACE 2010b, US ACE 2012). Plots should be of sufficient size according to the vegetation present and established at representative locations within each plant community occurring in the AA.

- **Identify species by vertical strata within the sampling plots:** In general, this should be done to the level of the Rapid Species List (Appendix 1). The Rapid FQA data form (Appendix 2) is organized according to US ACE strata and may be used as a primary field data form. There may be cases where the apparent dominant species is not on the Rapid Species List. If this occurs, these species need to be recorded in the margins and ultimately factored into the hydrophytic vegetation determination.
- **Estimate absolute percent cover:** This should be done for all of the species present that are on the Rapid Species List (and any that are perceived as dominates not on the list) according to US ACE guidance. Absolute cover can be recorded on the Rapid FQA data form in place of cover classes.
- **Determine the dominant species and make the hydrophytic vegetation determination:** Transfer the necessary data to the US ACE data form, determine the dominant species using the 50/20 rule, and complete the hydrophytic vegetation indicators according to the US ACE guidance.
- **Compute *wC* scores and complete the Rapid FQA:** This should be done according to sections 4.1-4.4 of this manual. Absolute cover can be used in the *wC* calculation or the Rapid FQA Calculator (Appendix 3) can be used if corresponding cover classes are entered. Unlike the US ACE sampling method, cover data are not analyzed by strata in the Rapid FQA. If the same species occurs within multiple strata in the same community, sum the cover prior to *wC* calculation.

Literature cited

US Army Corps of Engineers (US ACE). 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. US Army Engineer Waterways Experimental Station, Vicksburg, MS.

US Army Corps of Engineers (US ACE). 2010a. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0). ERDC/EL TR-10-1. US Army Engineer Research and Development Center, Vicksburg, MS.

US Army Corps of Engineers (US ACE). 2010a. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0). ERDC/EL TR-10-16. US Army Engineer Research and Development Center, Vicksburg, MS.

US Army Corps of Engineers (US ACE). 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0). ERDC/EL TR-12-1. US Army Engineer Research and Development Center, Vicksburg, MS.

Appendix 6-Incorporating the Rapid FQA with the MnRAM

The Minnesota Routine Assessment Method (MnRAM) was created as a practical assessment tool to systematically evaluate wetland functions (i.e., the goods and services wetlands provide) for both regulatory and planning applications following the passage of the Minnesota Wetland Conservation Act (MN BWSR 2010). The MnRAM relies on the observer making coarse/simplified field observations and then answering a series of categorical questions. This information is then used to produce functional ratings (Exceptional, High, Medium, and Low) for up to 12 separate wetland functions:

- Maintenance of Characteristic Vegetative Diversity/Integrity
- Maintenance of Hydrologic Regime
- Flood/Stormwater Attenuation
- Downstream Water Quality
- Maintenance of Wetland Water Quality
- Shoreline Protection
- Maintenance of Characteristic Wildlife Habitat Structure
- Maintenance of Characteristic Fish Habitat
- Maintenance of Characteristic Amphibian Habitat
- Aesthetics/Recreation/Education/Cultural
- Commercial Uses
- Groundwater Interaction

The MnRAM functional rating scales are conceptually calibrated to a theoretical pre-European-settlement condition baseline. A Management Classification System (MN BWSR 2012) has also been created to provide a basis to translate MnRAM results into management recommendations. In this way, the MnRAM produces results universally relative to minimally impacted wetlands, but those results can then be further evaluated according to a local context through Management Classification. An Access database has also been created to manage data and automate the reporting of MnRAM results.

The Vegetative Diversity/Integrity function is integral to the MnRAM. Making the vegetation observations typically is the most time consuming portion of the MnRAM field sampling. First, the plant communities (Eggers and Reed 2011) in a wetland are determined; the dominant species (according to the 50/20 rule) are identified; and the cover of invasive species is estimated for each community. The vegetation quality ratings are then derived based on the observations and a narrative guidance for each community. The overall Vegetative Diversity/Integrity function ratings for a wetland is then expressed as the: Highest Quality Community; Non-Weighted; and Weighted Average (based on the percent extent of each community) Quality of all communities. Vegetative Diversity/Integrity function results are incorporated into both the Maintenance of Wetland Water Quality and Characteristic Wildlife Habitat Structure functions and the community type/proportional information is used in the Wetland Sensitivity to Stormwater Input and Urban Development assessment. Vegetative Diversity/Integrity results also feed into the Management Classification System–where the quality ratings directly affect management recommendations.

The Rapid FQA has the potential to be substituted as an alternative vegetation component in the MnRAM. Both methods are similarly structured where vegetation observations are made and results are expressed by plant community types. They also share conceptually similar theoretical assessment frameworks. A pre-European-settlement wetland condition is the assessment baseline and the Rapid FQA condition categories are more or less equivalent to the four MnRAM Vegetation Integrity/Diversity ratings (Table 1). This allows for direct input of Rapid FQA community assessment results into the MnRAM.

Table 1. Comparison of Rapid FQA condition categories and MnRAM Vegetation Quality Categories. The MnRAM Vegetation Quality ratings are unique by community type. The summary descriptions provided here have been synthesized from the individual community ratings.

Rapid FQA Condition Categories		MnRAM Vegetation Diversity and Integrity Categories	
Condition Category	**Description**	**Veg Quality Category**	**Summary Description**
Exceptional	Community composition and structure as they exist (or likely existed) in the absence of measurable effects of anthropogenic stressors representing pre-European settlement conditions. Non-native taxa may be present at very low abundance and not causing displacement of native taxa.	Exceptional	Plant community is undisturbed, or sufficiently recovered from past disturbances, such that it represents pre-European settlement conditions
Good	Community structure similar to natural community. Some additional taxa present and/or there are minor changes in the abundance distribution from the expected natural range. Extent of expected native composition for the community type remains largely intact.	High	The characteristic native assemblage for the community type is present and dominant. Multiple native dominant taxa (as determined by the 50/20 rule) typically present. Invasive species comprise < 20% cover in any stratum.
Fair	Moderate changes in community structure. Sensitive taxa are replaced as the abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type diminished.	Medium	The number of native species is reduced. Invasive species comprise 20-50% cover in one or more strata.
Poor	Large to extreme changes in community structure resulting from large abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type reduced to isolated pockets and/or wholesale changes in composition.	Low	Few native species are dominants/present. Invasive species cover > 50% in one or more strata. > 50% of the canopy may be dead and/or no evidence of tree regeneration present in forested types.

The advantage of substituting the Rapid FQA for the MnRAM Vegetative Diversity/Integrity is a more rigorous method and consequently improved accuracy. This is due to the greater relative sampling intensity; quantitative results (*wC*); and the data-driven assessment criteria of the Rapid FQA. The Rapid FQA assessment criteria were derived from a large data set that included sites ranging from pre-European settlement conditions to severely impacted conditions. The MnRAM criteria were derived by the MnRAM workgroup based on the best professional judgment of the group and the best available information at the time. The disadvantage of substituting the Rapid FQA is the greater degree of botanical expertise and sampling effort required–making it not appropriate or attainable in all situations.

General Guidance

The following provides step-by-step guidance on how to substitute the Rapid FQA as the vegetation sampling and assessment component in the MnRAM.

- **Define the AA and community types prior to field sampling:** This should be done according to section 3.1 of this manual. Note that the AA as defined in the Rapid FQA is the wetland area that is being represented by the sampling (see Section 2.1). MnRAM guidance refers to the equivalent area as 'wetlands' or 'sites' and an 'assessment area' as being a larger land area that may include upland and multiple wetlands.
- **Complete the MnRAM GIS/Office observations:** The MnRAM requires information from non-field observations that include noting special features and designations; as well as, answering questions on landscape, buffer, and soil characteristics. Complete these portions of the MnRAM according to the MnRAM guidance.

- **Complete the Rapid FQA field sampling:** This should be done according to sections 3.2-3.6 of this manual. MnRAM vegetation sampling (#2) would not be done.
- **Complete additional MnRAM required field observations:** The Rapid FQA typically will provide enough observation to complete the MnRAM questions pertaining to within-wetland features. The MnRAM also requires observations of the surface water inputs/outputs (if present) and the immediate buffer surrounding the AA. Make these observations according to the MnRAM guidance. Results should be recorded on the MnRAM data sheet or directly entered into the database. Field sampling should be complete at this point and the remaining steps can be completed in the office.
- **Calculate *wC* Scores and complete the Rapid FQA assessment:** This should be done according to sections 4.1-4.3 of this manual.
- **Enter vegetation community information into the MnRAM:** Enter the community type and extent information recorded during the Rapid FQA sampling into the MnRAM database.
- **Convert Rapid FQA community condition categories to MnRAM Vegetation Quality Categories and enter into MnRAM:** Using Table 1–convert the condition category assessment of each community into the corresponding MnRAM Vegetation Quality Category. Enter this information into the MnRAM database.
- **Complete the MnRAM:** Complete any remaining MnRAM questions and enter results according to the MnRAM guidance. The MnRAM functional assessment should now be complete.
- **Additional Considerations:** The following are specific situations where completing the MnRAM requires deviation from the above guidance:
    - All Calcareous Fen communities will be rated as 'Exceptional' in the MnRAM regardless of the condition it is assessed as in the Rapid FQA.
    - The Rapid FQA has combined the Eggers and Reed (2011) Sedge Meadow and Fresh (Wet) Meadow into the more general class of Fresh Meadow (see Section 2.2). The more refined class designations can be made when substituting Rapid FQA into the MnRAM. In those cases, use the Fresh Meadow BCG assessment criteria for each class.
    - The Seasonally Flooded Basin community type is not included in the Rapid FQA (see Section 2.2). Proceed with the MnRAM vegetation procedure for this community type.
    - MnRAM Question #4 refers to the presence of listed rare plant species. If listed species are present and this question is answered as yes–then the overall Vegetative Diversity/Integrity function is rated as 'Exceptional' regardless of the condition the AA is assessed as in the Rapid FQA.
    - MnRAM Question #5 refers to whether the AA (or portion of) is mapped as a rare natural community/habitat in the MN DNR Natural Heritage Database/County Biological Survey. If the AA includes a rare natural community/habitat and this question is answered as yes–then the overall Vegetative Diversity Function is rated as 'Exceptional' regardless of which condition category the AA is assessed as in the Rapid FQA.
    - MnRAM Question #6 asks the user if the AA represents pre-European settlement conditions. If all communities in the AA are assessed as Exceptional in the Rapid FQA then answer this question 'yes'. If any community is assessed as Good-Fair-Poor, the answer this question 'no'.
- **Complete the Management Classification:** This should be done according to the Wetland Management Classification System guidance (MN BWSR 2012).
- **Reporting:** Clearly indicate in the results reporting if the Rapid FQA was substituted as the Vegetation Diversity/Integrity function and include additional Rapid FQA data and results according to the guidelines in Section 5 of this manual.

Literature cited

Eggers, S.D. and D.M. Reed. 2011. Wetland Plants and Plant Communities of Minnesota and Wisconsin (3rd Ed). US. Army Corps of Engineers, St. Paul District, St. Paul, Minnesota.

Minnesota Board of Water and Soil Resources (MN BWSR). 2010. Comprehensive General Guidance for Minnesota Routine Assessment Method (MnRAM) Evaluating Wetland Function, Version 3.4 (beta). Minnesota Board of Water and Soil Resources, St. Paul, Minnesota.

Minnesota Board of Water and Soil Resources (MN BWSR). 2012. Recommended Wetland Management Classification System: To accompany the Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.0. Minnesota Board of Water and Soil Resources, St. Paul, Minnesota.