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Biological Assessment Program Review:
Assessing Level of Technical Rigor to Support Water Quality Management

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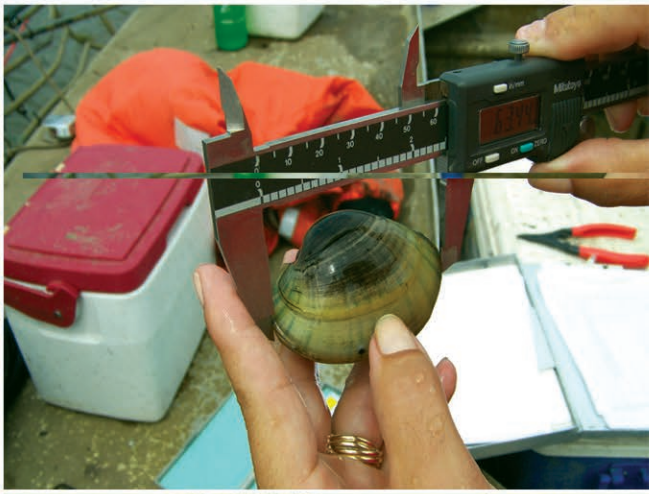

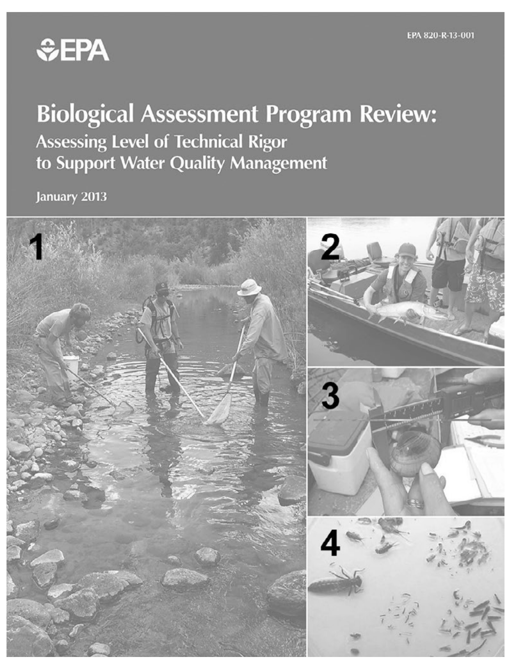

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Water Quality Management

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BIOLOGICAL ASSESSMENT PROGRAM REVIEW:

ASSESSING LEVEL OF TECHNICAL RIGOR TO SUPPORT

WATER QUALITY MANAGEMENT

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Foreword

State and tribal water quality agencies face challenges to ensure that the best available science serves as the backbone of their monitoring and assessment programs. The degree of confidence with which biological assessment information can be used to answer water quality management questions relies to a considerable degree on a program's level of technical rigor.

This document provides a process, including materials, for states and tribes to evaluate the technical rigor and breadth of capabilities of a biological assessment program. The review is intended to help states and tribes answer the following questions:

- What are the strengths of my technical program?
- What are the limitations of my technical program?
- How do I determine priorities and allocate resources to further develop the technical capabilities of my existing program?
- If I want to use biological assessments to more precisely define my designated aquatic life uses and develop numeric biological criteria, how do I begin technical development?

Using the program review process described in this document, states and tribes can identify the technical capabilities and the limitations of their biological assessment programs and develop a plan to build on the program strengths and address the limitations. The U.S. Environmental Protection Agency (EPA) recommends that the review include both EPA regional participants and agency program managers and staff, and that it be facilitated by a technical expert with expertise in biological assessments and biological criteria derivation. As part of the review process, a state or tribe evaluates how it currently uses biological assessment information to support its overall water quality management program and considers potential future applications using information gained by a strengthened technical program.

The document includes a description of 13 technical elements of a biological assessment program, provides a checklist for evaluating the level of technical development for each element, and includes a method for characterizing the overall level of program rigor. As a technical program is improved, biological assessment information can be used with increasing confidence to support multiple water quality program needs for information. Such needs include more precisely defined aquatic life uses and approaches for deriving biological criteria, monitoring biological condition, supporting causal analysis, and developing stressor-response relationships.

This document is intended to be used as a "how to" manual to guide technical development of a biological assessment program for providing information to meet multiple water quality information needs. Water quality agencies can use the outcomes of the programmatic review to develop the technical strengths of their biological assessment programs and allocate resources to build as robust programs as their resources will allow. The highest level of technical development as described in this document can be thought of as a well-equipped toolbox. Not all tools need to be applied all the time and in all situations. For a water quality program, the type and level of quality of a biological assessment tool (e.g., a collection method, monitoring design, or analytical approach) will depend on the question being asked and the specific environmental circumstances. For this reason this document does not, and is not intended to, establish minimum expectations regarding the amounts or types of biological data that might be considered necessary in the context of decision making in Clean Water Act regulatory programs. However, understanding the different programmatic expectations for the biological assessment data guides the technical review and recommendations for technical development.

Chapter 1: Biological Assessment Program Evaluation

1.1 Background

A biological assessment is an evaluation of the biological condition of a water body using surveys of the structure and function of resident biota, including migratory biota that reside in the water body for at least one part of their life cycle (USEPA 2011b). Biological assessment information is important to effectively and accurately answer water quality management questions about condition, protection, and restoration. It is a principal monitoring tool for state and tribal water quality agencies (referred to throughout as water quality agencies) and is used to varying degrees and purposes by all 50 states and increasingly by tribes (USEPA 2002b, 2011c). Over the past 20 years, water quality agencies have developed different abilities to use biological assessment information for water quality management. An agency's ability to use this information at the appropriate level of precision and accuracy to answer a given management question is called its *technical capability*. The technical capability of a program is dependent on its level of *technical rigor*. For the purposes of this document, a technically rigorous biological assessment program:

- Uses scientifically accepted and documented methods.
- Adheres to methods and protocols.
- Documents quality assurance and quality control.
- Provides information to support multiple WQM programs.

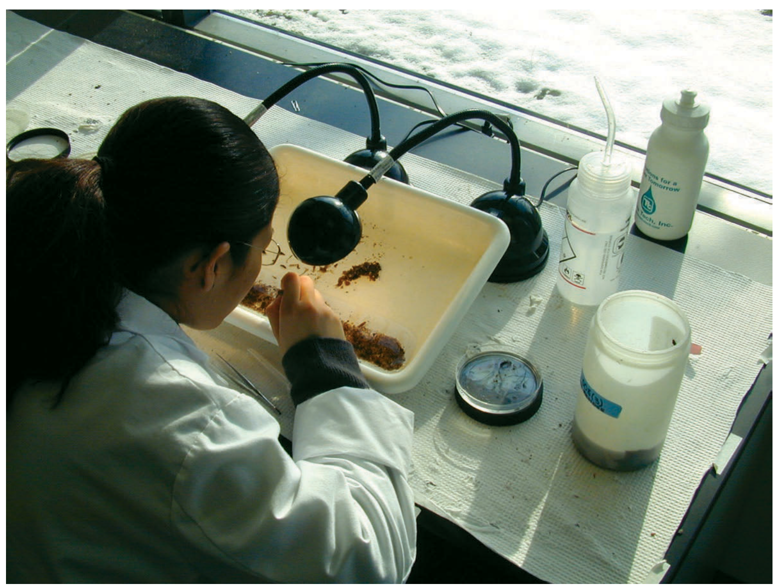
1.2 Why Is the Level of Technical Rigor Important?

The technical rigor of a biological assessment program determines the degree of accuracy and precision in assessing biological condition and deriving stressor-response relationships. With increasing technical rigor, a water quality agency gains increased confidence in data analysis and interpretation, as well as more comprehensive support for a variety of water quality management activities, including the following:

- More precisely defining goals for aquatic life use protection.
- Deriving biological criteria.

- Identifying high quality waters and establishing biological condition baselines.
- Identifying waters that fail to support designated aquatic life uses.
- Supporting development of water quality criteria.
- Conducting causal analysis.
- Monitoring biological response to management actions.

This document is intended to be used as a road map for technical development of a biological assessment program. It provides a step-by-step process for evaluating both the technical rigor of a water quality agency's biological assessment program and the extent to which the water quality agency uses the information to support overall water quality management. The evaluation is based on the degree of technical development of the biological assessment program's survey design, methods, analysis, and interpretation; how biological assessments are integrated into and supported by the monitoring program; how the agency currently uses biological assessments to support its water quality programs; and how it intends to use biological assessments in the future.



The end goal of this evaluation process is an action plan for technical program development and recommendations to enhance the use of biological assessments to support the agency's overall water quality management program (USEPA 2011c). The plan specifies incremental steps for technical and program development based on the strengths and gaps identified in the evaluation.

To date, this process has been applied to biological assessment programs for river and streams and reviews conducted with 22 states and 1 tribe (Yoder and Barbour 2009). However, the technical elements and the review process are applicable to other water body types with water body-specific modifications for biological assessment design, methods, and data analysis.

1.3 The Technical Foundation for a Biological Assessment Program

The determination of a biological assessment program's level of technical rigor is on the basis of evaluating 13 technical elements that provide the foundation of its biological assessment design, data collection and compilation, and analysis and interpretation (Figure 1-1). *Biological assessment design* includes temporal and spatial considerations in developing a monitoring program and selection of sampling sites, characterizing and accounting for natural variability, and determining reference condition. *Data collection and compilation* includes field and laboratory protocols and data handling, typically included in agency standard operating procedures (SOPs). *Analysis and interpretation* comprise all of the data analysis, interpretation, and review procedures used after data are obtained. The 13 technical elements are based on U.S. Environmental Protection Agency's (EPA's) Consolidated Assessment and Listing Methodology (CALM) guidance on collection and use of water quality data and information for environmental decision making (USEPA 2002a), and on EPA's *Evaluation Guidelines for Ecological Indicators* (Jackson et al. 2000; Kurtz et al. 2001). The evaluation guidelines described 15 guidelines in 4 areas (termed "phases" in the Guidelines) comprising conceptual relevance of the indicator, feasibility of implementation, response variability, and interpretation and utility. The CALM guidance describes seven critical technical elements of a biological assessment program. In that guidance EPA also describes four levels of technical program rigor, Levels 1 through 4, with Level 4 being the highest level of rigor. As described in chapter 2 of this document, the original 7 critical technical elements have been refined and expanded to 13 elements on the basis of a water quality agency's assessment program reviews conducted beginning in 2004 (Yoder and Barbour 2009; USEPA 2010b).

Technical Elements of a Biological Assessment Program

Biological assessment design

1. Index period
2. Spatial sampling design
3. Natural variability
4. Reference site selection
5. Reference conditions

Data collection and compilation

6. Taxa and taxonomic resolution
7. Sample collection
8. Sample processing
9. Data management

Analysis and interpretation

10. Ecological attributes
11. Discriminatory capacity
12. Stressor association
13. Professional review

Figure 1-1.The critical technical elements.

The technical elements and the level of development for a rigorous biological assessment program are discussed in more detail in chapter 2. Assessment of the technical elements is the technical backbone of the program review process, and it provides the detailed information needed by an agency program to develop its technical program. An estimate of overall level of program rigor is assigned based on the scoring of the technical elements that correspond with a program's increasing ability to detect incremental levels of biological change along a gradient of stress, associate biological response to stressors and their sources, and integrate biological assessments with other environmental data and information.

1.4 The Biological Program Review Process

The biological program review is a systematic *process* to evaluate the technical rigor of a water quality agency's biological assessment program and to identify logical next steps for overall program improvement. The review is typically conducted over two to three days for both a thorough evaluation of the technical elements and for agency cross-program discussions on the use of biological assessment data and information to support the overall water quality management program. The purpose of the cross-program discussions is to provide an opportunity for managers and staff from different water quality programs to identify the type and level of rigor of biological assessment that best addresses their information needs. Additionally, personnel can share their needs and timing for information to optimize collection and delivery of the data. These discussions might reveal areas for program improvement and coordination that will foster more efficient and comprehensive application of biological assessments. An improved understanding of how an agency uses biological assessment information in its water quality programs helps answer the "so what" question for why an agency would allocate staff and resources for technical development.

The review includes both EPA regional participants and agency program managers and staff, and it is typically facilitated by an independent technical expert with expertise in biological assessments and in biological criteria derivation.

The review team first evaluates the 13 technical elements of a biological assessment program. Each technical element receives a score on the basis of its current state of technical development. These scores are then summed for an overall program score—a higher score reflecting a higher level of technical development, corresponding with increased capability and confidence in use of biological assessment data.[1] A Level 4 assignment is the highest ranking, and Level 1 is the lowest ranking. These levels reflect sequential stages in technical development of a biological assessment program and are intended as a guide for assessing progress and targeting resources.

The review process is designed to evaluate the key gaps in a technical program and to identify incremental steps for addressing the gaps. The scoring of the individual elements provides the essential information for identifying these technical gaps. Incremental improvements in the individual technical elements are followed, often in a short time, by corresponding improvements in the technical capability of the overall program (Figure 1-2). At all levels of technical development described in this document, a state or tribal program is able to use biological assessment information to carry out Clean Water Act (CWA) activities. For example, a defensible decision that aquatic life use is impaired can be based on a qualitative visual observation of overwhelming biological evidence such as nearly total dominance of pollutant

[1] Because the overall score is the result of the summation of individual scores for the 13 separate elements, the overall score does not establish minimum expectations regarding a state's ability to make decisions in context of different CWA regulatory programs. At all levels of technical development, biological assessment information can be used to support water quality decisions.

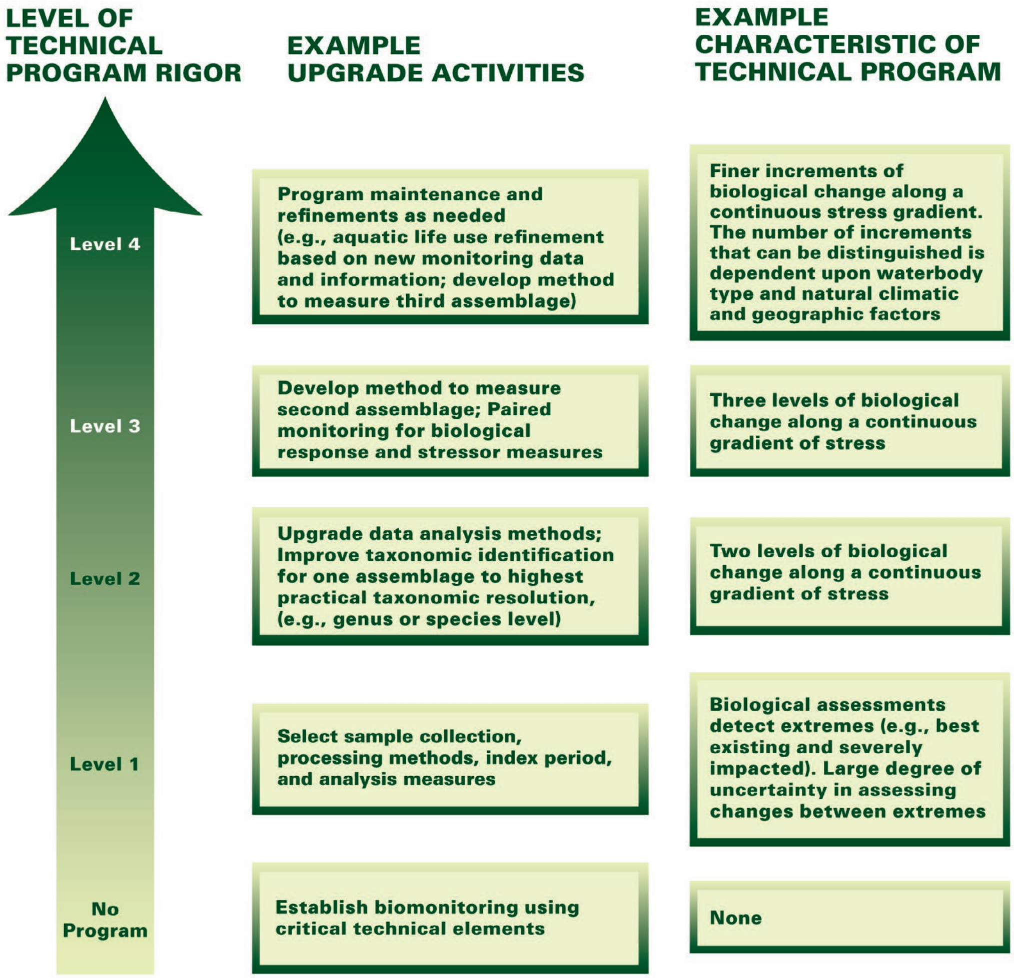


Figure 1-2. Examples of typical upgrade activities state or tribal water quality agencies have taken to incrementally strengthen their technical programs. The example characteristics provided in column three are relevant to a biological assessment program's technical capability to distinguish incremental biological change along a gradient of increasing stress. Improved ability to discriminate biological changes supports more detailed description of designated aquatic life uses and derivation of biological criteria.

tolerant organisms (e.g., scuds, worms, snails), a pervasive algae bloom, or a fish kill. As the technical program is improved, the agency will be able to use biological assessment information with increasing confidence to more precisely define aquatic life uses, develop biological criteria, and, in conjunction with whole effluent, physical, chemical, and land use data, identify stressors and their sources.

Matching the existing level of technical rigor with the intended use of the information can provide insight on the benefit of technical development. An agency can use this understanding to guide decisions and priorities on technical development of its biological assessment program. As part of the review, agency managers and staff from the biological assessment program and other water quality programs discuss how biological assessment information is currently used to support the overall water quality management program and on program enhancements that might lead to more comprehensive and effective use of biological assessment information. On the basis of the reviews conducted beginning in 2004 (Yoder and Barbour 2009; USEPA 2010b), an agency's ability to comprehensively and effectively use biological assessment information is supported by:

- Refined aquatic life use classification to protect existing conditions and maintain improvements.
- Numeric biological criteria adopted into water quality standards (WQS).
- Coordinated biological, whole effluent toxicity (WET), chemical, and physical monitoring to support both condition assessments and causal analysis.

Program managers and staff from the monitoring and assessment programs, WQS, CWA section 305(b) report, 303(d) list, Total Maximum Daily Load (TMDL), National Pollutant Discharge Elimination System (NPDES), and nonpoint source programs jointly discuss information needs and program schedules. A water quality agency might support development of a rigorous technical biological assessment program, but if the types and quality of data, data collection, and analysis are not aligned with water quality management program information needs and implementation schedules, the information might not be most effectively used. The cross-program discussion will help reveal any gaps and inconsistencies that the agency can then address. The long-term goal is to develop a well-integrated biological assessment program that produces information with the appropriate degree of accuracy, precision, and confidence to support multiple water quality program information needs (Table 1-1). The results of these discussions do not affect the scoring of the technical elements but can inform an agency's decision on level of technical development to best support its management objectives and program priorities.

Following the review, the independent technical expert prepares a technical memorandum that describes the program's current level of rigor for the 13 technical elements and identifies the technical gaps revealed in the evaluation. In conjunction with the agency review participants, the technical expert develops recommendations to improve specific technical elements. This information helps the agency target resources more efficiently, address weaknesses, and incrementally strengthen its program to better support water quality management decisions. More information about the biological assessment review process is in chapter 3.

1.5 Benefits of a Rigorous Biological Assessment Program

As stated previously, at all levels of technical development, biological assessment information can be used to support water quality decisions. However, the degree of confidence in the use of information will increase with technical development. For example, improvements in the ability to detect changes in biological assemblages along a gradient of stress can enhance precision in describing high-quality waters and setting incremental restoration targets, as well as discriminating between intermediate levels of condition (e.g., Diamond et al. 2012). Characteristics of high level programs include improved sensitivity in the biological indices to

Table 1-1. Example discussion questions and topics on use of biological assessments to support water quality management program information needs.

Self Assessment Question	Program Implementation
Does the biological assessment program produce adequate data and information to develop biological criteria, provide detailed descriptions of designated aquatic life uses, support identification and protection of high-quality waters, and inform use attainability analysis (UAA)?	Narrative descriptions of aquatic life use classes and attendant numeric biological criteria incorporate elements of natural classification strata consistent with underlying distinction of aquatic ecotypes at appropriate spatial scale for application of the information. The biological assessment program provides data and information to define biological expectations for a specific water body or watershed and support water quality management decisions to protect existing conditions and support improvements.
How is the biological monitoring and assessment program conducted to support multiple water quality management program objectives? Does the program work with other water quality management programs to coordinate biological (including WET), chemical, and physical monitoring and assessments?	Monitoring and assessment is integrated into the overall management of surface water quality to support both determination of general condition and causal analysis. Spatial design is sufficient to detect and characterize chemical and non-chemical pollution gradients and to associate measured changes in biotic assemblages with specific or categories of stressors. Results are expressed to support multiple program uses including WQS attainment, CWA sections 305(b) reporting and 303(d) listing, CWA section 402 NPDES program, and watershed, reach, and site-specific support (i.e., investigations, watershed planning, site-specific water quality criteria development, UAA).
Is there a method developed for stressor identification and implemented as part of the water quality program? How is the information used to support multiple water quality management programs?	Empirical relationships between biological measures and chemical/physical parameters are well-developed and documented. Information is used to support statewide/regional development and refinement of water quality criteria and support stressor identification as an integral part of the assessment process. This, in turn, supports development of TMDLs.

measure incremental biological changes along a gradient of stress (Levels 3 and 4) and a more complete assessment of the community by measuring two or more assemblages (Level 4). A Level 4 program should also be able to support more expedient and robust causal analysis, because the biological assessments are coordinated with WET, chemical, and physical monitoring. Field data are linked with information on sources of stress and watershed characteristics to support source identification. Two examples of program benefits shown by states that have piloted the biological assessment review follow.

Example 1: Aquatic life use refinement. A biological assessment program with a high level of technical rigor provides for a greater degree of confidence in an agency's ability to establish biological thresholds that protect existing conditions, determine potential for improvements, and monitor to track progress and maintain improvements. For example, based on measured changes in biotic assemblages, Vermont has the technical capability to discriminate multiple increments of biological change along a gradient of stress that spans excellent to severely impacted conditions. Based on these data and information, Vermont has adopted three aquatic life use classes in its WQS (e.g., excellent, very good, good). The state has set aquatic life uses classes for its streams and rivers to maintain existing high-quality conditions. The specific use class assigned to a water body is based on its current condition, and, if degraded, its potential for improvement. Ohio has likewise adopted multiple levels of aquatic life use classes (e.g., exceptional warmwater and warmwater habitat). Additionally, Ohio has established biological expectations for agricultural drainage ditches and permanently altered streams (e.g., modified warm water habitat and limited resource waters, respectively) following a use attainability analysis (UAA) process. Ohio's use assignments undergo periodic review and upgrades based on routine, coordinated chemical, physical, and biological monitoring and assessments, including data from WET monitoring.

For both states, biological assessments conducted in conjunction with physical, whole effluent, and chemical monitoring enables them to evaluate the potential for improved conditions in their streams and rivers and consequently set appropriate and attainable goals in their WQS (e.g., designated aquatic life uses). Additionally, routine monitoring provides new data that is used to upgrade waters to a higher aquatic life use class as conditions improve (USEPA 2011c).

Example 2: Causal analysis. A finding of biological impairment does not assist management in correcting the problem unless causes of the impairment can be identified. A common use of stressor identification, or causal analysis, is in the TMDL program in situations for which a water body has been determined to have one or more impaired designated uses but the pollutants causing or contributing to the use impairments are not identified at the time. A monitoring program that collects comprehensive biological (including WET), physical, and chemical information in a coordinated manner will have the ability to examine evidence for causes of observed impairments and to develop stressor-response relationships that can inform stressor identification (e.g., Yoder and Rankin 1995b; Suter et al. 2002). For example, the Maine Department of Environmental Protection (MDEP) evaluated the condition of the Pleasant River watershed with biological indices for benthic macroinvertebrates and algae in combination with chemical and physical data and information. Located in southern Maine, the Pleasant River watershed is primarily forested with some agriculture and increasing amounts of residential development in the downstream portions of the watershed. The Pleasant River has a water quality goal of Class B—good quality conditions.

MDEP sampled algal and macroinvertebrate communities in several locations on the Pleasant River. Biological assessment results showed that the headwater reach attained Class B. Further downstream, the macroinvertebrate samples attained Class B. However, some of the downstream algal samples attained a lower level of quality comparable to Class C conditions (i.e., waters in fair condition). The river segment was also listed as impaired because it did not attain the Class B dissolved oxygen criterion. MDEP used water chemistry data, habitat evaluations, and diagnostic algal and macroinvertebrate metrics to determine that phosphorus enrichment was the probable stressor for these downstream sites. To prepare for developing a TMDL, MDEP evaluated the watershed and identified some farms and residential areas as potential sources of nutrients in the lower part of the watershed. The combination of biological assessments for multiple taxonomic groups and associated chemical, habitat, and land use information allowed MDEP to complete a thorough and more expedient evaluation of the Pleasant River watershed. As a result, MDEP has started developing a TMDL that will effectively target management actions needed to maintain biological conditions in the headwaters and to restore downstream portions of the watershed.

Use of multiple biological assemblages and coordinated biological, WET, chemical, and physical monitoring are characteristics of a Level 4 biological assessment program, and these capabilities can lead to improved confidence in estimating stress-response relationships. A relational database that enables data export and analysis via query supports this function. This level of technical development improves an agency's efficiency in identifying water quality limited waters that must be placed on a state or tribe's CWA section 303(d) list, conducting causal analysis, and assigning probable cause, or causes, of impairment. As a result, an agency should be able to more efficiently develop the appropriate management action to address a TMDL (or suitable alternative means of achieving WQS) when a pollutant has been identified as the cause of a biological impairment. A well-established, well-supported, and comprehensive monitoring program then provides the data needed to track progress and evaluate the effectiveness of the management actions taken, whether monitoring discharges and tracking the effects of permit limits or monitoring the implementation of best management practices (BMPs) for nonpoint source pollution. Paired stressor-response data might also be used to develop or refine chemical water quality criteria (Cormier et al. 2008; USEPA 2010c), and it has been used to identify benchmarks for conductivity (USEPA 2011a).

Overall, a monitoring program that integrates biological assessment, WET, chemical, and physical data is key for the most effective implementation of the biological assessment program and supports use of biological assessments to more precisely define aquatic life uses and derive numeric biological criteria. Additionally, when the monitoring schedule coincides with the cycle of WQS establishment and review, CWA section 305(b) reporting and section 303(d) listing, TMDL development, NPDES permitting, and nonpoint source program implementation, biological and other environmental data are available when needed by water quality management programs. Several states have improved cross program coordination through a rotating basin approach.

A well-established biological monitoring and assessment program will further benefit an agency's water quality program if comparable or consistent sample collection methods and data analysis protocols are developed in conjunction with the biological monitoring programs of other agencies (e.g., at local level and adjacent states, tribes; federal). This approach will support development of regionally consistent taxonomy for biological data and will help address data gaps regarding regionally appropriate, taxon-specific tolerance values and other ecological traits. Such consistent data allow for shared use of reference site data across jurisdictional boundaries. In some places there is a paucity or total lack of reference sites comparable to minimally disturbed conditions. The ability to share data and expand reference site network beyond jurisdictional boundaries might support establishing more robust reference conditions.

1.5.1 Implications for Technical Program Development

The technical capabilities of Level 1 and 2 programs are appropriate for some, but not all, water quality program uses. For example, a Level 1 program can typically differentiate water bodies in the very best and worst conditions, whereas a Level 2 program can more confidentially assess good and poor conditions. Both these programs can make defensible determinations of failure to fully support a water body's designated aquatic life use, but they might fail to detect initial and significant changes in biological condition caused by anthropogenic stress. Some degraded water bodies might not be accurately assessed, and, therefore, no actions are initiated to remediate and restore them. Southerland et al. (2006) estimated that up to 25 percent of impaired sites would escape detection (i.e., would pass as unimpaired, or false negatives) simply from lax reference site-selection criteria. This situation is of particular concern if a threshold is selected at the low boundary of a reference condition.

1.5.2 Benefits of a Biological Assessment Program Review

An agency can use the biological program review to determine the capabilities of its biological assessment program in a consistent, systematic manner that supports further technical development and enables midcourse review and refinement. The review will help determine if information is collected and analyzed with the accuracy and precision appropriate to address a variety of water quality management issues. The agency will be able to propose refinements to its water quality program to enable more comprehensive and efficient use of biological assessment information to support water quality management in a variety of water quality programs (e.g., NPDES permitting, TMDLs). This process and its outcomes help communicate the value of further technical development to agency management and to the public. The process, steps, and workshop materials for the biological program review are further discussed in chapters 2 and 3 of this document.

CHAPTER 2: THE TECHNICAL ELEMENTS OF A BIOLOGICAL ASSESSMENT PROGRAM

A biological assessment program's level of rigor is dependent on the quality and level of resolution of 13 technical elements (Table 2-1).

Table 2-1. Definitions of the technical elements

	Technical Element	Definition
Biological Assessment Design	Index Period	A consistent time frame for sampling the assemblage to characterize and account for temporal variability.
	Spatial Sampling Design	Representativeness of the spatial array of sampling sites to support statistically valid inference of information over larger areas (e.g., watersheds, river and stream segments, geographic region) and for supporting water quality standards (WQS) and multiple programs.
	Natural Variability	Characterizing and accounting for variation in biological assemblages in response to natural factors.
	Reference Site Selection	Abiotic factors to select sites that are least impacted, or ideally, minimally affected by anthropogenic stressors.
	Reference Conditions	Characterization of benchmark conditions among reference sites, to which test sites are compared.
Data Collection and Compilation	Taxa and Taxonomic Resolution	Type and number of assemblages assessed and resolution (e.g., family, genus, or species) to which organisms are identified.
	Sample Collection	Protocols used to collect representative samples in a water body including procedures used to collect and preserve the samples (e.g., equipment, effort).
	Sample Processing	Methods used to identify and count the organisms collected from a water body, including the specific protocols used to identify organisms and subsample, the training of personnel who count and identify the organisms, and the methods used to perform quality assurance/quality control (QA/QC) checks of the data.
	Data Management	Systems used by a monitoring program to store, access, and analyze collected data.
Analysis and Interpretation	Ecological Attributes	Measurable attributes of a biological community representative of biological integrity and that provide the basis for developing biological indices.
	Discriminatory Capacity	Capability of the biological indices to distinguish different increments, or levels, of biological condition along a gradient of increasing stress.
	Stressor Association	Relationship between measures of stressors, sources, and biological assemblage response sufficient to support causal analysis and to develop quantitative stress-response relationships.
	Professional Review	Level to which agency data, methods, and procedures are reviewed by others.

The following section describes each technical element and provides a template for assigning a level of technical rigor to each element. Section 2.2 describes how these scores are summarized to estimate an overall level of technical rigor for a biological assessment program.

2.1 The Technical Elements

2.1.1 Index Period: Characterizing and Accounting for Temporal Variability (Element 1)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Temporal variability is not taken into account.	Sampling period established based on practices of other agencies and/or literature. Sampling outside the index is not adjusted for temporal influence.	Index period established based on a priori assumptions regarding temporal variability of biological community. Effects of the use of index period are documented. Data collected outside the index period data might be adjusted to correct for temporal influences.	Temporal variability is fully characterized and taken into account for all data. Agency information needs and index periods are coordinated so that adherence to an index period is strict.

Biological communities vary over time due to the life cycles of the targeted organisms (e.g., reproduction, recruitment, growth, emergence, and migration) and temporal variations in environmental conditions (e.g., changes in flow), so the characteristics of a biological sample can also vary depending on when that sample is collected. This temporal variability must be taken into account when interpreting biological data and assessing biological condition. Two approaches are commonly used: index periods and continuous models.

An index period is a contiguous time period used to minimize variation among biotic samples associated with systematic phonological changes in population densities and assemblage structure (Munné and Prat 2011; Kosnicki and Sites 2011). Selection of an index period can be based on a priori, existing knowledge regarding the predictable temporal changes in assemblage structure described above, when resident populations are comparatively stable (e.g., periods of growth between recruitment and emergence), and when potential exposure to anthropogenic stressors is highest (e.g., Resh and Rosenberg 1984, 1989; McElravy et al. 1989; Barbour et al. 1996; Bailey et al. 2004; Bollmohr and Schultz 2009). The index period can be further refined or based on analysis of data collected throughout the year to identify those periods in which assemblage composition is most stable. When selecting an index period, a biological assessment program also typically considers availability of sampling crew and accessibility to and safety of sampling sites.

Continuous models can also be used to characterize and account for natural temporal variations in the characteristics of biological assemblage. These statistical models estimate relationships between different biological attributes and the season or day of the year when the samples were collected (e.g., Hawkins 2006). For example, day of the year was the single most important predictor in development of an observed/expected (O/E) index in North Carolina, and the O/E model was adjusted for phonological shifts in species abundance (Hawkins 2006). The day of the year was the single most important predictor in development of the O/E index and the model adjusted for phonological shifts in species abundance. Continuous models can be applied to data collected in index periods or across multiple seasons. Indeed, approaches that combine data collected during index periods with models to account for temporal variations within index periods are often the most effective means of accounting for temporal variations. Also, one can calibrate multiple seasonal indicators and indexes, or develop an average or composite annual characterization based on multiple samples (e.g., Furse et al. 1984; Linke et al. 1999; Cao and Hawkins 2011; Pond et al. 2012).

Scoring of the index period element depends on how thoroughly a program has considered and documented the effects of different index periods on the characteristics of biological data and on decisions derived from this biological data. Example evaluation questions are:

- Is sampling carried out primarily within a defined index period?
  - If not, are the program's indices structured to account for temporal variability?
- What are the justifications for the defined index period, and has variability within the index period been quantified?
- If an alternative approach has been selected, does this approach adequately account for temporal variability?
- Are the monitoring and other water quality management programs coordinated their schedules so that data are provided when the programs need it? Does lack of coordination result in monitoring outside of the index period?

Programs that score highly on this element have documented the effects of the index period or an alternative approach to address temporal variability. Additionally, the monitoring and other water quality management programs have coordinated their schedules so that program information needs (e.g., condition assessments, permit reviews, total maximum daily load [TMDL] development) are coordinated with data delivery.

Frequently Asked Question

Question: What is the optimal time of year to select as an index period?

Answer: Selection of an index period is part of the overall design process that takes into account scientific knowledge, objectives, costs, logistics, and information desired from the monitoring program (Hughes and Peck 2008). For example, seasonal phenology influences the species composition in streams; late-instar (and hence easy to identify) stoneflies and mayflies occur in early spring, but in early summer they might be present only as very small early instars (e.g., McCord and Lambrecht 2006). Fish sampling is generally avoided in the spawning seasons of anadromous fish (Hughes and Peck 2008). Safety and logistics are also issues, as is scheduling the sequence of field, laboratory, data processing, and reporting tasks; sampling might be dangerous during the spring freshet (snowmelt), and high elevation streams might only be accessible in the summer (Hughes and Peck 2008). As depicted in Table 2-2, the index period can vary by state and assemblage group.

Table 2-2. Examples of biological assessment index periods for different state water quality agencies

	Winter			Spring			Summer			Fall		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Vermont (Benthos)										■	■	
Vermont (Fish)									▨	▨	▨	
New Jersey								■	■	■		
Maryland (Benthos)				■	■	■						
Maryland (Fish)							▨	▨	▨	▨		
Mississippi		■	■	■								
New Mexico				■	■	■	■	■	■	■	■	■
Iowa (Benthos)								■	■	■	■	
Iowa (Fish)								▨	▨	▨	▨	
Arizona					■	■	■					
Idaho							■	■	■			

Benthos ■ Fish ▨

2.1.2 Spatial Sampling Design (Element 2)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Study design consisting of isolated, single, fixed-point sites.	Low density fixed station design. Multiple sites are used for assessment of a water body or watershed condition. Spatial coverage suitable for general condition assessments. Non-random designs at coarse scale used (e.g., 4–8 digit hydrologic unit code [HUC]). Inference of site data to larger unit of assessment based on “rules of thumb” and might be supplemented by upstream/downstream assessments.	Low density random or stratified random sampling design which allows for a statistically valid inference of biological condition to a spatial unit larger than a site. The primary goal is to assess aggregate condition and trends on a statewide or regional basis.	High density (e.g., intensive) monitoring at comprehensive spatial sampling design suitable for watershed assessments (e.g., 10–12 digit HUC) and in support of multiple water quality management program needs for information (e.g., condition assessments, use refinement, use attainability analyses [UAAs], permits). As needed, the spatial sampling combines monitoring designs to optimize cost and efficiency in data collection and analysis (e.g., combination of upstream-downstream, intensive, probabilistic, and/or pollution gradient designs). Typically includes a rotating sequence of watershed units organized to provide data for management program support.

Water quality programs have multiple needs for information (e.g., status and trends, stressor identification, targeted studies, discharge monitoring). This technical element addresses how well a biological assessment program is able to (1) deploy monitoring designs that address the suite of water quality program information needs; (2) cover the pollution gradients that are relevant to the impairments that are detected; and (3) provide data relevant to the scale required for specific management program needs (e.g., stream segment, watershed, region, statewide) and that support statistically valid inferences of site data to the unit of assessment.

Study design pertains to the spatial array of sampling sites to support assessments at watershed and stream- or river-segment specific scales. It also includes the ability to provide biological assessment data and information to address multiple water quality program questions (e.g., status and trends, environmental outcomes of management actions, as well as relevant targeted studies such as discharge monitoring and TMDL implementation) at the same scale at which management is being applied. A biological assessment program will need to determine what sampling design, or combination of sampling designs, will provide the full suite of information needed to address its priority management questions (e.g., for site-specific use attainability determinations, biological criteria derivation, targeted assessments, causal analysis, statewide and regional status).

Whether single or multiple sampling designs are employed, they will need to support multiple management program support tasks. Multiple, overlapping monitoring designs can be appropriately scaled to address these specific needs when the designs are incorporated into an overall spatial network for monitoring (e.g., upstream-downstream; intensive, probabilistic, gradient design). For example, sampling upstream and downstream of a discharge is conducted to specifically quantify the effects of that discharge. A gradient design is appropriate for refinement or development of biological or other types of water quality criteria. Spatially intensive sampling can be designed for specific studies and purposes including site-specific criteria development or refinement. A probabilistic monitoring design can be tailored for condition assessments at different spatial scales (e.g., watershed, basin, ecological region, statewide). In some cases, with upfront planning, the monitoring designs can be complementary with sampling sites providing data relevant to more than one purpose.

Study designs also need to factor in adjustments for effects of natural gradients. This adjustment is typically accomplished iteratively when accounting for natural spatial variability (see technical element three) and dependent upon assessment objective (e.g., define stressor gradient, assess condition, determine cause of impairment in a stream segment). For example, in streams and rivers, the structure of aquatic assemblages changes naturally and predictably as one moves downstream from steeper, narrow, shaded, small steams to low-gradient, open-canopied, large streams (Vannote et al. 1980). Sampling sites might be located in linear juxtaposition to one another in a river or stream network. In these situations observations at nearby sites might be spatially autocorrelated and, hence, not statistically independent of one another (e.g., NAS 2002). These considerations should be addressed in the spatial sampling design and in subsequent analysis of data to accurately and precisely define the expected biological community for a water body (e.g., refined aquatic life use) and to minimize risk of making nonattainment decisions on the basis of natural changes in assemblage as one samples further downstream.

Scoring of this technical element is based on the degree to which the selected sampling sites can inform multiple water quality information needs and support decisions at different spatial scales. Example evaluation questions are:

- Is the spatial study design sufficient to represent the majority of water types in the area of interest?
- Are all pollution impacts and gradients adequately characterized?
- For condition assessments, how well can inferences be made to unsampled sites within the unit of assessment (e.g., site, stream segment, watershed, basin, statewide, ecological region)?
- For specific water bodies of concern, can valid inferences be made on differences in condition upstream and downstream of a discharge, and on changes before and after implementation of best management practices (BMPs)?

Programs that achieve high scores on this technical element have implemented an integrated sampling design, or combination of sampling designs, that provide the data and information necessary to support water quality management decisions at multiple spatial scales (e.g., specific sites, entire watersheds, basins, ecological regions, statewide).

Frequently Asked Questions

Question: What type of study design can efficiently support statewide condition assessments and 305(b) reports?

Answer: A probabilistic sampling design can be used to randomly select sampling sites from the population of water bodies so that inferences from this random subsample can be made to the entire population (Herlihy et al. 2000; Olsen and Peck 2008). A probabilistic design is the most efficient sampling design for statewide condition assessments such as the Clean Water Act (CWA) section 305(b) reports since all potential sampling locations have a known probability of being selected and inference to larger geographical area is statistically robust (e.g., Thompson 1992; Olsen et al. 1999; Olsen et al. 2009). When resources are not available to sample all basins statewide in any particular year, a rotating basin approach can be implemented.

Question: What type of study design can support assessing use designations, conducting use attainability analyses (UAAs), and providing information about multiple stressors at a watershed scale?

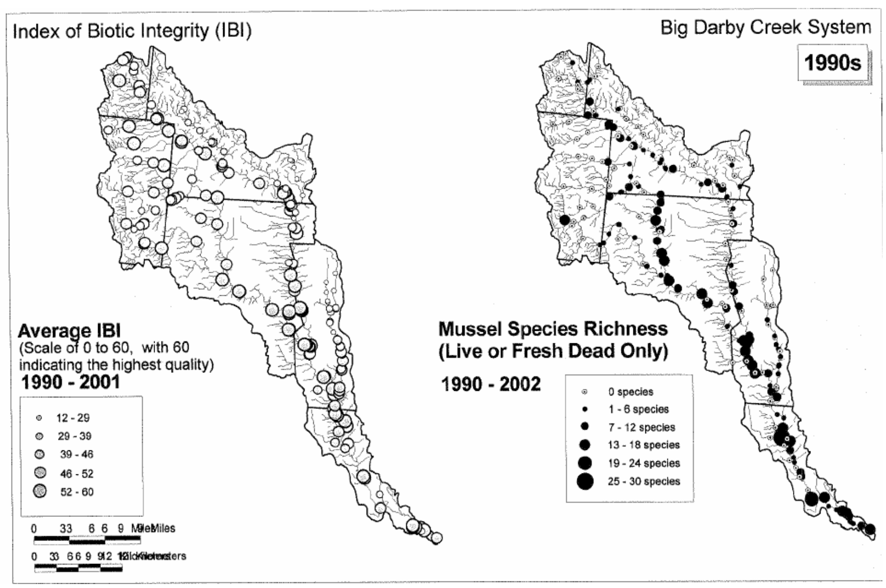


Figure 2-1. Geometric Watershed Design used to support multiple management needs in the Big Darby Creek watershed, Ohio (Ohio EPA 2004).

Answer: There are several sampling designs that could be used when appropriately designed to answer these questions, including a survey, gradient, or random designs tailored to the appropriate spatial scale. For example, a geometric and intensive watershed design was used at the 11-digit hydrologic unit code (HUC) scale in Big Darby Creek, Ohio, and, when considering serial autocorrelation between adjacent sites, is nearly equivalent to a census of the stream reaches of the watershed (Figure 2-1). The data were used to determine if the current aquatic life use of stream and river segments was appropriate and attainable and then to determine the status of each site. The data were also used to delineate impairments for reporting (e.g., CWA section 305[b]/303[d]), and causes and sources were determined to support specific water quality management actions (i.e., TMDLs, National Pollutant Discharge Elimination System [NPDES] permits, stormwater permitting, 401 certifications) and support watershed planning (i.e., section 319 planning and implementation). Ohio conducts four to five of these assessments annually with a rotating basin approach, and, in the aggregate, each contributes to a statewide inventory of streams and rivers and is part of a database that supports many program maintenance and developmental needs. These data are aggregated upwards to produce regional and statewide assessments for meeting CWA 305b reporting and internal program goal tracking (e.g., the Ohio 2020 goals).

Question: What are the benefits of combining probabilistic design surveys with intensive surveys designed to answer multiple water quality management questions?

Answer: Developing the technical capacity to conduct different types of survey designs enhances the breadth and depth of the monitoring program's ability to answer multiple water quality management questions and to more efficiently leverage resources. For example, in 2008, New York State Department of Environmental Conservation's (NYSDEC's) Stream Biomonitoring Unit merged a random probabilistic design survey with its legacy statewide basin studies. This *hybrid* survey design allows it to fit the needs of two primary objectives of its program: surveying targeted of-interest sites, and creating an unbiased random data set (Figure 2-2). Targeted sites include those that allow for the characterization of regional reference conditions, long-term temporal trend monitoring, assessment of unassessed waters, and the monitoring of sites that are of department, regional, and/or public interest. The random data set gives the ability to project aquatic life use attainment in an un-biased, statistically sound manner across the entire state, and provides uniform comparability between basin data sets and other national data sets. Targeted sites make up approximately 60 percent of the total number of sites sampled each year while random sites compose 40 percent.

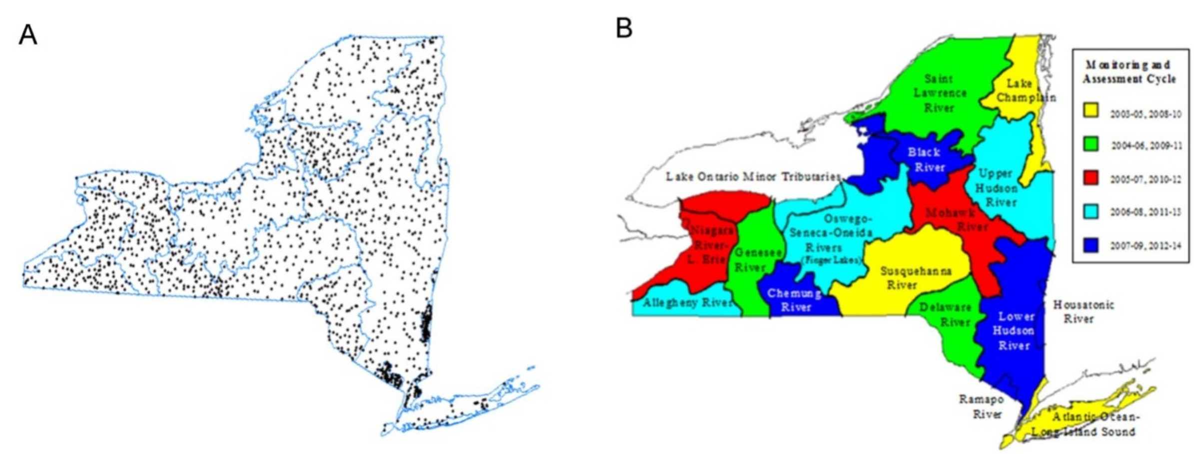


Figure 2-2. New York has integrated a probabilistic spatial survey design (A) into its routine rotating integrated basin studies program (B) (Source: NYSDEC 2009).

2.1.3 Natural Variability: Characterizing and Accounting for Spatial Variability (Element 3)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
No or minimal partitioning of natural variability in aquatic ecosystems. Does not incorporate differences in watershed characteristics such as size, gradient, temperature, elevation, etc.	Classification scheme is based on assumed, first-order classes. These include strata such as fishery-based cold or warmwater classes. There is no formal consideration of regional strata such as bioregions or aggregated ecoregions. Intra-regional strata such as watershed size, gradient, elevation, temperature are not addressed. Usually applied uniformly on a statewide basis.	A fully partitioned and stratified classification scheme or modeling approach is employed. Classes and/or continuous models are defined to take critical details of spatial variability into account. Inter-regional landscape features and phenomena are appropriately sequenced with intra-regional strata. Subcategories of lotic ecotypes are defined (e.g., includes the full strata of lotic water body types). Characterization of spatial variability is confined within jurisdictional boundaries.	Scheme to fully account for natural variation is periodically refined and updated as new data and methods become available. Classes, continuous models, or both, are examined to identify the most appropriate scheme for monitoring and assessment, regulatory support, and cost-effectiveness. Developed at scales that transcend jurisdictional boundaries when necessary to strengthen inter-regional classification outcomes; recognizes the full zoogeographical aspects of biological assemblages.

Biological assemblage structure varies spatially among different sites, often associated with variations in abiotic environmental conditions (Theinemann 1954; Hynes 1970; Poff 1997). Both local (e.g., water temperature, flow, and alkalinity) and regional environmental conditions (e.g., basin topography, climate) strongly influence assemblage structure, and when interpreting biological data and assessing condition, natural variations in assemblage structure must be characterized and taken into account to ensure that changes in assemblage structure can be confidently attributed to anthropogenic rather than natural factors.

Well-developed schemes to account for natural variation use a combination of large-scale physical characteristics (e.g., watershed drainage size, elevation, geographic location) and local site characteristics (e.g., temperature, alkalinity, substrate) (Moss et al. 1987; Reynoldson et al. 1997; Bailey et al. 1998; Marchant et al. 1999; Joy and Death 2002; Hawkins et al. 2000a; Oberdorff et al. 2002). The principal approaches used are classification (or typology), continuous models, and combinations of discrete and continuous models.

Classification schemes define classes of water bodies such that sites in each class are assumed to be similar with one another in terms of naturally varying abiotic factors. Then, biological assemblages observed at sites in each class are examined to determine if they are more similar to one another than among classes. These classes can be defined *a priori* based on an ecological understanding of natural factors that structure biological assemblages (Omernik 1987; Rabeni and Doisy 2011) to help design sampling strategies that represent all water body types in a study area. Classification schemes can also include classes of water bodies that pertain to inherent environmental requirements (e.g., warm and cold water, strata), differences in discrete lotic strata (headwaters to large rivers), and continuous changes in assemblage structure across natural environmental gradients (e.g., Moss et al. 1987). Classes can also be specified *a posteriori* by statistically examining how assemblage structure varies across different environmental gradients and defining discrete classes based on the results of these analyses (Gerritsen et al. 2000). In either case, the biological condition at a particular site is assessed by comparing to reference conditions in the class to which the site belongs.

Natural variations in assemblage structure can also be taken into account using models that represent changes in structure over continuous environmental gradients (Growns 2009; Hawkins and Vinson 2011; van Sickle and Hughes 2000). These models are based on statistical analyses that can be used to infer changes in assemblage structure due to different environmental variables (Clarke et al. 1996; Bailey et al. 1998; Marchant et al. 1999; Hawkins et al. 2000b; Simpson and Norris 2000; Joy and Death 2002). When a model is used to assess a site, a site-specific prediction of biological characteristics is calculated, and the observed characteristics assessed relative to this prediction. This information can also be used to supplement or refine discrete classification approaches.

A comprehensive classification and/or modeling scheme is dependent on the spatial density of the monitoring program. Sufficient spatial coverage is needed to test or verify a proposed classification and/or modeling scheme (see Technical Element 2).

Scoring of Technical Element 3 is based on the degree to which the scheme accounts for observed natural variability in biological assemblage structure. Example evaluation questions are:

- Does classification or modeling the effects of natural gradients sufficiently reduce natural variability relative to anthropogenic variability?
- Does the classification scheme and/or modeling process sufficiently include all the common regional and watershed strata in the study area?
- Is the approach sufficient to support the precision and accuracy needed in estimates of biological index values?
- Does the classification and/or model take into account information and considerations from beyond a state or tribe’s jurisdictional boundaries?

Programs that score highly in this technical element have demonstrated that their scheme to describe natural variability (whether classification and/or continuous models) accounts for the major sources of natural variability in the study area, and that the majority of the remaining variability in biological characteristics can be attributed to human activities.

Frequently Asked Questions

Question: What is meant by an ecoregional classification for biological assessment?

Answer: Partitioning the water bodies of an agency by natural variability in the biota results in a classification that can improve assessment of ecological condition. As an example, natural classification in Mississippi resulted in five bioregions (not counting the delta region in gray) as a basis for biological assessment (Figure 2-3). Bioregions are geographically distinct regions of water bodies that roughly correspond to ecoregions or aggregations of ecoregions.

Question: How would a multivariate cluster analysis serve as a form of classification?

Answer: Clustering the biological data from reference sites reveals the inherent natural variability among of sites. Clusters can be selected that represent classes for assessment membership.

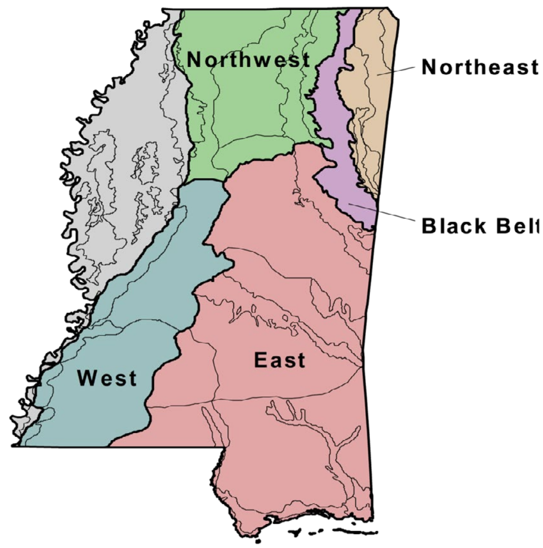


Figure 2-3. Example of bioregions as established for the Mississippi.

2.1.4 Reference Site Selection (Element 4)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Informal best professional judgment (BPJ) used in selection of control sites. No screens are used. Limited, if any, documentation and supporting rationale.	Based on "best biology" (i.e., BPJ on what the best biology is in the best water body). Minimal non-biological data used. Minimal documentation.	Selection based on narrative descriptions of non-biological characteristics. Combines BPJ with narrative description of land use and site characteristics. Might use chemical and physical data thresholds as primary filters.	Based on quantitative descriptions of non-biological characteristics with primary reliance on abiotic data on landscape conditions and land use. Chemical and physical data might be used as secondary filters or in a hybrid approach for severely altered landscapes. Independent data set used for validation.

Reference site selection is the basis for developing benchmarks against which a biological monitoring program can assess the biological condition of test sites (e.g., Hughes et al. 1986; Barbour et al. 1996; Bailey et al. 2004; Stoddard et al. 2006; Hawkins et al. 2010). Reference site selection is primarily based on abiotic factors that define sites that are "least stressed," or ideally, "minimally stressed" by anthropogenic stressors and include knowledge of whether invasive species are present (e.g., Hughes et al. 1986; Karr and Chu 1999; Bailey et al. 2004). Abiotic characteristics and attributes should be the principal screens for selecting candidate reference sites because such screens avoid circularity that is inherent in including ambient biological characteristics to define reference sites for assessing biological condition.

Factors to be considered in selecting reference sites include human population density and distribution, proximity to the influence of discharges, proximity to physical modifications of stream and river channels, road density, and the proportion of mining, logging, agriculture, urbanization, grazing, or other land uses. Candidate reference sites are evaluated with respect to these factors to determine the degree of human modification that has occurred. Sites that are minimally disturbed by potential stressor(s) are considered to be in reference condition (Bailey et al. 2004; Stoddard et al. 2006). Ideally, sites are eliminated if they have undergone direct human modification, especially to riparian zones and instream habitat (Bryce et al. 1999). However, in some pervasively altered regions or altered systems, "least disturbed" sites that represent the best available conditions have been used (e.g., Angradi et al. 2009).

Examples of evaluation questions are:

- Do factors for reference site selection emphasize abiotic measures of anthropogenic activity?
- Are procedures for selection of sites well documented? Do those procedures include consideration of watershed development, near stream development, and riparian condition?
- Are chemical, physical, and whole effluent toxicity (WET) sampling data used to validate either the absence of anthropogenic disturbance or the level of allowed disturbance?

Programs that score highly in this technical element use several layers of abiotic filters to identify reference sites for their study area, primarily based on landscape data from the surrounding catchment and other information that characterizes the level of disturbance. Independent data sets are used to validate reference site selection.

Frequently Asked Questions

Question: How do factors for reference site selection influence calibration of a biological index or indicator and setting a threshold for biological criteria or for CWA section 303(d) listing decisions?

Answer: Biological criteria are typically derived from a reference site database (USEPA 1990, 1998, 2001). The reference site approach is typically also a basis for biological listing methodologies and for U.S. Environmental Protection Agency's (EPA's) national surveys of stream condition (Herlihy et al. 2008). The factors for reference site selection help define the quality of the reference condition (e.g., undisturbed, minimally or moderately disturbed, least disturbed) (Stoddard et al. 2006). Herlihy et al. (2008) examined the effects of different quality of reference sites from the large database of the U.S. Wadeable Streams Assessment (WSA). Poorer quality reference sites (equivalent to relaxing the factors for reference site selection to accept more sites) resulted in assessments in which more test sites were similar to reference than assessments done with reference sites selected based on more stringent site selection factors. In other words, when the reference sites are influenced by human disturbance, an agency might lose its ability to accurately define the desired biological condition and to differentiate biologically degraded sites from reference. The quality of the reference sites as defined by the factors for reference site selection can inform selection of a biological threshold. The percentile selection should be based on the degree to which human activities influence the study area. For example, in the WSA, the threshold for a specific ecological region was adjusted from 10 to 25 percent of the reference site distribution to account for the presence of pervasive human disturbance at reference sites (Herlihy et al. 2008).

Question: What if the pool of reference sites has to include sites with substantial disturbance even though the sites are least-disturbed in the context of the region? For example, in the Midwest, row crops and grain farming are the primary land use, and virtually no unaffected water bodies exist.

Answer: Regions with extensively altered landscapes might require a model to extrapolate current conditions to a reasonable reference. For example, a PCA-based regression model was used to project "true" reference in regions where all reference sites are highly altered (Herlihy et al. 2008). Kilgour and Stanfield (2006) developed regressions between biotic condition and percent impervious cover, and extrapolated biotic condition for very low impervious cover scenarios. In a slightly different approach when naturally occurring conditions can be estimated, Chessman and Royal (2004) used species responses to temperature, flow regime, and riverbed composition to predict the species composition of different rivers with given combinations of naturally occurring temperature, flow, and bed composition. In some cases, an agency might manage to the least disturbed condition and set incremental restoration targets that support improvements as technology and BMPs are applied. If appropriate, the expectations for an adjacent ecological region could be used to establish reference. For example, Ohio concluded that least affected reference sites did not exist in the Lake Huron/Lake Erie Plain (HELP) ecological region and used the biological expectations for a neighboring ecological region to determine a biological threshold. The key step is to recognize when minimally altered conditions do not exist, and then derive a reasonable alternative for deriving a protective biological criteria.

2.1.5 Reference Conditions (Element 5)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
No reference condition has been developed. Biological data are assessed using BPJ or based on the presence of targeted or iconic taxa.	Reference condition based on biology of an estimated 'best' site or water body. Single reference sites are used to assess biological data collected throughout a watershed. A site-specific control or paired watershed approach might be used.	Reference condition is based on a regional aggregate of reference site information. Data representing most of the major natural environmental gradients but limited in number and/or spatial density. Overall number and coverage of reference sites insufficient to support statistical evaluation of the biological condition at test sites.	Reference condition is based on data from many reference sites that span all major natural environmental gradients in the study area. Reference condition can be estimated for individual sites by modeling biota-environmental relationships. The number of reference sites is sufficient to support statistical evaluation of biological condition at test sites. Reference sites are resampled periodically. In highly altered regions or water body types, alternative methods are used to develop reference condition.

A primary goal for a biological assessment program is to estimate the expected biological condition (reference condition) for individual sites as accurately and precisely as possible. The reference condition serves as the benchmark for judging condition of the site and as basis for derivation of biological criteria. This technical element considers the number of reference sites that are available and the degree to which those reference sites account for natural environmental gradients (e.g., elevation, water body size) (Figure 2-4). This element also considers whether the number of reference sites is sufficient to support appropriate use designation and the derivation of numeric biological criteria. It is important to consider how well the reference site network is re-monitored and reevaluated. Reference condition should also be tracked by the periodic resampling of reference sites and as an integral function of the overall monitoring program.

Using a representative network of reference sites ensures that the assessment of a test site is based on a comparison with its most appropriate benchmark. Accordingly, development of meaningful reference conditionsalso requires an adequate spatial coverage to obtain a sufficient sample of reference sites.When sufficient reference site data are not available, assessments might not be possible or might be conducted with more uncertainty. In regions where all water bodies are severely altered, alternative methods might be used, including historical data, models, or hindcasting (e.g., Dodds and Oakes 2004; Kilgour and Stanfield 2006; Angradi et al. 2009).

Scoring of this technical element is based on the degree to which a sufficient number, or network, of reference sites are available to establish reference condition. Example evaluation questions are:

- Is the pool of reference sites sufficient to characterize the natural gradients in the study area (e.g., basin, ecological region, statewide)?
- Is the number of reference sites sufficient to support the use designation and derivation of biological criteria?
- Are reference sites systematically resampled to track changes in reference condition over time?
- In regions or water bodies with no adequate reference sites, are alternative methods used effectively (e.g., historical data, modeling)?

High level programs should demonstrate that the network of reference sites fully represents all the major natural environmental gradients in the study area and that the number of reference sites is sufficient to support both appropriate use designation and derivation of attendant biological criteria. Figure 2-4 provides an example approach for assessing the representativeness of reference sites.

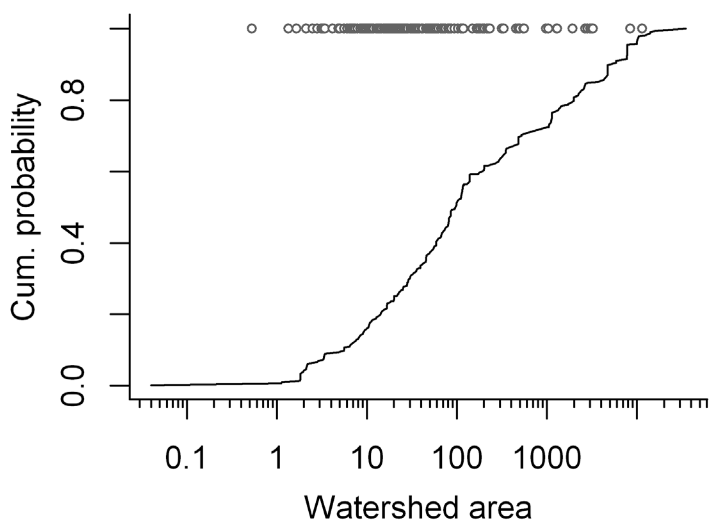


Figure 2-4. Example approach for assessing representativeness of reference sites. The solid line shows the cumulative distribution function of watershed areas for different streams in the assessed population, and the open circles show the watershed areas of the available reference sites. In this example, presence of reference sites for a watershed area is given by the density of the open circles. The majority of the watershed areas are well-represented by reference sites, because there is a high density of open circles above steep portions of the solid line; except for the largest streams (> 1,000 km^2). (USEPA 2006)

Frequently Asked Questions

Question: How does the number of reference sites (N) affect characterization of biological characteristics at a regional scale?

Answer: The number of reference sites affects both the ability to account for spatial variability (see Technical Element 3) and the precision with which thresholds can be specified. As discussed in Technical Element 3, many natural abiotic environmental factors can influence assemblage structure, and the number of reference sites directly affects the number of these factors that can be taken into account. For example, macroinvertebrate assemblage structure might vary primarily with changes in stream size (or catchment area) and, secondarily, with changes in alkalinity. Linear regression models generally require at least 10 sites per explanatory variable to accurately estimate a relationship, so at least 20 reference sites are required to model changes in assemblage structure with respect to both stream size and alkalinity. Additional reference sites that span other natural gradients would provide increased capabilities to more precisely specify natural expectations for different types of streams in the study area.

Once spatial variability is taken into account, distribution of expected index values derived from reference sites must be quantified so that index values at test sites can be evaluated. More specifically, to assess condition, one must test whether index values at a test site are within the range of index values observed in reference sites. Increased numbers of reference sites allows one to more precisely estimate the reference distribution, and therefore, more confidently assess test sites.

Question: How does the number of reference sites (N) affect the derivation of numerical biological criteria?

Answer: Determining the appropriate number of reference sites for deriving biological criteria is usually most applicable on a regional basis because of differences in reference site heterogeneity both within and between regions. In a more heterogeneous region, where natural conditions are more variable among streams, either (1) a larger reference sites pool will be necessary to accurately derive a biological criteria threshold, or (2) further partitioning of the natural variability through classification analysis might be needed. As illustrated in Figure 2-5, the variability in reference quality is reduced as the number of reference sites increases to estimate the biological criteria threshold.

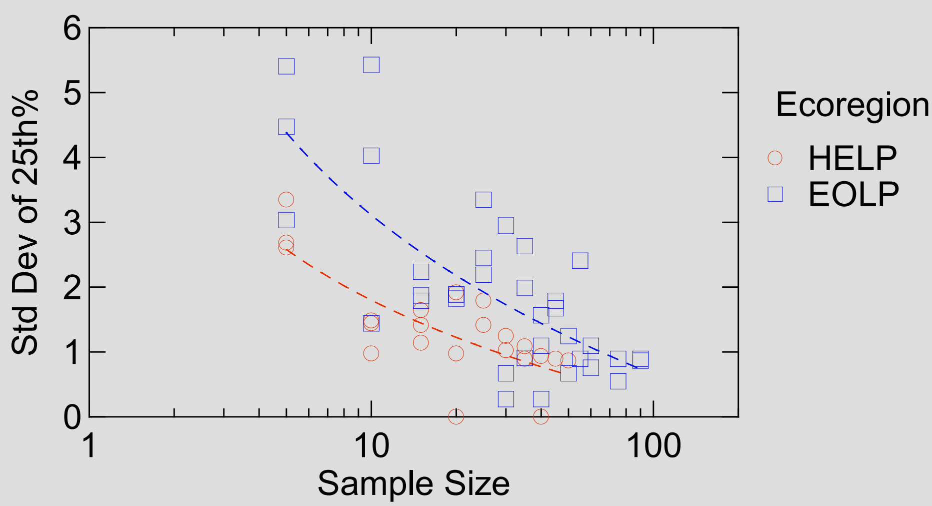


Figure 2-5. Standard deviations of 25th percentile fish assemblage Index of Biotic Integrity (IBI) scores estimated by randomly drawing reference sites at a given sample size (x-axis) five times for wading sites in the Lake Huron/Lake Erie Plain (HELP) and Erie Ontario Lake Plain (EOLP) ecoregions of Ohio (modified from Yoder and Rankin 1995a).

2.1.6 Taxa and Taxonomic Resolution (Element 6)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
One taxonomic assemblage (e.g., benthic macroinvertebrates, fish, algae, aquatic macrophytes). Very coarse taxonomic resolution (e.g., order/family). Expertise: amateur naturalist or stream watcher. Validation: none. QA/QC: none.	One taxonomic assemblage. Low taxonomic resolution (e.g., family). Expertise: novice or apprentice biologist. Validation: family level certification for macroinvertebrates. No certification available for fish or algae. QA/QC: mostly for taxonomic confirmation of voucher collections. Some sorting QA/QC implemented.	One taxonomic assemblage. Fine taxonomic resolution: genus/species for benthic macroinvertebrates and algae, species for fish. Expertise: trained taxonomist. Validation: genus-level certification or equivalent for benthic macroinvertebrates. Expert fish taxonomist or equivalent. Formal courses or training in algal taxonomy. QA/QC: addresses measuring bias, precision, and accuracy in all phases of sample processing through identification (e.g., outside validation of identification); voucher collection maintained.	Same as Level 3 except that two or more taxonomic assemblages are assessed. Rationale for selection of taxonomic groups should be well documented.

This taxonomic resolution technical element addresses the resolution to which organisms are taxonomically identified (order, family, genus, or species) and, for the highest level programs, how many different assemblages are included. Four assemblages have been primarily used in freshwater biological assessment and in making aquatic life use attainment decisions: benthic macroinvertebrates, fish, algae, and aquatic macrophytes. Methods for measuring amphibian assemblages (e.g., early life stages of salamanders) are also being developed (Moyle and Randall 1998; Whittier et al. 2007a, 2007b) for certain water body types such as primary headwater streams (Ohio EPA 2012). Each assemblage has different habitat ranges and preferences and might be susceptible to anthropogenic stressors in different manners and degrees.

As more assemblages are assessed, one can more confidently infer the condition of the entire biological community (e.g., Carlisle et al. 2008). Hence, collecting and assessing different assemblages provides a more complete assessment of the condition of aquatic life in a water body. For example, assemblages that represent more than one trophic level (primary producers, consumers, predators) might increase the ability to both assess the overall condition of the aquatic community and measure responses to multiple stressors that might affect the community. Additionally, some detectable changes in assemblages, or members of an assemblage, might provide a measure of initial stress and provide information helpful to protection of high-quality waters (e.g., Petty et al. 2010; Brooks et al. 2011; Danielson et al. 2012).

Collected organisms must be identified taxonomically before one can infer biological condition from a sample of these organisms, and the resolution of these identifications (e.g., order, family, genus, species) can influence inferences regarding the degree of biological alteration (e.g., Lenat and Resh 2001; Waite et al. 2004; Feio et al. 2006; Hawkins 2006; Pond et al. 2008; Cao and Hawkins 2011). In some cases, a finer level of taxonomic resolution allows one to better assess the sensitivity of the collected organisms to different types of stress. For example, the temperature requirements of mayflies in a certain family might vary substantially, so identifying taxa to genus or species when possible within this family might allow one to better understand the impacts of altered temperature on a water body (Vannote and Sweeney 1980). Conversely, in some regions, the number of different genera in each family might be comparatively low, so identification to family yields nearly as much information as identification to species or genus (Hawkins and Norris 2000b). In other regions, taxonomic resolution can be limited by existing taxonomic information on native fauna (e.g., Buss and Vitorino 2010). Taxonomic identification requires substantial training and practice, and quality assurance/quality control (QA/QC) of the identifications is critical for maintaining consistent standards of identification (e.g., Stribling et al. 2008).

Scoring of this technical element is based primarily on the resolution of the taxonomic identifications and on the level of QC and the number of assemblages that are routinely collected. Example evaluation questions are:

- What level of resolution is used for taxonomy and related biological attributes?
- How many assemblages are monitored?
- What training and certifications are required for persons identifying organisms?
- What are the enumeration and identification QA/QC procedures?

To score highly in this element, at least two assemblages should be used to more completely assess the condition of the entire aquatic community, and organisms should be identified to the finest practicable level of resolution. For example, for benthic macroinvertebrates this includes genus and/or species for key groups, and for fish it would include species resolution in accordance with the American Fisheries Society nomenclature (Nelson et al. 2004). Furthermore, staff who identify collected organisms should be formally trained and certified.

Frequently Asked Questions

Question: What is the best taxonomic level of identification?

Answer: The best level of taxonomic identification will vary depending on purpose of assessment and other considerations, such as the number of genera within each family in a region (Hawkins and Norris 2000b). Typically, species level is more responsive to impacts from stressors, but coarser level taxonomy can produce more precise indices (Hawkins 2006). The current ability to accurately and precisely achieve species level identification varies with the assemblage. Fish, diatoms, and macrophytes can usually be identified to species, whereas macroinvertebrates can usually be identified to genus. Lower levels of identification can improve one's ability to estimate stress-response relationships but only if that lower level of identification is not associated with a substantial increase in the uncertainty of the identifications (Stribling et al. 2008; Buss and Vitorino 2010).

Question: What is the best assemblage to assess biological condition?

Answer: Assemblages comprise different numbers and kinds of species that, in turn, differ in their sensitivities to stressors and also their occurrence and sensitivity by the water body type. The type of water body being assessed and its location (i.e., position in the landscape or river continuum) can influence the selection of assemblages to sample.

For example, small primary headwater streams (<1–10 km^2 catchment) typically have low fish species diversity, and development of fish indices can be challenging (McCormick et al. 2001; Hitt and Angermeier 2011). As such, assessing amphibian assemblage in these stream types is an alternative (e.g., Fausch et al. 1984; Moyle and Randall 1998; Whittier et al. 2007a, 2007b; Ohio EPA 2012). For wetlands, emergent macrophytes are the dominant macrobiota and are typically used for assessing wetlands (e.g., Fennessy et al. 2007), but they have also been used in rivers (Moore et al. 2012). Assemblages might also vary along the length of a waterway. For example, preferred assemblages for the Upper Mississippi River include fish, macroinvertebrates, and submerged aquatic macrophytes in the impounded portions but fish and macroinvertebrates in the open river reaches (Yoder et al. 2011).

Question: Level 4 requires 2 or more assemblages. What could the mix of assemblages include?
Answer: The mix of assemblages should be complementary rather than redundant in terms of their ecological, ecophysiological, and ecotoxicological properties (i.e., not represent the same trophic level or have the same habitat requirements). Assemblages vary in importance across water body types and respond differently to given stressors. They also respond to different intensities of the same stressor which, in turn, affects assessments of condition (e.g., Carlisle et al. 2008; Smucker and Vis 2009). For example, one approach might be to strike a balance among trophic levels: one or more animal assemblage (e.g., benthic macroinvertebrates, fish, zooplankton, benthic infauna [in estuaries]) and one plant assemblage (e.g., emergent macrophytes, floating/submerged macrophytes, periphyton, phytoplankton).

Question: Why are two or more assemblages recommended for a Level 4 program?
Answer: Measuring the response of two or more biological assemblages along a gradient of stress provides increased confidence in the program's capability to detect effects of stressors on aquatic life. There are multiple pathways in which stressors might affect the biota, and a more comprehensive measure of the biotic community provides greater confidence that these effects will be detected.
Examples of the responses of different assemblages to stressors include:

- Certain species of benthic macroinvertebrates have demonstrated consistent and measurable responses to metal toxicity. Clements et al. (2000) used cumulative criterion units to quantify metals concentrations in 95 sites in the Southern Rocky Mountain ecoregion, and they observed changes in the benthic macroinvertebrate assemblage to different levels of metals. The authors showed that highly contaminated sites had significantly lower densities of scrapers and predators and also lower in abundance and species richness of mayflies. Highly contaminated sites also had decreased abundance of mayflies, caddisflies, and stoneflies (i.e., ephemeroptera, plecoptera, trichoptera [EPT] taxa).
- A shift in species composition can signal changes in water quality. When associated with changes in levels of individual or categories of stressors, this information can be used to support identification of probable causes of biological impairment (e.g., Carlisle et al. 2008). For instance, a shift in benthic groups from those that filter the water for food to those that graze the sediments have been correlated with increase in suspended sediment load in a stream or river in absence of other stressors (Kaller and Hartman 2004). Carlisle et al. (2008) found that fish and macroinvertebrates in Appalachian streams were most sensitive to agriculture and urban land uses, while diatoms were most sensitive to chemical changes associated with mining.
- An initial increase in water column algae and shift in species composition can be an indicator of early nutrient enrichment (McCormick and Cairns 1994). Benthic diatoms have long been used as indicators of chemical water quality (e.g., Patrick 1949), and recent developments include quantitative models that infer water quality conditions from the observed diatom assemblage (e.g., Pan et al. 1996; Kelly 1998; Potapova and Charles 2003; Ponader et al. 2008; Danielson et al. 2011).
- The presence of lesions and tumors on fish can be caused by pulp and paper mill discharges (Flinders et al. 2009), pharmaceuticals (Kang et al. 2002; Lovy et al. 2007), and other types of chemicals or industrial/municipal discharges (Yoder and Rankin 1995b; Yoder and DeShon 2003). Dyer and Wang (2002) examined upstream and downstream data from 221 wastewater treatment plants in Ohio and observed impairments in fish communities downstream of large treatment plants.

- Multiple assemblages were evaluated in 268 Appalachian streams, and both fish and macroinvertebrate indices were responsive to urban and agriculturally influenced streams. Diatom assemblages were responsive to mining influence (Carlisle et al. 2008).

Question: How do we get taxonomic certification?
Answer: For some assemblages (algae, fish), professional certification of an individual's ability to accurately and precisely identify taxa is not available. However, because the accurate and precise identification of aquatic organisms is the foundation for biological assessment and monitoring programs for lakes, streams, rivers, and wetlands, certification programs are being developed. For macroinvertebrates, The Society for Freshwater Science recognized this issue a decade ago and has implemented a certification program for those professionals who identify macroinvertebrate assemblages for use in assessing aquatic habitats in North America. This program was designed to certify that trained and skilled persons are providing credible and reliable aquatic macroinvertebrate identifications at the genus and/or family level. The certification program tests a candidate's knowledge and skills in aquatic macroinvertebrate taxonomy and provides the successful applicant with a certificate of proficiency.[2]

Selected states might also offer certifications that address taxonomic and other biological assessment skills and qualification. For example, Ohio offers certification as a Qualified Data Collector under the Ohio Credible Data Law. Three levels are offered: Levels 1, 2, and 3. Level 3 is required for acceptance of data by Ohio Environmental Protection Agency (Ohio EPA) for CWA section 303(d) listing and use designation assignments under the Ohio Water Quality Standards (WQS). The certification is obtained by completing a required training class and then completing performance-based testing for fish (including habitat assessment) or macroinvertebrate assemblage assessment. Certification is also available for the Primary Headwater Habitat assessment methodology and for chemical/physical sampling. Additionally, California has developed a process to document the quality of the taxonomic identifications directly. Re-identification of a percentage (typically 10 percent) of taxonomic data by a QC laboratory is routinely required of most projects in California. Summaries of discrepancies are stored with the original data, providing users of the final data set with direct information about the quality of the original data, much as QA batch data provides information about chemistry analyses. In effect, California audits the data instead of the data providers. California also requires that taxonomists who provide data for the state be active members of the Southwest Association of Freshwater Invertebrate Taxonomists and follow its standard taxonomic effort protocols and reporting standards.[3]

Question: What is DNA barcoding, and is there potential for future application in biological assessments?
Answer: DNA barcoding is a technique by which organisms (fish, macroinvertebrates, macrophytes, algae) can be catalogued into species based on the nucleotide sequence of one or more gene (e.g., the mitochondrial c oxidase I gene for fish and macroinvertebrates). A recent approach to characterize the composition, and possibly the health of communities, is integrating DNA barcoding with metagenomics. Metagenomics refers to the technique developed to sequence all genetic material present in an environmental sample (soil or water). Moreover, next generation sequencing technology is allowing for the DNA of all species in a sample to be isolated and sequenced at once (i.e., resulting in a metagenome). Once a metagenome is obtained, sequencing of a specific gene region (barcoding) allows one to distinguish the species composition of organisms at a specific location. However, this approach cannot currently provide information regarding the relative abundance of the species present in the collections, which is an important factor in using species level data for water quality monitoring. One long-term goal of the DNA barcode approach is to link biodiversity with existing knowledge of species susceptibilities and tolerances to environmental stressors so that one can describe and evaluate the condition of a community given its biological signature.

[2] http://www.nabstcp.com/
[3] http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

2.1.7 Sample Collection (Element 7)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Approach is cursory and relies on operator skill and BPJ. Training limited to that which is conducted annually for non-biologists who compose the majority of the sampling crew. Methods are not systematically documented as standard operating procedures (SOPs).	Textbook methods are used without considering the applicability of the methods to the study area. SOPs to specify methods but methods are neither well documented nor evaluated for producing comparable data across agencies. A cursory QA/QC document might be in place. Training consists of short courses (1–2 days) and is provided for new staff and periodically for all staff.	Methods are evaluated for applicability to study area and refined (if needed). Detailed and well documented SOPs are updated periodically and supported by in-house testing and development. A formal QA/QC program is in place with field replication requirements. Rigorous training required for all professional staff.	Same as Level 3, but methods cover multiple assemblages. A field audit of sampling crews is performed annually to ensure that protocols and proper sample handling/documentation are followed.

The sample collection technical element consists of standard operating procedures (SOPs) used to collect and preserve biological samples and take field measurements. Standardized and well-tested field methods minimize the variability in biological samples associated with differences in sampling procedures. A robust QA/QC system provides assurance that SOPs are followed. Numerous studies have demonstrated that the field methods used can have strong effects on the characteristics of the collected organisms. For example, samples collected in slow water, depositional areas provide a different set of taxa compared with samples collected in riffles (Parsons and Norris 1996). As such, for benthic macroinvertebrates, sampling protocols should specify how different habitats in a stream reach are selected for sampling (Gerth and Herlihy 2006; Rehn et al. 2007). Similarly, greater sampling effort (e.g., more time spent collecting) results in larger numbers of individuals and taxa. Use of different sampling equipment (e.g., kicknets vs. Surber samplers) alter the characteristics of the collected assemblage (e.g., Stark 1993; Cao et al. 2007; Cao and Hawkins 2011).

Scores for this technical element are based on the extent of standardization and evaluation of field sampling methods and the completeness of the QA/QC system. Example evaluation questions are:

- Are standardized methods used to select sampling locations (e.g., single or multiple habitats, transects) within a selected site and to collect and preserve samples?
- How is QA/QC incorporated in sample collection?

Biological assessment programs that score highly for this technical element have developed well-defined and rigorous SOPs that specify details of the collection (e.g., where samples are collected, what sampling equipment should be used, when samples should be collected, how samples should be preserved). The QA/QC system should provide for regular audits of field crewand replication of samples at a certain proportion of sites, assign responsibility, define personnel qualifications, establish protocols, define preventative and corrective action, provide information tracking, and ensure that study objectives are met (USEPA 1995; Stribling et al. 2008). Voucher specimens are retained to verify the accuracy of taxonomic identifications.

Frequently Asked Questions

Question: How does sample collection influence the rigor of a biological assessment?

Answer: Sample collection is the genesis of biological assessment data; therefore, how it is designed and executed influences the ability of a biological assessment to adequately and accurately describe biological quality. However, biological assessment sample collection should be sufficiently cost-effective so as to produce a sample with 2–3 hours' effort in the field.

Question: How do I know which method is best for my biological indicator (Figure 2-6)?

Answer: Methods should have a well-developed SOP, and all field personnel should be trained by qualified professionals. The SOP should minimize the decisions that need to be made in the field, and the training should provide guidance for how to handle unusual situations. If well-developed SOPs and training are done by qualified professionals with appropriate checks and/or audits in place, the actual sampling could be done by more junior personnel under the direction of senior level staff. This type of apprenticeship or mentoring is important for maintaining consistency in sample collection and minimizing variability due to who is doing the sampling at any one location and/or time.

Figure 2-6. Stream sampling methods.

2.1.8 Sample Processing (Element 8)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Organisms are sorted, identified, and counted in the field using dichotomous keys.	Organisms are sorted, identified, and counted primarily in the field by trained staff. Adequate QA/QC is not possible. For fish, cursory examination of presence and absence only. Agency SOPs not developed or published.	All samples (except for fish) are processed in the laboratory. A formal QA/QC program is in place. Rigorous training is provided. Voucher organisms are retained for ID verification. SOPs are published and available to others.	Same as Level 3, but applied to multiple assemblages. Subsampling level is tested. Presence of fish deformities, erosions, lesions, tumors (DELT) and other anomalies are quantified and documented.

Sample processing refers to the protocols (i.e., SOPs) that are followed to subsample, sort, identify, and count the organisms collected from a water body. These protocols include the specific methods for identifying organisms (e.g., by employing established keys), for training of the personnel who count and identify the organisms, and for QA/QC. Consistent protocols for sample processing can minimize the potential that differences in sample processing cause differences in site assessments.

Protocols for subsampling, including how the subsample is selected and how many organisms are counted should be specified. For most assemblages, it is infeasible to identify all the organisms in the sample, and, therefore, a subsample of the collected organisms is identified and counted. In general, the more organisms that are identified, the more accurately and precisely one can characterize the structure of the biological assemblage (e.g., Barbour and Gerritsen 1996; Ostermiller and Hawkins 2004; Cao and Hawkins 2005; Cao et al. 2007). However, sample processing costs increase with subsampling effort, so the relative benefits of increased subsampling effort versus processing costs should be considered and documented.

The most appropriate protocols can depend on the assemblage that is collected. For example, macroinvertebrates are more effectively sorted and identified in the laboratory (Nichols and Norris 2006), whereas fish are typically identified and counted in the field prior to returning them to the water body. (Note that when field identifications are used, voucher specimens should be retained for QA in the laboratory.) Similarly, the presence of deformities, erosions, lesions, and tumors (DELT) usually can only be assessed with fish samples.

Scores for this technical element are based on the degree to which sample processing is standardized, and the degree to which QA/QC procedures are both documented and implemented. Example evaluation questions are:

- Are standardized methods for sample processing in place?
- Do methods include processing macroinvertebrate and algae samples in the laboratory, retaining voucher specimens for fish, and using a formal QA/QC program?

- Is the increased accuracy and precision of more intense subsampling effort for macroinvertebrates and algae relative to the costs of subsampling documented?
- For fish, does the program record DELT and other anomalies?

Programs that score highly on this technical element process macroinvertebrate and algae samples in the laboratory, count DELT anomalies on fish, retain voucher specimens, and use a formal QA/QC program. The process used to select subsampling effort for macroinvertebrates and algal assemblages is documented, and it is sufficient for accurate and precise characterizations of assemblage structure.

Frequently Asked Question

Question: How does the level of macroinvertebrate subsampling affect the results of biological assessment?

Answer: In general, precision of site-specific estimates of taxon richness might improve with both sampling and subsampling effort. However, there may be diminishing returns for increasing subsample effort, and various studies have suggested that subsampling more than 500 macroinvertebrate organisms yields little or no additional precision or accuracy (e.g., Barbour and Gerritsen 1996; Ostermiller and Hawkins 2004; Cao and Hawkins 2005; Cao et al. 2007). The costs of increased sampling and subsampling effort at single sites needs to be considered in the overall program design with the information expected to be gained from more extensive sampling (increased number of sites and sample density). Depending on the questions to be answered, increased subsampling effort might increase precision and power for before-after and upstream-downstream investigations, while increased extent of sites might increase power for statewide status and trends investigations.

2.1.9 Data Management (Element 9)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Sampling event data organized in a series of spreadsheets (e.g., by year, by data-type). QA/QC is cursory and mostly for transcription errors. Might be paper files only.	Databases for physical-chemical, and biological data, and geographic information exist (Access, dBase, Geographic Information System [GIS], etc.) but are not linked or integrated. Data-handling methods manuals are available. QA/QC for data entry, value ranges, and site locations. A documented data dictionary defines data fields in terms of field methods and data collection.	Relational databases that integrate all biological, physical, and chemical data (Oracle, SQL Server, Access, etc.). Validation checks that guard against inadvertently storing incorrect or incomplete sampling data. Fully documented and implemented QA/QC process. Structure provides for data export and analysis via query includes dedicated database management. Fully documented data dictionary. Access to all databases is available for routine analysis in support of condition assessment.	Same as Level 3 adding automated data review and validation tools. Numerous built-in data management and analysis tools to support routine and exploratory analyses. Ability to track history of changes made to the data. Ability to control who has privilege to change, update, or delete data. Data import and export tools. Integrated connection to GIS showing monitored sites in relation to other relevant spatial data layers. Fully documented metadata according to accepted database standards. Reports on commonly used endpoints are easily retrieved (e.g., menu driven).

The data management technical element evaluates the processes and systems that are used by a monitoring program to store and access collected data. A reliable, well-designed, and quality-assured database and management system is fundamental to a program's ability to effectively use monitoring information to assess environmental problems and allows historical data to be used to evaluate trends and provide historical context. Proper data management ensures that the appropriate data can be retrieved and analyzed when necessary and with ease of access, and that historical data are archived in a data repository to protect against data loss (e.g., Michener and Jones 2012).

Proper data management also requires documented metadata, that is, data about the data. Metadata documents are the who, what, why, where, when, and how of the data in the database, so it would include documentation of methods, units, design, objectives. The metadata ranges from methodological description of the study (or studies) to the data dictionary describing fields in the database. Metadata can be coded into Ecological Metadata Language, a metadata specification developed for ecology, based on work sponsored by the National Science Foundation (The Knowledge Network for Biocomplexity; http://knb.ecoinformatics.org/index.jsp).

Scoring of this technical element is based on the degree to which data management systems permit the program to retrieve data in formats that are useful for conducting analyses and supporting decision making. A low score in this element would be associated with simple spreadsheet storage of monitoring data. Higher scores would be associated with data stored in a relational database allowing integration with spatial data and providing stakeholders with Web access. Also, the methods used for archiving data and for making the data available to outside users are considered. Example evaluation questions are:

- Are data storage and analysis programs in place to access data, determine data quality, and manipulate the data to evaluate the relationship between measures of stressors or categories of stressors with biological assemblage response?
- Does data management include comprehensive and integrated storage of biological assessment, physical, chemical, WET, and watershed observations, such that these can be integrated with respect to space and time?

For a program to score high on this technical element, all monitoring data are stored in a relational database allowing integration with spatial data and providing users and stakeholders with Web access to access raw and summary data. Transparent and well-documented QA/QC procedures are in place for data storage and retrieval, including protocols for tracking changes in taxonomic nomenclature over time. All relevant data collected by the agency are in one integrated database system.

Frequently Asked Questions

Question: How do I know what type of data management system I need?
Answer: Data organization and management allows users to perform assessments and reorganize and summarize data according to analysis needs, including exploratory analyses, index development, and more advanced research. Use of spreadsheets is the minimum level of an electronic database management system, but spreadsheets are deficient in error checking and data integration, and they are limited in the amount of information that can be stored. A relational database addresses these shortcomings. A thorough QA/QC check on the database ensures a “clean” data set for use throughout an agency’s program. A small relational database management system (RDBMS) such as Microsoft Access could serve as a logical step from spreadsheets to a more sophisticated relational database. These smaller systems can be used to develop a biological assessment database that includes most of the relational data integrity and validation features of a larger RDBMS. Most large RDBMS are installed on a server that provides options for making the database available through a network or Internet connection. Larger RDBMS are usually installed and administered by an agency’s information technology (IT) department. IT departments can help program managers identify qualified professionals to assist with creating a custom database to meet the data management and analysis needs of biological assessment programs.

When developing a relational database, it is important to recognize that data access depends on creating and running queries, which must be properly programmed to extract appropriate data, and to make extracted data tables available to outside users as flat files.

Question: If I’m able to use electronic spreadsheets or even a small RDBMS such as Microsoft Access, why do I need a data dictionary (metadata)?
Answer: A well-documented data dictionary defines not only how the data in a particular field relate to field operations and data collection, but it specifies how those values are stored and validated. Creating a well-documented data dictionary requires the data manager to address questions ranging from fairly simple to more complex. For example, are the data numeric or text? Are they allowed to be null? The answers to these questions might show that multiple types of data are being stored in one field and should be separated. Answering these questions helps to bridge the gap between using spreadsheets and moving toward a more robust data management system.

2.1.10 Ecological Attributes (Element 10)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Biological program relies solely on the evaluation of the presence or absence of targeted or key species. No rationale is provided for selection of indicators. Assessment endpoints and ecological attributes are not defined.	Biological program based on "off the shelf" indicators for one biological assemblage. Rationale for selection of indicators is partially documented. Generic assessment endpoints and ecological attributes are defined but not specifically evaluated for state or regional conditions.	Biological program based on well-developed ecological attributes for one biological assemblage. Rationale for attribute selection is thorough and well-documented. Explicit linkage is provided between management goal, assessment endpoints, and ecological attributes.	Same as Level 3, but biological program based on well-developed ecological attributes for two or more biological assemblages (e.g., faunal, flora) for more complete assessment of the members of an aquatic community.

The objective of the 1972 CWA is to "… to restore and maintain the chemical, physical and biological integrity of the Nation's waters." However, the CWA does not provide an explicit description of biological integrity nor specify ecological assessment endpoints and scientific methods to measure integrity. One description of biological integrity is "a balanced, integrated, and adaptive community of organisms having a composition and diversity comparable to that of natural habitats of the region" (Frey 1975; Karr and Dudley 1981). Primarily based on this definition or on later refinements (Karr and Chu 2000), states and tribes have used biological assessments to measure the condition of biological communities relative to biological integrity.

This technical element evaluates how well a biological assessment program has selected and operationally defined assessment endpoints that adequately represent biological integrity. Assessment endpoints are measurable characteristics, or attributes, representative of a management goal (USEPA 1998). The attributes provide the basis for development of quantitative measures (e.g., biological indices) to assess attainment of the management goal. Selection of attributes to measure biological integrity includes consideration of their ecological relevance, susceptibility to known or potential stressors, and relevance to the management goal (USEPA 1998). Ecologically relevant attributes might be identified at any level of organization (e.g., individual, population, community, ecosystem, landscape). Typically states and tribes have identified species diversity and abundance as ecologically relevant attributes for measuring biological integrity and have developed biological indices using measures of taxonomic diversity and completeness, composition, trophic state, and trophic composition.

Full consideration of all three selection criteria (e.g., ecological relevance, susceptibility to known or potential stressors, relevance to management goal) provides the best foundation for development of biological indices to measure biological integrity. Poorly defined attributes can lead to miscommunication and uncertainty in applying assessment results to making a judgment on attainment of the management goal. For example, susceptibility of an ecological attribute to stressors and/or levels of human disturbance in the environment is important in selecting attributes but should be considered in the context of how well an attribute can represent the management goal. Otherwise, an attribute could be selected that leads to a biotic index that provides a robust and precise measure of human disturbance but not an accurate measure of biological integrity.

Scientists from EPA, U.S. Geological Survey, state and tribal agencies, and academic institutions jointly developed a conceptual scientific model that describes the response of 10 ecological attributes to increasing anthropogenic stress (Davies and Jackson 2006, Table 2-3). This model, the Biological Condition Gradient (BCG), is based on a suite of ecological attributes used by different state and tribal biological assessment programs across the country. The BCG was developed to provide a common framework for interpretation of biological assessments regardless of methods or regional differences. The ecological attributes of the BCG might serve as a template, or starting point, for states and tribes to consider in their selection of attributes.

Scoring for this technical element is based on how a biological assessment program has selected and operationally defined ecological attributes to assess biological integrity and then used them as the basis for development of biological indices. Because the condition of a biological community can be more confidently assessed with more than one biotic assemblage, the number and type of assemblages are considered in the evaluation (e.g., Carlisle et al. 2008). Example evaluation questions are:

- Are ecological attributes defined that provide for development of biological indices to measure attainment of biological integrity? If so, what are the ecological attributes and what is the basis for their selection?
- What aquatic assemblages are assessed?
- How is the linkage between biological integrity, ecological attributes, and biological indices defined, tested, and documented?

Programs that receive the highest scores for this technical element have well-developed ecological attributes for two or more assemblages. The linkage between biological integrity, assessment endpoints, ecological attributes and the resulting biological indices is explicit and documented.

Table 2-3. Biological and other ecological attributes used to characterize the BCG

Attribute	Description
I. Historically documented, sensitive, long-lived, or regionally endemic taxa	Taxa known to have been supported according to historical, museum, or archaeological records, or taxa with restricted distribution (occurring only in a locale as opposed to a region), often due to unique life history requirements (e.g., sturgeon, American eel, pupfish, unionid mussel species).
II. Highly sensitive (typically uncommon) taxa	Taxa that are highly sensitive to pollution or anthropogenic disturbance. Tend to occur in low numbers, and many taxa are specialists for habitats and food type. These are the first to disappear with disturbance or pollution (e.g., most stoneflies, brook trout [in the east], brook lamprey).
III. Intermediate sensitive and common taxa	Common taxa that are ubiquitous and abundant in relatively undisturbed conditions but are sensitive to anthropogenic disturbance/pollution. They have a broader range of tolerance than highly sensitive taxa (attribute II) and can be found at reduced density and richness in moderately disturbed sites (e.g., many mayflies, many darter fish species).
IV. Taxa of intermediate tolerance	Ubiquitous and common taxa that can be found under almost any conditions, from undisturbed to highly stressed sites. They are broadly tolerant but often decline under extreme conditions (e.g., filter-feeding caddisflies, many midges, many minnow species).
V. Highly tolerant taxa	Taxa that typically are uncommon and of low abundance in undisturbed conditions but that increase in abundance in disturbed sites. Opportunistic species able to exploit resources in disturbed sites (e.g., tubificid worms, black bullhead).
VI. Nonnative or intentionally introduced species	Any species not native to the ecosystem (e.g., Asiatic clam, zebra mussel, carp, European brown trout). Additionally, there are many fish that have expanded their range within North America because they have been introduced to areas where they were not native.
VII. Organism condition	Anomalies of the organisms; indicators of individual health (e.g., deformities, erosions, lesions, tumors [DELT]).
VIII. Ecosystem function	Processes performed by ecosystems, including primary and secondary production; respiration; nutrient cycling; decomposition; their proportion/dominance; and what components of the system carry the dominant functions. For example, shift of lakes and estuaries to phytoplankton production and microbial decomposition under disturbance and eutrophication.
IX. Spatial and temporal extent of detrimental effects	The spatial and temporal extent of cumulative adverse effects of stressors, (e.g., widespread tile drainage and stream channelization throughout an ecoregion resulting in extirpation of several species of native macroinvertebrates and fish).
X. Ecosystem connectance	Access or linkage (in space/time) to materials, locations, and conditions required for maintenance of interacting populations of aquatic life; the opposite of fragmentation (e.g., levees restrict connections between flowing water and floodplain nutrient sinks [disrupt function]; dams impede fish migration and spawning).

Source: Modified from Davies and Jackson 2006.

Frequently Asked Questions

Question: Are all 10 BCG attributes necessary to characterize biological integrity?

Answer: The selection of attributes might depend on the spatial scale and specific water body being assessed. Each attribute provides some information about the biological condition of a water body. Combined into a conceptual model comparable to the BCG, the attributes can offer a more complete picture about current water body conditions and also provide a basis for comparison with naturally expected water body conditions. All states and tribes that have applied a BCG for streams, rivers, and wetlands have used the first seven attributes that describe the composition and structure of biotic community on the basis of the tolerance of species to stressors and, where available, included information on the presence or absence of native and nonnative species, and, for fish and amphibians, used measures of overall condition (e.g., size, weight, abnormalities, tumors). Though not measured directly in state or tribal stream biological assessment programs, the last three BCG attributes of ecosystem function and connectedness and spatial and temporal extent of stressors can provide valuable information when evaluating the potential for a stream, river, or wetland to be protected or restored. For example, a manager can choose to target resources and restoration activities to a stream where there is limited spatial extent of stressors or there are adjacent intact wetlands and stream buffers or intact hydrology, rather than a stream with comparable biological condition but where adjacent wetlands have been recently eliminated, hydrology altered, and stressor input is predicted to increase.

However, for comprehensive water body-wide assessments of large systems like estuaries and coastal ecosystems, the full suite of attributes might be important for application at both a single habitat scale similar to streams and for a landscape level assessment that describes the distribution and connectedness of habitats within an ecosystem necessary for the survival and resiliency of the resident biota (e.g., fish, benthic invertebrates, migratory water birds, aquatic mammals).

Question: I have a calibrated index. Why do I need to consider the ecological attributes of the BCG?

Answer: The BCG serves as a conceptual model, or framework, for organizing and communicating information on biological community response to increasing levels of stress in aquatic ecosystems. The BCG was developed in partnership with scientists from state and tribal biological assessment programs from across the country (Davies and Jackson 2006). The BCG attributes and levels of condition represent shared, measurable patterns of biological response to increasing stress condition regardless of location and method. Many of the state and tribal scientists involved in BCG development had already derived biological indices based on methods and approaches developed in the 1980s through 1990s (e.g., index of biotic integrity (IBI) for fish [Karr et al.1986]). Therefore, there is both conceptually and quantitatively a close association between BCG attributes and the biological indices currently used by many states and tribes. The suite of BCG attributes can serve as a template for reviewing and improving an existing biological index or for developing a new index.

Question: What is a trait-based approach?

Answer: A trait-based approach predicts patterns of species attributes (i.e., reproductive, physiological, behavioral) and environmental conditions (Poff et al. 2006; Pollard and Yuan 2010). This approach has not been consistently applied or formally articulated until the last decade. It is based on sound theoretical concepts, such as the Habitat Templet Concept, which predicts that habitat and environmental conditions select organisms with particular life-history strategies and biological traits (Southwood 1977, 1988). Many studies have demonstrated that patterns in the traits of species can be related to environmental conditions (e.g., Townsend et al. 1997; Richards et al. 1997; Statzner et al. 2005; Van Kleef et al. 2006).

2.1.11 Discriminatory Capacity (Element 11)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Coarse method (low signal) and detects only high and low values. Supports distinguishing only extreme change in biological condition at the upper and lower ends of a generalized stress gradient.	A biological index for one assemblage is established but is not calibrated for water body classes, regional or statewide applications. BPJ based on single dimension attributes. The index can distinguish two general levels of change in biological condition along a generalized stress gradient.	A biological index for one assemblage has been developed and calibrated for statewide or regional application and for all classes and strata of a given water body type. The index can distinguish 3 to 4 increments of biological change along a continuous stress gradient. Supports narrative evaluations (e.g., good, fair, poor) based on multimetric or multivariate analyses that are relevant to the selected ecological attributes (Technical Element 10).	Same as Level 3 but biological indices for two or more assemblages have been developed and calibrated. Additionally, the indices can distinguish finer increments of biological change along a continuous stress gradient. The number of increments that potentially can be distinguished is dependent on water body type and natural climatic and geographic factors.

This technical element addresses how a biological assessment program has developed one or more biological indices based on ecological attributes (Technical Element 10) and the degree of sensitivity of the indices in distinguishing incremental change along a continuous gradient of stress. Detailed descriptions of biological change along a gradient of stress can provide detailed descriptions of a state's designated aquatic life uses for specific water bodies and regions and lead to biological criteria development. Additionally, depending on the sensitivity, or discriminatory capacity, of the index, the information can be used to help identify high-quality waters and establish incremental restoration goals for degraded waters.

The ability of a biological index to measure change along a continuous gradient of stress includes consideration of the appropriate scale for application of the index (e.g., a specific water body, class of water body, region, statewide) and defining, and wherever possible, quantifying overall variability and sources of uncertainty.

The BCG discussed in the preceding section (Technical Element 10) is a conceptual model that describes measurable increments of biological change along a gradient of stress (Davies and Jackson 2006). Six general increments of change have been described for each of the BCG's ecological attributes. The gradient ranges from natural, undisturbed conditions to severely degraded conditions caused by anthropogenic stresses. These incremental changes can serve as a template for developing biological indices that represent aspects of biological integrity and show a predictable, measurable response to increasing levels of stress.

Scoring of this technical element is based on the demonstrated ability of the biological index to detect increments of change along a continuous gradient of stress. Examples of evaluation questions are:

- Is the index developed and calibrated at the appropriate scale for its intended application?
- Is the index developed and verified by independent data sets?
- What is the sensitivity of the index to detect shifts in biological assemblages along a full gradient of anthropogenic stress?
- How well defined, quantified, and documented is overall variability and its sources?
- What biotic assemblages are assessed?

Programs that score highly on this technical element have well-developed indices for one or more assemblages and have demonstrated the ability of their indices to distinguish incremental levels of biological condition change along a continuous stressor gradient for specific water body types and regions. Sources of uncertainty are well defined and quantified. For a program to score at the highest level, well-developed biological indices for two or more assemblages are used for a more complete assessment of biological integrity.

Frequently Asked Questions

Question: Can an agency's existing biological index be refined rather than replaced to improve discriminatory capacity?
Answer: As a biological index is further developed, it can be recalibrated and compared with performance of the previous iteration to compare past and present results. Recalibration of an index or model should be considered, for example, when sample collection or processing protocols change; classification is refined; level of taxonomic identification is made more precise; or, the data set is substantially expanded to include longer time-series, stressor conditions, or reference characteristics. These technical improvements can influence discriminatory capacity of an index or model.

Developing a quantitative translation between the original and refined index might require a special study where samples are collected simultaneously using the two protocols (for methodological changes). For example, in New England, alternative sampling and index methods were run side-by-side at the same sites (Snook et al. 2007). For minor methodological changes (e.g., taxonomic level, sampling or subsampling effort), analysis could be performed on samples that are virtually reformatted to provide two samples reflecting each protocol. For example, if Chironomidae (midges) were previously identified at the family level, but are currently identified at the genus level, the identifications in new samples could be reset at family level for calculation of the old index. Then comparisons of old and new indices could be performed on the reformatted and complete samples, yielding old and new index scores that could be compared through regression or other analyses. This would allow prediction of one index from the other and comparison of the assessment thresholds.

Question: Are the same increments of measurement expected for all aquatic water body ecotypes or in all regions of the United States?
Answer: The number of increments that can be distinguished is dependent not only on the water body ecotype and natural climatic and geographic factors that define the assemblage characteristics, but the effect of anthropogenic stressors. For example, the sensitivity of an index developed for a forested, high-gradient stream might support distinguishing five to six increments of change along a continuous stressor gradient while an intermittent, seasonal, or desert stream might support only three increments. Some of this is due to inherent natural characteristics of the assemblages and some might be due to current limitations of science and practice.

2.1.12 Stressor Association (Element 12)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
No ability to develop relationships between biological responses and anthropogenic stress.	Site-specific paired biological and stressor samples for studies of an individual water body or a segment of a water body (e.g., a stream reach). Stress-response relationships are developed based on assemblage attributes at coarse level taxonomy (e.g., family for benthic macroinvertebrates). Information might be used on a case-by-case basis to inform a first order causal analysis.	Low spatial resolution for paired biological and stressor samples in time and space across the state at basin or sub-basin scale (e.g., HUC 4–8). Stress-response relationships developed for one assemblage using regression analysis. Taxonomy at level sufficient to detect patterns of response to stress (e.g., species or genus for benthic macroinvertebrates or periphyton, species for fish). Relational database supports basic queries. Information is frequently used to inform causal analysis. Reevaluation of stress-response relationships on an as-needed basis.	High spatial resolution for paired biological (including DELT anomalies and other indicators of organism health) and stressor samples in time and space across the state at watershed or subwatershed scales (e.g., HUC 10–12). Other data (e.g., watershed characteristics, land use data and information, flow regime, habitat, climatic data) are linked to field data for source identification. Stress -response relationships are fully developed for two or more assemblages, stressors, and their sources using a suite of analytical approaches (e.g., multiple regression, multivariate techniques). Relational database supports complex queries. Information is routinely used to inform causal analysis and criteria development. Ongoing evaluation of stress- response relationships and monitoring for new stressors is supported.

Stressor association refers to the use of biological assessment data at appropriate levels of taxonomy to develop relationships between measures of biological response and anthropogenic stressors, including both stressor and their sources (Yuan and Norton 2003; Huff et al. 2006; Yuan 2010; Miller et al., 2012). This includes examination of biological assessment data for patterns of response to categorical stressors (Yoder and Rankin 1995b; Riva-Murray et al. 2002; Yoder and DeShon 2003). A capability for developing these relationships extends the use of biological assessments from assessing condition to informing identification of possible causes and sources of a biological impairment at multiple scales.[4]

The technical capability to associate biological response with stressors and their sources affecting aquatic systems requires a comprehensive database that should include biological, chemical, physical, and WET data and information; detailed watershed and land use

[4] For more information about stressor identification, see EPA's Causal Analysis/Diagnosis Decision Information System website at: http://www.epa.gov/caddis.

information; locations of discharges; discharge monitoring; Geographic Information System (GIS) capability to assemble watershed and discharge information and relate them to the correct sampling sites, etc. Paired biological and other relevant environmental data support developing quantitative stress-response relationships. A relational database that enables data export and analysis via query is required to support this function. Since chemical sampling is often more frequent (several times per year) than biological sampling, the database should be able to accommodate queries to relate the higher-frequency chemical sampling to lower-frequency biological sampling. It should also be able to reveal the spatial coincidence of biological and chemical/physical sampling locations to reveal the extent to which these are actually paired.

Stressor association, is directly dependent on a high level of technical development of other elements, particularly the elements for spatial sampling design, taxa and level of taxonomic resolution, database management, and discriminatory capacity. These elements are important building blocks for the data collection and analysis needed to more confidently identify stressors and their sources and to estimate stress-response relationships. For example, the ability to estimate these relationships relies on paired stressor and response sampling at appropriate spatial and temporal scales and a level of taxonomic resolution and index sensitivity sufficient to detect incremental biological changes along a stress gradient. Also, a relational database that supports complex queries enables efficient and full utilization of data. A high level of technical development for each of these elements and others provides the foundation for stressor association.

Scoring for this technical element is based on the degree to which biological assessments are used to estimate stress-response relationships and discern patterns of response to individual or categorical stressors. Example evaluation questions are:

- Are biological sample collection and stressor sample collection coordinated? What assemblages are sampled and to what level of taxonomy?
- Does the database support analysis of biological responses to individual stressors or categories of stressors? If so, at which spatial scale(s)?
- Is a systematic approach for identifying stressors at biologically degraded sites used? Is this information used on a routine basis to support identification of probable cause of the biological impacts and source of the stressors?
- Does the database support the continued analysis of biological responses, including WET, to individual stressors or categories of stressors especially as additional data are collected and as stressors change over time?

Programs receiving the highest score on this technical element collect data and conduct analyses that enable the estimation of relationships between biological responses for two or more assemblages and the dominant stressors in their regions. Data sets are examined to discern patterns of response to categorical stressors and for source identification. To elucidate stress-response relationships, the biotic and abiotic data and measurements must be both temporally and spatially linked in data sets. Within-site variability is characterized and appropriately incorporated into the analysis. New monitoring data and information on changes in land use and new stressors are systematically gathered and evaluated as a part of the routine monitoring and assessment program so that new stressors and their biological impacts are detected and stressor-response variables developed accordingly. Information is used to inform causal analysis and support criteria development. Timely information is also provided to other water quality programs to meet their information needs on stressor-response relationships and causal analysis.

Frequently Asked Questions

Question: What biological assessment information can be used as a basis for diagnosing problems?

Answer: Appropriately detailed biological assessment information is needed to discriminate between different categories of stressors and requires analyses of large data sets to reveal patterns of biological response across spatial and temporal gradients. To further examine for patterns of biological response to stress, equally detailed information on stressors, habitat, potential sources, and the natural background condition are also needed.

Question: How does one analyze stress-response?

Answer: There is a large and growing base of literature exploring different approaches to analyzing stress-response relationships from field data. Methods range from simple regressions to complex multivariate models and new methodologies (see Legendre and Legendre 1998 for an overview). The objective is to find community-level diagnostics, also called biological response signatures, which are characteristics of a biological community and are associated with specific stressors or categories of stressors and can be used diagnostically. In some cases, these indicators have been used by agencies to identify possible stressors from biological data (Yoder and DeShon 2003; Yoder and Rankin 1995b; Riva-Murray et al. 2002). A further refinement to this approach compares stressor-specific tolerance values associated with taxa collected at sampling sites with those from an expected assemblage predicted by a RIVPACS-type model (Huff et al. 2006; Hubler 2008). Additionally, new analytical approaches are being explored for identifying patterns of biological response to individual stressors, types or categories of stressors, and/or their sources (e.g., Shipley 2000; USEPA 2000; Oksanen and Minchen 2002; Cade and Noon 2003; Cormier et al. 2008; Baker and King 2009; King and Baker 2010; USEPA 2010a; Cormier et al. 2013).

Question: What are biomarkers, and can they be used for diagnosis?

Answer: Biomarkers are histopathological or biochemical signatures found in organisms that indicate some combination of stress, exposure to specific chemicals, or a disease. They are typically assayed from single individuals, where several individuals from a single site are sampled. They have been used most often in attempts to diagnose causes of observed impairments or mortality in fish. For example, Ripley et al. (2008) examined protein expression profiles of smallmouth bass in the Shenandoah River to identify candidate causes of biological impairment of the river and of several fish kills. They found that fish in the Shenandoah are immunologically stressed; however, there are multiple candidate causes of the stress (eutrophication, pesticides, agricultural animal runoff) (Ripley et al. 2008). Biomarkers of exposure to polycyclic aromatic hydrocarbons (PAHs) were examined in fish in contaminated rivers in Ohio, and they were key in identification of PAHs as one of several causes of biological impairment in the rivers (Lin et al. 2001; Yoder and DeShon 2003). This example illustrates how biological assessments in combination with other biological, chemical, or physical information support more robust causal analysis.

2.1.13 Professional Review (Element 13)

(Lowest) 1.0	2.0	3.0	4.0 (Highest)
Review is limited to editorial aspects. No technical review.	Internal technical review only.	Outside review of documentation and reports are conducted on an ad hoc basis.	Formal process for technical review to include multiple reference and documented system for reconciliation of comments and issues. Process results in methods and reporting improvements. Can include production of peer-reviewed journal publications by the agency.

The professional review technical element is the level to which agency data, methods, and procedures are reviewed, especially with regard to external stakeholder and scientific peer reviews. Subjecting documented methods and assessment reports to rigorous scientific peer review is ultimately the best way to ensure that an agency's data and scientific underpinnings are credible. Inherently, scientific peer reviews should be conducted in an objective and independent manner (outside the agency and with no vested interest in the outcome) by technical and other experts able to provide valid critique and suggestions, and where recommendations for improvement and refinement are taken in good faith. Validation of SOPs for all aspects of the assessment and monitoring program by outside experts is an initial step in establishing confidence in the resulting data. Programs that do not address and implement critical recommendations fail to benefit from an independent endorsement of their procedures and assessments.

The scoring for this technical element is based on the level of scientific peer review. Example evaluation questions are:

- Are documented methods and assessment reports subject to a rigorous scientific peer review process?
- What type of peer review is conducted, and how does the agency address review comments and document its response?

To score high in this technical element, a program will have a formal process for routine scientific peer review of data and documents. Programs with a high level of rigor ensure that reviews are done by outside, independent reviewers. The agency will also have an established, transparent process for documenting and tracking how it responds to comments from reviewers. Technical approaches might be included in peer review journal articles.

Frequently Asked Question

Question: Agency documents and reports are subjected to a thorough internal review by management—why is that not sufficient?

Answer: A peer review by technical experts from outside the agency is crucial to validating all aspects of a biological assessment program. Peer review provides feedback for strengthening a program and validation for the technical foundation to support water quality management decisions. In particular, publishing biological assessment protocols through a peer-reviewed process demonstrates a high level of technical rigor and acceptance in the scientific community.

2.2 Determining the Overall Technical Program Level of Rigor

A technical element's scoring matrix or "checklist" has been developed to rate or score the key technical elements according to a four-tiered narrative description along a sliding scale that ranges from 1 to 4 (Appendix E). The checklist is used to evaluate each element and rate it independently as part of the overall program evaluation process. The scoring of the individual technical elements is based on the role of each element in supporting a biological assessment program's ability to:

- Assess biological condition of a water body in terms of biological integrity.
- Define biological change along a gradient of stress.
- Relate biological response to stressors and develop stress-response relationships.

EPA recognizes that the components of the various technical elements are inherently interrelated and the status or refinement of one element can influence others. However, focusing on individual elements first and then aggregating them into a cumulative rating provides an estimate for the overall level of rigor of a biological assessment program. The individual technical element scores can be used to prioritize specific areas for corrective actions and improvement, and these are detailed in Appendix E. The checklist should be completed for major water body types (e.g., flowing waters, lakes,

☛ The 13 technical elements are evaluated equally for the purpose of identifying strengths and areas for improvement. Clearly, several entail greater level of effort for development. Many are building blocks for others. For example, Technical Element 5, Reference Condition, evaluates the number of reference sites that are available based on reference site section factors (Technical Element 4); the degree to which the reference sites represent natural environmental gradients (Technical Element 3) and whether the number of sites is sufficient to support statistical evaluation of condition and derivation of numeric biological criteria. Likewise, Technical Element 12, Stressor Association, is influenced by whether there is sufficient spatial resolution (Technical Element 2) and natural classification (Technical Element 3) to characterize both natural and stress gradients as well as number of assemblages used to measure aquatic life use and detect stress-response relationships (Technical Element 6). Fundamental to this element is an adequate data management system (Technical Element 9) so that data is readily accessible and can be manipulated for complex analysis. The relationships between the technical elements and level of effort and sequence for each are part of the discussion in development of recommendations and action plan.

wetlands) with the assemblages used for each water body type noted. Different levels of biological assessment rigor might be evident among the different water body types and assemblages sampled, which is important for the water quality agency to determine and reconcile for management purposes.

It is important that the determination of the level of rigor be done with care to avoid an erroneous classification of the program. The evaluation of each technical element and the overall level of rigor of a biological assessment program should be done with the direct input of the state or tribal manager, supervisor(s), and technical staff. Documentation about the biological assessment program will be needed to complete various aspects of the checklist. The checklist should be completed for each water body ecotype as appropriate for the natural classification framework (e.g., lake, flowing waters, wetland, and per ecological region or other classification factors such as elevation) that the water quality agency routinely monitors. It is possible that different levels of rigor are being implemented for the different water body ecotypes within the jurisdiction of the state or tribe. The overall program score provides an indication of a biological assessment program's capability to derive biological criteria, describe biological change along a gradient of stress and develop response-stress relationships (Table 2-4).[5]

Table 2-4. Scoring associated with technical element levels of rigor

Level of Rigor	CE Score	% CE Score[6]
4	49–52	≥ 93.2
3	43–48	≥ 81.7–93.1
2	34–42	≥ 66.4–81.6
1	13–33	24.0–66.3

The central tendency of a biological assessment program's technical capability for each technical element is evaluated to arrive at a score. A score for one element might end up as a 3.5 if its central tendency is comparable to the technical capabilities of Level 3 but it has some technical characteristics of a Level 4 program and none of Level 2. It is important to emphasize that the evaluation process is intended to guide program development building on existing technical capabilities and addressing the gaps revealed in the review, rather than being viewed as a report card.

Summing the individual scores of the 13 technical elements provides a raw score for the biological assessment program with a range of 13–52. This score is then converted to a percent score by dividing the raw CE score by 52. The thresholds for determining the four levels of rigor

[5] Because the overall score is the result of the summation of individual scores for the 13 separate elements, the overall score does not establish minimum expectations regarding a state's ability to make decisions in context of different CWA regulatory programs. At all levels of technical development, biological assessment information can be used to support water quality decisions.

[6] The percent CE score is calculated based on 0.5 increments between CE raw scores.

are based on an allowable deviation from the maximum cumulative score of 52 across all 13 elements (Table 2-5). These thresholds correspond with improved program capabilities to detect shifts in biological assemblages along a gradient of stress, more comprehensively assess the biotic community, detect the suite of stressors impacting the biota, and quantify stressor-response relationships. For Level 4, there is a 3-point deviation or departure, a 9-point departure for Level 3, and an 18-point departure for Level 2. Deviations greater than 18 result in a Level 1 assignment.

Table 2-5. Allowable deviation of technical elements scores for each of the four levels of rigor

Level of Rigor	Departure from maximum cumulative score
4	-3
3	-9
2	-18
1	greater than -18

The levels of rigor are based on departures across the 13 technical elements as opposed to a strictly linear interpretation across the four narrative descriptions of each element (e.g., 3 x 13 = 39 as the maximum score for Level 3, 2 x 13 = 26 as the maximum score for Level 2). As such, the delineations of the four levels are based on the aggregate degree of departure across all 13 elements and in recognition that the overall level of rigor is an aggregate reflection of all 13 elements combined. It also recognizes the scoring across the four element narratives as an ordinal gradient as opposed to rigid and discrete categories. Based on the pilot evaluations, state and tribal biological assessment programs might exhibit characteristics of adjacent categories—hence the sliding scoring scale in 0.5 point increments.

The pilot testing done with states in 2002–2004 and follow-up evaluations conducted with selected states through 2010 show a congruence between the level of rigor and the formal adoption of numeric biological criteria and refined aquatic life uses in WQS (Table 2-6). Of the three states that have adopted numeric biological criteria and/or refined aquatic life uses in their WQS, two are Level 4 programs and one is 0.5 point from Level 4. Of the remaining five Level 3 states, three were considering developing numeric biological criteria and refined aquatic life uses, and each was expecting to continue technical development towards Level 4 as a result of ongoing technical and program developmental efforts. For states either achieving or developing a Level 4 program, coordinated biological, WET, chemical, and physical assessments and implementation of stressor identification as part of the water quality management program were either in place or being planned for.

Table 2-6. State Pilot Biological Assessment Reviews: Correspondence of the level of rigor to adoption or development of refined aquatic life uses and/or biological criteria in state WQS

CE Level (n)	Refined Aquatic Life Uses &Biological Criteria in WQS[7]	Refined Aquatic Life Uses & Biological Criteria in Development	Not Developing Refined Aquatic life Uses &/or Biological Criteria in WQS
4 (2)	2		
3 (5)	1	3	2
2 (14)	0	0	14
1 (0)	0	0	0

The guiding principles of the technical elements approach are intended to help state and tribal monitoring and assessment programs achieve levels of standardization, rigor, reliability, and reproducibility that are reasonably attainable under current technology and available funding (Yoder and Barbour 2009). While the assignment of a biological assessment program to one of the four levels of rigor has meaning and utility as a summary tool for assessing overall progress, how a state or tribe responds to the evaluation results is the critical action. For Level 4 programs, the focus is on program maintenance and how the program is incorporating new advances in the science and technology of biological assessment. In contrast, for Level 1, 2 and 3 programs, the focus is on the technical developments that are either already underway or that need to take place to meet the agency's needs for biological assessment data and information.

[7] includes biologically-based refined uses only.

CHAPTER 3: THE PROGRAM EVALUATION PROCESS

3.1 Introduction to the Evaluation Process

The biological program review is a systematic process to evaluate the technical capabilities of a state's biological assessment program and to identify next steps for overall program improvement. In this process, an expert reviewer conducts in-person interviews with the water quality agency and guides discussions with water quality agency managers and staff. Regional U.S. Environmental Protection Agency (EPA) managers and/or staff typically participate in the review and provide support to the process. The number of water quality agency personnel engaged in the review usually varies depending on the topic of discussion. The biological assessment and Water Quality Standards (WQS) program managers and technical staff are present throughout the review and constitute the core technical review team. Managers and staff from other programs within the agency, as well as other state agencies that conduct biological monitoring and assessments, might participate for the full workshop or engage for specific topics, overall summary discussions, and the concluding session (see Figure 3-1).

The expert reviewer acts as a facilitator to provide an objective perspective on a state's biological assessment program and to lead the review process, including the scoring of the individual technical elements and writing the results (e.g., the technical memorandum). Important considerations for selection of an expert reviewer include:

- Expertise in biological assessments and aquatic ecology.
- In-depth experience in conducting biological assessments and data analysis.
- Practical and applied knowledge of state and tribal biological assessment programs.
- Ability to facilitate the review and complete the technical memorandum objectively.

The review is composed of two parts (Figure 3-1). The first part of the review provides an overview of the biological assessment program and involves discussion of many aspects of the biological assessment program and how that information is used by different water quality programs. The second part of the review, the technical elements review, is the evaluation by the core review team of the technical rigor of the biological assessment program. The first part of the review focuses on program background to provide context for a state or tribal water quality management program to evaluate the type and quality of biological assessments appropriate to answering specific information needs. Using the review results as a road map, a state or tribe can develop a technical program to support its intended use of biological assessments. This is why the first part of the review process includes discussion of how a program functions and whether the biological assessment program is providing the type and level of information needed by the state or tribe. This discussion sets the stage for the technical evaluation—the determination of biological assessment program strengths and limitations in context of an agency's water quality management program information needs.

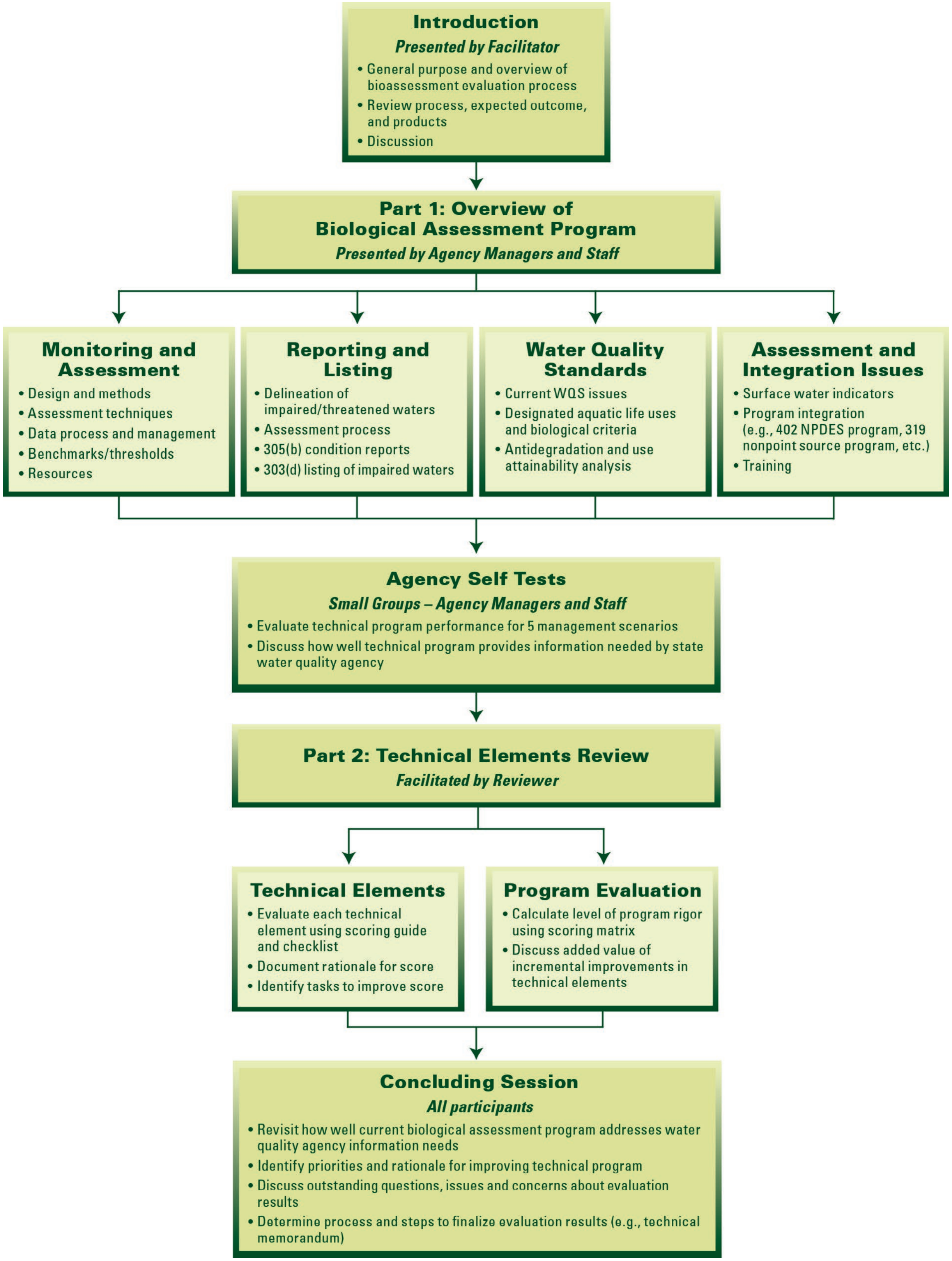


Figure 3-1. Flow chart of the 3-day biological assessment program evaluation process.

During the first part of the review—the overview—the reviewer leads the team in a discussion of the water quality agency's monitoring and assessment program, WQS and programs such as the Total Maximum Daily Load (TMDL), National Pollutant Discharge Elimination System (NPDES) permits, and nonpoint source programs. The discussion also serves as baseline fact finding for scoring each of the 13 technical elements of a biological assessment program and for identifying how the agency is currently using biological assessments and considering future applications (a complete listing of all annotated discussion topics is available in Appendix B: Interview Topics for Agency Review). This discussion provides managers and technical personnel with a better understanding of the program's history, why decisions were made, and how managers and staff interact across the monitoring and assessment program, WQS, listing, TMDL, NPDES, and nonpoint source programs. The discussion provides insight to the agency participants on the current technical strengths and deficits of the biological assessment program and the improvements needed to better support water quality management.

In the second part of the program review, the core review team evaluates 13 technical elements of a biological assessment program associated with biological assessment design, methods, and analysis. Through evaluation of the technical elements, the review team works together to assign a level of rigor (1–4) for the overall program based on the factors outlined in Chapter 2. On the basis of the discussion in the first part of the review, the review team develops a list of recommendations that the water quality agency can use to improve its program.

The final outcome of the program review is a technical memorandum written by the reviewer in collaboration with the full review team. In the memorandum, the reviewer describes important attributes of the overall program, summarizes the water quality agency's biological assessment program, justifies the assignment of the program's level or rigor, and recommends future actions. A step-by-step guide for conducting a biological assessment program evaluation is below.

3.2 Preparation for the Review

For a biological program review to be successful, preparation is necessary for the reviewer as well as the water quality agency personnel. Key tasks for the water quality agency include 1) identifying a comprehensive list of program managers and staff to attend the review; 2) communicating the importance and purpose of each person's participation; and 3) providing materials that the expert reviewer uses to become knowledgeable about the state program.

3.2.1 Identifying Participants

It is essential that water quality agency personnel from different program areas are engaged in the discussions so that data quality and information requirements are accurately represented and properly implemented, especially with regard to EPA published methodologies. Participation from different water quality programs, for example, is also important in the review to build a shared understanding and broad perspective on the existing use of biological assessment information and to begin to identify the technical program gaps and areas for improved use. One person from the water quality agency is designated as the lead for the effort. This state contact is responsible for bringing together the appropriate state personnel and ensuring that necessary documentation is compiled for the review.

Participants should include both agency managers and staff involved in the following programs:

- WQS
- Monitoring and assessment
- Reporting and listing
  - Section 305(b)/303(d) integrated report and listings
- TMDL development and implementation
- Planning
- Nonpoint source assessment and management
- Dredge and fill (section 404/401)
- NPDES program
- Other relevant programs

The reviewer will designate a member of the water quality agency review team to serve as a note taker. The note taker should be available for the entire evaluation and is responsible for ensuring that all discussion is captured. These notes will aid the reviewer with developing the technical memorandum.

3.2.2 Materials Provided as Basis for Program Review

This guidance document itself should be distributed to the water quality agency personnel prior to beginning the program review to provide participants with an understanding of the technical elements and the checklist process. The document also introduces the water quality agency to the next steps in the biological criteria implementation process, including the option for the water quality agency to develop a timeline for achieving a biological assessment program of Level 4 rigor by setting specific milestones for program development.

The appendices include the materials to be used during the evaluation and as supplemental information. By reviewing this chapter and appendices prior to the on-site visit, personnel can familiarize themselves with their content. Some of these documents serve simply as templates and are modified by the reviewer prior to the review.

- **Agenda (Appendix A)**—outlines the basic structure of a biological assessment program evaluation. It is conceptual in design, open to input from both the water quality agency and reviewer, and serves as a starting point for coordinators to plan the evaluation. A review-specific agenda is developed prior to the review itself.

- **Water Quality Agency Interview Topics** (**Appendix B)**—provides an overview of the major topics addressed during the biological assessment evaluation. The water quality agency is also encouraged to identify topic areas of interest and is free to steer the discussion accordingly. The reviewer and note taker each utilize this format for recording answers and discussion content.
- **Water Quality Agency Self-Assessments (Appendix C)**—designed to facilitate internal consideration about how the water quality agency's present biological assessment program can respond to specific water quality program information needs.
- **Technical Memorandum Template** (**Appendix D)**—serves as an example of the scope and content of the technical memorandum, the principal product of the biological assessment program evaluation.
- **Technical Elements Checklist (Appendix E)**—worksheet for evaluating the degree of development for each technical element of an agency's biological assessment program and associated comments on the elements for the biological assessment program.

3.2.3 Preparation of Documents

Prior to the review, the water quality agency compiles documentation that describes the state's decision-making process, the legal and regulatory framework, and technical components of the overall water quality management program (electronic links or documents are preferred). Access to the following materials should be provided to the independent expert reviewer prior to the site visit:

- Monitoring strategy
- WQS documents
- Biological standard operating procedures (SOPs)
- Listing methodology/guidance
- Section 305(b) report/303(d) list
- Example biological assessment reports/watershed assessments
- Any other materials the agency might determine relevant to the review, such as SOPs for other types of data (e.g., stressors, Geographic Information Systems [GIS])

The reviewer uses these materials to prepare for the interview and in developing the technical memorandum. The water quality agency also prepares an overview of its biological program that includes a brief history and a description of both current and planned program developments. The detail and mode of this presentation is left to the discretion of the water quality agency.

3.3 Part 1: Overview of Current Water Quality Program

3.3.1 Introduction and Overviews

(1) Participants

At the beginning of the evaluation, the water quality agency lead introduces managers and technical staff and briefly describes the purpose and scope of the biological assessment program review process. Individual personnel also offer detail about their specific roles with respect to the water quality agency's biological assessment program. The introductions provide an opportunity for the reviewer to become more familiar with the participants.

(2) Role of Biological Assessment

The reviewer begins the evaluation by giving a presentation to briefly introduce the key concepts of biological assessment-based aquatic life uses and biological criteria in relation to a water quality agency's biological monitoring and assessment program. The presentation, *Aquatic Life Uses: A Conceptual and Practical Basis for Determining Water Quality Management Goals and Outcomes Using Biological Assessments,* covers the relationships of biological, chemical, and physical indicators and criteria in the assessment of a water body's ecological health and the importance of using a system with which the biological response to stress in a water body can be evaluated. Topics included are:

- The linkage of biological assessments to other monitoring and assessment programs, with a focus on the WQS program.
- Information on how a biological assessment-based approach to water quality management support meeting the goals set forth by the water quality agency and Clean Water Act (CWA).
- Case examples of biological assessment programs that either currently achieve, or are building towards, high quality technical programs.

(3) Agency Objectives for Biological Assessment

The next step of the process is the water quality agency presenting an overview of its biological assessment program. This overview helps inform the assessment of the technical elements that follows by defining current technical components, use of the biological assessment information, and how the information produced aligns with managers' expectations and information needs. The water quality agency monitoring coordinator is asked to articulate how the water quality agency views the purpose, goals, and objectives of its monitoring program. This is helpful to have on record as it defines, in the water quality agency's own words, what the water quality agency wants to accomplish and how it intends to use information gathered from monitoring efforts. The water quality agency should include a brief history and any current developments or updates, but the remainder of the presentation's specifics is left up to the water quality agency. Personnel can develop an overview that is water quality agency- and program-specific by highlighting the key aspects that are self-identified as being of high importance.

3.3.2 Monitoring and Assessment

Monitoring and assessment includes the systematic collection of data from the environment and their subsequent analysis to allow assessments regarding attainment status, severity, and extent of impairments, stressor identification, and pollutant source identification. Monitoring and assessment is used to support the reporting requirements mandated by the CWA and other water quality agency efforts to characterize the status of water bodies and plan and implement restoration efforts. Discussion of current agency data quality objectives and measurement quality objectives (DQOs and MQOs, respectively) is a critical part of this discussion and documentation. In addition to specific agency objectives, it is useful to gather information on whether the agency aligns its monitoring program with, or directly feeds into, local and federal monitoring and assessments. When the agency personnel later conduct a self-assessment, the DQOs, MQOs, and other information will factor into this assessment and might be reviewed and revised as a consequence.

The following information is discussed during the evaluation:

- Spatial sampling design—The water quality program personnel describe the sampling design(s) employed by the water quality agency (e.g., how the water quality agency determines sampling locations, such as using a rotating basin approach, a probability-based approach, or via fixed stations). In addition, the water quality agency identifies the various water body types for which a monitoring and assessment program exists, as the design might vary among resource types.
- Index periods—The water quality agency clarifies whether a seasonal index period exists by indicator and/or assemblage and whether considerations are given for index periods during attenuated flows.
- Chemical/physical/whole effluent toxicity (WET) assessment—To clarify the design and logistics of the water quality agency's sampling regime (e.g., chemical, physical, WET), the agency personnel provide the reviewer with specifics regarding survey design, parameters and indicators, sampling frequency, sampled media (i.e., water, sediment, fish tissue), and the type of samples collected (e.g., grabs, composites). In addition, the group identifies goals of the sampling, such as characterizing ambient conditions, long-term trend assessments, and the determination of reference conditions. Finally, agency personnel provide the reviewer with information regarding laboratory support, specifically quality assurance/quality control (QA/QC) procedures and analytical costs.
- Reference condition—Agency personnel provide information on whether reference sites have been established, and if so, how many and for what period. The water quality agency provides additional detail about reference conditions, such as how reference is determined (e.g., reference site selection), and explanation of the spatial organization of reference sites and the degree to which these sites are stratified by landscape or other classification schemes and method for determining nonattainment of reference condition (i.e., membership or non-membership in a set of reference sites).

- Data processing and management—A relational database is essential to a highly rigorous biological assessment program. The water quality agency provides information on several technical elements related to data: (1) how biological, chemical, and physical data are stored and whether analysis can be conducted across multiple sampling types and data sets; (2) data management QA/QC procedures (including any documentation); and (3) the accessibility of these data to both agency personnel and outside parties.
- Basin assessments—The water quality agency responds to questions about the scale of basin assessments (e.g., using hydrologic unit code [HUC] units as a basis for expressing spatial scale), how basins are selected, the number of sites in a typical assessment unit (e.g., site density), and the number of basin assessments the water quality agency conducts each year. In addition, any stratifying factors are discussed, such as watershed area or stream order, flow, and the total number of sampling sites. Analysis of the data acquisition process culminates with a discussion of the study planning process to determine the level of integration, if any, of the various monitoring disciplines and interactions with water quality management programs. Finally, to garner an understanding of the assessment process, the sequence of data analysis and reporting will be determined and any logistical concerns identified.
- Monitoring strategy—The water quality agency provides the latest version of its monitoring strategy for review and responds to questions about the frequency of updates. Through discussion the reviewer will establish whether DQOs are clearly defined and evaluate the usefulness of the strategy to guide implementation of the monitoring program and to ensure use of the information to support water quality program information needs.
- Resources—The water quality agency provides specifics regarding the allocation of full time employees (FTEs), particularly how they are allocated to monitoring and assessment for each of the major scientific disciplines and the proportion of monitoring and assessment FTEs compared to those devoted to other water quality management programs. The water quality agency should provide an organizational table for the CWA components of the various programs at the staff level, and it should include any contracted resources. Finally, the water quality agency should identify current funding sources, any existing resource limitations, and what additional resources, if any, are needed.

3.3.3 Reporting and Listing (CWA sections 305[b] and 303[d]) and TMDLs

This part of the evaluation deals with the process of producing integrated CWA section 305(b) and 303(d) reports, which identify waters with impaired or threatened uses, and TMDLs. These reports are often used to delineate program priorities and allocate resources, and the information in these reports will help the reviewer make determinations about how its biological assessment program is used.

- Identification of waters with impaired or threatened uses—The water quality agency provides information on the procedures, protocols, and assessment methods for identifying waters with impaired or threatened uses. The water quality agency provides details on what data (biological, physical, and/or chemical) and methodology are used to determine aquatic life use impairments, and whether such impairments are based on assessment of aquatic life assemblages. Discussion can include the degree to which impairments are characterized for level of severity, extent, and cause. Finally, the water quality agency provides details on the extent to which the state's waters have been assessed and what percentage of the total waters this figure comprises.
- Data acquisition and management process—The water quality agency explains the process for making assessments of condition and status, including how the data and information is documented and quality controlled and protected against unauthorized changes. The water quality agency also describes requirements regarding any data acquired by outside organizations (e.g., volunteer groups, water collaboratives), such as admission requirements and accuracy determinations. Finally, the reviewer evaluates the water quality agency's legislation (if any) pertaining to data management.
- CWA section 303(d) list topics—The water quality agency should describe the extent to which biological assessment information has been used to identify waters with impaired or threatened uses, under which 305(b)/303(d) integrated reporting categories such waters are assigned, and how the information is used in the planning process for establishing TMDL development schedules as part of the 303(d) list submittal. The water quality agency should also describe and discuss any issues concerning the integration of biological information into one assessment methodology for both CWA section 305(b) and 303(d) reporting.
- CWA section 303(d) list and TMDL development and implementation topics—The water quality agency should describe the extent to which data from biological assessments and stressor identification evaluations are used in the development of TMDLs and the evaluation of their implementation. Finally, the reviewer will want to discuss any specific CWA section 303(d) or TMDL resource considerations.

3.3.4 Water Quality Standards

The WQS section of the review focuses on the development and integration of designated aquatic life uses and biological criteria in the state's WQS program. WQS are the basis for judging the effectiveness of water quality management programs. The water quality agency should provide all participants with a copy of the state's WQS during the evaluation, and the reviewer asks participants to refer to specific parts of the document as they become relevant during the discussion.

- General issues—The water quality agency describes the basis of the agency's WQS, such as how chemical water quality criteria are derived and whether site-specific criteria have ever been developed. The water quality agency describes its antidegradation policy and implementation procedures. The discussion should also include how the monitoring and assessment program is integrated with the WQS program.
- Designated uses—The water quality agency should provide a description of its aquatic life use designations and explain the process for assigning uses to water bodies. The reviewer will want the agency to describe any other special considerations, such as tributary rules and application of default uses. In addition, any triggers for re-designations should be described. The water quality agency should describe what it recognizes as waters meeting the CWA section 101(a)(2) goals.
- Use attainability analysis (UAA)—The water quality agency should explain its protocol for conducting a UAA and describe what data or information might initiate the process. Discussion of current technical issues or obstacles encountered when conducting UAAs can be included to help determine need for additional biological assessment information or other types of environmental data.
- Biological criteria—The water quality agency provides the reviewer with information to determine whether biological criteria have been developed and whether such criteria are narrative, numeric, or both. Secondly, participants describe habitat assessments and associated criteria, if applicable. The agency provides information to help the reviewer understand the linkage between biological criteria and aquatic life designated uses and how this information has been used to support water quality management programs.

3.3.5 Integration of Monitoring, Reporting, Standards, and Management

Integrating information gathered from monitoring and assessment efforts with other water quality management programs is integral to the overall program's effectiveness. The topics below are designed to assess the state's development, use, and integration of biological assessment information into water quality management programs.

- Indicators for surface waters—The water quality agency should describe its existing measures of the effectiveness of its water quality management programs. In addition, the agency should gauge the dependency of these indicators on monitoring data and identify the most important measures of water quality management program success.
- Program integration—The water quality agency explains how water quality management programs have relied on information gathered from ambient monitoring and assessment, focusing discussion on specific programs, including WQS, nonpoint source assessment and management, TMDLs, NPDES permitting, CWA section 404/401 dredge and fill permits, and any other important permitting and planning schemes. The agency should explain how data gathered via monitoring and assessments are viewed in context of their importance to application to other water quality management programs.

- Training—The water quality agency provides information on training of agency program personnel, including the depth of training and its frequency. In addition, the water quality agency clarifies whether such training is extended to outside entities affected by management programs.

3.3.6 Self-Assessments

During the on-site review, the water quality agency completes two self-assessments. In the self-assessments, the reviewer guides the water quality agency through discussion questions (see Appendix C) to discuss how its existing program would respond to given situations and to consider what additional technical capability would optimize its program capability and efficiency. Cross program discussion will foster a more complete understanding within the agency of whether the current biological assessment program is providing the needed data and information in the appropriate time frame to support multiple water quality programs and potentially identify areas where technical changes would enhance use of the data and better support agency water quality program goals and objectives.

The water quality agency is asked to modify the discussion questions prior to the on-site evaluation to make them as relevant and applicable as possible, including substituting any terminology (e.g., specific types of aquatic resources). Agency personnel proceed through each of the discussion questions and summarize how the programs currently incorporate biological assessment information to support their programs and develop recommendations for improvements. Agency personnel are encouraged to include comments describing each answer and specifics on how the current state program would respond to the discussion question. Upon completion, the reviewer collects the information and recommends and uses them to help develop recommendations for technical development of the biological assessment program to be included in the technical memorandum.

3.4 Part 2: Technical Elements Evaluation

Following a brief presentation regarding the technical elements evaluation process, the reviewer leads a discussion about the 13 technical elements (described in chapter 2). During this discussion participants provide input on scoring (see chapter 2 and Appendix E). Once a score has been assigned for each of the 13 elements, the numbers are tabulated and converted to a percentage that yields the agency's level of rigor. The water quality agency also provides information about any in-progress improvements to the biological assessment program that will result in the elevation of the score for specific technical elements.

3.4.1 Technical Elements of State Biological Assessment Programs: A Process to Evaluate Program Rigor and Comparability

The review typically begins with an overview presentation of the evaluation process. The presentation can include ways states and tribes can determine their current level of rigor and how to use this information to achieve specific milestones to improve the overall level of program rigor. The overview can also include examples of previous assessments, specifically those from the EPA regional pilots that were conducted annually during 2002–2008 (Yoder and Barbour 2009; this document). The presentation might also include general recommendations that were made to the pilot states and tribes, which prescribe implementing high-level biological assessment programs as a continual, iterative process involving the creation of regional working groups consisting of water quality agency staff and regional EPA personnel.

3.4.2 Technical Elements Checklist

As described in Chapter 2, the 13 technical elements checklist (see Appendix E) is used to assign a level of rigor to a water quality agency's biological assessment program. Agency personnel and the reviewer will discuss the basis for the scores using the checklist for each of the 13 elements. The reviewer will assign a preliminary score for each of the 13 elements and take notes regarding the score's justification and any ongoing water quality agency efforts and/or program developments that would affect the score. A tour of field and/or laboratory facilities might also be conducted during this portion of the review. Once each of the 13 elements has been scored, the results are tabulated and a score is assigned. These results are discussed by the review team and steps to address program gaps are identified. The score determines the level of rigor of an agency's biological assessment program. The water quality agency and reviewer will discuss the results of the technical elements exercise during the on-site visit and through follow-up conversations after the technical memorandum has been received and reviewed by the water quality agency.

3.5 Preparation of Technical Memorandum

The final output of the biological assessment program evaluation is the technical memorandum. Using the detailed information and documents provided by the water quality agency, the reviewer prepares a technical memorandum that summarizes the agency's biological assessment program, assigns the program a level of rigor, and justifies this assignment by providing the scoring's rationale. The technical memorandum includes recommendations on how the water quality agency can improve its biological assessment program and the development and use of numeric biological criteria, and on what steps it can take to achieve a higher level of rigor. These recommendations typically include enhancements relative to design, methodology, and execution of credible data.

Following completion of the technical memorandum, the reviewer submits it to the water quality agency and EPA regional staff for review and comment. Once the comments are received, they are incorporated into a final version. A template for the technical memorandum is available in Appendix D.

3.6 Action Plan Development

The ultimate goal of the biological program review is to produce the data and information needed by water quality agencies to strategically plan and allocate resources to develop and support a high-quality biological assessment program. In addition to evaluating the technical elements of a biological assessment program, identification of water quality program information needs (e.g., CWA section 303[d] listing, TMDLS, NPDES, nonpoint sources) and the flow of data from the monitoring program to the different water quality programs is an essential part of the evaluation. The program review produces technical recommendations for development of a high-quality biological assessment program and for effective use of the data and information that the technical program will generate.

In 2006 EPA Region 5 convened a region and state workshop on development of biological assessment and criteria programs. A central theme at the workshop was the importance of parallel efforts to:

- Establish early dialogue between management and technical staff to determine how high quality biological assessment information will be incorporated into the water management program. This dialogue is critical to ensure that the monitoring program plans for the design and production of data and information that will support water program information needs.
- Plan for the appropriate use of biological assessment information as the monitoring and assessment program's level of technical rigor increases. At all levels of technical development, biological assessment information can be used to support water quality decisions. The degree of confidence with which this can be done varies depending on the questions being addressed. The information produced by a program with a low level of rigor might be used to support screening for high-quality or severely degraded conditions (e.g., looking for "hot spots" that need immediate attention) and to identify water quality limited waters. Additionally, the biological assessment methods characteristic of a low level program might be used to support special studies as long as the degree of confidence (e.g., within site variability) is characterized and documented. As the level of program rigor is increased, more comprehensive and detailed condition assessments can be produced to further support CWA section 305(b) reporting and 303(d) listing decisions and report environmental outcomes from water quality management actions. As the state further develops and refines its biological assessment measures in conjunction with chemical, physical, WET, and landscape assessments, the monitoring and assessment program is increasingly able to provide information that contributes to stressor identification and development of attainable restoration targets.

Based on the discussions with the 23 program reviews done to date, the technical program needs to be developed within context of management needs and agency policy so that the information ultimately produced is used to support water quality management. For example, a biological assessment program with a high level of rigor might have the technical capability to develop biological measures sensitive to early changes in biological assemblages. The agency might consider incorporating these measures into its numeric biological criteria and refining its aquatic life uses to support protection of excellent and good conditions and implement preventive actions. In the pilot states where the dialogue between the monitoring program and the parts of the water program that use the data did not occur regularly, biological assessment information to support water quality management had not been fully realized.

3.7 Summary

The integration of rigorous biological assessments with other environmental data and assessments (e.g., chemical, WET, physical, landscape) is important for developing a comprehensive, data-driven but cost effective approach to support water quality management (USEPA 2011c). Despite advancements and successes in water quality management since the CWA was enacted, pollutants (e.g., pathogens, metals, nitrogen, and phosphorus pollution) continue to be major causes of water quality degradation. Additionally, the impact of other significant stressors, including habitat loss and fragmentation, hydrologic alteration, invasive species, and climate change, can be better understood using analytical tools and information that can operate at the ecosystem scale, such as biological assessments.

The biological assessment program review can be a first step toward identifying the specific actions a water quality agency can take to attain a rigorous biological assessment program. Additionally, an agency's overall ability to make management decisions is enhanced by using biological assessment to more precisely define designated aquatic life uses, develop numeric biological criteria, and associate biological response to chemical, physical, and landscape data (USEPA 2011c). The results of the review are intended to inform incremental technical development, future use refinements, and biological criteria derivation in context of sound scientific information and well-integrated monitoring and assessment information. For example, Minnesota's biological assessment program underwent a review in 2005 and then developed a plan with milestones to implement the review recommendations. The review process helped Minnesota Pollution Control Agency produce a detailed plan for technical program development to support refining the state's designated aquatic life uses and development of numeric biological criteria for streams and rivers.[8] Likewise, the California biological assessment program underwent a technical elements review in 2009. At the time of the review, California was already implementing a plan to develop its biological assessment program, but participation in the review process helped California align its program to the national elements framework. This helped California reinforce the importance of several key program elements (e.g., reference conditions, data management) and helped secure sustained management support. In 2009 the state initiated a public process to develop biological objectives (numeric biological criteria) for perennial streams and rivers.[9] This effort has included the development of guidance for selecting and evaluating candidate causes of biological impairment in different regions of the state, using the EPA's causal assessment process as a starting point. The biological objectives will be used to establish numeric scoring tools for measuring stream ecological integrity and define numeric thresholds needed to protect the state's designated aquatic life uses.

Aquatic life can vary from water body to water body. One major challenge in defining and assessing designated aquatic life uses is separating the natural variability that is a function of water body type and the ecological region from the variability that results from exposure to

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[8] http://www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-rulemaking/tiered-aquatic-life-use-talu-framework.html

[9] http://www.waterboards.ca.gov/plans_policies/biological_objective.shtml

stressors. Rigorous biological assessment programs can provide the detailed information required to more precisely define the expected biotic community for a water body and derive numeric biological criteria. By accounting for natural variability in aquatic systems, rigorous biological assessments can help reduce a source of uncertainty and error in water quality management. Additionally, in nature there is a continuous gradient of biological response to increasing exposure to stressors. A rigorous biological assessment program can support other agency water quality programs with the technical capability to discriminate levels of biological response along a stressor gradient to help identify and protect high-quality waters and set attainable restoration goals for degraded waters.

By conducting rigorous biological assessments in conjunction with chemical, WET, physical, and landscape data and assessments, more detailed relationships between the aquatic resource, stressor agents, and management actions can be developed. This means that an agency's biological assessment program can provide data and information for more than general status assessments as required by CWA section 305(b) and that can be used to inform impact assessments, studies, and investigations to support an agency's section 303(d) list, TMDL, NPDES permitting, and nonpoint source programs. Each of these programs relies on monitoring and assessment and the WQS programs to provide an accurate delineation of impairments and their associated causes, as well as determine attainment of specific requirements (e.g., criteria) on which calculations of water quality based limits are based.

The biological assessment program review process provides information and technical recommendations to the agency to further develop its technical rigor and to enhance program application. It is the agency's decision on when and how to implement the review results and recommendations for program improvements. Involvement of EPA staff in the review process is recommended to align agency efforts and resources to support the desired program development and foster agency partnerships. For example, regional EPA staff was involved throughout the Minnesota review and were instrumental is aligning EPA support and assistance. In California, strong and sustained support from regional EPA staff helped consolidate the state's biological assessment infrastructure development and enabled the state to rapidly develop the technical basis for the state's biological criteria. If an agency is interested in conducting a biological assessment program review, it is recommended that agency personnel contact EPA's regional or headquarters biological criteria program for further information and to plan a review.

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Acronyms and Abbreviations

BCG	biological condition gradient
BMP	best management practice
BPJ	best professional judgment
CALM	Consolidated Assessment and Listing Methodology
CWA	Clean Water Act
DELT	deformities, erosions, lesions, and tumors
DQO	data quality objective
EOLP	Erie Ontario Lake Plain
EPA	U.S. Environmental Protection Agency
EPT	ephemeroptera, plecoptera, trichoptera taxa
FTE	full-time employee
GIS	geographic information system
HELP	Lake Huron/Lake Erie Plain
HUC	hydrologic unit code
IBI	index of biological/biotic integrity
IT	information technology
MDEP	Maine Department of Environmental Protection
MQO	measurement quality objective
NPDES	National Pollutant Discharge Elimination System
NYSDEC	New York State Department of Environmental Conservation
Ohio EPA	Ohio Environmental Protection Agency
QA	quality assurance
QC	quality control
PAH	polycyclic aromatic hydrocarbon

RDBMS	relational database management system
SOP	standard operating procedure
TMDL	total maximum daily load
UAA	use attainability analysis
WET	whole effluent toxicity
WQS	water quality standards
WSA	Wadeable streams assessment

GLOSSARY

aquatic assemblage	An association of interacting populations of organisms in a water body; for example, fish assemblage or a benthic macroinvertebrate assemblage.
aquatic community	An association of interacting assemblages in a water body, the biotic component of an ecosystem.
aquatic life use	A beneficial use designation in which the water body provides, for example, suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms.
attribute	The measurable part or process of a biological system.
benthic macroinvertebrates or benthos	Animals without backbones, living in or on the sediments, of a size large enough to be seen by the unaided eye and which can be retained by a U.S. Standard no. 30 sieve (28 meshes per inch, 0.595-mm openings); also referred to as benthos, infauna, or macrobenthos.
best management practice	An engineered structure or management activity, or combination of those, that eliminates or reduces an adverse environmental effect of a pollutant.
biological assessment or bioassessment	An evaluation of the biological condition of a water body using surveys of the structure and function of a community of resident biota.
biological criteria or biocriteria	Narrative expressions or numeric values of the biological characteristics of aquatic communities based on appropriate reference conditions; as such, biological criteria serve as an index of aquatic community health.
biological indicator or bioindicator	An organism, species, assemblage, or community characteristic of a particular habitat, or indicative of a particular set of environmental conditions.
biological integrity	The ability of an aquatic ecosystem to support and maintain a balanced, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats in a region.

biological monitoring or biomonitoring	Use of a biological entity as a detector and its response as a measure to determine environmental conditions; ambient biological surveys and toxicity tests are common biological monitoring methods.
biological survey or biosurvey	Collecting, processing, and analyzing a representative portion of the resident aquatic community to determine its structural and/or functional characteristics.
Clean Water Act	The act passed by the U.S. Congress to control water pollution (formally referred to as the Federal Water Pollution Control Act of 1972). Public Law 92-500, as amended. 33 U.S.C. 1251 *et seq*.
Clean Water Act 303(d)	This section of the act requires states, territories, and authorized tribes to develop lists of impaired waters for which applicable WQS are not being met, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that the jurisdictions establish priority rankings for waters on the lists and develop TMDLs for the waters. States, territories, and authorized tribes are to submit their lists of waters on April 1 in every even-numbered year.
Clean Water Act 305(b)	Biennial reporting requires description of the quality of the nation’s surface waters, evaluation of progress made in maintaining and restoring water quality, and description of the extent of remaining problems.
criteria	Elements of state water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use.
DELT	Presence of deformities, erosions, lesions, and tumors as a measure of organism health, typically assessed for fish.
designated uses	Those uses specified in WQS for each water body or segment whether or not they are being attained.
disturbance	Human activity that alters the natural state and can occur at or across many spatial and temporal scales.
ecoregion	A relatively homogeneous ecological area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables.

function	Processes required for normal performance of a biological system (might be applied to any level of biological organization).
guild	A group of organisms that exhibit similar habitat requirements and that respond in a similar way to changes in their environment.
historical data	Data sets from previous studies, which can range from handwritten field notes to published journal articles.
index of biological/biotic integrity	An integrative expression of site condition across multiple metrics; an IBI is often composed of at least seven metrics.
invasive species	A species whose presence in the environment causes economic or environmental harm or harm to human health. Native species or nonnative species can show invasive traits, although that is rare for native species and relatively common for nonnative species. (Note that this term is not included in the biological condition gradient [BCG].)
least disturbed condition	The best available existing conditions with regard to physical, chemical, and biological characteristics or attributes of a water body within a class or region. Such waters have the least amount of human disturbance in comparison to others in the water body class, region, or basin. Least disturbed conditions can be readily found but can depart significantly from natural, undisturbed conditions or minimally disturbed conditions. Least disturbed condition can change significantly over time as human disturbances change.
metric	A calculated term or enumeration that represents some aspect of biological assemblage, function, or other measurable aspect and is a characteristic of the biota that changes in some predictable way with increased human influence.
minimally disturbed condition	The physical, chemical, and biological conditions of a water body with very limited, or minimal, human disturbance.
multimetric index	An index that combines indicators, or metrics, into a single index value. Each metric is tested and calibrated to a scale and transformed into a unitless score before being aggregated into a multimetric index. Both the index and metrics are useful in assessing and diagnosing ecological condition. See **index of biological/biotic integrity.**

narrative biological criteria	Written statements describing the structure and function of aquatic communities in a water body that support a designated aquatic life use.
native	An original or indigenous inhabitant of a region; naturally present.
nonnative or intentionally introduced species	With respect to an ecosystem, any species that is not found in that ecosystem; species introduced or spread from one region of the United States to another outside their normal range are nonnative or non-indigenous, as are species introduced from other continents.
numeric biological criteria	Specific quantitative measures of the structure and function of aquatic communities in a water body necessary to protect a designated aquatic life use.
periphyton	A broad organismal assemblage composed of attached algae, bacteria, their secretions, associated detritus, and various species of microinvertebrates.
rapid bioassessment protocols	Cost-effective techniques used to survey and evaluate the aquatic community to detect aquatic life impairments and their relative severity.
reference condition (biological integrity)	The condition that approximates natural, unaffected conditions (biological, chemical, physical, and such) for a water body. Reference condition (biological integrity) is best determined by collecting measurements at a number of sites in a similar water body class or region undisturbed by human activity, if they exist. Because undisturbed conditions can be difficult or impossible to find, minimally or least disturbed conditions, combined with historical information, models, or other methods can be used to approximate reference condition as long as the departure from natural or ideal is understood. Reference condition is used as a benchmark to determine how much other water bodies depart from this condition because of human disturbance. See **minimally disturbed condition** and **least disturbed condition**

reference site

A site selected for comparison with sites being assessed. The type of site selected and the types of comparative measures used will vary with the purpose of the comparisons. For the purposes of assessing the ecological condition of sites, a reference site is a specific locality on a water body that is undisturbed or minimally disturbed and is representative of the expected ecological integrity of other localities on the same water body or nearby water bodies.

sensitive taxa

Taxa intolerant to a given anthropogenic stress; first species affected by the specific stressor to which they are *sensitive* and the last to recover following restoration.

sensitive or regionally endemic taxa

Taxa with restricted, geographically isolated distribution patterns (occurring only in a locale as opposed to a region), often because of unique life history requirements. Can be long-lived, late-maturing, low-fecundity, limited-mobility, or require mutualist relation with other species. Can be among listed endangered/threatened or special concern species. Predictability of occurrence often low; therefore, requires documented observation. Recorded occurrence can be highly dependent on sample methods, site selection, and level of effort.

sensitive - rare taxa

Taxa that naturally occur in low numbers relative to total population density but can make up large relative proportion of richness. Can be ubiquitous in occurrence or can be restricted to certain microhabitats, but because of low density, recorded occurrence is dependent on sample effort. Often stenothermic (having a narrow range of thermal tolerance) or coldwater obligates; commonly k-strategists (populations maintained at a fairly constant level; slower development; longer lifespan). Can have specialized food resource needs or feeding strategies. Generally intolerant to significant alteration of the physical or chemical environment; are often the first taxa observed to be lost from a community.

sensitive - ubiquitous taxa

Taxa ordinarily common and abundant in natural communities when conventional sample methods are used. Often having a broader range of thermal tolerance than sensitive or rare taxa. These are taxa that constitute a substantial portion of natural communities and that often exhibit negative response (loss of population, richness) at mild pollution loads or habitat alteration.

stressors	Physical, chemical, and biological factors that adversely affect aquatic organisms.
structure	Taxonomic and quantitative attributes of an assemblage or community, including species richness and relative abundance structurally and functionally redundant attributes of the system and characteristics, qualities, or processes that are represented or performed by more than one entity in a biological system.
taxa	A grouping of organisms given a formal taxonomic name such as species, genus, family, and the like.
taxa of intermediate tolerance	Taxa that compose a substantial portion of natural communities; can be r-strategists (early colonizers with rapid turnover times; boom/bust population characteristics). Can be eurythermal (having a broad thermal tolerance range). Can have generalist or facultative feeding strategies enabling use of relatively more diversified food types. Readily collected with conventional sample methods. Can increase in number in waters with moderately increased organic resources and reduced competition but are intolerant of excessive pollution loads or habitat alteration.
threatened waters	Waters that are currently attaining water quality standards, but which are expected to exceed water quality standards by the next 303(d) listing cycle.
tolerant taxa	Taxa that compose a small proportion of natural communities. They are often tolerant of a broader range of environmental conditions and are thus resistant to a variety of pollution- or habitat-induced stresses. They can increase in number (sometimes greatly) in the absence of competition. Commonly r-strategists (early colonizers with rapid turnover times; boom/bust population characteristics), able to capitalize when stress conditions occur; last survivors.
total maximum daily load	The calculated maximum amount of a pollutant a water body can receive and still meet WQS and an allocation of that amount to the pollutant's source.
water quality management (nonregulatory)	Decisions on management activities relevant to a water resource, such as problem identification, need for and placement of best management practices, pollution abatement actions, and effectiveness of program activity.

water quality standard A law or regulation that consists of the designated use or uses of a water body, the narrative or numerical water quality criteria (including any biological criteria) that are necessary to protect the use or uses of that water body, and an antidegradation policy.

whole effluent toxicity The aggregate toxic effect of an aqueous sample (e.g., whole effluent wastewater discharge) as measured by an organism's response after exposure to the sample (e.g., lethality, impaired growth or reproduction); WET tests replicate the total effect and actual environmental exposure of aquatic life to toxic pollutants in an effluent without requiring the identification of the specific pollutants.

APPENDIX A: AGENDA FOR ON-SITE INTERACTION MEETING

State/Tribal Agency Biological Assessment Program Evaluation

AGENDA

DAY 1	Date
	Building #____ Room ____
9:30–10:00 am	**Welcome and Introductions** • Refinements to the agenda • General purpose and overview
10:00–11:30	**[Agency] Biological Assessment Program Review & Development** • Key concepts and examples • Development of state programs • U.S. Environmental Protection Agency (EPA) methods and key documentation
11:30–1:00 pm	**LUNCH**
1:00–2:00	**Overview of [name of water quality agency to be reviewed] Biological Assessment Program by [Agency] staff** • Brief history of [water quality agency] biological program • Current developments and updates
2:00–5:00	**[Agency] Monitoring & Assessment Program—following list of annotated discussion topics** Monitoring & Assessment Program ▪ Water body types ▪ Spatial design ▪ Basin assessments

- Indicators—chemical, physical, biological
- Data management
- Resources for monitoring and assessment

Reporting & Listing

- Delineation of impairments
- Assessment process
- 305(b)/303(d)
- Other program support

DAY 2 Date

Building #____ Room ____

9:00–10:30 am **[Agency] Managers' Overview of Biological Assessment-based Programs**

- Process overview
- Concepts and examples–implications for water quality standards (WQS)

10:30–11:30 **Assessment and Integration**

- Using indicators to measure effectiveness
- Using monitoring and assessment to support water quality management programs

11:30–1:00 pm **LUNCH**

1:00–3:00 **Water Quality Standards**

- General description of [Agency] WQS
- Structure of designated uses and attendant criteria
- Aquatic life uses and biological criteria

- Use attainability analyses (UAAs), site-specific modifications, etc.
- Implications

3:00–5:00 **Agency Self-Assessments**

- Complete agency self-assessments and discuss results (might be beneficial to have the agency complete the self-assessments prior to the biological assessment program evaluation)

DAY 3 Date

Building #____ Room ____

8:30–11:30 am **Technical Elements Review of [Agency] Biological assessment Program**

- Overview of technical elements review process
- Scoring each element in the technical elements checklist

11:30–1:00 pm **LUNCH**

1:00–2:00 **Technical Elements Review (continued)**

2:00–4:30 **Q&A**

- Follow-up on any of the previous days' topics

APPENDIX B: INTERVIEW TOPICS FOR AGENCY REVIEW

State/Tribal Monitoring and Assessment and Water Quality Standards Program Interviews: Annotated List of Discussion Topics

Introduction

A critical component of the biological program review is the detailed interviews of key agency program managers and staff. The purpose of these discussions is to understand the existence and extent of data-driven water quality management. These interviews are an opportunity to better define and understand the uses of monitoring and assessment information in the water quality agency and to determine the opportunities, incentives, impediments, and barriers to the fuller use of this information in support of water quality management programs. In addition, the interviews examine the intersections of biological assessment with water quality standards (WQS), designated aquatic life uses, and criteria.

The biological program review is focused on current and planned uses of monitoring and assessment information in support of all relevant water quality management programs. This includes the following broad program areas that water quality management agencies have in common:

- WQS focusing on designated uses and criteria
- Reporting and listing (watershed assessments, Clean Water Act [CWA] section 305(b)/303(d) reporting) and total maximum daily load (TMDL) development schedules
- Water quality planning, TMDL development and implementation, nonpoint source assessment and management, dredge and fill (CWA section 404/401)
- National Pollutant Discharge Elimination System (NPDES) program (CWA section 402)

Managers and staff who can speak to the operation and management of these programs should attend the interview when these topics are discussed.

The following topics are intended to guide the interview process. These topics are also intended to help the agency determine who from the agency programs should attend each day's discussions.

Monitoring and Assessment Program

Monitoring is the systematic collection of chemical, physical, and biological (including WET) data in the ambient environment. Assessment is the analysis and transformation of that data into meaningful information that includes attainment/nonattainment determinations, characterization of impairments (extent and severity), associations between impaired status and causes (i.e., agents) and sources (i.e., activity or origin), and data and information to develop improved tools, indicators, criteria, and policies. Monitoring and assessment supports the reporting that is required by the CWA (sections 305[b], 303[d] list, 319, etc.) and that is used by the agency for allied purposes (watershed assessments, site-specific assessments, planning, TMDL development, etc.). The following are core topics for discussion. The agency might wish to add other topics.

1. Spatial design
    - Is a rotating basin approach used? Describe the sequence and cycle and, linkages to management activities.
    - Is the spatial design probability-based (scale and scope, statewide, regional, etc.)?
    - Fixed station (e.g., tenure and history)
    - What resource types are covered (wadeable streams, large rivers, great rivers, lakes, wetlands, headwater streams, etc.)?
    - Is the spatial design for the monitoring program aligned with, or directly feeding into, other monitoring and assessment programs at the local, regional, or federal level?
2. Basin assessments
    - At what scale are assessments done (major basin, subbasin, watershed, subwatershed)? Hydrologic unit code (HUC) units?
    - What is the site-selection process (targeted, random, other)?
    - What stratifying factors are considered (watershed area, stream order, other)?
    - How many sites are assessed each year?
    - What site density (i.e., the number of sites allocated to a specific study area) is used?
    - What is the data analysis and reporting sequence?
    - What are the bottlenecks in data analysis and reporting?
    - Are there other significant logistical issues?
    - What study planning process is used? Are all affected disciplines integrated?
3. Index periods
    - Describe the seasonal sampling index periods by indicator (summer-fall, monthly, other).
    - Explain the flow attenuated considerations (loading estimates, event related, summer-fall low flow, etc.).
4. Biological (including WET)/chemical/physical assessment
    - What media are assessed (water, sediment, tissues, etc.)?

- What is the purpose of sampling (ambient characterization, model calibration, long-term trends, reference/background, etc.)?
- Which parameter groups are considered? How are the groups selected?
- What type of laboratory support is available?
- Describe the sampling design and logistics (survey design, frequency, grabs vs. composites).
- Are there exceedance issues (magnitude, duration, frequency)?

5. Reference condition
    - Have reference sites been established? For what purposes (e.g., biological criteria, nutrients, background conditions)?
    - How many reference sites are used?
    - What is the spatial organization and stratification (ecoregions, hydrologic units, physiographic regions, other)?
    - How is reference condition established (data driven, cultural, least affected)?
6. Data processing and management
    - How are data stored (WQX, other system)?
    - How are data accessed by staff for analysis?
    - What resources are dedicated to data management (full time employees [FTEs])?
    - What are the quality assurance/quality control (QA/QC) procedures for ensuring data quality?
    - What is the timetable for entry and validation?
    - Describe the ease of data availability within and outside the agency.
    - What is the demand for data from outside the agency?
7. Monitoring strategy
    - Discuss the latest monitoring strategy available (please provide a copy).
    - Is the strategy a useful document?
    - Should the strategy serve as documentation of data acceptability?
    - Are data quality objectives (DQOs) defined?
    - How frequently is the strategy updated?

8. Resources
    - How many FTEs are devoted to monitoring and assessment by discipline (chemical/physical, biological assessment, TMDL/modeling, etc.)?
    - What proportion of FTEs is devoted to water quality management programs? (provide a table of organization for the CWA parts of the water quality agency program)
    - What funding sources are available? What are their limitations? Is the agency leveraging resources with other programs?
    - Are current resources adequate? If not, what is needed?

Reporting and Listing (305[b]/303[d]) and TMDLs

Reporting and listing are the processes of producing the integrated CWA section 305(b)/303(d) report, which includes the list of waters with impaired or threatened uses and TMDL development schedules. The information contained in these reports and lists is not only important to determining the effectiveness of a water quality agency's water quality management programs, but is increasingly being used to set program priorities and allocate funding. Monitoring and assessment information is an indispensable element of this process and how it is generated and applied determines, in part, the accuracy of the statistics that are reported and used. Thus, it is important to determine and understand how each water quality agency uses monitoring and assessment information to support these determinations.

1. Delineation of impaired or threatened waters
    - What are the procedures and protocols for determining impaired waters (including extent and severity)?
    - What are the primary arbiters of impairment and threat?
    - What data qualifiers are used (analogs to the formerly used monitored and evaluated categories)?
    - What is the extent of extrapolation from single and aggregate sampling sites? How was this developed, and has it been tested?
    - What data are the basis of decisions about aquatic life use impairment (biological, chemical/physical, mix of both, best professional judgment [BPJ], etc.)?
    - Is determination of causes and sources of impairment and threat linked to an impairment or threat?
    - How are determinations of severity, extent, and incremental change made?

- How is the universe of resources defined (miles of rivers and streams, lake acres, etc.)?
- How does the water quality agency account for the proportion of resources that are actually assessed?

2. Assessment process
    - Explain "chain-of-custody." Do the same staff who collect and analyze sampling data also produce the assessments? Are there any "hand-offs"?
    - How are data from volunteer organizations used? Are there "admission" requirements? Any testing of accuracy? Pressure to accept data?
    - How are data from other organizations handled? What are the acceptance requirements?
    - Are there requirements for credible data or similar legislation?
3. 305(b) reporting topics
    - How are trends assessed (e.g., tracking of aggregate condition through time, by resource type, designated uses, etc.)?
    - How is CWA section 305(b) reporting information used by agency to guide water quality management? Is it the 305(b) report viewed by management as a report card? Does it have other uses? Does it distinguish impairment by point and nonpoint sources? Any subsets within each?
    - What is the extent to which outside groups use 305(b) reporting information?
    - What would be the impact of any changes due to assessment method?
4. 303(d) listing and TMDLs
    - Describe the relationship between former CWA section 305(b) report and existing 303(d) list (e.g., conversion process, issues, concerns, gaps, and shortfalls).
    - Is TMDL development coordinated or aligned with ambient monitoring and assessment?
    - Are biological data used in the TMDL process? Are there any issues and concerns? Conflicts?
    - How are biological impairments considered? Which listing category?
    - Are there sufficient biological assessment tools available to help develop defensible TMDLs that will contribute to restoration of impaired aquatic life uses? If not, what is needed and how long will it take?

Water Quality Standards

WQS provide the basis for water quality management and for judging the effectiveness of water quality management programs.

- General WQS issues
  - Describe the structure of the water quality agency's current WQS (designated uses, criteria, and antidegradation policy and implementation procedures).
  - How are chemical water quality criteria derived? Any modifiers or adjustment factors?
  - How are existing uses determined?
  - When and where are site-specific criteria used? How many instances?
  - How would better monitoring and assessment affect the WQS process?
- Designated uses
  - Describe aquatic life designated uses in the state WQS (a copy of the relevant parts of the WQS is requested).
  - Are individual waters designated? Are there default uses? Undesignated waters? Tributary rules? Other issues?
  - What triggers individual water body designations? Are they always downgrades? Does anything trigger an upgrade? Is there a regular process for inventorying these needs?
  - Are there designated uses that are less than the CWA section 101(a)(2) goal uses? Are they defined?
  - Is there a process to use biological assessments to more precisely define designated aquatic life uses and develop numeric biological criteria to protect those uses?
  - What is the level of water quality agency interest in use of biological assessment to more precisely define uses (advantages, disadvantages, barriers to development and implementation)?
- Use attainability analysis (UAA)
  - Does the agency have experience with UAAs (number attempted/completed, problems, issues)?
  - Outline/describe the existing UAA process. Is it routine? Special project oriented? What triggers a UAA? What are preferred data and information requirements?

  - How do stakeholders perceive the UAA process (pros and cons, requests for and by whom, etc.)?
  - Has the emphasis on CWA section 303(d) listing increased the "interest" in UAAs?
  - What criteria are used to determine attainability of uses?
  - What are the likely stressors in your state? What are the sources of the stressors?
- Biological criteria
  - Have biological criteria been adopted or proposed (narrative, numeric)?
  - How are biological criteria linked to designated uses?
  - Are biological assessments used to more precisely define designated aquatic life uses and develop numeric biological criteria?
  - What are the advantages and disadvantages of biological criteria in WQS?
  - How would numeric biological criteria affect the use review process?
  - Describe habitat assessments and criteria.
  - What are stakeholder perceptions and viewpoints on biological criteria?

Assessment Integration Issues

The integration of monitoring and assessment information within water quality management programs is an important and emerging issue. The National Environmental Performance Partnership System promotes joint priority setting and planning through the increased use of environmental goals and indicators. Shared goals and milestones could be used to more comprehensively report to the public and environmental decision makers about the status of water resources in the water quality agency and to document progress in meeting these goals. The goals and milestones could also be used to more effectively target programmatic efforts at all levels. It is important to be able document achievements so that environmental successes are recognized, funding is maintained at appropriate levels, and effective management programs continue to be implemented. The following are aimed at assessing the water quality agency's efforts to develop and use indicators and integrate them into water quality management.

1. Indicators for surface waters
   - What efforts have been taken to develop a process for using environmental indicators to fulfill the role as a measure of the effectiveness of water quality management programs (provide any documentation)?
   - Are any implemented or practiced?
   - How dependent are these systems on monitoring data?

- What is the awareness of past U.S. Environmental Protection Agency (EPA) indicator development efforts (i.e., national indicators for surface waters, hierarchy of indicators, etc.)?
- Is there any recognition of indicator roles (i.e., stress, exposure, response roles of indicators)?
- What is (are) the most important measure(s) or indicator(s) of water quality management program success in your water quality agency?

2. Program integration
   - Are there any examples in which water quality management programs rely on ambient monitoring and assessment information?
   - Is monitoring and assessment information used to support:
     - The NPDES permitting process (e.g., reasonable potential determinations and permit compliance)? CWA section 402 NPDES program including stormwater phase I or II?
     - CWA section 319/nonpoint source planning and implementation?
     - CWA 404/401 process? Other programs?
   - How is monitoring and assessment information and resulting assessments and reports, regarded by the above programs (essential, useful, nice to have, inconsequential)?
3. Training
   - Are training opportunities afforded to staff and/or management?
   - How do these relate to indicators development, monitoring and assessment, biological assessment, or ecological principles in general?
   - Does your agency receive requests for field demonstrations (fish, bugs, sampling, etc.) for internal and external purposes?
   - Is training available for external entities?

APPENDIX C: SELF-ASSESSMENTS BY STATE/TRIBAL AGENCY MANAGERS

The self-assessment exercise is conducted during the on-site evaluation. The technical expert walks participants through a discussion of how biological assessment information can be more effectively used to support water quality program needs for information. It is important that representatives from different water quality programs participate in order to: (1) gain a cross-program understanding of how biological assessments can be used to support multiple water quality programs; (2) identify the type of biological assessment information needed by their programs and timing for information delivery; and, (3) identify efficiencies for more cost effective biological assessments. Programs interested in conducting a review do not need to complete these self-assessment questions in advance. The results of these discussions do not factor into scoring of the technical elements.

The topics and questions included in the worksheets are provided as examples that can be used to initiate cross program discussion.

SELF-ASSESSMENT 1

Use of biological assessments to protect aquatic life use

1. Answering these questions requires a thorough understanding of the aquatic life uses in your water quality agency's water quality standards law.
   - To know this, you have to be familiar with the aquatic life uses in your water quality standards and understand what parts, if any, of the aquatic life uses are assessed with biological assessment data.
2. For aquatic life uses that are assessed using biological assessment data, an estimate of what biological condition gradient (BCG) level, or levels, your water quality agency's uses provide protection is recommended;
   - To know this, the biological monitoring technical staff can determine (for example, by a consensus of professional judgment) to what BCG level(s) your water quality agency's biological criteria thresholds (e.g., numeric criteria, Rapid Bioassessment Protocol (RBP), or Index of Biological Integrity (IBI) ranges) provide protection. Alternatively, if your program does not have numeric biological criteria, the staff can evaluate what BCG level your state uses for listing biologically impaired waters. In other words, how does biologically-based aquatic life use attainment measured by numeric biological criteria and/or CWA section 303(d)-listing thresholds map to a BCG level?
   - Familiarity with your water quality agency's application of biological criteria thresholds in regulatory decision-making is important to help identify how biological assessment information can be used to guide the discussion on added value of further technical improvement (i.e., be familiar with findings that have triggered an agency response based on aquatic life use attainment as determined by biological assessment and criteria).
   - Example scenarios characteristic of situations your agency encounters are recommended to help focus the discussion and the identification of current strengths and limitations of the biological assessment program.

WORKSHEET FOR TOPIC 1: PROTECTION OF HIGH QUALITY WATERS

Example: A watershed with minimal impacts to aquatic systems from anthropogenic stress. Streams, wetlands, lakes, and rivers support high quality biological communities based on biological indices (e.g., benthic macroinvertebrates, algal, and/or fish assemblages). The presence of reproducing native species is documented. Downstream waters such as bays and estuaries support a range of biological conditions, including high quality biological communities in areas that are minimally impacted.

1. Does the existing biological assessment program provide information to detect declines in biological condition in high quality waters?

_____YES _____NO

2. If yes, does the program provide information to detect declines within the assigned aquatic life use class?

_____YES _____NO

If no to either of the above two questions, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 1: PROTECTION OF HIGH QUALITY WATERS (page 2)

3. Does the existing biological assessment program provide information to support an agency action to assign the highest quality waters to different aquatic life use categories?

_____YES _____NO

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

4. Does the existing biological assessment program currently provide information to support agency decisions and actions (e.g., antidegradation policies, best management practices) to protect the highest quality waters?

_____YES _____NO

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 2: PROTECTION OF CURRENT CONDITIONS

Example: A watershed with a mix of minimal to moderate impacts to aquatic systems from anthropogenic stress. Streams, wetlands, lakes, and rivers support a range of biological conditions based on biological indices (e.g., benthic macroinvertebrates, algal, and/or fish assemblages). The presence of reproducing native species has been observed in waters where there is minimal anthropogenic stress. Downstream waters such as bays and estuaries also support a comparable range of biological conditions and levels of anthropogenic stress.

1. Does the existing biological assessment program provide information to detect declines in biological condition?

_____YES _____NO

2. If yes to above, are the current indices sufficiently sensitive to detect incremental declines within the assigned aquatic life use class?

_____YES _____NO

If no to either of the above questions, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 2: PROTECTION OF CURRENT CONDITIONS (page 2)

3. Does the biological assessment program provide information that the agency could use to evaluate potential impacts on the aquatic community? (For example, a new and/or modification to an existing industrial, transportation, or residential development is proposed that might have an impact on aquatic life in the watershed.)

_____YES _____NO

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 2: PROTECTION OF CURRENT CONDITIONS (page 3)

4. If an evaluation for potential impacts indicates that the proposed activity would result in a further decline in biological condition, would the biological assessment information used in the evaluation support an agency action to minimize or prevent the predicted decline?

_____YES _____NO

If yes, what changes to the type, amount, or quality of biological assessment information would be useful to provide better support?

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 3: PROTECTION OF IMPROVED CONDITIONS

Example: A watershed with mix of minimal to severe impacts from anthropogenic stress. Streams, wetland, lakes, and rivers support a range of biological conditions from poor to excellent based on biological indices (e.g., benthic macroinvertebrates, algal, and/or fish assemblages). The presence of reproducing native species is documented only in higher quality waters. Some of the severely impacted waters have been assigned a limited or modified aquatic life use based on the findings of a use attainability analysis. Incremental improvements in biological conditions in several water bodies have been observed. For a few of the severely impacted waters, incremental improvements have been observed but conditions still do not meet a higher use class. Downstream waters such as bays and estuaries also support a comparable range of biological conditions and levels of anthropogenic stress.

1. Does the existing biological assessment program provide information to detect incremental improvements in biological condition?

_____YES _____NO

2. If yes to above, are the current indices sufficiently sensitive to detect incremental changes within the assigned aquatic life use class?

_____YES _____NO

If no to either of the two questions above, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 3: PROTECTION OF IMPROVED CONDITIONS **(page 2)**

3. Does the biological assessment program produce information to support an agency decision to report and take action to protect improved aquatic life condition in a water body where incremental improvements have been observed?

_____YES _____NO

If yes, please identify the specific management programs currently supported by biological assessment data. Are there improvements to the type, quality, or delivery of the data that can enhance use of the data?

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 4: SUPPORT USE CLASSIFICATION

Example: A watershed with a mix of minimal to severe impacts from anthropogenic stress. Streams, wetlands, lakes, and rivers support range of biological conditions from poor to excellent based on biological indices (e.g., benthic macroinvertebrates, algal, and/or fish assemblages). The presence of reproducing native species in the higher quality waters is well documented.

1. Does the biological assessment program produce information to support refining an aquatic life use goal for water bodies?

_____YES _____NO

If no, what changes to the type, amount or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

SUMMARY WORKSHEET: SELF ASSESSMENT SESSION 1

Discussion Topics	YES	NO
1. Protect high quality waters		
2. Protect current conditions		
3. Protect improved conditions		
4. Support for use classification		

Summary observations and key recommendations:

SELF-ASSESSMENT 2

Use of biological assessments to support water quality management programs

1. To answer these questions requires a thorough understanding of the information flow and management decision-making process within and between programs in your agency. In some cases this communication and decision-making may primarily occur at the technical staff level, but in other cases it may occur between program managers (e.g., between the permitting and the monitoring manager, or the water quality standards coordinator and the monitoring manager) or even at the level of the water Program Director or agency Commissioner.

    - The questions are most usefully answered during a cross-program group discussion that includes representatives from all programs and levels of management.

2. For state agencies with aquatic life uses that are assessed using biological monitoring data, it is helpful to estimate to what BCG level, or levels, your water quality agency's aquatic life uses and numeric biological criteria provide protection;

    - To know this, the biological monitoring technical staff can determine (for example, by a consensus of professional judgment) to what BCG level(s) your water quality agency's biological criteria thresholds (e.g., numeric criteria, RBP, modeled index (e.g. RIVPACS), or IBI ranges) provide protection. Alternatively, if your program does not have numeric biological criteria, the staff can evaluate what BCG level your state uses for listing biologically impaired waters. In other words, how does biologically-based aquatic life use attainment measured by numeric biological criteria and/or CWA section 303(d)-listing thresholds map to a BCG level?

3. The group answering this self-assessment should have some familiarity with your water quality agency's application of biological criteria thresholds in regulatory decision-making (i.e., be familiar with findings that have triggered an agency response based on aquatic life use attainment/non-attainment as determined by biological assessment and criteria).

4. Example scenarios characteristic of situations your agency encounters are recommended to help focus the discussion and the identification of current strengths and limitations of the biological assessment program.

WORKSHEET FOR TOPIC 1: SUPPORT FOR WATER QUALITY STANDARDS

1. Does the biological assessment program provide data to support derivation of numeric biological criteria?

_____YES _____NO

If yes, please list the water body types for which numeric biological criteria have been developed:

Primary Headwater Streams	_____YES	_____NO
Streams	_____YES	_____NO
Rivers	_____YES	_____NO
Large Rivers	_____YES	_____NO
Lakes	_____YES	_____NO
Wetlands	_____YES	_____NO
Estuaries	_____YES	_____NO
Other (add below)	_____YES	_____NO
[water body type]	_____YES	_____NO
[water body type]	_____YES	_____NO
[water body type]	_____YES	_____NO

If yes to any of the above, are there improvements or refinements to the type, amount, quality, or delivery of the data that would be useful? Please specify any recommendations for further technical development.

If no to any of the above, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 1: SUPPORT FOR WATER QUALITY STANDARDS (page 2)

2. Does biological assessment information, whether from monitoring or from peer reviewed literature, contribute to review of existing water quality criteria and/or to detection of the need for new criteria or site-specific modifications?

_____YES _____NO

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 1: SUPPORT FOR WATER QUALITY STANDARDS (page 3)

3. Has your agency ever used biological assessments to assess effects or determine the need for criteria for observed stressors for which there are no existing criteria?

Potential examples are listed below.

Habitat alteration	_____YES	_____NO
Water withdrawal/flow alterations	_____YES	_____NO
Suspended sediment	_____YES	_____NO
Nutrient effects	_____YES	_____NO
Other [list below if needed]	_____YES	_____NO

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 1: SUPPORT FOR WATER QUALITY STANDARDS (page 4)

4. During a triennial review, does the biological assessment program provide a list of waters that are attaining biological conditions higher than their currently assigned aquatic life use?

_____YES _____NO

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 1: SUPPORT FOR WATER QUALITY STANDARDS (page 5)

5. Does the biological assessment program produce information to support designating a water body to an antidegradation tier?

_____YES _____NO

If no, what changes to the type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 2: SUPPORT FOR CWA SECTION 303(D) AND TMDL PROGRAMS

1. Does the biological assessment program provide data and information used to support assessments for CWA section 303(d) purposes?

_____YES _____NO

If yes, what changes to the type, amount, or quality of biological assessment information and/or the timing of data availability improve support to your program? (Please provide specific recommendations.)

If no, what additional type, amount, or quality of biological assessment information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 2: SUPPORT FOR CWA SECTION 303(D) AND TMDL PROGRAMS (page 2)

2. If biological assessment data has been used as the sole basis for putting one or more waters on the 303(d) list (Category 5 of the Integrated Reporting Guidance [IRG]) for failure to fully support the designated aquatic life use, was the non-support determination based on:

2a. Failure to meet a state numeric biological criteria? Or

2b. Conditions inconsistent with one or more narrative WQC?

_____YES _____NO

If yes for 2b, was the determination regarding failure to meet narrative water quality criteria based on:

- Numeric biological thresholds issued as guidance values, rather than having been incorporated into the state's WQS regulations _____
- Qualitative guidance on how to interpret biological assessment data _____
- Primarily, the best professional guidance of state agency staff _____

If yes for any of these aspects, what changes to the type, amount, or quality of biological assessment information and/or the timing of data availability would improve use of biological assessments as sole basis for 303(d) listing of water bodies?

If no, what changes to the type, amount, or quality of biological assessment information might lead to use of biological assessments as the sole basis for 303(d) listing of water bodies?

WORKSHEET FOR TOPIC 2: SUPPORT FOR CWA SECTION 303(D) AND TMDL PROGRAMS (page 3)

3. Has biological assessment data been used (in the absence of evidence of failure to meet one or more chemical or physical water quality criteria) as the basis for making an affirmative determination that one or more water bodies fully supports its designated aquatic life use, and thereby belongs in Category 1 or 2 of the IRG? (Here "an affirmative determination of full support" is intended to be distinguished from simply determining that available information does not justify concluding that aquatic life use is NOT supported, which would call for putting the water body in Category 3 of the IRG, as to aquatic life use.)

If yes, would changes to the type, amount, or quality of biological assessment information improve support to your program? (Please provide specific recommendations.)

_____YES _____NO

If no, what changes to the type, amount, or quality of biological assessment information (in the absence of evidence of failure to meet one or more chemical or physical water quality criteria) might lead to use of biological assessments as the basis for declaring a water to be fully supportive of its designated aquatic life use?

WORKSHEET FOR TOPIC 2: SUPPORT FOR CWA SECTION 303(D) AND TMDL PROGRAMS (page 4)

4. Does the biological assessment program provide data and information used in support of stressor identification analyses for waters identified as having impaired aquatic life use based on biological assessments? If yes, were any individual (e.g., a particular pollutant or altered flow) stressors identified? (Please list them.)

_____YES _____NO

If yes, were there any individual stressors for which biological assessment data was the sole basis of identifying the stressors? (Please list these stressors.)

If there were no individual stressors identified using only biological assessment data:

- How was biological assessment data used to supplement other kinds of data and information in the course of identifying individual stressors? (If possible, answer on a stressor-by-stressor basis)
- What, if any, categories of stressors (e.g., heavy metals, PAHs, nutrients) were identified using biological assessment data alone?

Would changes to the type, amount, or quality of biological assessment information and/or the timing of data availability provide better support for stressor identification?

_____YES _____NO

If so, please provide specific recommendations on improvements to the biological assessment program that would improve particular aspects of your stressor identification efforts.

WORKSHEET FORTOPIC 2: SUPPORT FOR CWA SECTION 303(D) AND TMDL PROGRAMS (page 5)

5. Does the biological assessment program provide data and information to support development of TMDLs?

_____YES _____NO

If yes, in which of the following aspects of TMDL development have biological assessment data played a direct role?

__ Calculating of the overall water body-pollutant loading capacity:

__ Selecting a margin of safety:

__ Identifying sources of the pollutant of concern:

__ Allocating loads among existing and future sources:

__ Other aspects:

For any of these aspects, what changes to the type, amount, or quality of biological assessment information and/or the timing of data availability would enable such information to play a larger role? (If possible, answer on a TMDL function-by-function basis).

If no, what changes to the type, amount, or quality of biological assessment information and/or the timing of data availability would enable such information to play a direct role in TMDL development? (If possible, answer on a TMDL function-by-function basis.)

WORKSHEET FOR TOPIC 3: SUPPORT FOR CWA SECTION 402 NPDES PROGRAM

1. Is biological assessment information used to support the CWA section 402 NPDES program?

_____YES_____NO

If yes, how is the NPDES program supported by biological assessment information?

Impact assessment	_____YES_____NO
Water quality-based effluent limits (WQBELs)	_____YES_____NO
Mixing zone determination	_____YES_____NO
WET limits and monitoring	_____YES_____NO
Causal diagnosis	_____YES_____NO
Other (please specify)	_____YES_____NO

Would changes to the type, amount, or quality of biological assessment information and/or the timing of data availability improve support to your program? (Please provide specific recommendations.)

If no to any of the above questions, what additional type, amount, or quality of technical information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 3: SUPPORT FOR CWA SECTION 402 NPDES PROGRAM (page 2)

2. During NPDES permit reissuance, is information about biological condition downstream of the point source reviewed for evidence of any need to evaluate and potentially change permit limits to address observed problems? If yes, does the biological assessment program provide data and information to support the NPDES program for this purpose?

_____YES_____NO

If yes, would changes to the type, amount or quality of biological assessment information and/or the timing of data availability improve support to your program? (Please provide specific recommendations.)

If no, what additional type, amount, or quality of technical information would be useful? Would changes to data collection, data analysis, and/or internal communication (e.g., notification of permit reissuance schedule) contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 4: SUPPORT FOR CWA SECTION 319 PROGRAM

1. Does the biological assessment program provide data and information to support implementation of the CWA section 319 program?

_____YES _____NO

If yes, would changes to the type, amount, or quality of biological assessment information and/or the timing of data availability improve support to the program? (Please provide specific recommendations.)

If not, what additional type, amount, or quality of technical information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 5: SUPPORT FOR SECTION 401 CERTIFICATION

1. Does the biological assessment program provide data and information to support your agency's section 401 certification program?

_____YES _____NO

If yes, would changes to the type, amount, or quality of biological assessment information and/or the timing of data availability improve support to the program? (Please provide specific recommendations.)

If not, what additional type, amount, or quality of technical information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

WORKSHEET FOR TOPIC 6: SUPPORT FOR [insert program]

1. Does the biological assessment program provide data and information to support implementation of _______________________?

_____YES _____NO

If yes, would changes to the type, amount, or quality of biological assessment information and/or the timing of data availability improve support to the program? (Please provide specific recommendations.)

If not, what additional type, amount, or quality of technical information would be useful? Would changes to data collection and analysis and/or internal communication contribute to the use of biological assessments? Are there additional recommendations?

SUMMARY WORKSHEET: SELF ASSESSMENT 2

Discussion Topics	YES	NO
1. Water Quality Standards		
2. CWA section 303(d) and TMDL Programs		
3. CWA section 402 NPDES Programs		
4. CWA section 319 NPS Programs		
5. CWA section 401 certification		
6.		
7.		
8.		

Summary observations and key recommendations:

APPENDIX D: TECHNICAL MEMORANDUM TEMPLATE

TECHNICAL MEMORANDUM

Technical Elements Evaluation of the [State/Tribal] Biological Assessment Program

[State/Tribal Agency]

[Location]

[Dates of Third Party Assessment]

Purpose:

To evaluate the technical program and to make recommendations for enhancements relative to design, methodology, and execution for credible data as a basis of making informed decisions regarding the ecological condition of [state/tribal agency's] surface waters.

Attendance:

Agency Participant Contact, Organization, (email) Phone Number (XXX) (XXX-XXXX)

[List all state/tribal agency and U.S. Environmental Protection Agency (EPA) attendees]

Basis for Evaluation

Since 1990, EPA has supported the development of water quality agency biological assessment programs via the production of methods documents, case studies, regional workshops, and evaluations of individual water quality agency programs. EPA recommends that states and tribes use biological assessments to more precisely define their designated aquatic life uses and adopt numeric biological criteria necessary to protect those uses (USEPA 1990, 1991).

Overview and Summary of [State/Tribal Agency] Program and Significant Issues

The [date of evaluation] evaluation of the [state/tribal agency] biological assessment program addressed a range of topics, as summarized below. A biological program review was also completed using a standardized checklist and scoring methodology. The results are discussed as part of this memorandum.

Please provide a detailed summary of the agency's program for the flowing topics:

A. Monitoring and Assessment Program

____

B. Water Quality Standards (WQS): Designated Uses

____

C. Delineation of Impaired Waters

____

Biological assessment program evaluation

The following is a description of the current status of the program and the results of the technical elements evaluation.

Biological assessment program description

Please provide a detailed summary of the state's biological assessment program.

Critical elements evaluation

A biological program review was conducted by proceeding through the technical elements checklist (Appendix E) in accordance with the methodology described in *The Biological Program Review: Assessing Level of Technical Rigor to Support Water Quality Management* (EPA 820-R-13-001. The document includes a description of 13 technical elements of a biological assessment program, the checklist for evaluating the level of technical development for each element, and a method for characterizing the overall level of program rigor. The [water quality agency] critical elements evaluation yielded a raw score of __ out of a maximum possible score of 52. This is a Level __ program (range __ – __). The critical technical elements of biological assessment programs are described and divided into four general levels of technical development with Level 4 the highest level of rigor. A Level 4 program is able to provide the most comprehensive support for a water quality management program. As a technical program is improved, biological assessment information can be used with increasing confidence to support multiple water quality program needs for information. These needs include more precisely defined aquatic life uses and approaches for deriving biological criteria, supporting causal analysis, and developing stressor-response relationships.

Highlights of each element are indicated in Table D-1 (hypothetical example shown). The improvements that are needed to elevate the score for each element are described by element in the same order that they appear in the attached checklist as follows:

Table D-1. Example review results: The following recommendations were made to a state water quality agency as a result of their critical elements evaluation

Element	Comment
Element 1: Index Period Score assigned = 2.0	The score of2.0 reflects a varied adherence to a seasonal index period. Logistical bottlenecks seem to be the principal reason for deviations that can extend into the following spring of each year. Elevating the score for this element will require a strict adherence to the August 15–November 15 index period.
Element 2: Spatial Sampling Design Score assigned = 2.0	The score of 2.0 conservatively reflects the synoptic design and spatial density of sampling sites that is employed. Elevating the score to the maximum of 4.0 will require a greater spatial density within watershed assessment units particularly getting beyond the “pour point” as the only sampling site on a river or stream.
Element 3: Natural Variability Score assigned = 2.0	The CE score of 2.0 should be elevated to 4.0 with the developments that are already underway including the addition of new regional reference sites and the fuller inclusion of the other bioregions.
Element 4: Reference Site Selection Score assigned = 3.0	As criteria are further refined (site-scoring process) for reference sites, the CE score of 3.0 should improve to 4.0 because it is being employed in the selection of new regional reference sites.
Element 5: Reference Conditions Score assigned = 3.0	The CE score of 3.0 should improve to 4.0 with the additional regional reference sites that are being established as part of the ongoing improvements described for elements 3 and 4.
Element 6: Taxa and Taxonomic Resolution Score assigned = 3.0	The CE score of 3.0 reflects the full development of the macroinvertebrate assemblage and the in progress development of a second and third assemblage. Reaching the CE score of 4.0 is contingent on the full development and use of a second assemblage.
Element 7: Sample Collection Score assigned = 3.0	The CE score of 3.0 reflects the full development of the macroinvertebrate assemblage (i.e., for the mountain region only) and the in-progress development of a second and third assemblage. Reaching the CE score of 4.0 is contingent on the full development and use of a second assemblage and for all applicable bioregions.

Element	Comment
Element 8: Sample Processing Score assigned = 3.0	The CE score of 3.0 reflects the full development of the macroinvertebrate assemblage for the mountain bioregion and the in progress development of the other bioregions and a second and third assemblage. Reaching the CE score of 4.0 is contingent on the full development and use of a second assemblage.
Element 9: Data Management Score assigned = 3.0	The CE score of 3.0 can be improved to 4.0 once the data management system includes all data (i.e., habitat and fish) and is readily accessible.
Element 10: Ecological Attributes Score assigned = 2.0	The CE score of 2.0 should increase with the development of the macroinvertebrate multimetric index (MMI) for all bioregions. A descriptive analysis of the biological condition gradient (BCG) for each representative bioregion and application of these concepts to the full development of the biological indicators and assemblages will improve the score to 4.0.
Element 11: Discriminatory Capacity Score assigned = 2.0	The CE score of 2.0 will be increased to at least 3.0 with the full development of the macroinvertebrate MMI and the derivation of appropriately detailed numeric biological criteria. Achieving a score of 4.0 will require that this be accomplished for a second biological assemblage.
Element 12: Stressor Association Score assigned = 2.0	The comparatively low CE score of 2.0 is a common characteristic of biological assessment programs that are in development and/or which have singularly been focused on status assessments with no or limited coordination with other environmental assessments. Improving the score for this element will occur as a result of addressing preceding elements 2, 3, 6, 10, and 11 and gaining a familiarity with how diagnostic capacity is developed. This will require some dedication to exploratory analyses in which the response of the biological assemblages is evaluated along the stressor axis of the BCG.
Element 13: Professional Review Score assigned = 2.0	The CE score of 2.0 can be elevated to 4.0 by instituting a more formal peer review process and by publishing some of the ongoing developments in peer reviewed journals.

Critical Elements Summary

Please provide a detailed summary of the agency's critical elements performance and include a discussion of ongoing program improvements that will increase the rigor of the agency's biological assessment program.

Recommendations

Summary of recommendations to the agency on how to improve the rigor of its biological assessment program and recommendations for program enhancements to support more comprehensive and efficient use of biological assessments in an agency's water quality program.

Citations

USEPA (U.S. Environmental Protection Agency). 1990. *Biological Criteria: National Program for Surface Waters*. EPA 440-5-90-004. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <http://www.epa.gov/bioindicators/pdf/EPA-440-5-90-004Biologicalcriterianationalprogramguidanceforsurfacewaters.pdf>. Accessed October 2012.

USEPA (U.S. Environmental Protection Agency). 1991. *Policy on the Use of Biological Assessments and Criteria in the Water Quality Program.* U.S. Environmental Protection Agency, Washington, DC. <http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/biocriteria/upload/2002_10_24_npdes_pubs_owm0296.pdf>. Accessed February 2013.

APPENDIX E. TECHNICAL ELEMENTS CHECKLIST

The following is a checklist for evaluating the degree of development for each technical element of a biological assessment program and associated comments on the elements for the [water quality agency] biological assessment program. The point scale for each element ranges from lowest to highest resolution.

Element 1	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Index Period	Temporal variability is not taken into account.	Sampling period established based on practices of other agencies and/or literature. Sampling outside the index is not adjusted for temporal influence.	Index period established based on *a priori* assumptions regarding temporal variability of biological community. Effects of the use of index period are documented. Data collected outside the index period data might be adjusted to correct for temporal influences.	Temporal variability is fully characterized and taken into account for all data. Agency information needs and index periods are coordinated so that adherence to an index period is strict.	 **Points** —

Element 2	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Spatial Sampling Design	Study design consisting of isolated, single, fixed-point sites.	Low density fixed station design. Multiple sites are used for assessment of a water body or watershed condition. Spatial coverage suitable for general condition assessments. Non-random designs at coarse scale used (e.g., 4–8 digit hydrologic unit code [HUC]). Inference of site data to larger unit of assessment based on "rules of thumb" and might be supplemented by upstream/downstream assessments.	Low density random or stratified random sampling design which allows for a statistically valid inference of biological condition to a spatial unit larger than a site. The primary goal is to assess aggregate condition and trends on a statewide or regional basis.	High density (e.g., intensive) monitoring at comprehensive spatial sampling design suitable for watershed assessments (e.g., 10–12 digit HUC) and in support of multiple water quality management program needs for information (e.g., condition assessments, use refinement, use attainability analyses [UAAs], permits). As needed, the spatial sampling combines monitoring designs to optimize cost and efficiency in data collection and analysis (e.g., combination of upstream-downstream, intensive, probabilistic, and/or pollution gradient designs). Typically includes a rotating sequence of watershed units organized to provide data for management program support.	 **Points** —

Element 3	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Natural Variability	No or minimal partitioning of natural variability in aquatic ecosystems. Does not incorporate differences in watershed characteristics such as size, gradient, temperature, elevation, etc.	Classification scheme is based on assumed, first-order classes. These include strata such as fishery-based cold or warmwater classes. There is no formal consideration of regional strata such as bioregions or aggregated ecoregions. Intra-regional strata such as watershed size, gradient, elevation, temperature are not addressed. Usually applied uniformly on a statewide basis.	A fully partitioned and stratified classification scheme or modeling approach is employed. Classes and/or continuous models are defined to take critical details of spatial variability into account. Inter-regional landscape features and phenomena are appropriately sequenced with intra-regional strata. Subcategories of lotic ecotypes are defined (e.g., includes the full strata of lotic water body types). Characterization of spatial variability is confined within jurisdictional boundaries.	Scheme to fully account for natural variation is periodically refined and updated as new data and methods become available. Classes, continuous models, or both, are examined to identify the most appropriate scheme for monitoring and assessment, regulatory support, and cost-effectiveness. Developed at scales that transcend jurisdictional boundaries when necessary to strengthen inter-regional classification outcomes; recognizes the full zoogeographical aspects of biological assemblages.	**Points** —

Element 4	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Reference Sites Selection	Informal best professional judgment (BPJ) used in selection of control sites. No screens are used. Limited, if any, documentation and supporting rationale.	Based on "best biology" (i.e., BPJ on what the best biology is in the best water body). Minimal non-biological data used. Minimal documentation.	Selection based on narrative descriptions of non-biological characteristics. Combines BPJ with narrative description of land use and site characteristics. Might use chemical and physical data thresholds as primary filters.	Based on quantitative descriptions of non-biological characteristics with primary reliance on abiotic data on landscape conditions and land use. Chemical and physical data might be used as secondary filters or in a hybrid approach for severely altered landscapes. Independent data set used for validation.	**Points** —

Element 5	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Reference Conditions	No reference condition has been developed. Biological data are assessed using BPJ or based on the presence of targeted or iconic taxa.	Reference condition based on biology of an estimated 'best' site or water body. Single reference sites are used to assess biological data collected throughout a watershed. A site-specific control or paired watershed approach might be used.	Reference condition is based on a regional aggregate of reference site information. Data representing most of the major natural environmental gradients but limited in number and/or spatial density. Overall number and coverage of reference sites insufficient to support statistical evaluation of the biological condition at test sites.	Reference condition is based on data from many reference sites that span all major natural environmental gradients in the study area. Reference condition can be estimated for individual sites by modeling biota-environmental relationships. The number of reference sites is sufficient to support statistical evaluation of biological condition at test sites. Reference sites are resampled periodically. In highly altered regions or water body types, alternative methods are used to develop reference condition.	**Points** —

Element 6	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Taxa and Taxonomic Resolution	One taxonomic assemblage (e.g., benthic macroinvertebrates, fish, algae, aquatic macrophytes). Very coarse taxonomic resolution (e.g., order/family). Expertise: amateur naturalist or stream watcher. Validation: none. QA/QC: none.	One taxonomic assemblage. Low taxonomic resolution (e.g., family). Expertise: novice or apprentice biologist. Validation: family level certification for macroinvertebrates. No certification available for fish or algae. QA/QC: mostly for taxonomic confirmation of voucher collections. Some sorting QA/QC implemented.	One taxonomic assemblage. Fine taxonomic resolution: genus/species for benthic macroinvertebrates and algae, species for fish. Expertise: trained taxonomist. Validation: genus-level certification or equivalent for benthic macroinvertebrates. Expert fish taxonomist or equivalent. Formal courses or training in algal taxonomy. QA/QC: addresses measuring bias, precision, and accuracy in all phases of sample processing through identification (e.g., outside validation of identification); voucher collection maintained.	Same as Level 3 except that two or more taxonomic assemblages are assessed. Rationale for selection of taxonomic groups should be well documented.	**Points** —

Element 7	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Sample Collection	Approach is cursory and relies on operator skill and BPJ. Training limited to that which is conducted annually for non-biologists who compose the majority of the sampling crew. Methods are not systematically documented as standard operating procedures (SOPs).	Textbook methods are used without considering the applicability of the methods to the study area. SOPs to specify methods but methods are neither well documented nor evaluated for producing comparable data across agencies. A cursory QA/QC document might be in place. Training consists of short courses (1–2 days) and is provided for new staff and periodically for all staff.	Methods are evaluated for applicability to study area and refined (if needed). Detailed and well documented SOPs are updated periodically and supported by in-house testing and development. A formal QA/QC program is in place with field replication requirements. Rigorous training required for all professional staff.	Same as Level 3, but methods cover multiple assemblages. A field audit of sampling crews is performed annually to ensure that protocols and proper sample handling/documentation are followed.	**Points** —

Element 8	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Sample Processing	Organisms are sorted, identified, and counted in the field using dichotomous keys.	Organisms are sorted, identified, and counted primarily in the field by trained staff. Adequate QA/QC is not possible. For fish, cursory examination of presence and absence only. Agency SOPs not developed or published.	All samples (except for fish) are processed in the laboratory. A formal QA/QC program is in place. Rigorous training is provided. Voucher organisms are retained for ID verification. SOPs are published and available to others.	Same as Level 3, but applied to multiple assemblages. Subsampling level is tested. Presence of fish deformities, erosions, lesions, tumors (DELT) and other anomalies are quantified and documented.	**Points** —

Element 9	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Data Management	Sampling event data organized in a series of spreadsheets (e.g., by year, by data-type). QA/QC is cursory and mostly for transcription errors. Might be paper files only.	Databases for physical-chemical, and biological data, and geographic information exist (Access, dBase, Geographic Information System [GIS], etc.) but are not linked or integrated. Data-handling methods manuals are available. QA/QC for data entry, value ranges, and site locations. A documented data dictionary defines data fields in terms of field methods and data collection.	Relational databases that integrate all biological, physical, and chemical data (Oracle, SQL Server, Access, etc.). Validation checks that guard against inadvertently storing incorrect or incomplete sampling data. Fully documented and implemented QA/QC process. Structure provides for data export and analysis via query includes dedicated database management. Fully documented data dictionary. Access to all databases is available for routine analysis in support of condition assessment.	Same as Level 3 adding automated data review and validation tools. Numerous built-in data management and analysis tools to support routine and exploratory analyses. Ability to track history of changes made to the data. Ability to control who has privilege to change, update, or delete data. Data import and export tools. Integrated connection to GIS showing monitored sites in relation to other relevant spatial data layers. Fully documented metadata according to accepted database standards. Reports on commonly used endpoints are easily retrieved (e.g., menu driven).	**Points** —

Element 10	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Ecological Attributes	Biological program relies solely on the evaluation of the presence or absence of targeted or key species. No rationale is provided for selection of indicators. Assessment endpoints and ecological attributes are not defined.	Biological program based on "off the shelf" indicators for one biological assemblage. Rationale for selection of indicators is partially documented. Generic assessment endpoints and ecological attributes are defined but not specifically evaluated for state or regional conditions.	Biological program based on well-developed ecological attributes for one biological assemblage. Rationale for attribute selection is thorough and well-documented. Explicit linkage is provided between management goal, assessment endpoints, and ecological attributes.	Same as Level 3, but biological program based on well-developed ecological attributes for two or more biological assemblages (e.g., faunal, flora) for more complete assessment of the members of an aquatic community.	 **Points** —

Element 11	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Discriminatory Capacity	Coarse method (low signal) and detects only high and low values. Supports distinguishing only extreme change in biological condition at the upper and lower ends of a generalized stress gradient.	A biological index for one assemblage is established but is not calibrated for water body classes, regional or statewide applications. BPJ based on single dimension attributes. The index can distinguish two general levels of change in biological condition along a generalized stress gradient.	A biological index for one assemblage has been developed and calibrated for statewide or regional application and for all classes and strata of a given water body type. The index can distinguish 3 to 4 increments of biological change along a continuous stress gradient. Supports narrative evaluations (e.g., good, fair, poor) based on multimetric or multivariate analyses that are relevant to the selected ecological attributes (Technical Element 10).	Same as Level 3 but biological indices for two or more assemblages have been developed and calibrated. Additionally, the indices can distinguish finer increments of biological change along a continuous stress gradient. The number of increments that potentially can be distinguished is dependent on water body type and natural climatic and geographic factors.	**Points** —

Element 12	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Stressor Association	No ability to develop relationships between biological responses and anthropogenic stress.	Site-specific paired biological and stressor samples for studies of an individual water body or a segment of a water body (e.g., a stream reach). Stress-response relationships are developed based on assemblage attributes at coarse level taxonomy (e.g., family for benthic macroinvertebrates). Information might be used on a case-by-case basis to inform a first order causal analysis.	Low spatial resolution for paired biological and stressor samples in time and space across the state at basin or sub-basin scale (e.g., HUC 4–8). Stress-response relationships developed for one assemblage using regression analysis. Taxonomy at level sufficient to detect patterns of response to stress (e.g., species or genus for benthic macroinvertebrates or periphyton, species for fish). Relational database supports basic queries. Information is frequently used to inform causal analysis. Reevaluation of stress-response relationships on an as-needed basis.	High spatial resolution for paired biological (including DELT anomalies and other indicators of organism health) and stressor samples in time and space across the state at watershed or subwatershed scales (e.g., HUC 10–12). Other data (e.g., watershed characteristics, land use data and information, flow regime, habitat, climatic data) are linked to field data for source identification. Stress -response relationships are fully developed for two or more assemblages, stressors, and their sources using a suite of analytical approaches (e.g., multiple regression, multivariate techniques). Relational database supports complex queries. Information is routinely used to inform causal analysis and criteria development. Ongoing evaluation of stress- response relationships and monitoring for new stressors is supported.	 **Points** —

Element 13	(Lowest) 1.0	2.0	3.0	4.0 (Highest)	Comments
Professional Review	Review is limited to editorial aspects. No technical review.	Internal technical review only.	Outside review of documentation and reports are conducted on an ad hoc basis.	Formal process for technical review to include multiple reference and documented system for reconciliation of comments and issues. Process results in methods and reporting improvements. Can include production of peer-reviewed journal publications by the agency.	 **Points** —

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tained (including attainment of the objective of this chapter) from achieving such limitation.

(B) Reasonable progress

The Administrator, with the concurrence of the State, may issue a permit which modifies the effluent limitations required by subsection (a) of this section for toxic pollutants for a single period not to exceed 5 years if the applicant demonstrates to the satisfaction of the Administrator that such modified requirements (i) will represent the maximum degree of control within the economic capability of the owner and operator of the source, and (ii) will result in reasonable further progress beyond the requirements of section 1311(b)(2) of this title toward the requirements of subsection (a) of this section.

(c) Delay in application of other limitations

The establishment of effluent limitations under this section shall not operate to delay the application of any effluent limitation established under section 1311 of this title.

(June 30, 1948, ch. 758, title III, § 302, as added Pub. L. 92–500, § 2, Oct. 18, 1972, 86 Stat. 846; amended Pub. L. 100–4, title III, § 308(e), Feb. 4, 1987, 101 Stat. 39.)

AMENDMENTS

1987—Subsec. (a). Pub. L. 100–4, § 308(e)(2), inserted ''or as identified under section 1314(*l*) of this title'' after ''Administrator'' and ''public health,'' after ''protection of''.

Subsec. (b). Pub. L. 100–4, § 308(e)(1), amended subsec. (b) generally. Prior to amendment, subsec. (b) read as follows:

''(1) Prior to establishment of any effluent limitation pursuant to subsection (a) of this section, the Administrator shall issue notice of intent to establish such limitation and within ninety days of such notice hold a public hearing to determine the relationship of the economic and social costs of achieving any such limitation or limitations, including any economic or social dislocation in the affected community or communities, to the social and economic benefits to be obtained (including the attainment of the objective of this chapter) and to determine whether or not such effluent limitations can be implemented with available technology or other alternative control strategies.

''(2) If a person affected by such limitation demonstrates at such hearing that (whether or not such technology or other alternative control strategies are available) there is no reasonable relationship between the economic and social costs and the benefits to be obtained (including attainment of the objective of this chapter), such limitation shall not become effective and the Administrator shall adjust such limitation as it applies to such person.''

§ 1313. Water quality standards and implementation plans

(a) Existing water quality standards

(1) In order to carry out the purpose of this chapter, any water quality standard applicable to interstate waters which was adopted by any State and submitted to, and approved by, or is awaiting approval by, the Administrator pursuant to this Act as in effect immediately prior to October 18, 1972, shall remain in effect unless the Administrator determined that such standard is not consistent with the applicable requirements of this Act as in effect immediately prior to October 18, 1972. If the Administrator makes such a determination he shall, within three months after October 18, 1972, notify the State and specify the changes needed to meet such requirements. If such changes are not adopted by the State within ninety days after the date of such notification, the Administrator shall promulgate such changes in accordance with subsection (b) of this section.

(2) Any State which, before October 18, 1972, has adopted, pursuant to its own law, water quality standards applicable to intrastate waters shall submit such standards to the Administrator within thirty days after October 18, 1972. Each such standard shall remain in effect, in the same manner and to the same extent as any other water quality standard established under this chapter unless the Administrator determines that such standard is inconsistent with the applicable requirements of this Act as in effect immediately prior to October 18, 1972. If the Administrator makes such a determination he shall not later than the one hundred and twentieth day after the date of submission of such standards, notify the State and specify the changes needed to meet such requirements. If such changes are not adopted by the State within ninety days after such notification, the Administrator shall promulgate such changes in accordance with subsection (b) of this section.

(3)(A) Any State which prior to October 18, 1972, has not adopted pursuant to its own laws water quality standards applicable to intrastate waters shall, not later than one hundred and eighty days after October 18, 1972, adopt and submit such standards to the Administrator.

(B) If the Administrator determines that any such standards are consistent with the applicable requirements of this Act as in effect immediately prior to October 18, 1972, he shall approve such standards.

(C) If the Administrator determines that any such standards are not consistent with the applicable requirements of this Act as in effect immediately prior to October 18, 1972, he shall, not later than the ninetieth day after the date of submission of such standards, notify the State and specify the changes to meet such requirements. If such changes are not adopted by the State within ninety days after the date of notification, the Administrator shall promulgate such standards pursuant to subsection (b) of this section.

(b) Proposed regulations

(1) The Administrator shall promptly prepare and publish proposed regulations setting forth water quality standards for a State in accordance with the applicable requirements of this Act as in effect immediately prior to October 18, 1972, if—

(A) the State fails to submit water quality standards within the times prescribed in subsection (a) of this section.

(B) a water quality standard submitted by such State under subsection (a) of this section is determined by the Administrator not to be consistent with the applicable requirements of subsection (a) of this section.

(2) The Administrator shall promulgate any water quality standard published in a proposed

regulation not later than one hundred and ninety days after the date he publishes any such proposed standard, unless prior to such promulgation, such State has adopted a water quality standard which the Administrator determines to be in accordance with subsection (a) of this section.

(c) Review; revised standards; publication

(1) The Governor of a State or the State water pollution control agency of such State shall from time to time (but at least once each three year period beginning with October 18, 1972) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards. Results of such review shall be made available to the Administrator.

(2)(A) Whenever the State revises or adopts a new standard, such revised or new standard shall be submitted to the Administrator. Such revised or new water quality standard shall consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses. Such standards shall be such as to protect the public health or welfare, enhance the quality of water and serve the purposes of this chapter. Such standards shall be established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, and also taking into consideration their use and value for navigation.

(B) Whenever a State reviews water quality standards pursuant to paragraph (1) of this subsection, or revises or adopts new standards pursuant to this paragraph, such State shall adopt criteria for all toxic pollutants listed pursuant to section 1317(a)(1) of this title for which criteria have been published under section 1314(a) of this title, the discharge or presence of which in the affected waters could reasonably be expected to interfere with those designated uses adopted by the State, as necessary to support such designated uses. Such criteria shall be specific numerical criteria for such toxic pollutants. Where such numerical criteria are not available, whenever a State reviews water quality standards pursuant to paragraph (1), or revises or adopts new standards pursuant to this paragraph, such State shall adopt criteria based on biological monitoring or assessment methods consistent with information published pursuant to section 1314(a)(8) of this title. Nothing in this section shall be construed to limit or delay the use of effluent limitations or other permit conditions based on or involving biological monitoring or assessment methods or previously adopted numerical criteria.

(3) If the Administrator, within sixty days after the date of submission of the revised or new standard, determines that such standard meets the requirements of this chapter, such standard shall thereafter be the water quality standard for the applicable waters of that State. If the Administrator determines that any such revised or new standard is not consistent with the applicable requirements of this chapter, he shall not later than the ninetieth day after the date of submission of such standard notify the State and specify the changes to meet such requirements. If such changes are not adopted by the State within ninety days after the date of notification, the Administrator shall promulgate such standard pursuant to paragraph (4) of this subsection.

(4) The Administrator shall promptly prepare and publish proposed regulations setting forth a revised or new water quality standard for the navigable waters involved—

(A) if a revised or new water quality standard submitted by such State under paragraph (3) of this subsection for such waters is determined by the Administrator not to be consistent with the applicable requirements of this chapter, or

(B) in any case where the Administrator determines that a revised or new standard is necessary to meet the requirements of this chapter.

The Administrator shall promulgate any revised or new standard under this paragraph not later than ninety days after he publishes such proposed standards, unless prior to such promulgation, such State has adopted a revised or new water quality standard which the Administrator determines to be in accordance with this chapter.

(d) Identification of areas with insufficient controls; maximum daily load; certain effluent limitations revision

(1)(A) Each State shall identify those waters within its boundaries for which the effluent limitations required by section 1311(b)(1)(A) and section 1311(b)(1)(B) of this title are not stringent enough to implement any water quality standard applicable to such waters. The State shall establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters.

(B) Each State shall identify those waters or parts thereof within its boundaries for which controls on thermal discharges under section 1311 of this title are not stringent enough to assure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife.

(C) Each State shall establish for the waters identified in paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those pollutants which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

(D) Each State shall estimate for the waters identified in paragraph (1)(B) of this subsection the total maximum daily thermal load required to assure protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife. Such estimates shall take into account the normal water temperatures, flow rates, seasonal variations, existing sources of heat input, and the dissipative capacity of the identified waters or parts thereof. Such estimates shall include a calculation of the maximum heat input that can be made into each such part and shall include a margin of safety which takes into account any lack of knowledge concerning the development of thermal water quality criteria for such protection and propagation in the identified waters or parts thereof.

(2) Each State shall submit to the Administrator from time to time, with the first such submission not later than one hundred and eighty days after the date of publication of the first identification of pollutants under section 1314(a)(2)(D) of this title, for his approval the waters identified and the loads established under paragraphs (1)(A), (1)(B), (1)(C), and (1)(D) of this subsection. The Administrator shall either approve or disapprove such identification and load not later than thirty days after the date of submission. If the Administrator approves such identification and load, such State shall incorporate them into its current plan under subsection (e) of this section. If the Administrator disapproves such identification and load, he shall not later than thirty days after the date of such disapproval identify such waters in such State and establish such loads for such waters as he determines necessary to implement the water quality standards applicable to such waters and upon such identification and establishment the State shall incorporate them into its current plan under subsection (e) of this section.

(3) For the specific purpose of developing information, each State shall identify all waters within its boundaries which it has not identified under paragraph (1)(A) and (1)(B) of this subsection and estimate for such waters the total maximum daily load with seasonal variations and margins of safety, for those pollutants which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation and for thermal discharges, at a level that would assure protection and propagation of a balanced indigenous population of fish, shellfish, and wildlife.

(4) LIMITATIONS ON REVISION OF CERTAIN EFFLUENT LIMITATIONS.—

(A) STANDARD NOT ATTAINED.—For waters identified under paragraph (1)(A) where the applicable water quality standard has not yet been attained, any effluent limitation based on a total maximum daily load or other waste load allocation established under this section may be revised only if (i) the cumulative effect of all such revised effluent limitations based on such total maximum daily load or waste load allocation will assure the attainment of such water quality standard, or (ii) the designated use which is not being attained is removed in accordance with regulations established under this section.

(B) STANDARD ATTAINED.—For waters identified under paragraph (1)(A) where the quality of such waters equals or exceeds levels necessary to protect the designated use for such waters or otherwise required by applicable water quality standards, any effluent limitation based on a total maximum daily load or other waste load allocation established under this section, or any water quality standard established under this section, or any other permitting standard may be revised only if such revision is subject to and consistent with the antidegradation policy established under this section.

(e) Continuing planning process

(1) Each State shall have a continuing planning process approved under paragraph (2) of this subsection which is consistent with this chapter.

(2) Each State shall submit not later than 120 days after October 18, 1972, to the Administrator for his approval a proposed continuing planning process which is consistent with this chapter. Not later than thirty days after the date of submission of such a process the Administrator shall either approve or disapprove such process. The Administrator shall from time to time review each State's approved planning process for the purpose of insuring that such planning process is at all times consistent with this chapter. The Administrator shall not approve any State permit program under subchapter IV of this chapter for any State which does not have an approved continuing planning process under this section.

(3) The Administrator shall approve any continuing planning process submitted to him under this section which will result in plans for all navigable waters within such State, which include, but are not limited to, the following:

(A) effluent limitations and schedules of compliance at least as stringent as those required by section 1311(b)(1), section 1311(b)(2), section 1316, and section 1317 of this title, and at least as stringent as any requirements contained in any applicable water quality standard in effect under authority of this section;

(B) the incorporation of all elements of any applicable area-wide waste management plans under section 1288 of this title, and applicable basin plans under section 1289 of this title;

(C) total maximum daily load for pollutants in accordance with subsection (d) of this section;

(D) procedures for revision;

(E) adequate authority for intergovernmental cooperation;

(F) adequate implementation, including schedules of compliance, for revised or new water quality standards, under subsection (c) of this section;

(G) controls over the disposition of all residual waste from any water treatment processing;

(H) an inventory and ranking, in order of priority, of needs for construction of waste treatment works required to meet the applicable requirements of sections 1311 and 1312 of this title.

(f) Earlier compliance

Nothing in this section shall be construed to affect any effluent limitation, or schedule of compliance required by any State to be implemented prior to the dates set forth in sections 1311(b)(1) and 1311(b)(2) of this title nor to preclude any State from requiring compliance with any effluent limitation or schedule of compliance at dates earlier than such dates.

(g) Heat standards

Water quality standards relating to heat shall be consistent with the requirements of section 1326 of this title.

(h) Thermal water quality standards

For the purposes of this chapter the term ''water quality standards'' includes thermal water quality standards.

(i) Coastal recreation water quality criteria

(1) Adoption by States

(A) Initial criteria and standards

Not later than 42 months after October 10, 2000, each State having coastal recreation waters shall adopt and submit to the Administrator water quality criteria and standards for the coastal recreation waters of the State for those pathogens and pathogen indicators for which the Administrator has published criteria under section 1314(a) of this title.

(B) New or revised criteria and standards

Not later than 36 months after the date of publication by the Administrator of new or revised water quality criteria under section 1314(a)(9) of this title, each State having coastal recreation waters shall adopt and submit to the Administrator new or revised water quality standards for the coastal recreation waters of the State for all pathogens and pathogen indicators to which the new or revised water quality criteria are applicable.

(2) Failure of States to adopt

(A) In general

If a State fails to adopt water quality criteria and standards in accordance with paragraph (1)(A) that are as protective of human health as the criteria for pathogens and pathogen indicators for coastal recreation waters published by the Administrator, the Administrator shall promptly propose regulations for the State setting forth revised or new water quality standards for pathogens and pathogen indicators described in paragraph (1)(A) for coastal recreation waters of the State.

(B) Exception

If the Administrator proposes regulations for a State described in subparagraph (A) under subsection (c)(4)(B) of this section, the Administrator shall publish any revised or new standard under this subsection not later than 42 months after October 10, 2000.

(3) Applicability

Except as expressly provided by this subsection, the requirements and procedures of subsection (c) of this section apply to this subsection, including the requirement in subsection (c)(2)(A) of this section that the criteria protect public health and welfare.

(June 30, 1948, ch. 758, title III, § 303, as added Pub. L. 92–500, § 2, Oct. 18, 1972, 86 Stat. 846; amended Pub. L. 100–4, title III, § 308(d), title IV, § 404(b), Feb. 4, 1987, 101 Stat. 39, 68; Pub. L. 106–284, § 2, Oct. 10, 2000, 114 Stat. 870.)

REFERENCES IN TEXT

This Act, referred to in subsecs. (a)(1), (2), (3)(B), (C) and (b)(1), means act June 30, 1948, ch. 758, 62 Stat. 1155, prior to the supersedure and reenactment of act June 30, 1948 by act Oct. 18, 1972, Pub. L. 92–500, 86 Stat. 816. Act June 30, 1948, ch. 758, as added by act Oct. 18, 1972, Pub. L. 92–500, 86 Stat. 816, enacted this chapter.

AMENDMENTS

2000—Subsec. (i). Pub. L. 106–284 added subsec. (i).

1987—Subsec. (c)(2). Pub. L. 100–4, § 308(d), designated existing provision as subpar. (A) and added subpar. (B).

Subsec. (d)(4). Pub. L. 100–4, § 404(b), added par. (4).

§ 1313a. Revised water quality standards

The review, revision, and adoption or promulgation of revised or new water quality standards pursuant to section 303(c) of the Federal Water Pollution Control Act [33 U.S.C. 1313(c)] shall be completed by the date three years after December 29, 1981. No grant shall be made under title II of the Federal Water Pollution Control Act [33 U.S.C. 1281 et seq.] after such date until water quality standards are reviewed and revised pursuant to section 303(c), except where the State has in good faith submitted such revised water quality standards and the Administrator has not acted to approve or disapprove such submission within one hundred and twenty days of receipt.

(Pub. L. 97–117, § 24, Dec. 29, 1981, 95 Stat. 1632.)

REFERENCES IN TEXT

The Federal Water Pollution Control Act, referred to in text, is act June 30, 1948, ch. 758, as amended generally by Pub. L. 92–500, § 2, Oct. 18, 1972, 86 Stat. 816. Title II of the Act is classified generally to subchapter II (§ 1281 et seq.) of this chapter. For complete classification of this Act to the Code, see Short Title note set out under section 1251 of this title and Tables.

CODIFICATION

Section was enacted as part of the Municipal Wastewater Treatment Construction Grant Amendments of 1981, and not as part of the Federal Water Pollution Control Act which comprises this chapter.

§ 1314. Information and guidelines

(a) Criteria development and publication

(1) The Administrator, after consultation with appropriate Federal and State agencies and other interested persons, shall develop and publish, within one year after October 18, 1972 (and from time to time thereafter revise) criteria for water quality accurately reflecting the latest scientific knowledge (A) on the kind and extent of all identifiable effects on health and welfare including, but not limited to, plankton, fish, shellfish, wildlife, plant life, shorelines, beaches, esthetics, and recreation which may be expected from the presence of pollutants in any body of water, including ground water; (B) on the concentration and dispersal of pollutants, or their byproducts, through biological, physical, and chemical processes; and (C) on the effects of pollutants on biological community diversity, productivity, and stability, including information on the factors affecting rates of eutrophication and rates of organic and inorganic sedimentation for varying types of receiving waters.

(2) The Administrator, after consultation with appropriate Federal and State agencies and other interested persons, shall develop and pub-

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Development of fish-based indices of biological integrity for Minnesota lakes

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ABSTRACT

Indices of biological integrity (IBIs) have been developed for a wide variety of locales and ecological systems to describe their biological condition. Due to variability in geophysical and chemical conditions, IBIs are often developed regionally and applied to similar ecological systems. Researchers in Minnesota previously developed a fish IBI (FIBI) for lakes; however, its application was limited to lakes 40–200 ha surface area and located in central Minnesota. The objectives of this study were to develop FIBIs and ecologically meaningful thresholds for application to a broader suite of Minnesota lakes with surface areas 40–4,050 ha. Fish communities in 419 lakes throughout Minnesota were sampled using gill nets, trap nets, backpack electrofishers, and beach seines between mid-June and early-September 2005–2013. Fish species were assigned to functional groups based on family, tolerance, primary feeding niche, special habitat use, and whether they were native to Minnesota. Lakes were classified into seven groups based on their geophysical and chemical attributes, and four groups were ultimately used in FIBI development. A suite of potential metrics was evaluated for each of the four FIBIs based on their relationships to measures of human-induced watershed and in-lake stressors and 8–15 were retained for each FIBI. Metrics that were retained were summed, and composite scores were scaled 0–100. Biological Condition Gradient (BCG) models were developed for each FIBI. The BCG models established thresholds for impairment and exceptional condition. The FIBIs and thresholds are being used to guide clean water planning, restoration, and protection efforts and to complement pollutant-based water quality sampling efforts in lakes during the Minnesota watershed assessment process.

1. Introduction

Human actions on the landscape have subjected aquatic ecosystems to many unnatural changes. Industrialization, urban development, and cultivation of land for intensive agriculture are just a few examples of actions that have historically contributed to decreases in water quality and loss of aquatic habitat globally (Baker, 2003; Foley et al., 2005). Recognizing the importance of healthy aquatic ecosystems and the extent of environmental degradation that had occurred in the United States specifically, Congress passed the Clean Water Act (CWA) in 1972, with the objective of restoring and maintaining the chemical, physical, and biological integrity of waters of the United States.

The CWA tasks states and tribes nationwide with evaluating water resource condition and determining whether CWA objectives are met. Chemical and physical parameters are well defined and routinely used during such evaluations; however, these parameters do not sufficiently represent the suite of stressors that can negatively affect a water body or its biota. Examples of stressors to aquatic biota include eutrophication (Smith et al., 1999), chemicals (Johnson and Finley, 1980), decreased oxygen (Kramer, 1987), sedimentation (Newcombe and MacDonald, 1991), increased temperature (Wood and McDonald, 1997), habitat degradation (Gorman and Karr, 1978), and competition from non-native species (Cucherousset and Olden, 2011). Because biota are fundamental indicators responding to a variety of such stressors over time (Loeb, 1994), they can be monitored directly to evaluate biological integrity. Indices of biological integrity (IBIs), which utilize multiple community attributes such as species composition and ecological structure to describe overall biological condition of a water body (Karr, 1981), are widely accepted and used concurrently with select chemical and physical parameters to monitor and assess aquatic ecosystems.

IBIs have been developed for a wide variety of locales and ecological systems, using several indicator biota. IBIs are commonplace in

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assessment of stream health (Herman and Nejadhashemi, 2015), but are expanding into assessment of lake health (Beck and Hatch, 2009). Lake IBIs have been developed to assess several biological community types including plankton (Kane et al., 2009), macroinvertebrates (Lewis et al., 2001; Blocksom et al., 2002), macrophytes (Mikulyuk et al., 2017), and fish (Minns et al., 1994; Launois et al., 2011; Argillier et al., 2013).

Regional development of IBIs and application only to similar ecological systems provides an appropriate assessment framework that considers natural variability in geophysical and chemical conditions. Working with the Minnesota Department of Natural Resources (MNDNR), the Minnesota Pollution Control Agency (MPCA) as an authorized CWA program develops and implements water quality standards in Minnesota, including biological criteria, for streams and lakes. The MPCA has used IBIs in its stream monitoring and assessment program since the mid-1990′s, and in recent years, developed comprehensive statewide fish and invertebrate IBIs for streams and rivers (MPCA, 2014). By the early-2000′s, MNDNR fisheries researchers also developed a fish IBI (FIBI) for lakes; however, its application was limited to lakes with similar geophysical and chemical features, 40 to 200 ha surface area, and located in central Minnesota (Drake and Pereira, 2002; Drake and Valley, 2005).

Passage of Minnesota's Clean Water Legacy Act (CWLA) in 2006 provided a policy framework and resources to accelerate efforts to monitor, assess, and restore impaired waters, and to protect unimpaired waters. Subsequent passage of the Minnesota Clean Water, Land and Legacy Amendment in 2008 provided additional funding to the MPCA, MNDNR, and partner agencies to continue with, and expand on, efforts outlined in the CWLA, including development of FIBIs applicable to a broader suite of Minnesota lakes. Therefore, the primary objectives of this study were to expand the Drake and Pereira (2002) Minnesota lake FIBI to a more diverse set of lakes, and to develop ecologically meaningful thresholds based on distinct lake groups for assessing attainment of aquatic life use goals in Minnesota lakes.

2. Materials and methods

2.1. Study area

We conducted 893 surveys on 661 lakes with surface areas exceeding 40 ha in all geographic regions throughout Minnesota (Fig. 1). Surveyed lakes represented a wide variety of sizes, depths, morphometries, alkalinities, and fish communities. Several types of lakes that were excluded from the Drake and Pereira (2002) FIBI development were included in our FIBI sampling efforts, such as lakes larger than 200 ha, shallow lakes, aerated lakes, and lakes located in southern Minnesota.

Although initially sampled, several lake types were excluded from the final data set. These include Canadian Shield lakes that typically contain soft water and species compositions that differ greatly from the glacial outwash lakes found in the remainder of the state. Similarly, we excluded lakes that experienced a significant naturally-induced winterkill (resulting from shallow maximum depth and involving suspected loss of species and lack of year classes within the previous decade), if there was lower than acceptable sampling effort or very difficult sampling, if there were uncertainties regarding fish identification, or if the lake had a strong riverine influence (indicated by a fish community dominated by riverine species or if the waterbody was legally classified as a reservoir). Exclusion of these lakes resulted in 562 surveys on 419 lakes that were used for FIBI development in this study (Fig. 1).

2.2. Fish sampling

MNDNR staff used four traditional fisheries gears to sample the fish communities in study lakes between mid-June and early-September 2005–2013. In each surveyed lake, double frame 19 mm mesh trap nets and standard graduated mesh gill nets (i.e., five 15.2 m long × 1.8 m deep panels of 19 mm, 25 mm, 32 mm, 38 mm, and 51 mm bar mesh) were used to sample littoral and limnetic areas, respectively (MNDNR, 2017). All fish were identified to species, measured to the nearest mm, and weighed to the nearest gram. A combination of seines (i.e., 15.2 and

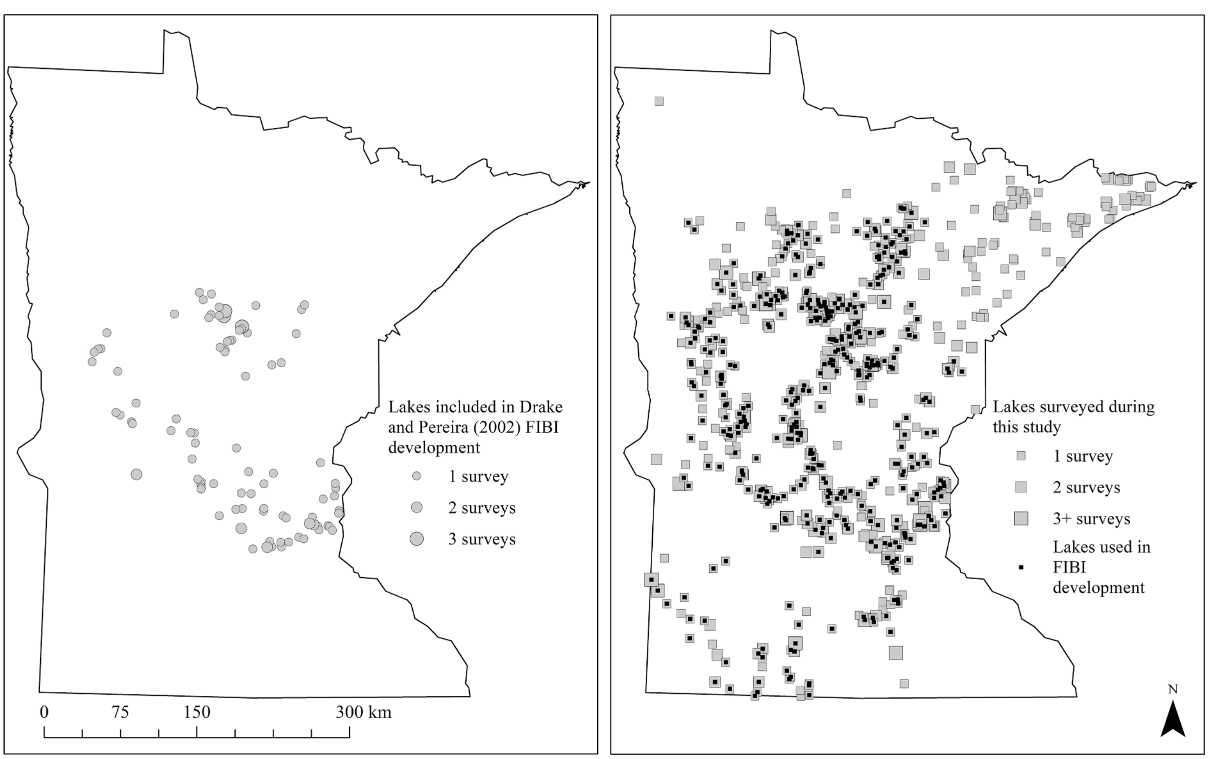

Fig. 1. Map of Minnesota indicating location of lakes included in Drake and Pereira (2002) FIBI development is shown on the left. Location of lakes sampled and used for developing the FIBIs during this study are shown on the right.

4.6 m long × 1.5 m deep with 3 mm bar mesh) and backpack electrofishers was used to sample nearshore, wadeable areas of each lake along 30.5 m stations. We also developed sampling protocols to address difficult to sample shorelines (e.g., boat assisted seining along steep shorelines and boat assisted backpack electrofishing among or along stands of aquatic vegetation) to ensure sufficient sampling effort in a wide variety of lakes. All fish captured in nearshore gears were identified to species and enumerated, and a subset of specimens from each species was vouchered and independently verified in a lab setting.

2.3. Sampling site selection

The numbers of gill nets and trap nets set on each lake followed MNDNR lake survey methods (MNDNR, 2017) and were determined by the size and characteristics of the lake. Typically, trap nets were set in 9–15 locations and gill nets in 6–15 locations. Net sites were chosen systematically to represent available habitat within each lake. Nearshore sampling stations were equally spaced around the shoreline of the lake from a random starting point.

Several methods were used to determine the number of nearshore stations sampled within each lake. For lakes 40–200 ha, Drake (2007) previously determined the number of nearshore sampling stations required to achieve 90% observed species richness using sample-based rarefaction curves with 1,000 resampled datasets from 56 lakes. To determine the number of stations needed for lakes greater than 200 ha, we oversampled seven lakes 1,020–2,600 ha in the summer of 2012 with forty stations per lake and simulated 5,000 bootstrap samples for each survey by choosing lower numbers of stations with replacement. The bootstrapped samples were used to estimate the number of stations required to accumulate approximately 90% of species in each category (i.e., numbers of native, intolerant, tolerant, insectivore, omnivore, cyprinid, small benthic-dwelling, and vegetation-dwelling species) observed in the full samples in these lakes. The total number of stations required for sampling was then adjusted incrementally based on lake surface area for lakes 200 to 4,050 ha. Additional bootstrap power analyses were performed for 20 repeat surveys on four MNDNR Long Term Monitoring Program lakes (MNDNR, 2017) of varying size, depth, and species richness to verify that these incremental adjustments were sufficient across lakes with different characteristics and fish communities. All statistical analyses were performed using the statistical program R (R Core Team, 2013).

2.4. Lake grouping

We then grouped lakes with similar physical features (independent of water quality productivity parameters such as Secchi depth and average total phosphorus (TP)) to facilitate the development of unique FIBIs for each lake grouping. Lake groupings from all Minnesota lakes greater than 40 ha were derived using median values for eight lake attributes associated with an ecological lake classification system developed by Schupp (1992): total area (ha), maximum depth (m), percent littoral area (percent of lake area ≤4.6 m deep), shoreline development index (SDI, shoreline length relative to the shoreline length of a perfectly circular lake of equal area), total alkalinity (ppm), volume (total area (ha) × maximum depth (m)/3), area (ha):shoreline (km) ratio, and growing degree days (base 5 °C, 1981–2010). We normalized area, maximum depth, SDI, volume, and area:shoreline ratio using natural logarithm transformations and alkalinity using a square root transformation; we then centered the attributes to the distributions of the variables. Finally, we used a hierarchical cluster analysis to determine lake groupings for FIBI development. The R function hclust() with Ward's minimum variance method was used to cluster the lake classes, and the function cutree() was used to cut the cluster tree into 5–10 groups (R Core Team, 2013).

2.5. Fish classification

We classified all collected species according to their tolerance to disturbance (i.e., intolerant, tolerant, or other), feeding guild (i.e., insectivore, omnivore, top carnivore, or other), special habitat use (i.e., small benthic-dwelling, vegetation-dwelling, or other), origin (i.e., native or non-native), and whether they were a cyprinid (excluding non-native Common Carp *Cyprinus carpio*). Several sources were consulted for determining tolerance, primary feeding niche, and special habitat use assignments including primary sources with fish classifications specific to lakes (Whittier and Hughes, 1998; Jennings, et al., 1999b; Drake and Pereira, 2002) and FIBIs developed for Minnesota and Wisconsin streams and rivers (Lyons et al., 2001; MPCA, 2014). Other sources were consulted for several species where there was disagreement between primary sources. The primary source used to assign feeding guild classifications was Goldstein and Simon (1999).

In addition, we used logistic regression to examine whether the probability of sampling a species in a lake was related to various stressor variables to further aid in classification of species tolerance and habitat use. For each species, we considered presence or absence relative to ecoregion, average trophic state index (TSI; Carlson, 1977), TP, percent watershed disturbance (Cross and Jacobson, 2013), aquatic plant floristic quality index (FQI; Radomski and Perleberg, 2012), and interaction terms. We used Akaike information criterion (AIC) to compare 13 models and determine which stressor variables, if any, best explained the presence or absence of a given species. We examined the most parsimonious models to determine if the relationships between species presence and stressor variables were statistically significant ($p \leq 0.05$). Rare species (i.e., <7% occurrence), riverine species, species with very limited geographic range, and ubiquitous species (i.e., >90% occurrence) were not included in the logistic regression models to aid in classification. Rather, we determined assignments for these species using literature review and expert opinion.

The classification schemes and natural history information from the literature review, in addition to the results of the modeling, were compiled and species assignments were drafted for review and input from a panel of eight subject matter experts from two state agencies and the University of Minnesota.

Table 1
Potential metrics based on Drake and Pereira (2002) considered for FIBI development.

FIBI metric	Abbreviation
Number of species captured that are native species (all gears)	Nat
Number of species captured that are intolerant of stressors (all gears)	Intol
Number of species captured that are tolerant of stressors (all gears)	Tol
Number of species captured that are insectivores (all gears)	Insect
Number of species captured that are omnivores (all gears)	Omni
Number of species captured that are cyprinids (all gears)	Cyp
Number of species captured that are small benthic-dwelling (all gears)	Smb
Number of species captured that are vegetation-dwelling (all gears)	Veg
Proportion of individuals captured in the nearshore gears that are classified as intolerant of stressors	Raintol
Proportion of individuals captured in the nearshore gears that are classified as small benthic-dwelling	Rasmb
Proportion of individuals captured in the nearshore gears that are classified as vegetation-dwelling	Raveg
Proportion of biomass in trap nets from insectivores	Bioinsect
Proportion of biomass in trap nets from omnivores	Bioomni
Proportion of biomass in trap nets from species classified as tolerant of stressors	Biotol
Proportion of biomass in gill nets from top carnivores	Biotc
Presence/absence of a species classified as intolerant of stressors in the gill nets	Biointol

2.6. FIBI metric selection and scoring

We used our fish species classifications and the suite of proposed fish assemblage metrics defined by Drake and Pereira (2002; Table 1) to calculate raw metric values for all lakes included in our development set. We calculated richness metrics, defined as the number of native species or number of species within tolerance, feeding, habitat, and family groups, by combining species data across gears. We expressed gear-specific metrics describing assemblage composition as the proportional biomass of a specific group in either the trap net or gill net survey, or proportion of individuals sampled with nearshore gears.

Drake and Pereira (2002) chose gear-specific metrics for evaluation based on species vulnerability to a given gear. Nearshore sampling data were used for assemblage composition metrics describing small, nongame species and included the relative abundance of small benthic-dwelling, vegetation-dwelling, and intolerant fishes. Trap net and gill net data were used for composition metrics based on game fish and larger nongame species. Drake and Pereira (2002) evaluated both relative biomass and abundance of trap net and gill net data and found relative biomass to be a better indicator in all cases, therefore we also calculated our trap net and gill net composition metrics based on relative biomass. Trap net data were used for insectivore, omnivore, and tolerant composition metrics whereas gill net data were used for top carnivore composition and intolerant species metrics. The proportion of biomass in gill nets from top carnivores metric was considered with and without Walleye *Sander vitreus* based on the assumption that the Walleye in some lake groups were nearly all of stocked origin and not dependent on available spawning habitat.

We evaluated the distributions of raw metric values and conducted natural log transformations where needed to achieve approximately normal distributions (Table B1.1). For each metric within each FIBI, we calculated a standardized metric value based on the mean value and standard deviation of the metric across all lakes in each group used in FIBI development. Because we had repeat surveys on several lakes, linear mixed-effect models were fit using the lmer() function in the lme4 package (Bates et al., 2015). The models included lake as a random effect to calculate the overall lake group mean and standard deviation (SD) for each metric across all lakes within each group. The standardized metric score (*metric*stnd) was calculated as:

*metric*stnd = (*metric*raw - meangroup) / SDgroup

where *metric*raw is the raw metric value or *metric*lograw is the log transformed metric value from Table 1, meangroup is the mean of the lake group, and SDgroup is the standard deviation of the lake group. For example, a bioinsectstnd score of 0 would indicate that the proportion of biomass in trap nets from insectivores (bioinsect) was equal to the average for lakes in that group used in FIBI development. A score of 1 would indicate that the value was 1 SD above average, and so on.

Lake characteristics including surface area, maximum depth, SDI, percent littoral area, total alkalinity, contributing watershed size (MNDNR, 2013), and lake connectivity (T. Cross, MNDNR, unpublished data) were also evaluated to determine their potential influence on FIBI metrics. For richness metrics with a significant relationship ($p \leq 0.05$) to lake surface area (log(ha)), we used linear regression to identify the relationship and adjusted the metric score accordingly so that metric response would represent differences in lake integrity rather than differences based on lake size. The size-adjusted score (*metric*stndsizeadj) was calculated as:

*metric*stndsizeadj = (*metric*raw - sizedev - meangroup) / SDgroup

where *metric*raw is the raw metric value, meangroup is the mean of the group, SDgroup is the standard deviation of the group, and sizedev was calculated as:

sizedev = A + B * log (ha)

where A is the intercept and B is the slope of the linear relationship between surface area and each significant richness metric.

We also calculated FIBI scores restricting metric scores at −2 to 2, −3 to 3, and −4 to 4, but ultimately decided to leave metric scores unbound to allow exceptionally high and exceptionally low scoring metrics to assert their relative influence on the overall FIBI score.

The intolerant species in the gill net (biointol) metric was scored as a discrete value. The primary species targeted with this metric (e.g., Cisco *Coregonus artedi*, and also Burbot *Lota lota,* Rock Bass *Ambloplites rupestris*, Smallmouth Bass *Micropterus dolomieu*, Muskellunge *Esox masquinongy*, Lake Whitefish *Coregonus clupeaformis*, and others) were not sampled consistently in gill nets, and the metric performed better as a discrete versus a proportional metric. This metric (biointolassigned) was calculated as:

biointolassigned = 2 points for surveys that yielded at least one intolerant individual in the gill nets

biointolassigned = −1 points for surveys that did not yield an intolerant individual in the gill nets on lakes within the native range of Cisco (Hatch, 2015) and with maximum depth > 12 m

biointolassigned = 0 points for surveys that did not yield an intolerant individual in the gill nets on lakes not within the native range of Cisco or with maximum depth ≤ 12 m

We evaluated performance of individual metrics for each FIBI. We first identified variables that reflected the primary stressors influencing fish habitat. As in Drake and Pereira (2002), we used disturbance within a lake’s contributing watershed (i.e., percent agriculture, percent urban, percent forested, and overall percent watershed disturbance as defined in Cross and Jacobson (2013)) as a measure of water quality, sedimentation, hypolimnetic oxygen availability, and regime shifts. Land use percentages were derived using 2011 National Land Cover Database data (Homer et al., 2004), which corresponded with the timing of fish sampling in this study. We also considered aquatic plant richness and FQI as measures of structural fish habitat and dock density (Beck et al., 2013) as a measure of shoreline disturbance and recreational pressure. We then used Spearman’s rank correlation analysis to identify metrics significantly correlated to each of these variables ($p \leq 0.05$). We calculated correlations for both raw and standardized metrics. Correlations with average TP and TSI were also calculated and considered as supporting information, but they were not the considered the primary stressor variables for metric selection. We wanted to construct FIBIs that would add unique information to the existing lake assessment process, which had already included assessment of suitability for aquatic recreation based on summer TP, Secchi depth, and chlorophyll *a* sampling.

We used an elimination process to select metrics for each FIBI, beginning with similar metrics to Drake and Pereira (2002). Standardized metrics that were significantly correlated ($p \leq 0.05$) with one or more stressor variables were retained. If two metrics were highly correlated (rho ≥ 0.8), the metric that best predicted watershed disturbance, shoreline disturbance, or both was retained and the redundant metric eliminated. Ecological relevance was also considered, and in some cases, correlations to secondary stressor variables TP and TSI were considered when the range of other stressor variables was limited. In cases when a relationship was significant but did not follow ecological expectations, the metric was dropped from consideration on a conceptual basis. Conceptual factors for metric selection were also considered during IBI development for Minnesota streams (MPCA, 2014). Furthermore, because we found a positive relationship between dock density and water quality, we used generalized additive models (GAM), where:

Metric = TP + percent watershed disturbance + dock density

to evaluate whether dock density was significantly related to metrics after accounting for the relationships with watershed disturbance and water quality and to provide additional supporting information for metric selection.

We then calculated FIBI scores both with and without questionable metrics included and looked at the correlations with stressor variables to determine whether any questionable metrics should be retained. Metrics that were retained were summed, and composite FIBI scores were scaled 0–100 using the minimum and maximum scores for lakes used in FIBI development. The specific calculations for each FIBI are included in Eq.

B2.1–4 in Appendix B.

We also examined the variability of each metric and the resulting FIBI scores across 228 repeat surveys completed between 2005 and 2013 on 96 lakes. The minimum, median, and maximum time that passed between repeat surveys was 1 day, 3 years, and 6 years, respectively. For evaluations of metric and lake group variability, we included only repeat surveys that were completed within three or fewer seasons (i.e., 182 surveys on 68 lakes) assuming that lake conditions and fish communities were relatively stable within that timeframe, as even the shortest-lived fish species have a lifespan of approximately 2–3 years (Becker, 1983). We did look at FIBI score differences beyond three years to study FIBI variability across time, recognizing that lake conditions, stressors, and fish communities may change in some cases for surveys completed further apart. Lakes included in the MNDNR Long Term Monitoring Program (MNDNR, 2017) were sampled numerous times during FIBI development during this study and constituted a large portion of repeat surveys. These lakes represent a diversity of lake characteristics (e.g. size, depth, clarity) and are located in all Minnesota ecoregions. Additionally, a minimum of ten percent of lakes surveyed for FIBI development each year from 2010 to 2013 received repeat sampling to allow for further evaluation. Variability, measured as absolute metric and FIBI score differences between repeat surveys, was evaluated between years and groups using mixed effect models with lake as a random effect due to unequal sample size among lakes. Significance of fixed effects was evaluated with chi-square tests, and pairwise comparisons were performed using Tukey's multiple comparison tests with degrees of freedom calculated with the Kenward and Roger (1997) method.

2.7. FIBI threshold development

In order to use the FIBIs to assess the health of Minnesota lakes, biocriteria were developed that identified impairment and exceptional quality thresholds for each FIBI. Biological Condition Gradient (BCG) models for fish assemblages in Minnesota lakes were developed independently of the FIBIs to define changes to the fish communities along a gradient of increasing anthropogenic stress. The BCG is a conceptual model that describes changes in aquatic communities along a gradient in response to increasing levels of human disturbance and is useful in establishing ecologically meaningful thresholds (Davies and Jackson, 2006). The BCG models in this study used rules to classify lakes into six levels along a degradation gradient with level one describing lakes where system functionality is intact and all natural biological components are retained. Level two is defined as supporting nearly all native taxa with some changes in biomass and/or abundance and ecosystem functions are fully maintained within the range of natural variability. In level three, some highly sensitive native taxa may be lost but more common sensitive taxa are abundant and ecosystem functions are fully maintained. Level four is characterized by moderate changes in structure with more tolerant taxa becoming more common and a loss of most sensitive taxa but ecosystem functions are still largely maintained. A shift in ecosystem function is noted in level five with an unbalanced distribution of fish species and sensitive taxa absent or nearly so. Level six described lakes at the far end of the gradient where system functionality is severely altered and biological communities have drastically changed from what would be expected from a similar lake in the absence of anthropogenic disturbance. These biologically recognizable stages in lake condition were used to form a biological basis for establishing criteria and expressing goals for lakes, including setting criteria for exceptional lakes and defining impairment thresholds for lakes that do not meet minimum aquatic life use goals as defined under the CWA.

The BCG models for Minnesota lakes were developed by Tetra Tech, Inc. with participation of aquatic biologists from MPCA, MNDNR, Midwest Biodiversity Institute, and an independent fisheries biologist (Gerritsen and Stamp, 2014). Methods of calibrating BCG models and developing thresholds were similar to those used for developing biocriteria for Minnesota streams (Gerritsen et al., 2017). BCG model development used fish survey data and lake characteristic information (i.e., lake size, lake group, and percent littoral area) from 194 fish surveys, including 158 to calibrate the models and 36 to evaluate model performance. BCG models for each lake group were developed, calibrated, and confirmed for fish communities in lakes with FIBI survey data, and scoring for each BCG model was adjusted based on lake size (Gerritsen and Stamp, 2014). BCG levels were then used to develop thresholds for Minnesota lakes using a Tiered Aquatic Life Uses (TALU) framework that included General and Exceptional uses, with the Exceptional Use tier applied to lakes with fish communities near the natural condition and the General Use tier applied to remaining lakes. FIBIs and BCG models were developed independently and BCG assignments were compared to FIBI scores after development. For each FIBI, the median FIBI score for each BCG level was calculated and levels 4 and 5 were considered for a General Use threshold assignment and levels 2 and 3 for an Exceptional Use threshold assignment.

3. Results

3.1. Sampling site selection

Bootstrap resampling simulations of oversampled lakes 1,020–2,600 ha and repeat sampling on lakes 300–1,050 ha identified four levels of effort needed to sufficiently sample the nearshore fish communities in most Minnesota lakes. Based on the bootstrap resampling results for each category of fishes, including the number of native species (Fig. 2), the number of nearshore stations was established at 10 for lakes <200 ha (Drake, 2007), 14 for lakes 200–485 ha, 18 for lakes 486–810 ha, or 24 for lakes >810 ha.

3.2. Lake grouping

Hierarchical cluster analysis produced seven groups of lakes, of which four were ultimately used for developing FIBIs (Table 2). Development focused on lake groups 2, 4, 5, and 7, thus corresponding FIBIs for each lake group will be referred to as FIBIs 2, 4, 5, and 7, respectively (Table 2). On average, group 2 lakes are the deepest, and most thermally stratify. They span a wide range of sizes and geographic locations in addition to having the highest average fish species diversity (Fig. 3). Group 4 lakes are also deep, often thermally stratify, are generally smaller than 200 ha, and are primarily located in central and northern Minnesota. Group 5 and 7 lakes range in size and are typically much shallower; group 5 lakes are primarily located in central and northern Minnesota whereas group 7 lakes are primarily in southern and western Minnesota. Group 5 lakes are on average deeper than group 7 lakes, with less littoral area, and as a result, fewer have experienced historic winterkill events. Records of historic loss of species due to naturally occurring winterkill are incomplete, but most group 7 lakes likely experienced some historic winterkill events as a result of their shallow maximum depths that temporarily or permanently affected species assemblages, depending on severity and species present in connected waters. Currently, many group 7 lakes have aeration systems operating during winters when needed to prevent winterkill of game fish.

Group 6 lakes, which comprised approximately 11% of lakes included in the cluster analysis, exhibited characteristics similar to other groups included in FIBI development. In order to have a sufficient sample size in each group and because the fish communities were similar between groups, minor edits were made to the groupings primarily using level 3 ecoregions (Omernik and Griffith, 2014), fish communities, and lake characteristics. Group 6 lakes that were redistributed to groups 5 and 7 each had greater than 80 percent littoral area, and those redistributed to group 5 were primarily located in the Northern Lakes and Forest ecoregion whereas those redistributed to group 7 were primarily located in the North Central Hardwood Forest ecoregion. These edits resulted in approximately 64% of group 6 lakes redistributed into group 5 and 36% into group 7.

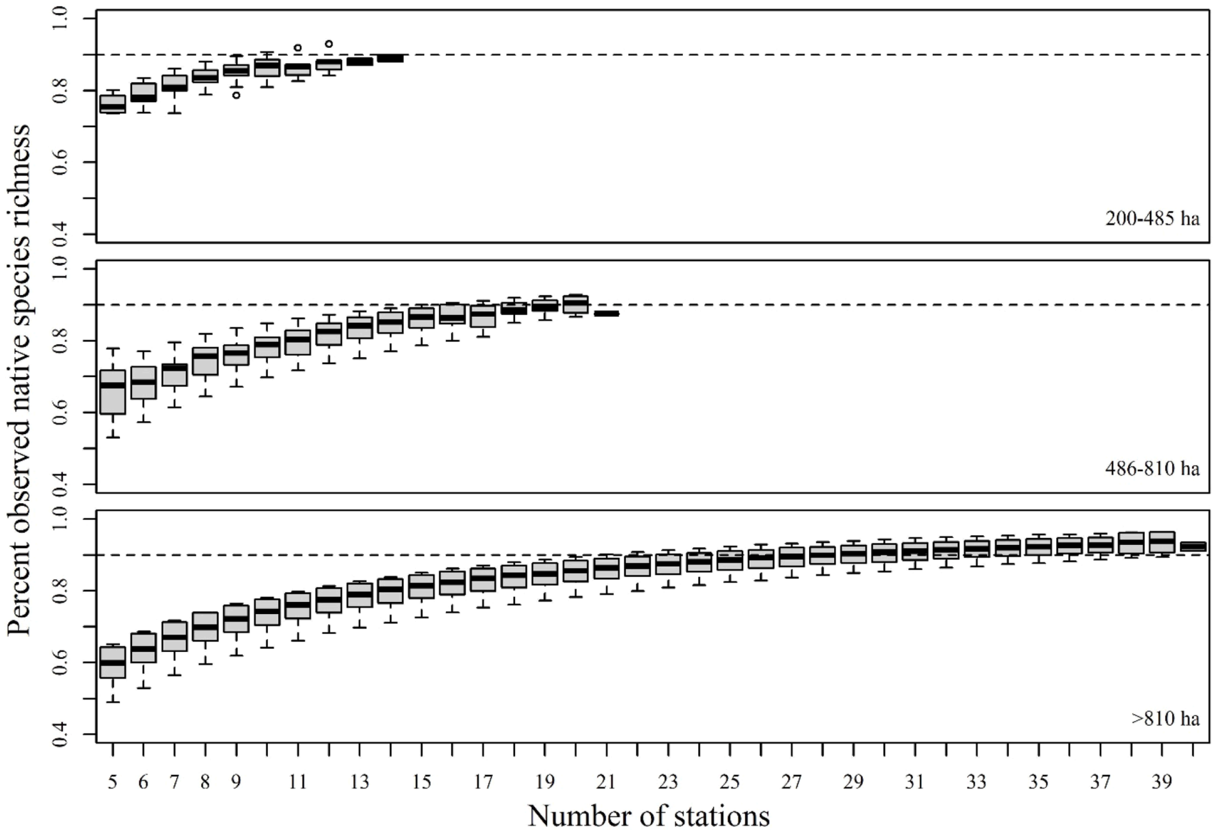

Fig. 2. Box-and-whisker plots depicting the estimated number of stations needed to accumulate approximately 90% of observed native species richness based on bootstrap simulations (N = 5,000) from repeat sampling completed on two lakes 200–485 ha and two lakes 486–810 ha, and oversampling completed on seven lakes greater than 810 ha. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians.

Table 2
Lake groupings identified for FIBIs and median values for lake attributes. SDI = shoreline development index, GDD = growing degree days (1981–2010).

Group (FIBI): lake description	Area (ha)	Maximum depth (m)	Percent littoral	SDI	Total alkalinity (ppm)	Volume (area*max depth/3)	Area: shoreline (km) ratio	GDD
FIBIs developed during this study								
2: Deepest, high SDI, tend to stratify	227	18	41	1.8	140	1,221	21.7	2,106
4: Deep, lower SDI, tend to stratify, primarily central and northern MN	78	11	50	1.6	110	303	15.9	1,991
5: Moderate depth, often heavily vegetated, primarily central and northern MN	79	8	74	2.0	122	226	12.6	2,014
7: Shallow (greater than80% littoral), primarily southern and western MN	136	3	99	1.8	165	132	18.8	2,379
FIBIs not developed during this study								
1: Softwater lakes, in northcentral and northeast MN	54	14	36	1.5	30	246	13.6	1,862
3: Large lakes, northern MN	41,662	18	33	2.1	145	162,064	203.5	1,988
6: Redistributed into FIBI groups 5 and 7 above	101	5	91	1.6	119	183	18.6	2,031

The range of stressor variables was limited in some lake groups, with nearly all group 4 and 5 lakes having relatively low watershed disturbance and all group 7 lakes having significant watershed disturbance (Fig. 4). Group 2 lakes had the widest range of values for watershed disturbance. Lakes in groups 5 and 7 generally had lower shoreline disturbance as measured by dock density than lakes in groups 2 and 4.

3.3. Fish classification

Ninety fish species were classified based on origin, family, tolerance, primary feeding niche, and special habitat use. Of those, 56 species were either rare or ubiquitous in lakes and therefore we did not model their probability of occurrence relative to stressor variables to aid in classification. We assigned several riverine species that are rare in most lakes a tolerance of “other” for the lake FIBI even though they may be an intolerant indicator species in streams. Probability of occurrence relative to stressor variables was estimated for the remaining 34 species. For a few of these species (i.e., Brook Silverside *Labidesthes sicculus*, Mottled Sculpin *Cottus bairdii*, and Cisco), the geographic range was adjusted by ecoregion prior to modeling. Of the 34 species, 29 had one or more significant relationships ($p \leq 0.05$) with a stressor variable (Appendix A). The modeling results were used to inform decisions regarding classification of tolerance and special habitat use. See Table A1.1 in Appendix A for details specifying which species probabilities were not

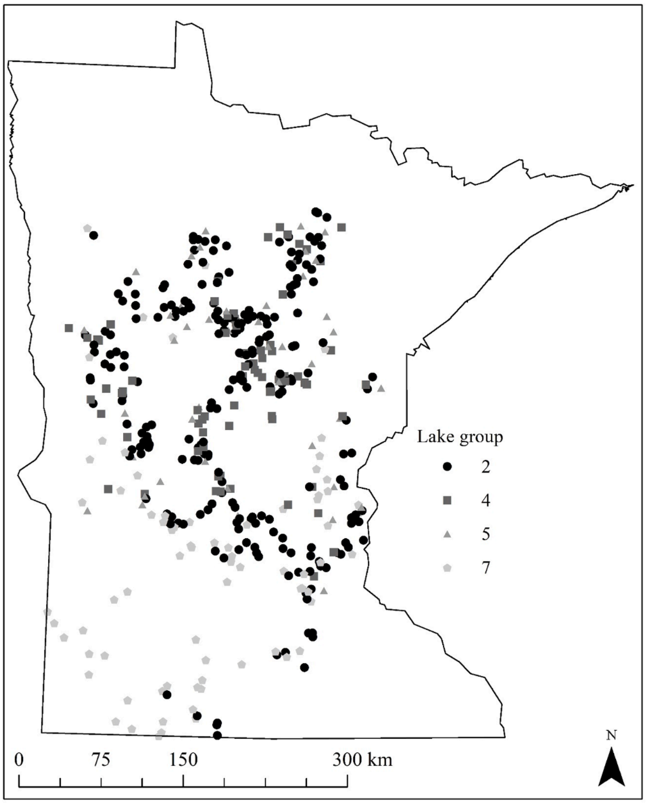

Fig. 3. Map illustrating distribution of lake groups across Minnesota.

modeled, a summary of model results, species classifications in other FIBIs and resources reviewed, and final species classification assignments.

3.4. FIBI metric selection and scoring

All 16 raw metrics were evaluated, adjusted, and standardized for each FIBI (Table B1.1). Five raw proportional metrics were log transformed for normality. Similarly, several raw richness metrics were significantly influenced ($p \leq 0.05$) by lake surface area and were subsequently adjusted for lake size during scoring. Significant relationships were also detected between several metrics and maximum depth and percent littoral area, but because depth is related to a lake's resiliency and ability to absorb watershed and shoreline stress, these metrics were not adjusted. Metrics were not related to SDI, alkalinity, watershed size, or lake connectivity.

Standardized metrics for groups 2, 4, and 7 generally had similar relationships with stressors, with changes in fish metrics responding in a predictable direction such as higher numbers and proportions of intolerant species, vegetation-dwelling species, and insectivore species associated with higher FQI values, lower watershed disturbance, and lower dock densities for some FIBIs. Similarly, higher numbers and proportions of tolerant species were associated with lower FQI values and higher watershed disturbance. However, several of the evaluated metrics for group 5 lakes had relationships that were unexpected, with higher numbers of native, cyprinid, insectivore, and vegetation-dwelling species correlated with higher measures of human induced stress, although the stressor gradient was narrow for group 5 lakes. Therefore, for group 5 lakes, we relied more on proportional metrics as well as intolerant and tolerant metrics.

Several metrics, or modifications to metrics, were only applied to select FIBIs based on expectations for those lake groups. The intolerant species in the gill net (biointol) metric was used only in FIBIs 2 and 4, which have deep water that support coldwater species. The proportion of top carnivores in the gill net metric in FIBI 7 performed better without Walleye (which are primarily of stocked origin in group 7 lakes), therefore the top carnivore metric for FIBI 7 is the proportion of habitat-dependent top carnivores, which are largely unstocked species. Of the evaluated metrics, 15 were retained for FIBI 2, 11 were retained for FIBI 4, and 8 were retained for FIBIs 5 and 7 based on their responsiveness to stressor variables and redundancy with other metrics (Table B1.1). Standardized metric scores varied from −4.8 to 5.3 across FIBIs.

Examination of absolute metric score differences by FIBI (Figs. 5–8) indicated significant differences across years ($p < 0.01$), with the smallest differences occurring between repeat surveys conducted within the same season. There were no significant differences between repeat surveys conducted one, two, or three years apart but all three exhibited larger differences than repeat surveys conducted within the same season. Individual metric score differences were similar across FIBIs (i.e., $p > 0.05$); however, significant differences in metric variability within each FIBI, aside from FIBI 7, did occur. Within FIBI 2, the proportional abundance of small benthic-dwelling individuals (i.e., Rasmb) and the cyprinid richness (i.e., Cyp) metrics exhibited the largest differences. Similarly, the Rasmb metric exhibited the largest difference within FIBI 4. Within FIBI 5, the proportional biomass of insectivorous individuals metric (i.e., Bioinsect) exhibited the largest difference.

Scores for lakes included in FIBI development varied from 0 to 100, with a median score of 48, across lake groups. For each of the four FIBIs, scores were negatively correlated with percent watershed disturbance and positively correlated with FQI (Fig. 9). Scores were also negatively correlated with dock density for lake groups 2, 4, and 5; however, these correlations were not statistically significant.

Absolute score differences between repeat surveys were examined over time and between FIBIs (Fig. 10). Score differences were relatively consistent but increased slightly between zero and six years, suggesting FIBI scores remain relatively consistent over short durations in the absence of environmental change. When compared with repeat surveys completed within the same year, repeat surveys completed three to five years apart exhibited significantly larger score differences ($p < 0.05$), and there were likely too few repeat surveys completed six years apart to detect a significant difference at that time interval. Differences as high as 20 or more points were observed on 3% of lakes with surveys completed within two years and an additional 17% of lakes with surveys completed three to six years apart. Slight score differences that were observed, particularly for repeat surveys within the same year, could be attributed to variability in fish surveys resulting from fish movement, weather patterns, and other factors affecting sampling efficacy. Though not statistically significant, the mean score difference for group 5 lakes was nearly twice as high as was observed for groups 2, 4, and 7. The lack of significance could be attributed to the relatively small number of repeat surveys conducted on group 5 lakes. A wider range in FIBI score differences was also observed in smaller lakes, although this too was not statistically significant.

3.5. FIBI threshold development

The BCG models for the four different lake groups correctly assessed anywhere from 93 to 100% of the calibration samples and 75 to 100% of the confirmation samples (Gerritsen and Stamp, 2014). Likewise, the BCG levels for each lake group corresponded with the primary stressors (Fig. 11). Overall 28% of lakes used in BCG development were assigned to BCG levels 1 or 2, which, based on participants' input, represent the present-day highest quality waters in this region.

Similar to impairment threshold development for Minnesota streams (Bouchard et al., 2016), for each lake group, the score corresponding to the median of BCG level 4 was assigned as the General Use impairment threshold (Fig. 12). Repeat surveys conducted within three years were evaluated using ANOVA to calculate the 90% confidence interval for the General Use impairment threshold. The 90% confidence interval for each FIBI varied from 8 to 15 points (Fig. 12). These are similar to 90%

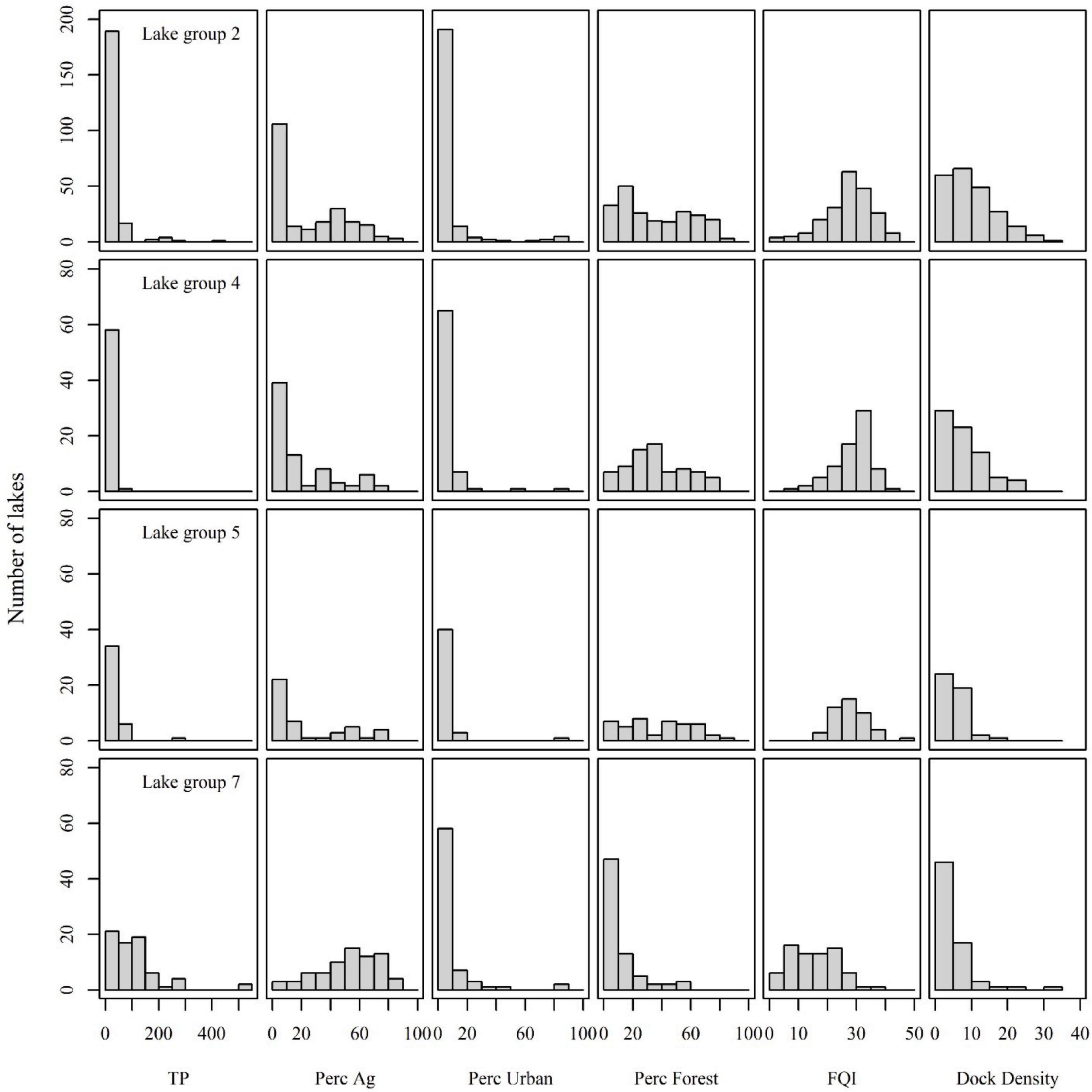

Fig. 4. Histograms showing the distribution of variables related to anthropogenic stressors by lake group for lakes used in FIBI development. TP = mean total phosphorus, Ag = Agriculture, FQI = floristic quality index, and Dock Density = number of docks per kilometer of shoreline.

confidence intervals reported for FIBIs for Minnesota streams, which vary from 9 to 16 points, with a median of 10, on a 100 point scale (J. Sandberg, personal communication, 2021).

Lakes with FIBI scores near the General Use impairment threshold generally contained a lower diversity and proportion of intolerant species, a higher proportion of biomass from tolerant species, and a higher proportion of biomass from omnivores relative to insectivores. These observations were consistent with the description provided by Davies and Jackson (2006), where BCG level 4 corresponds with moderate changes in the structure of the biotic community due to replacement of some sensitive taxa by more tolerant taxa. The Exceptional Use threshold was assigned for lake groups 2 and 4 at scores corresponding to the upper quartile of BCG level 3, which was very similar in value to the median of BCG level 2 (Fig. 12). Lakes with FIBI scores above the Exceptional Use threshold generally contained a high number of intolerant and small benthic-dwelling species and a low number or absence of tolerant species. Likewise, insectivores, top carnivores, and vegetation-dwelling species represented a large proportion of the catch in these lakes. These observations were also in alignment with the descriptions of BCG levels 2 and 3, where either virtually all native taxa are maintained or where some changes in biotic community structure have occurred due to loss of some rare native taxa but where sensitive taxa are still common and abundant (Davies and Jackson, 2006).

Impairment thresholds varied from 24 to 45 (Fig. 12). Most lakes with FIBI scores used in FIBI and BCG development in lake groups 2, 4, and 5 had scores above the impairment threshold. Most lakes in group 7 scored below the impairment threshold.

4. Discussion

IBIs should be developed such that they effectively characterize species composition and ecological structure and respond predictably to

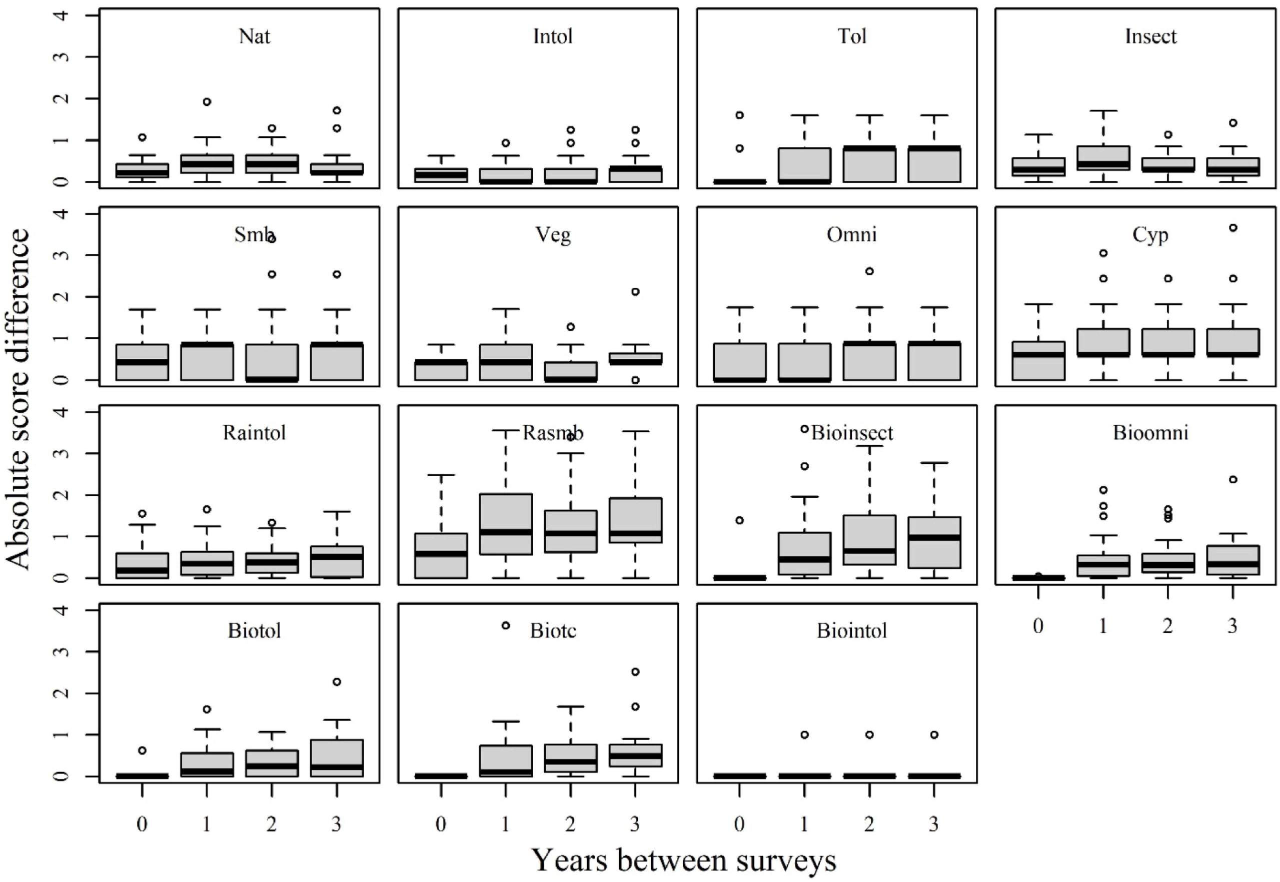

Fig. 5. Box-and-whisker plots showing distributions of FIBI 2 absolute metric score differences for 151 repeat surveys on 58 lakes across three years. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians.

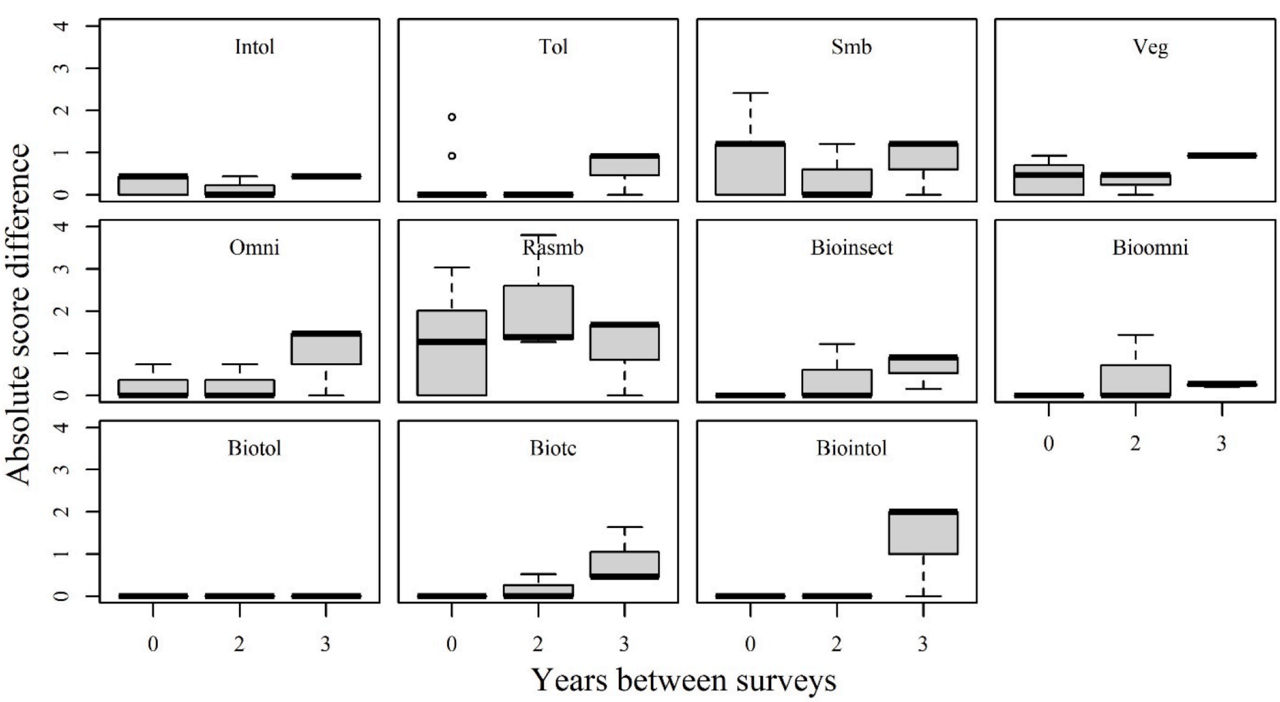

Fig. 6. Box-and-whisker plots showing distributions of FIBI 4 absolute metric score differences for 28 repeat surveys on 13 lakes across three years. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians.

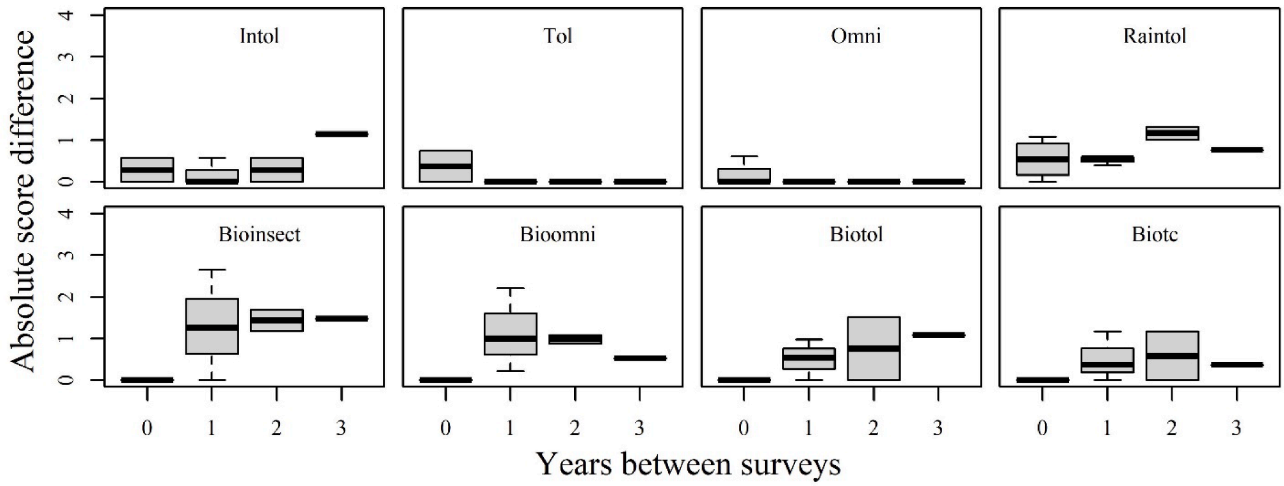

Fig. 7. Box-and-whisker plots showing distributions of FIBI 5 absolute metric score differences for 16 repeat surveys on 6 lakes across three years. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians.

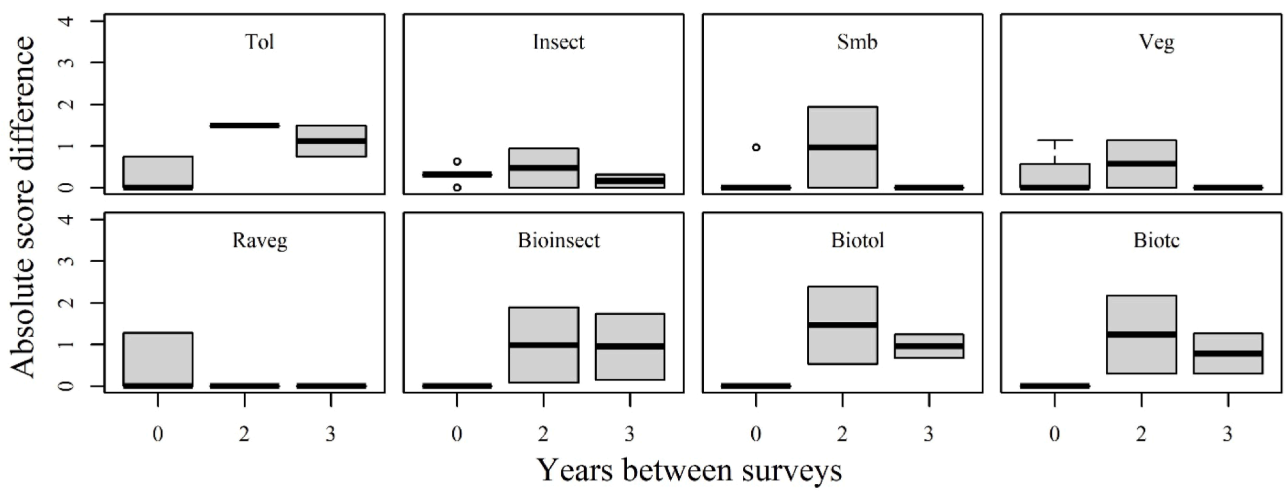

Fig. 8. Box-and-whisker plots showing distributions of FIBI 7 absolute metric score differences for 39 repeat surveys on 18 lakes across three years. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians.

human-caused stressors (Karr, 1981). The FIBIs developed for four groups of lakes during this study included 8–15 metrics that reasonably characterized fish communities in lakes and corresponded with varying levels of human-caused stressors such as eutrophication and physical habitat alteration.

Unlike wadeable streams that are commonly sampled with electrofishing to characterize fish assemblages (Simonson and Lyons, 1995), lakes contain a diverse array of habitats that can only be effectively sampled when using a combination of gear types (Jackson and Harvey, 1997). For example, many intolerant and habitat specialist species reside in the nearshore areas of lakes and are sampled readily with a combination of electrofishing and seining but are often too small to be sampled by gears such as trap nets and gill nets (Drake and Pereira, 2002). Conversely, insectivore, omnivore, and top carnivore species are generally larger and can be effectively sampled in these gear types. Consistent with Drake and Pereira (2002), we determined that electrofishing, seining, trapnetting, and gillnetting should be used in combination to capture the full suite of species in lakes and to provide the most reliable species richness and community composition metrics for inclusion in our FIBIs.

We used lake groupings from the hierarchical cluster analysis to develop the FIBIs in this study; however, we also evaluated alternative groupings based on level 3 ecoregions (Omernik and Griffith, 2014). We used principal components analysis (PCA) biplots to visually identify correlation patterns and relationships among community metrics and stressor variables within and among groupings and ecoregions. PCA biplots of FIBI metrics and stressor variables suggested that FIBI metrics and scores behaved similarly within their respective lake groups and within ecoregions, and that the lake groups 2, 4, 5, and 7 were appropriate for developing fish community expectations and estimators (Fig. C1.1–2 in Appendix C). Records indicate that most of the fish species found in Minnesota lakes are similarly distributed, or at least were historically, particularly across the Northern Lakes and Forests and North Central Hardwood Forests ecoregions and corresponding major basins (Hatch, 2015). Consequently, fish communities in Minnesota lakes are more likely shaped by localized factors such as lake characteristics and stressors. This, in addition to lower sample size for some ecoregions, resulted in selection of the lake groupings approach for FIBI development.

With several exceptions (e.g., winterkill or riverine influence), the four FIBIs developed during this study can be used to assess 73% of fisheries managed lakes greater than 40 ha within Minnesota, which is a substantial increase from the number assessable under the constraints of the Drake and Pereira (2002) FIBI. The FIBIs are also suitable for chains of lakes; similar basins are combined for sampling and assessment after taking hydrologic connections and habitat characteristics into

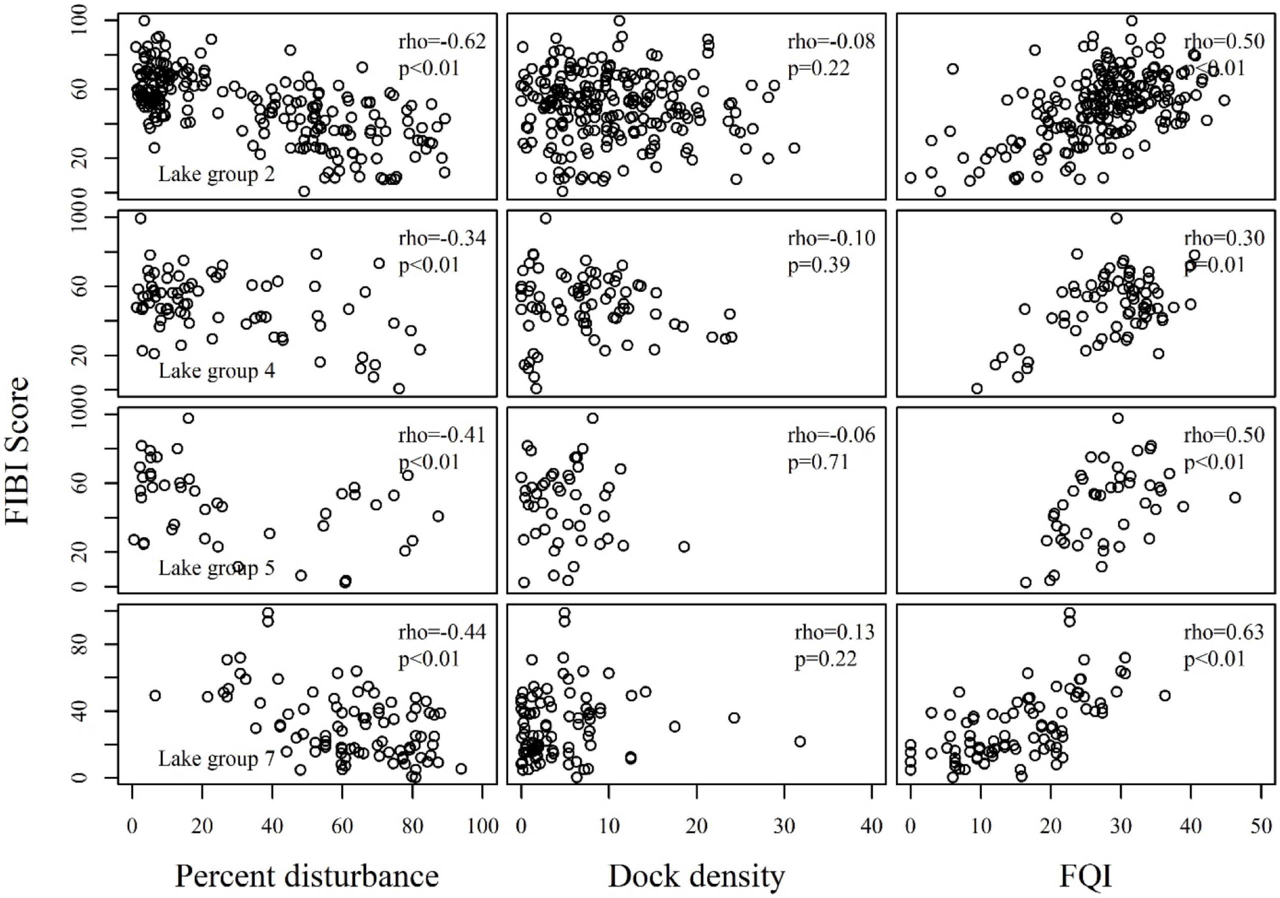

Fig. 9. FIBI scores relative to percent watershed disturbance, dock density (number of docks per kilometer of shoreline), and floristic quality index (FQI) for lake groups 2, 4, 5, and 7.

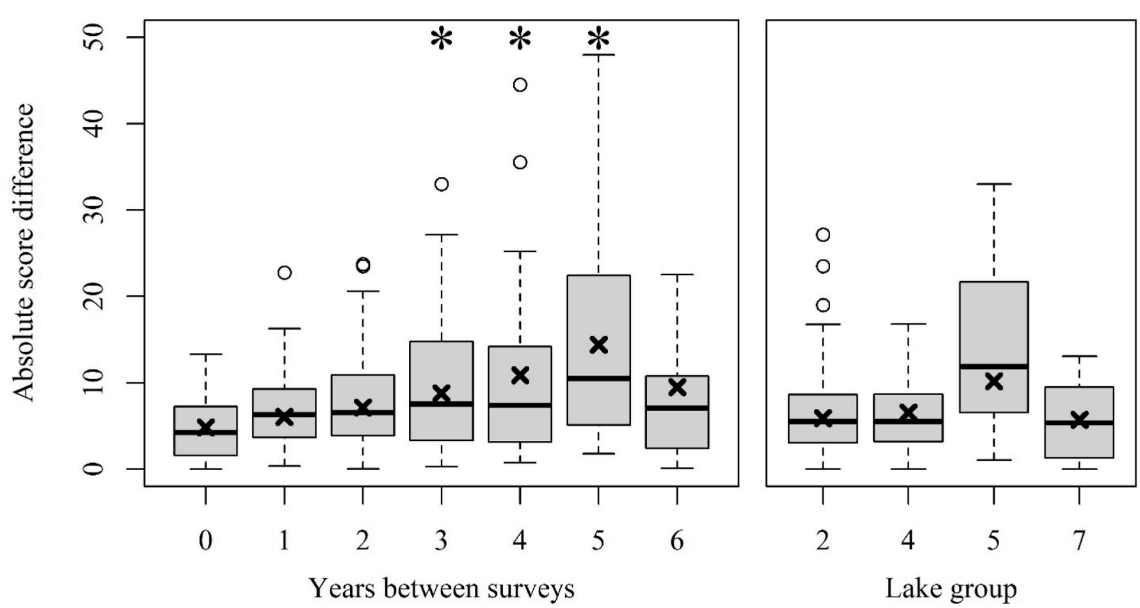

Fig. 10. Absolute FIBI score differences for repeat surveys across years and lake groups. The lake group boxplot includes only absolute score differences from surveys repeated within three years. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians from the sample. Mixed effect model estimated means are denoted by an X. Years denoted by an * are significantly different ($p < 0.05$) from repeat surveys conducted within the same year.

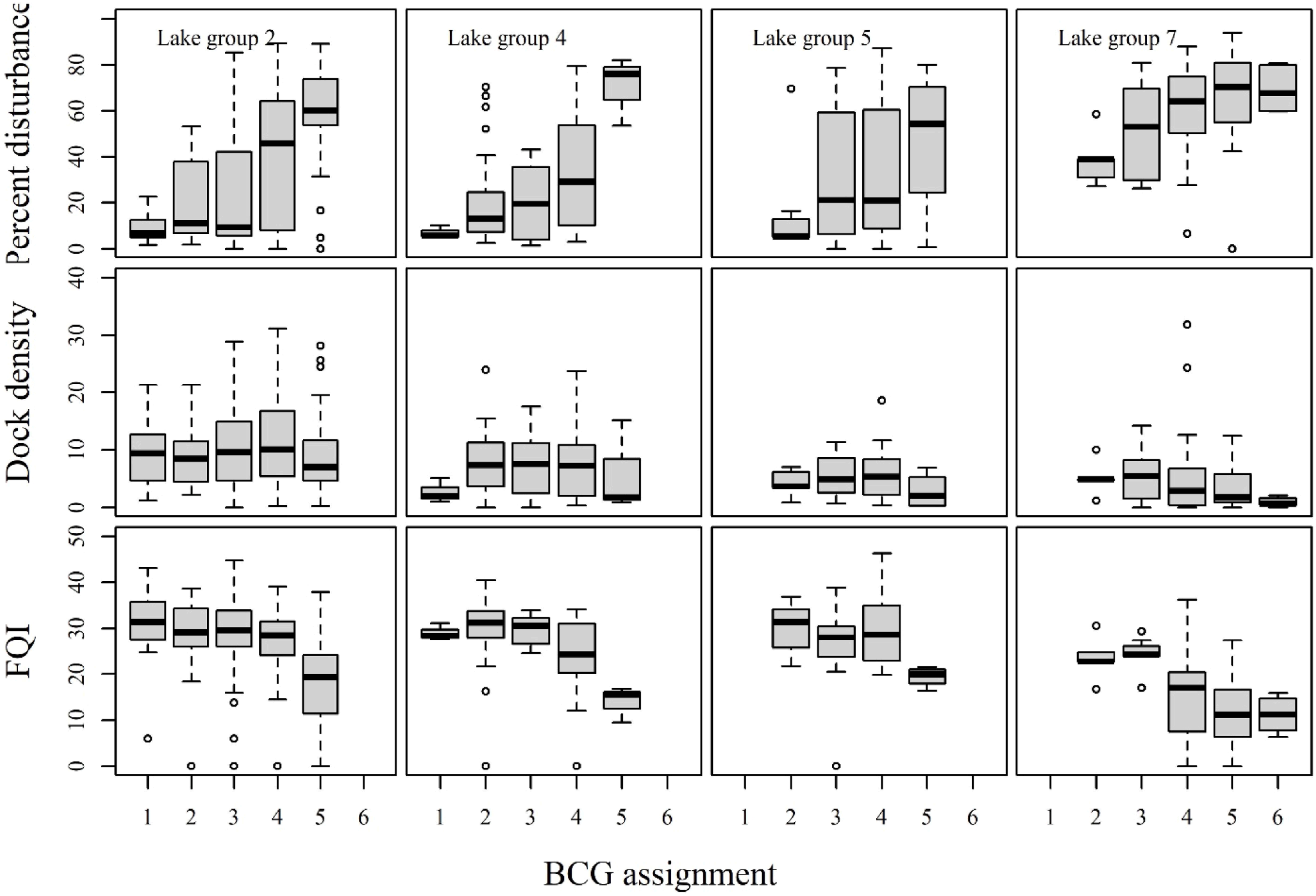

Fig. 11. Box-and-whisker plots showing the distribution of stressor variables (percent watershed disturbance, dock density (number of docks per kilometer of shoreline), and floristic quality index (FQI)) for each biological condition gradient (BCG) assignment and lake group. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians.

consideration. However, the FIBIs are not suitable for lakes with riverine fish communities and are not used to survey and assess reservoirs (defined based on estimated residence time of less than 14 days), as the fish communities are composed of a different suite of species that were not evaluated during FIBI development.

Of the 27% of lakes greater than 40 ha that are not assessable with the four FIBIs developed during this study, 95% are Canadian Shield lakes that were ultimately excluded from FIBI development as they are characterized as having very soft water, a limited stressor gradient, and low species diversity. The remaining 5% were identified in this study as either group 1 lakes that contained soft water and relatively low species diversity or group 3 lakes that constituted a subset of uniquely managed lakes with surface areas greater than approximately 5,000 ha. Research directed at understanding fish community expectations in group 1 and 3 lakes and in Canadian Shield lakes is ongoing and will be critical to evaluating and protecting the biological health of these lake types in the future.

Although metrics were adjusted based on lake surface area as appropriate, application of the FIBIs to lakes that are smaller or larger than the range used in this study should be carefully considered. Several lakes less than 40 ha were evaluated using FIBI protocols during this study, and resulting FIBI metrics and scores exhibited high variability, at least in part due to naturally limited habitat diversity and associated effects on species diversity similar to other studies (Jennings et al., 2009; Benson and Magnuson, 1992). Conversely, three lakes larger than 2,500 ha were evaluated during this study, and in total, only eleven of Minnesota's fisheries managed lakes in groups 2, 4, 5, or 7 exceed 2,500 ha. Future research may be warranted to verify that the FIBIs developed during this study can be applied to these lakes.

Accurate species classification was an important component necessary to characterize species composition and ecological structure in Minnesota lakes; therefore, we consulted a wide variety of sources and subject matter experts as well as conducted modeling using data specific to Minnesota lakes to assign tolerance, feeding guild, and special habitat use. Fish classification was generally in agreement with other studies, although several instances occurred where this was not the case. Namely, several species identified as tolerant (e.g., Central Mudminnow *Umbra limi*, White Sucker *Catostomus commersonii*) or intolerant (e.g., adult Chestnut Lamprey *Ichthyomyzon castaneus*, Slenderhead Darter *Percina phoxocephala*, Spottail Shiner *Notropis hudsonius*, Rainbow Darter *Etheostoma caeruleum*) in rivers and streams (Lyons et al., 2001; MPCA, 2014) were not classified as such in this study. Several of these species are rare in Minnesota lakes, therefore despite the differences, their overall contribution to applicable metrics and FIBI scores is likely negligible regardless of classification. Conversely, species that were more common in lakes were classified based on modeling specific to Minnesota lakes as part of this study when disagreements existed. Regional differences in classifications also existed (e.g., Fathead Minnow *Pimephales promelas*), as was evident from discrepancies between Midwestern (Jennings et al., 1999b; Drake and Pereira, 2002; this study) and Northeastern (Whittier and Hughes, 1998) United States studies. These differences are not surprising, as Karr (1981) indicated that tolerance classifications may differ between regions based on differences in water body condition, stressors, and associated species responses.

A vast majority of the species found in Minnesota lakes are

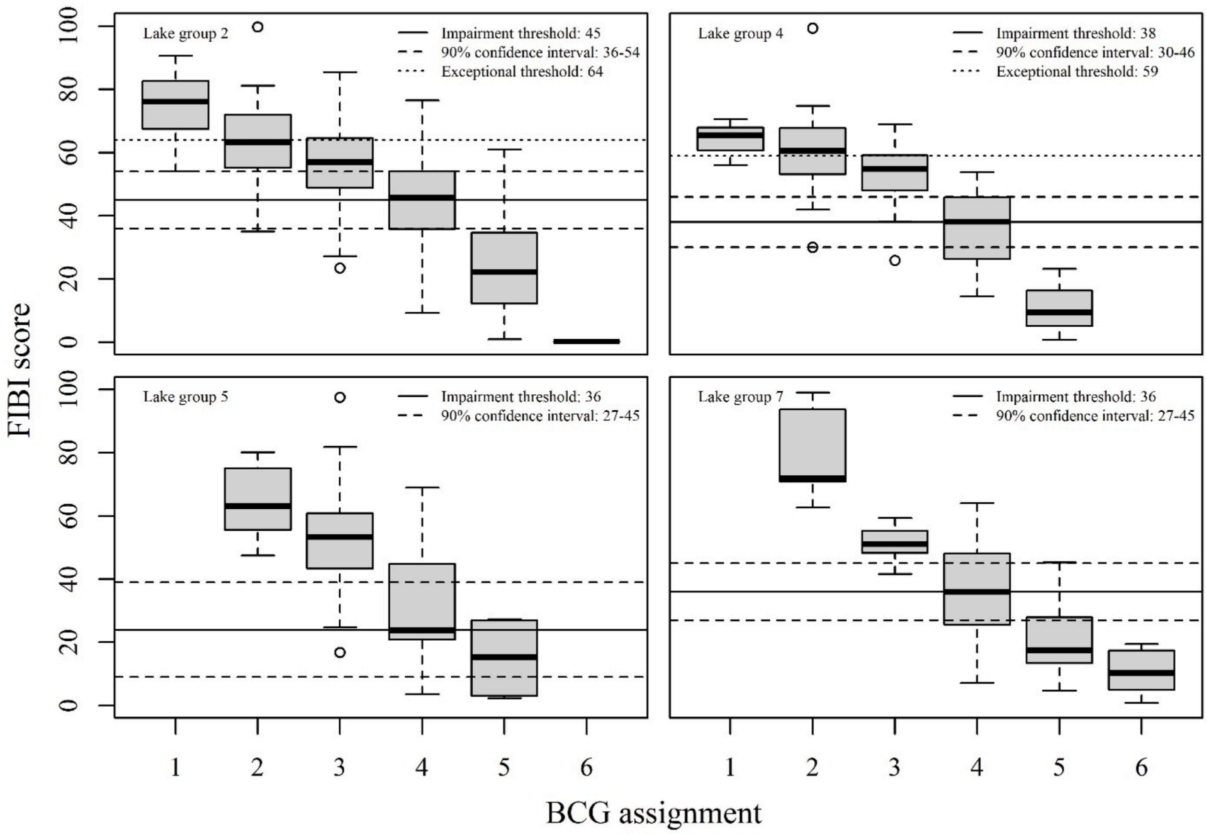

Fig. 12. Box-and-whisker plots showing the distribution of FIBI scores for each biological condition gradient (BCG) assignment and lake group. Rectangles represent the 25th and 75th percentiles, bars are the 5th and 95th percentiles, dots represent outliers, and horizontal midlines are medians.

considered warm- or coolwater species; therefore, the FIBIs largely assess the health of these communities, although some intolerant coldwater species are sampled and positively affect metrics in group 2 and 4 lakes. However, hundreds of lakes throughout central and northern Minnesota support populations of coldwater species such as Lake Trout *Salvelinus namaycush*, Lake Whitefish, and Cisco that require cold, well-oxygenated water. Recognizing this, we are engaged in a collaborative effort to develop and implement additional standards to add protections specific to coldwater fishes.

Although we started with the sixteen metrics included in the Drake and Pereira (2002) FIBI, we recognized the need to evaluate individual metric responses specific to each group of lakes to ensure each FIBI was performing sufficiently. Nearly all of the evaluated metrics were included for FIBI 2. Group 2 lakes are the most species rich group and include lakes similar to those used to develop the Drake and Pereira (2002) FIBI. Most of the metrics were also relevant for group 4 lakes, which are also deep and relatively species rich, with the metric scoring adjusted such that the species richness expectations were lower. FIBIs 5 and 7 included fewer of the evaluated metrics, likely due to lower overall species richness and lower habitat complexity in shallower lakes. Our findings regarding positive relationships between species richness and lake surface area for some lake groups highlight the importance of evaluating and accounting for natural (i.e., non-human) influences on fish communities (Karr, 1981) and corroborate other studies (Minns, 1989).

This study took a rigorous approach to understanding variability in metric scores and FIBI scores, with over 200 repeat surveys on nearly 100 lakes, including annual repeat surveys on several long term monitoring lakes. Variability in metric and FIBI scores was higher in group 5 lakes, which tended to have lower relative abundances of fish, lower overall species richness, and less of a stressor gradient than other lake groups in our study; we also had fewer repeat surveys in group 5 lakes. Because FIBI scores were similar among surveys conducted within seasons and between years relative to the range of scores observed, we can use data from just one or two survey events in most cases for determining lake condition and making a biological assessment decision. However, in group 5 lakes, which have higher score variability on average, and in lakes with scores near the impairment threshold, we recommend multiple survey events for determining lake condition based on the FIBI.

The BCG models developed during this study were the first to be developed for lakes, although BCG models have been developed and widely used in streams and river systems throughout the United States. For streams in Minnesota, MPCA developed Tiered Aquatic Life Uses (TALU) using fish and invertebrate IBIs and thresholds established by a BCG approach to provide the framework to designate uses that are attainable, and give greater protection to high quality waters and set appropriate goals for systems impacted by legacy uses (Bouchard et al., 2016). Biological thresholds for streams have been established for Exceptional Use (highest quality waters), General Use (waters meeting interim goal Clean Water Act criteria), and Modified Use (waters with legacy physical modifications such as ditching) waters (Bouchard et al., 2016). The approach in this study was similar in that it established a General Use threshold for each FIBI and an Exceptional Use threshold for two of the FIBIs. Using the BCG to set the FIBI thresholds standardized aquatic use goals across lake types and regions. Thresholds are used to identify impairments, to identify lakes at risk of becoming impaired, and to protect exceptional communities and habitat in high quality, exceptional lakes.

Although not a primary objective of this study, we did compare BCG assignments to reference and non-reference condition lakes using an approach similar to Bouchard et al. (2016). Reference lakes were identified using watershed disturbance based on land use classification (i.e., <10% disturbance and < 5% urban), dock density (i.e., <7.5 docks/

km), and other considerations (e.g., invasive species prevalence and water level manipulations). Ultimately, the reference lake approach was less useful than BCG models for developing meaningful thresholds because of the limited range of stressor gradients in lake groups 4, 5, and 7. Nearly all group 4 and 5 lakes are located in northern Minnesota in forested watersheds with minimal watershed disturbance and excellent water quality, and group 7 lakes are located in watersheds with very high agricultural land use in southern and western Minnesota and nearly all have poor water quality. As a result, there was less separation between lakes identified as reference and non-reference than we observed in the BCG levels. Nonetheless, we did compare potential thresholds using 10% and 25% of the FIBI score for reference lakes and determined that the impairment thresholds would have been higher using the reference lake approach than they were using the median of BCG 4. Based on the lack of disturbance gradient and lack of separation of scores between reference and non-reference lakes, we determined the BCG approach to be more suitable for setting meaningful biocriteria based on the FIBI.

Human-caused stressors that were not explicitly evaluated during metric selection or FIBI development but could also influence fish community health include climate change (Jeppesen et al., 2010), pesticides (Schäfer et al., 2011), toxic chemicals (Sánchez-Bayo et al., 2011), angling behaviors (Lewin et al., 2006), fisheries management activities (Cowx and Gerdeaux, 2004), and invasive species introductions (Gallardo et al., 2016), among others. Most of our study lakes are or have been stocked with Walleye fingerlings or fry, but similar to Drake and Pereira (2002); we found no significant relationships between FIBI scores or metrics and the number of species stocked, relative abundance of stocked species, or Walleye stocking density. Although other stressors were not directly evaluated due to a lack of lake- or watershed-specific data at the time of this study, many of these stressors are correlated with watershed disturbance (Anderson et al., 1996; Sass et al., 2010), which was a stressor variable that we considered during FIBI development.

We did evaluate several of the most likely stressors to fish communities in Minnesota lakes, and our results indicate that eutrophication most strongly influenced fish community health as measured by our FIBIs. This finding is consistent with numerous studies that have identified eutrophication as the most prominent stressor to aquatic ecosystems (Brönmark and Hansson, 2002; Stendera et al., 2012). FIBI scores were also correlated with FQI, a measure of structural fish habitat; however, this finding may also be confounded by the negative relationship between FQI and eutrophication (Radomski and Perleberg, 2012). Further, FQI was one of the variables used for FIBI metric selection, so correlation with overall scores is unsurprising. The relationship between FIBI scores and shoreline disturbance was often less well defined, perhaps because stressors often co-occur, particularly on highly developed lakes, and the cumulative effects on fish community health are often difficult to quantify (Jennings et al., 1999a; Dustin and Vondracek, 2017). Further, shoreline disturbance is not random, with more interest in building on certain lakes, varying shoreline ordinances on lakes resulting in higher development on some lakes (Radomski et al., 2010), and lower shoreline disturbance on shallow lakes (e.g. dock density, Fig. 4). Future studies that expand upon our current knowledge of the influence of a diverse array of human-caused stressors on fish community health would better inform the stressor identification process and allow resource managers to provide more guidance on best management practices to restore and protect our aquatic resources.

Now that our study has established a framework for assessing fish community health in a majority of Minnesota's fisheries managed lakes, future monitoring will also be needed to evaluate and document changes through time resulting from implementation activities as well as ongoing effects of various stressors.

5. Conclusions

The development of four lake FIBIs has proven instrumental in attainment of CWA goals in Minnesota. This expansion from the original Drake and Pereira (2002) FIBI, and the concurrent establishment of impairment thresholds for each FIBI via BCG models, has enabled resource agencies to evaluate aquatic life use within a broad suite of lakes distributed throughout the state. Results from FIBI sampling, in addition to pollutant-based water quality sampling, have been incorporated into a watershed assessment process, which ultimately aims to guide clean water planning, restoration, and protection efforts into the future.

Funding

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A–C. Supplementary data

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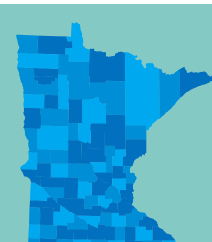
Use Designations

May 2022

Amendments to aquatic life (Class 2) use designations for streams

MINNESOTA POLLUTION CONTROL AGENCY



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Acronyms or abbreviations

2Ae	Aquatic Life and Recreation - Exceptional Cold water Aquatic Life and Habitat
2Ag	Aquatic Life and Recreation - General Cold water Aquatic Life and Habitat
2Bde	Aquatic Life and Recreation also protected as a source of drinking water - Exceptional Warm Water Habitat
2Bdg	Aquatic Life and Recreation also protected as a source of drinking water - General Warm Water Habitat
2Bdm	Aquatic Life and Recreation also protected as a source of drinking water - Modified Warm Water Habitat
2Be	Aquatic Life and Recreation - Exceptional Cool and Warm Water Aquatic Life and Habitat
2Bg	Aquatic Life and Recreation - General Cool and Warm Water Aquatic Life and Habitat
2Bm	Aquatic Life and Recreation - Modified Cool and Warm Water Aquatic Life and Habitat
AUID	Assessment Unit Identification
BCG	Biological Condition Gradient
ch.	Chapter
CWA	Clean Water Act (33 U.S.C. § 1251 et seq.)
DNR	Minnesota Department of Natural Resources
EPA	U.S. Environmental Protection Agency
HUC 8	8-digit Hydrological Unit Code
HUC 10	10-digit Hydrological Unit Code
HUC 12	12-digit Hydrological Unit Code
IBI	Index of Biological (Biotic) Integrity
IWM	Intensive Watershed Monitoring
Minn. R.	Minnesota Rules
Minn. Stat.	Minnesota Statutes
MN	Minnesota
MPCA or Agency	Minnesota Pollution Control Agency
MSHA	MPCA Stream Habitat Assessment
NPDES	National Pollutant Discharge Elimination System
PLS	Public Land Survey
TALU	Tiered Aquatic Life Uses
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
U.S.C.	United States Code
WID	Water Body Identification
WQS	Water Quality Standards

Definitions

The following definitions of terms used in this document are based on standard use and are provided for the convenience of the reader. Unless otherwise specified, these definitions are specific to this document.

Aquatic Biota: The aquatic community composed of game and nongame fish, minnows and other small fish, mollusks, insects, crustaceans and other invertebrates, submerged or emergent rooted vegetation, suspended or floating algae, substrate-attached algae, microscopic organisms, and other aquatic-dependent organisms that require aquatic systems for food or to fulfill any part of their life cycle, such as amphibians and certain wildlife species. See Minn. R. 7050.0150, subp. 4.

Aquatic Life Use: A designated use that protects aquatic biota including fish, insects, mollusks, crustaceans, plants, microscopic organisms and all other aquatic-dependent organisms. Attainment of aquatic life uses are measured directly in Minnesota using Indices of Biological Integrity (IBIs) and biological criteria. Chemical and physical standards are also used to protect aquatic life uses.

Aquatic Life Use Goals: A goal for the condition of aquatic biota; required by the Clean Water Act (CWA). Minimum aquatic life use goals are established using the CWA interim goal ("…water quality which provides for the protection and propagation of fish, shellfish, and wildlife…"). A Tiered Aquatic Life Uses (TALU) framework establishes multiple aquatic life use goals or tiers to protect attainable biological conditions. The objectives for these goals are established in Minnesota Rule using narrative standards, numeric standards, or both. Attainment of these goals is directly measured in Minnesota using IBIs and associated "Biological Criteria" or "Biocriteria."

Assemblage: A taxonomic subset of a biological community such as fish in a stream community. See Minn. R. 7050.0150, subp. 4.

Beneficial Use: A designated use described under Minn. R. 7050.0140 and listed under Minn. R. 7050.0400 to Minn. R. 7050.0470 for each surface water or segment thereof, whether or not the use is being attained. (The term "designated use" may be used interchangeably.) See also "Existing Use."

Biological Assessment: An evaluation of the biological condition of a water body using surveys of the structure and function of an assemblage of resident biota. It also includes the interdisciplinary process of determining condition and relating that condition to chemical, physical, and biological factors that are measured along with the biological sampling. Guidance for performing biological assessments in Minnesota is described in MPCA (2018a; https://www.pca.state.mn.us/sites/default/files/wq-iw1-04j.pdf). (The term "bioassessment" may be used interchangeably.)

Biological Condition Gradient (BCG): A concept describing how aquatic communities change in response to increasing levels of stressors. In application, the BCG is an empirical, descriptive model that rates biological communities on a scale from natural to highly degraded. See Minn. R. 7050.0150, subp. 4.

Biological Criteria,[1] Narrative or Biocriteria, Narrative: Written statements describing the attributes of the structure and function of aquatic assemblages in a water body necessary to protect the designated aquatic life beneficial use. See Minn. R. 7050.0150, subp. 4.

---

[1] The term "biological criteria" can be used interchangeably with "biological standard." Minnesota rule uses the term "standard" to mean "a number or numbers established for a pollutant or water quality characteristic to protect a specified beneficial use" (Minn. R. 7050.0218, subp. 3). The U.S. Environmental Protection Agency (EPA)'s use of the term "criteria" is similar to Minnesota's use of "standard." "Biological criteria" and "biocriteria" are the terms most commonly used in the United States to refer to numerical values, which represent the biological condition or health necessary to protect designated uses. Using

Biological Criteria,[1] **Numeric or Biocriteria, Numeric:** Specific quantitative measures of the attributes of the structure and function of aquatic communities in a water body necessary to protect the designated aquatic life beneficial use. See proposed definition in Minn. R. 7050.0150, subp. 4.

Biological Integrity: The ability of an aquatic ecosystem to support and maintain an assemblage of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats within a region.

Biological Monitoring: The measurement of a biological entity (taxon, species, assemblage) as an indicator of environmental conditions. Ambient biological surveys and toxicity tests are common biological monitoring methods. (The term "biomonitoring" may be used interchangeably.)

Clean Water Act (CWA): An act passed by the U.S. Congress to control water pollution (formally referred to as the Federal Water Pollution Control Act of 1972). 33 U.S.C. § 1251 et seq.

Criteria: Narrative descriptions or numerical values which describe the chemical, physical, or biological conditions in a water body necessary to protect designated uses. See also the definitions for "biological criteria/biocriteria" and "standard".

Designated Use: See "beneficial use."

Existing Use: Those uses actually attained in the surface water on or after November 28, 1975. See definition in Minn. R. 7050.0255, subp. 15.

Hydrological Unit Code (HUC): Watersheds in the United States are divided in to a series of hierarchical units. Each watershed at each level is designated by a hydrological unit code. At the highest level (Level 1), watersheds are divided into regions and are assigned a two-digit code. For example, the Upper Mississippi watershed is assigned the two-digit code "07" (see below). The region is subdivided in to subregions and an additional two digits are added to the code for each of the subregions creating a unique four-digit code for each. Each subsequent level is subdivided and assigned a unique, hierarchical code down to level six. The seventh level is part of the Minnesota Department of Natural Resources (DNR) watershed system. The minor watersheds are a further division of the 12-digit HUCs and are similar to 14-digit HUCs. These watersheds are used to organize water quality monitoring, assessment, and management activities.

Level	Name	Digits	Example code (HUC)	Example name
1	Region	2	07	Upper Mississippi
2	Subregion	4	0701	Mississippi Headwaters
3	Basin	6	070102	Upper Mississippi-Crow-Rum
4	Subbasin	8	07010206	Mississippi River - Twin Cities
5	Watershed	10	0701020606	Minnehaha Creek
6	Subwatershed	12	070102060601	Sixmile Creek
7	Minor watershed	NA	20053	Sixmile Creek

Index of Biological Integrity or Index of Biotic Integrity (IBI): An index developed by measuring attributes of an aquatic community that change in quantifiable and predictable ways in response to human disturbance, representing the health of that community. See MPCA 2017a, b.

Minnesota rule terminology, these values would be called "biological criteria" or "biocriteria" before promulgation and "biological standards" following promulgation in rule. However, to be consistent with the terminology used by federal agencies and by other states and tribes, the terms "biological criteria" and "biocriteria" are used in this document and in rule to refer to both the promulgated and unpromulgated values.

Standard: Regulatory limits on a particular pollutant, or a description of the condition of a water body, presumed to support or protect the beneficial use or uses. Standards may be narrative or numeric and are commonly expressed as a chemical concentration, a physical parameter, or a biological assemblage endpoint. See also the definitions for "biological criteria/biocriteria" and "criteria".

Stressors: Physical, chemical, and biological factors that can adversely affect aquatic organisms. The effect of stressors is apparent in biological responses because stressor conditions are outside the conditions for which an organism is adapted. This leads to changes in the fitness of organisms and changes in the composition of organisms found in aquatic communities. Under the effect of stressors, the normal functioning of organisms is disturbed (e.g., increased metabolism, interruption of behavior) which results in negative impacts such as decreased fitness, reduced growth, increased disease prevalence, interruption of reproductive behavior, increased emigration, and increased mortality. Examples of stressors in aquatic systems are low levels of dissolved oxygen, suspended sediments, toxic pollutants, habitat alteration, altered hydrology, and reduced connectivity.

Use Attainability Analysis (UAA): A structured scientific assessment of the physical, chemical, biological, and economic factors affecting attainment of the uses of water bodies. A UAA is required to remove a designated use specified in section 101(a)(2) of the CWA that is not an existing use. The allowable reasons for removing a designated use are described in 40 CFR § 131.10 (g). See definition in Minn. R. 7050.0150, subp. 4.

Tiered Aquatic Life Use (TALU) Framework: A TALU framework is the structure of designated aquatic life uses that incorporates a hierarchy of use subclasses. The TALUs in a TALU framework are based on representative ecological attributes reflected in the narrative description of each TALU tier and embodied in the measurements that extend to expressions of that narrative through numeric biological criteria and, by extension, to chemical and physical indicators, and standards.

Tiered Aquatic Life Uses (TALUs): Tiered aquatic life uses or TALUs are designated uses assigned to water bodies based on their ecological potential and the ability to protect or restore a water body to that attainable level. This means that the assignment of a TALU tier to a specific water body is done based on reasonable restoration or protection expectations and attainability. Knowledge of the current condition of a water body and an accompanying and adequate assessment of stressors affecting that water body are needed to make these assignments.

Total Maximum Daily Load (TMDL): The maximum amount of a pollutant that a body of water can receive while still meeting WQS. Alternatively, a TMDL is an allocation of a water pollutant deemed acceptable to still attain the beneficial use assigned to the water body. See 40 CFR § 130.7.

Water Body Identification (WID): The MPCA assigns a unique code to water bodies which is used for tracking information on these waters including assigned beneficial uses and assessment outcomes. For streams, this code consists of an 8-digit HUC code followed by a unique, 3-digit identifier (XXXXXXXX-XXX). Lake and wetlands are assigned a 2-digit county code, a 4-digit identifier, and a 2-digit subbasin code (XX-XXXX-XX). WIDs are also referred to as Assessment Unit Identification (AUID) codes.

Water Quality Standards (WQS): A law or regulation that consists of the beneficial use or uses of a water body, the narrative or numerical WQS that are necessary to protect the use or uses of that particular water body, and antidegradation.

A. Overview

The Minnesota Pollution Control Agency (MPCA) routinely reviews use designations to ensure that beneficial uses assigned to streams, lakes and wetlands are protective and attainable as defined by the Clean Water Act (CWA) and Minnesota Rule. As a result of routine monitoring and rule changes by the Minnesota Department of Natural Resources (DNR), the MPCA has identified water bodies where the currently designated beneficial use does not accurately reflect an attainable use. The most important reason to assign accurate beneficial uses to these water bodies is that the designated use for each water body needs to be correct and appropriate because the designated use affects many of the water quality protection and restoration efforts at the MPCA (e.g., assessment, stressor identification, National Pollutant Discharge Elimination System [NPDES] permitting, Total Maximum Daily Loads [TMDLs]). Fundamentally, assigning the correct beneficial uses to Minnesota's waters also serves to accurately document the types and condition of Minnesota's aquatic resources.

The recommended use designations in this document only affect Class 2 (i.e., aquatic life and recreation) and are focused on aquatic life beneficial uses. The amendments to Minn. R. 7050.0470 described herein serve as the technical documentation for these designations. This document includes several sections including an overview of the use review process, a list of reaches proposed to be designated, and a technical justification for each use designation. Additional documentation for use designations which affect Class 2A are also provided in Appendix A. This information is provided before these use designations are formally proposed as part of an effort to provide stakeholders with ample time to review these designations and to engage with the MPCA staff regarding concerns with these draft designations.

The use designations in this document can be divided into two groups: 1) Tiered Aquatic Life Use (TALU) reviews and 2) cold water/warm water reviews (Classes 2A and 2B/2Bd) (Table 1). Most use designations are the result of routine use reviews that are performed as part of MPCA's Intensive Watershed Monitoring (IWM) efforts. Of these, most reviews are TALU reviews in watersheds that were monitored in 2016[2] and 2017[3]. In addition, to TALU reviews, cold water (Class 2A) and cool/warm water (Classes 2B and 2Bd) uses are reviewed using IWM data largely from IWM efforts in 2012-2017. The intention of Class 2A and 2B/2Bd reviews is to assign the correct designation to these waters before these watersheds are monitored and assessed again in IWM Cycle II. In addition, a number of Class 2A and 2B/2Bd designations were triggered by DNR amendments to Minn. R. 6264.0050, which the MPCA agreed were appropriate to amend in Minn. R. 7050.0470.

For many draft use designations, the new use designation carries with it more or less stringent water quality standards (WQS). In cases where designation results in less stringent WQS, this cannot be considered a downgrading or the removal of an existing use. In all cases, these waters had not been reviewed previously because the use designation was assigned by default or data/tools for reviewing use attainability were not previously available. For example, with Class 2A and 2B/2Bd designations, the use designations were solely based on the DNR's trout waters list (Minn. R. 6264.0050). Because the MPCA and DNR have different management goals and are accountable to different state and federal rules, the MPCA's Class 2A and the DNR's trout waters list are not necessarily aligned although these designations largely overlap. Overall, the recommended use designations in this document represent a

[2] *Watersheds monitored in 2016: Kettle, Mississippi River – Brainerd, Mississippi River – Sartell, Otter Tail, and Upper St. Croix.*
[3] *Watersheds monitored in 2017: Blue Earth, Cottonwood, Lower Rainy, North Fork Crow, Pomme de Terre, Rainy Lake, Rapid, Redwood, and Snake.*

more accurate beneficial use assignment for these waters that are aligned with Minnesota and Federal water quality rules.

In total, the recommended use designations in this document include designations for 232 stream assessment units (AUIDs; 859 river miles) (Table 1). There is also a single reach (07040004-763) which was originally designated Class 2A as a trout protection water, but which has now been demonstrated to support a cold water habitat. There is no use designation change for this reach, but the presence of a cold water habitat is confirmed and documented in this report. The list of draft use designations are in Table 2. In this table and throughout this document, use designations are organized hierarchically by major watershed and then by 8-digit hydrological unit code (HUC 8). Within HUCs, water bodies are sorted by WID number. Following the use designation table, there is a description of the use designation process for both TALU and cold water reviews. The final section, and the bulk of this document, are descriptions of the evidence supporting the draft use designation for each water body. Additional supplemental evidence is provided in Appendix A.

Table 1: Summary of use designation proposals for streams (p*arentheses around "2Ag" indicate the reach was designated 2A as a trout protection water).*

Current use	Proposed use	# of WIDs	River miles	First MPCA biological use review
2Ag	2Ae	1	4.2	Yes
(2Ag)	2Ag	1	0.8	Yes
(2Ag)	2Bdg	23	12.4	Yes
2Ag	2Bdg	43	143.2	Yes
2Bg	2Ag/2Ag^{o}	25	67.3	Yes
2Bg	2Be	17	92.4	Yes
2Bg	2Bm	123	539.0	Yes

Table 2: List of recommended use designations (Abbreviations: 2Bg = General cool and warm water aquatic life and habitat; 2Bdg = General cool and warm water aquatic life and habitat also protected as a source of drinking water; 2Be = Exceptional cool and warm water aquatic life and habitat; 2Bm = Modified cool and warm water aquatic life and habitat; 2Ag = General cold water aquatic life and habitat; 2Ae = Exceptional cold water aquatic life and habitat; DNR = Minnesota Department of Natural Resources; TALU = Tiered Aquatic Life Use review; CWR = Cold water Review; (2Ag) = the parentheses indicate the reach was designated 2A as a trout protection water and was not managed for trout; * indicates the stream has not undergone a Use Attainability Analysis and is currently designated General Use by default; º aquatic life designation justified using results other than an MPCA biological survey).

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
Minn. R. 7050.0470, subp. 1. Lake Superior Basin						
1.A.(1) Lake Superior - North Watershed (04010101)						
04010101-692	Wilson Creek	2Agº	2Bdg	0.34	Lake	CWR
04010101-A01	Unnamed creek (Greenwood River Tributary)	2Agº	2Bdg*	0.57	Cook	DNR
04010101-D87	Unnamed creek (Sugar Loaf Creek)	2Agº	2Bdg*	0.70[4]	Cook	DNR
04010101-D97	Unnamed creek (Greenwood River Tributary)	(2Agº)	2Bdg*	0.43	Cook	DNR
1.A.(2) Lake Superior - South Watershed (04010102)						
04010102-985	Nicadoo Creek	2Bg*	2Agº	0.17	Lake	DNR
04010102-A25	Unnamed creek (Skunk Creek Tributary)	2Agº	2Bdg*	(0.30)[4]	Lake	DNR
04010102-A39	Unnamed creek (Split Rock River Tributary)	(2Agº)	2Bdg*	0.56	Lake	DNR
04010102-B70	Unnamed creek	(2Agº)	2Bdg*	0.39	Lake	DNR
04010102-C46	Unnamed creek (Encampment River Tributary)	2Bg*	2Agº	1.79	Lake	DNR
04010102-C48	Stony Creek	2Bg*[5]	2Agº	(1.27)[6]	Lake	DNR
04010102-C53	Unnamed creek (Encampment River Tributary)	2Agº	2Bdg*	1.18	Lake	DNR
1.A.(3) St. Louis River Watershed (04010201)						
04010201-617	Spider Creek (Spider Muskrat Creek)	2Agº	2Bdg	1.22	St. Louis	DNR
04010201-823	Unnamed creek (Peters Creek)	2Agº	2Bdg*	1.51	Itasca	DNR
04010201-824	Unnamed creek (Peters Creek)	2Agº	2Bdg*	1.25	Itasca	DNR
04010201-862	Spider Creek (Spider Muskrat Creek)	2Agº	2Bdg*	0.71	St. Louis	DNR

[4] The draft use designation for this WID is changing the length of the 2Ag reach to align it with the DNR's trout waters designation. Therefore, the draft use designation only affects part of this WID. These stream miles represent only the portion where the Class 2Ag would be removed.

[5] The portion of this WID in PLS section T55 R10W S27 (as 04010102-A38), is currently designated Class 2Ag in the beneficial use table for the Lake Superior – South Watershed (04010102).*

[6] The length of this WID is 1.37 mi, but 0.10 mi is currently designated Class 2Ag. As a result, these stream miles represent only the portion where the Class 2Ag would be removed.

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
04010201-863	Spider Creek (Spider Muskrat Creek)	2Ag^{o}	2Bdg*	0.61	St. Louis	DNR
04010201-864	Spider Creek (Spider Muskrat Creek)	2Ag^{o}	2Bdg*	0.84	St. Louis	DNR
04010201-865	Spider Creek (Spider Muskrat Creek)	2Ag^{o}	2Bdg*	1.49	St. Louis	DNR
1.A.(4) Cloquet River - Headwaters Watershed (04010202)						
04010202-617	Unnamed creek (Carey Creek)	2Ag^{o}	2Bdg*	0.86	St. Louis	DNR
04010202-657	Pine Creek	2Bg*	2Ag	4.58	Lake, St. Louis	CWR
04010202-672	Hellwig Creek	2Ag^{o}	2Bdg	4.75	St. Louis	CWR
1.A.(5) Nemadji River Watershed (04010301						
04010301-763	Spring Creek	(2Ag^{o})	2Bdg*	0.51	Carleton	DNR
04010301-765	Unnamed creek (Skunk Creek Tributary)	(2Ag^{o})	2Bdg*	0.76	Carleton	DNR
04010301-767	Unnamed creek (Skunk Creek Tributary)	(2Ag^{o})	2Bdg*	0.50	Carleton	DNR
Minn. R. 7050.0470, subp. 2. Lake of the Woods Basin						
2.A.(1) Rainy River - Headwaters Watershed (09030001)						
09030001-676	Hog Creek	2Bg*	2Ag	1.13	Lake	CWR
09030001-874	Unnamed creek (Ash River Tributary)	(2Ag^{o})	2Bdg*	0.60	Saint Louis	DNR
09030001-875	Unnamed creek (Ash River Tributary)	(2Ag^{o})	2Bdg*	0.18	Saint Louis	DNR
09030001-876	Unnamed creek (Ash River Tributary)	(2Ag^{o})	2Bdg*	0.60	Saint Louis	DNR
09030001-877	Unnamed creek (Ash River Tributary)	(2Ag^{o})	2Bdg*	0.60	Saint Louis	DNR
09030001-887	Unnamed creek (Blackduck River Tributary)	(2Ag^{o})	2Bdg*	1.07	Saint Louis	DNR
09030001-924	Unnamed creek (Ninemile Creek Tributary)	(2Ag^{o})	2Bdg*	0.44	Saint Louis	DNR
09030001-929	Unnamed creek (Ninemile Creek Tributary)	(2Ag^{o})	2Bdg*	0.34	Saint Louis	DNR
09030001-932	Unnamed creek (Ninemile Creek Tributary)	(2Ag^{o})	2Bdg*	0.15	Saint Louis	DNR
09030001-974	Larch Creek	2Bg*	2Ag	3.64	Cook	CWR
09030001-979	Harriet Creek	2Bg*	2Ag	4.26	Lake	CWR
09030001-987	Dunka River	2Bg*	2Ag	4.82	Saint Louis	CWR
09030001-A29	Unnamed creek (Ash River Tributary)	(2Ag^{o})	2Bdg*	0.25	Saint Louis	DNR
09030001-A30	Unnamed creek (Blackduck River Tributary)	(2Ag^{o})	2Bdg*	0.29	Saint Louis	DNR
09030001-A32	Unnamed creek (Ash River Tributary)	(2Ag^{o})	2Bdg*	1.63	Saint Louis	DNR
09030001-A34	Unnamed creek (Ninemile Creek Tributary)	(2Ag^{o})	2Bdg*	0.30	Saint Louis	DNR
2.A.(2) Vermilion River Watershed (09030002)						
09030002-648	East Two River	2Ag^{o}	2Bdg	3.24	Saint Louis	CWR

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
2.A.(4) Little Fork River (09030005)						
09030005-545	Unnamed creek (Lost River Tributary)	(2Ag^{o})	2Bdg*	(0.26)[7]	Saint Louis	DNR
09030005-546	Unnamed creek (Lost River Tributary)	(2Ag^{o})	2Bdg*	(0.28)[7]	Saint Louis	DNR
Minn. R. 7050.0470, subp. 3. Red River of the North Basin						
3.A.(3) Otter Tail River Watershed (09020103)						
09020103-526	Toad River	2Ag^{o}	2Bdg	10.59	Becker	CWR
09020103-665	Unnamed creek (Toad River Tributary)	2Ag^{o}	2Bdg*	0.85	Becker	CWR
09020103-764	Judicial Ditch 2	2Bg*	2Bm	2.09	Otter Tail, Wilkin	TALU
3.A.(7) Wild Rice River Watershed (09020108)						
09020108-534	Buckboard Creek	2Ag^{o}	2Bdg	7.41	Clearwater	CWR
3.A.(9) Upper/Lower Red Lake Watershed (09020302)						
09020302-540	Mud River	2Ag^{o}	2Bdg	2.89	Beltrami	CWR
09020302-542	Meadow Creek	2Ag^{o}	2Bdg	4.33	Beltrami	CWR
09020302-544	O'Brien Creek	2Ag^{o}	2Bdg*	8.57	Beltrami	CWR
09020302-546	Spring Creek	2Ag^{o}	2Bdg	2.82	Beltrami	CWR/DNR
3.A.(12) Clearwater River Watershed (09020305)						
09020305-530	Lost River	2Ag^{o}	2Bdg	4.46	Clearwater	CWR
09020305-654	Clearwater River	2Ag^{o}	2Bdg	5.82	Beltrami	CWR
09020305-900	Unnamed creek (Spring Lake Creek)	2Ag^{o}	2Bdg*	1.07	Beltrami	DNR
Minn. R. 7050.0470, subp. 4. Upper Mississippi River Basin						
4.A.(2) Leech Lake River Watershed (07010102)						
07010102-527	Pokety Creek	2Ag^{o}	2Bdg	4.54	Hubbard	CWR/DNR
4.A.(3) Mississippi River – Grand Rapids Watershed (07010103)						
07010103-594	Sand Creek	2Ag°	2Bdg	8.66	Itasca	CWR
07010103-595	Warba Creek	2Ag°	2Bdg	4.81	Itasca	CWR/DNR
07010103-599	Michaud Brook	2Ag°	2Bdg	1.02	Cass	CWR/DNR
07010103-601	Libby Brook	2Ag°	2Bdg*	1.05	Aitkin	CWR/DNR

[7] *The draft use designation for this WID is changing the length of the 2Ag reach to align it with the DNR's trout waters designation. Therefore, the draft use designation only affects part of this WID. These stream miles represent only the portion where the Class 2Ag would be removed.*

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
07010103-602	Libby Brook	2Ag°	2Bdg	2.72	Aitkin	CWR/DNR
07010103-603	Hasty Brook	2Ag°	2Bdg	6.75	St. Louis, Carlton	CWR
07010103-606	Hasty Brook	2Ag°	2Bdg	10.29	St. Louis, Carlton	CWR
07010103-608	Bruce Creek	2Ag°	2Bdg	3.53	Itasca	CWR/DNR
07010103-609	Bruce Creek	2Ag°	2Bdg*	2.59	Itasca	CWR/DNR
07010103-623	Trib. To Mississippi River (Two River Springs)	2Ag°	2Bdg	1.34	Aitkin	CWR
07010103-722	Unnamed creek	2Bg*	2Ag	2.19	Itasca	CWR
07010103-762	Morrison Brook	2Ag°	2Bdg	2.80	Aitkin	CWR
4.A.(4) Mississippi River - Brainerd Watershed (07010104)						
07010104-590	Unnamed ditch	2Bg*	2Bm	0.95	Aitkin	TALU
07010104-666	Ripple River	2Bg*	2Bm	2.26	Aitkin	TALU
07010104-679	Unnamed creek	2Bg*	2Bm	3.78	Crow Wing	TALU
07010104-683	Unnamed creek	2Bg*	2Be	4.56	Morrison	TALU
07010104-684	Unnamed creek	2Bg*	2Bm	2.77	Morrison	TALU
07010104-685	Unnamed creek	2Bg*	2Bm	1.88	Morrison	TALU
07010104-691	Unnamed ditch	2Bg*	2Bm	3.96	Aitkin	TALU
07010104-697	Unnamed ditch	2Bg*	2Bm	5.52	Aitkin	TALU
07010104-701	Little Willow River Old Channel	2Bg*	2Bm	5.66	Aitkin	TALU
4.A.(5) Pine River Watershed (07010105)						
07010105-525	Brittan Creek	2Ag°	2Bdg	1.27	Cass	CWR
07010105-528	Bungo Creek	2Ag°	2Bdg	6.31	Cass	CWR/DNR
07010105-535	Bungo Creek	2Ag°	2Bdg*	0.81	Cass	CWR/DNR
4.A.(9) Mississippi River - Sartell Watershed (07010201)						
07010201-545	Platte River	2Bg*	2Be	13.90	Morrison, Benton	TALU
07010201-622	Unnamed creek	2Bg*	2Bm	4.19	Morrison	TALU
07010201-632	Unnamed creek	2Bg*	2Bm	3.92	Stearns	TALU
07010201-640	Unnamed creek	2Bg*	2Bm	2.89	Benton	TALU
07010201-652	Little Rock Creek	2Ag°	2Bdg	8.10	Morrison	CWR
4.A.(10) Sauk River Watershed (07010202)						
07010202-660	Trib. to Sauk River	2Bg	2Ag	1.22	Stearns	CWR
07010202-725	Stony Creek	2Bg*	2Ag	2.34	Stearns	CWR

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
4.A.(12) North Fork Crow River Watershed (07010204)						
07010204-532	County Ditch 47	2Bg*	2Bm	9.53	Kandiyohi, Meeker	TALU
07010204-548	Unnamed creek	2Bg*	2Bm	3.57	Meeker	TALU
07010204-553	Unnamed creek (County Ditch 4)	2Bg*	2Bm	1.48	Meeker	TALU
07010204-557	Silver Creek	2Bg*	2Bm	4.25	Meeker	TALU
07010204-563	County Ditch 10	2Bg*	2Bm	2.56	Wright	TALU
07010204-578	County Ditch 32	2Bg*	2Bm	2.04	Stearns	TALU
07010204-580	County Ditch 7	2Bg*	2Bm	2.66	Stearns	TALU
07010204-584	Judicial Ditch 1	2Bg*	2Bm	3.36	Stearns	TALU
07010204-585	Jewitts Creek (County Ditch 19, 18, and 17)	2Bg*	2Bm	8.57	Meeker	TALU
07010204-600	Unnamed creek	2Bg*	2Bm	0.98	Kandiyohi	TALU
07010204-614	County Ditch 19	2Bg*	2Bm	1.03	Meeker	TALU
07010204-643	County Ditch 26	2Bg*	2Bm	2.29	Meeker	TALU
07010204-652	County Ditch 26	2Bg*	2Bm	1.45	Kandiyohi	TALU
07010204-700	County Ditch 36	2Bg*	2Bm	1.35	Stearns	TALU
07010204-748	Grove Creek	2Bg*	2Bm	1.00	Meeker	TALU
07010204-751	Washington Creek (County Ditch 9)	2Bg*	2Bm	3.61	Meeker	TALU
07010204-753	Washington Creek (County Ditch 9)	2Bg*	2Bm	1.80	Meeker	TALU
07010204-755	County Ditch 36	2Bg*	2Bm	4.58	Meeker	TALU
07010204-757	Unnamed creek (Battle Creek)	2Bg*	2Bm	4.95	Meeker	TALU
07010204-759	French Creek	2Bg*	2Bm	1.70	Wright	TALU
07010204-761	Sucker Creek	2Bg*	2Bm	11.43	Meeker, Wright	TALU
07010204-763	Crow River, North Fork	2Bg*	2Bm	7.85	Pope, Stearns	TALU
Minn. R. 7050.0470, subp. 5. Minnesota River Basin						
5.A.(2) Pomme de Terre River Watershed (07020002)						
07020002-515	County Ditch 22	2Bg*	2Bm	2.19	Stevens	TALU
07020002-545	Unnamed creek	2Bg*	2Bm	1.83	Swift	TALU
07020002-547	Unnamed creek	2Bg*	2Bm	1.11	Swift	TALU
07020002-566	Unnamed creek	2Bg*	2Bm	0.36	Big Stone, Swift	TALU
07020002-576	Unnamed creek	2Bg*	2Bm	1.37	Stevens	TALU

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
5.A.(6) Redwood River Watershed (07020006)						
07020006-513	Redwood River	2Ag°	2Bdg	6.72	Lyon	CWR
07020006-517	Judicial Ditch 14 & 15	2Bg*	2Bm	7.86	Redwood	TALU
07020006-518	Judicial Ditch 33	2Bg*	2Bm	1.73	Redwood	TALU
07020006-520	Judicial Ditch 33	2Bg*	2Bm	2.90	Redwood	TALU
07020006-521	Ramsey Creek	2Ag°	2Bdg	0.62	Redwood	CWR
07020006-524	Ramsey Creek	2Bg*	2Bm	2.92	Redwood	TALU
07020006-529	County Ditch 33	2Bg*	2Bm	4.42	Redwood	TALU
07020006-540	Judicial Ditch 32	2Bg*	2Bm	7.33	Redwood, Yellow Medicine	TALU
07020006-553	Unnamed creek	2Bg*	2Bm	5.36	Redwood	TALU
07020006-554	Judicial Ditch 30	2Bg*	2Bm	1.74	Lincoln	TALU
07020006-556	County Ditch 7	2Bg*	2Bm	5.28	Lincoln	TALU
07020006-558	Unnamed creek	2Bg*	2Bm	0.88	Lyon	TALU
07020006-559	Unnamed creek	2Bg*	2Bm	7.55	Lyon	TALU
07020006-560	Judicial Ditch 3	2Bg*	2Bm	3.09	Lyon, Redwood	TALU
07020006-561	Unnamed creek	2Bg*	2Bm	4.86	Lyon, Redwood	TALU
07020006-565	Threemile Creek	2Bg*	2Bm	6.19	Lyon	TALU
07020006-567	Clear Creek	2Bg*	2Bm	22.80	Lyon, Redwood	TALU
07020006-572	Unnamed creek	2Bg*	2Bm	2.45	Lyon	TALU
07020006-574	Unnamed creek	2Bg*	2Bm	0.67	Lincoln	TALU
07020006-576	County Ditch 31	2Bg*	2Bm	1.86	Lyon	TALU
07020006-578	County Ditch 60	2Bg*	2Bm	4.22	Lyon	TALU
07020006-580	Unnamed creek	2Bg*	2Bm	2.75	Lyon	TALU
5.A.(7) Minnesota River - Mankato Watershed (07020007)						
07020007-627	Unnamed creek (Minnesota River Tributary)	(2Ag°)	2Bdg*	0.85	Nicollet	CWR
07020007-668	Unnamed Creek	2Bg*	2Ag	2.71	Renville	CWR
5.A.(8) Cottonwood River Watershed (07020008)						
07020008-530	Judicial Ditch 30, West Branch	2Bg*	2Bm	5.67	Redwood	TALU
07020008-537	County Ditch 38	2Bg*	2Bm	1.66	Cottonwood	TALU
07020008-543	County Ditch 54	2Bg*	2Bm	4.81	Redwood	TALU
07020008-550	County Ditch 24	2Bg*	2Bm	5.51	Redwood	TALU

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
07020008-557	County Ditch 38	2Bg*	2Bm	5.20	Redwood	TALU
07020008-561	County Ditch 68	2Bg*	2Bm	5.34	Redwood	TALU
07020008-564	County Ditch 60	2Bg*	2Bm	1.62	Brown	TALU
07020008-565	County Ditch 5	2Bg*	2Bm	1.92	Brown	TALU
07020008-569	Unnamed ditch	2Bg*	2Bm	5.88	Lyon	TALU
07020008-573	Unnamed creek	2Bg*	2Bm	0.57	Lyon	TALU
07020008-576	Unnamed creek	2Bg*	2Bm	2.33	Lyon	TALU
07020008-586	Unnamed creek	2Bg*	2Bm	3.61	Murray	TALU
07020008-589	County Ditch 19	2Bg*	2Bm	6.10	Murray	TALU
07020008-594	Unnamed ditch	2Bg*	2Bm	0.98	Redwood	TALU
07020008-595	Unnamed creek	2Bg*	2Bm	2.42	Redwood	TALU
07020008-596	Judicial Ditch 35	2Bg*	2Bm	2.97	Redwood	TALU
07020008-597	County Ditch 26	2Bg*	2Bm	3.12	Redwood	TALU
07020008-598	Sleepy Eye Creek	2Bg*	2Bm	45.92	Redwood, Brown	TALU
07020008-602	Plum Creek (Judicial Ditch 20A)	2Bg*	2Bm	3.60	Murray	TALU
07020008-604	Coal Mine Creek	2Bg*	2Bm	17.33	Redwood, Brown	TALU
07020008-606	Unnamed creek	2Bg*	2Bm	0.61	Brown, Cottonwood	TALU
07020008-609	Judicial Ditch 30	2Bg*	2Bm	5.78	Brown	TALU
07020008-610	Highwater Creek	2Bg*	2Bm	2.85	Cottonwood	TALU
07020008-613	Unnamed creek	2Bg*	2Bm	1.46	Lyon	TALU
07020008-615	Unnamed creek	2Bg*	2Bm	0.57	Lyon	TALU
07020008-623	Unnamed creek	2Bg*	2Bm	3.35	Redwood	TALU
5.A.(9) Blue Earth River Watershed (07020009)						
07020009-545	Judicial Ditch 8	2Bg*	2Bm	2.91	Martin	TALU
07020009-551	Unnamed ditch	2Bg*	2Bm	5.42	Faribault	TALU
07020009-556	Foster Creek	2Bg*	2Bm	6.71	Faribault	TALU
07020009-567	Elm Creek, North Fork	2Bg*	2Bm	6.27	Jackson	TALU
07020009-568	Judicial Ditch 14 (Badger Creek)	2Bg*	2Bm	11.76	Faribault	TALU
07020009-571	Judicial Ditch 13 Branch A	2Bg*	2Bm	8.05	Faribault	TALU
07020009-599	Unnamed ditch	2Bg*	2Bm	4.61	Faribault	TALU
07020009-603	County Ditch 25	2Bg*	2Bm	3.31	Faribault	TALU

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
07020009-605	County Ditch 5	2Bg*	2Bm	1.64	Faribault	TALU
07020009-610	Judicial Ditch 98	2Bg*	2Bm	4.24	Martin	TALU
07020009-611	Judicial Ditch 7	2Bg*	2Bm	13.02	Faribault	TALU
07020009-612	County Ditch 31	2Bg*	2Bm	8.18	Faribault	TALU
07020009-614	Judicial Ditch 14	2Bg*	2Bm	10.51	Faribault, Martin	TALU
07020009-615	Judicial Ditch 14	2Bg*	2Bm	2.77	Faribault	TALU
07020009-616	County Ditch 17	2Bg*	2Bm	3.17	Faribault	TALU
07020009-619	Judicial Ditch 116	2Bg*	2Bm	8.41	Blue Earth, Martin	TALU
07020009-620	County Ditch 89/Judicial Ditch 24	2Bg*	2Bm	4.81	Blue Earth	TALU
07020009-621	Unnamed creek	2Bg*	2Bm	7.46	Faribault, Freeborn	TALU
07020009-622	Thisius Branch	2Bg*	2Bm	1.94	Faribault	TALU
07020009-623	Judicial Ditch 14	2Bg*	2Bm	1.07	Faribault, Freeborn	TALU
07020009-624	Unnamed creek	2Bg*	2Bm	4.63	Faribault	TALU
07020009-628	County Ditch 26	2Bg*	2Bm	1.74	Faribault	TALU
07020009-634	Dutch Creek	2Bg*	2Bm	1.90	Martin	TALU
07020009-636	Dutch Creek	2Bg*	2Bm	0.97	Martin	TALU
07020009-639	South Creek	2Bg*	2Bm	3.77	Martin	TALU
07020009-643	Blue Earth River, West Branch	2Bg*	2Bm	0.66	Faribault	TALU
07020009-645	Blue Earth River, Middle Branch	2Bg*	2Bm	1.01	Faribault	TALU
07020009-647	Coon Creek	2Bg*	2Bm	9.23	Faribault	TALU
07020009-650	Blue Earth River, East Branch	2Bg*	2Bm	4.49	Faribault	TALU
07020009-652	Blue Earth River, East Branch	2Bg*	2Bm	1.97	Faribault	TALU
07020009-655	Brush Creek	2Bg*	2Bm	4.50	Faribault	TALU
07020009-657	Cedar Creek (Cedar Run Creek)	2Bg*	2Bm	1.24	Martin	TALU
07020009-658	Badger Creek	2Bg*	2Bm	1.35	Faribault	TALU
07020009-660	Judicial Ditch 38	2Bg*	2Bm	4.82	Martin	TALU
07020009-663	Unnamed creek	2Bg*	2Bm	0.20	Martin	TALU
07020009-667	County Ditch 72	2Bg*	2Bm	2.33	Martin	TALU
07020009-669	County Ditch 8	2Bg*	2Bm	7.34	Faribault	TALU
5.A.(12) Minnesota River – Lower Watershed (07020012)						
07020012-710	Bluff Creek	2Bg*	2Ag	7.17	Carver	CWR

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
07020012-866	Unnamed creek	2Bg*	2Ag°	0.64	Hennepin	CWR
Minn. R. 7050.0470, subp. 6. Saint Croix River Basin						
6.A.(1) Upper St. Croix River Watershed (07030001)						
07030001-520	Redhorse Creek, West Fork	2Bg*	2Be	0.57	Pine	TALU
07030001-541	Crooked Creek	2Bg*	2Be	2.32	Pine	TALU
07030001-545	Bangs Brook	2Ag°	2Ae	4.24	Pine	TALU
07030001-554	Little Sand Creek	2Bg*	2Be	5.58	Pine	TALU
07030001-555	Little Sand Creek	2Bg*	2Be	3.34	Pine	TALU
07030001-562	Kenney Brook	2Ag°	2Bdg	1.20	Pine	CWR
07030001-613	Upper Tamarack River	2Bg*	2Be	4.35	Pine	TALU
07030001-615	Crooked Creek, East Fork	2Bg*	2Be	6.23	Pine	TALU
07030001-618	Sand Creek	2Bg*	2Be	7.99	Pine	TALU
6.A.(2) Kettle River Watershed (07030003)						
07030003-503	Kettle River	2Bg*	2Be	5.50	Pine	TALU
07030003-505	Kettle River	2Bg*	2Be	4.87	Pine	TALU
07030003-506	Kettle River	2Bg*	2Be	2.19	Pine	TALU
07030003-560	Little Pine Creek	2Bg*	2Be	1.62	Pine	TALU
07030003-618	Skunk Creek	2Bg*	2Ag	3.25	Pine	CWR
07030003-622	Willow River	2Bg*	2Be	8.19	Pine	TALU
07030003-624	Pine River	2Bg*	2Be	13.75	Pine	TALU
07030003-626	Unnamed creek	2Bg*	2Bm	3.79	Pine	TALU
07030003-628	Moose Horn River, West Branch	2Bg*	2Be	5.09	Carlton	TALU
07030003-629	Moose Horn River	2Bg*	2Be	2.38	Carlton	TALU
6.A.(3) Snake River Watershed (07030004)						
07030004-515	Spring Brook	2Bg*	2Ag	3.38	Kanabec	CWR
Minn. R. 7050.0470, subp. 7. Lower Mississippi River Basin						
7.A.(4) Zumbro River Watershed (07040004)						
07040004-763	Unnamed Creek	(2Ag°)	2Ag	0.84	Wabasha	CWR
07040004-764	Unnamed Creek	(2Ag°)	2Bdg	1.10	Wabasha	CWR
07040004-950	Tompkins Creek	2Bg*	2Ag°	1.62	Olmsted	DNR
07040004-951	Tompkins Creek	2Bg*	2Ag°	0.44	Olmsted	DNR

WID	Water-body name	Current use class	Draft use class	Miles	County	Use review type
07040004-A00	Unnamed spring/unnamed creek	2Bg*	2Ag°	1.25	Dodge, Olmsted	DNR
7.A.(5) Mississippi River - La Crescent Watershed (07040006)						
07040006-576	Pine Creek	2Bg*	2Ag	13.14	Houston, Winona	CWR
7.A.(7) Mississippi River - Reno Watershed (07060001)						
07060001-521	Crooked Creek, North Fork	2Bg*	2Ag°	1.22	Houston	DNR
07060001-693	Winnebago Creek	2Bg*	2Ag	0.92	Houston	CWR
07060001-696	Unnamed Creek (Shamrock Creek)	2Bg*	2Ag°	1.50	Houston	DNR
07060001-698	Unnamed Creek (Shamrock Creek)	2Bg*	2Ag°	0.20	Houston	DNR
7.A.(8) Upper Iowa River Watershed (07060002)						
07060002-535	Unnamed creek	2Bg*	2Ag	2.44	Houston	CWR

B. Use designation reviews

The draft use designations in this document are divided into two types: 1) tiered aquatic life uses and 2) cold water/warm water reviews. A summary of each use designation type and an overview of the process for reviewing each follows.

i. Tiered Aquatic Life Uses

The TALU designations in this document are the result of routine monitoring during the 2016-17 IWM efforts (Figure 1). Determination of the proposed uses were made through a review to determine the attainable aquatic life use goal for each stream reach. This process is detailed in the "Technical guidance for designating aquatic life uses in Minnesota streams and rivers" (MPCA 2015). This review is called a Use Attainability Analysis (UAA). A UAA is a detailed process that considers several lines of evidence including biological condition, habitat limitation, the nature of any habitat alterations, and restorability of the habitat (see Figure 3 in MPCA [2015]). The UAA begins with a review of biological condition (i.e., fish and macroinvertebrate assemblages). If both assemblages meet the Exceptional Use biocriteria, then the reach is eligible for designation as an Exceptional Use. If both assemblages meet the General Use biocriteria, the reach will be designated General Use[8]. If one or both assemblages do not meet the General Use, then the process proceeds to a review of the habitat. This step involves a review of habitat attributes to determine if habitat is limiting attainment of the General Use. This step uses habitat models to predict if habitat is limiting the biology (MPCA 2015). If habitat is not limiting either assemblage, then the reach would be designated General Use. However, if habitat is limiting, then it would need to be determined if this habitat condition is the result of legal alterations to the water body (e.g., ditching). If the alterations were done so illegally, the reach would not be eligible for a Modified Use and the reach would be designated General Use. If the water body was legally altered, then the reach would be reviewed to determine if it is restorable or if it is likely to recover on its own in the next five years. If either is true, then the reach would be designated a General Use. However, if it is not restorable or not likely to recover on its own, available data would be reviewed to determine if the General Use was attained on or after November 28, 1975 (i.e., existing use). If there is evidence that the General Use was attained, including if channel modifications occurred after the existing use date, then the reach would be designated General Use. Otherwise the reach would be eligible for the Modified Use. Through this process, available data are considered including the condition of fish and macroinvertebrate assemblages, multiple habitat measures, chemistry data, and data from adjacent or nearby stream reaches. For example, a biological model called the Biological Condition Gradient (Gerritsen et al. 2013; Figure 2) is often used as a line of evidence when considering biological scores falling within confidence limits around the biocriteria. In this process, all available data are reviewed with data collected on or after November 28, 1975 most relevant to the establishment of existing use (40 CFR § 131.3(e)).

[8] *Streams are designated General Use by default. When data is sufficient for a use designation review and these data demonstrate that the General Use is the highest attainable use, the General Use will be considered a confirmed General Use. The distinction between default and confirmed General Use is noted in the use designation tables incorporated by reference in Minn. R. 7050.0470. By definition, any stream reaches designated as Exceptional or Modified uses have undergone a UAA or UAA-like process and the use is confirmed.*

Figure 1:Map of watersheds sampled during 2016-17 Intensive Watershed Monitoring.

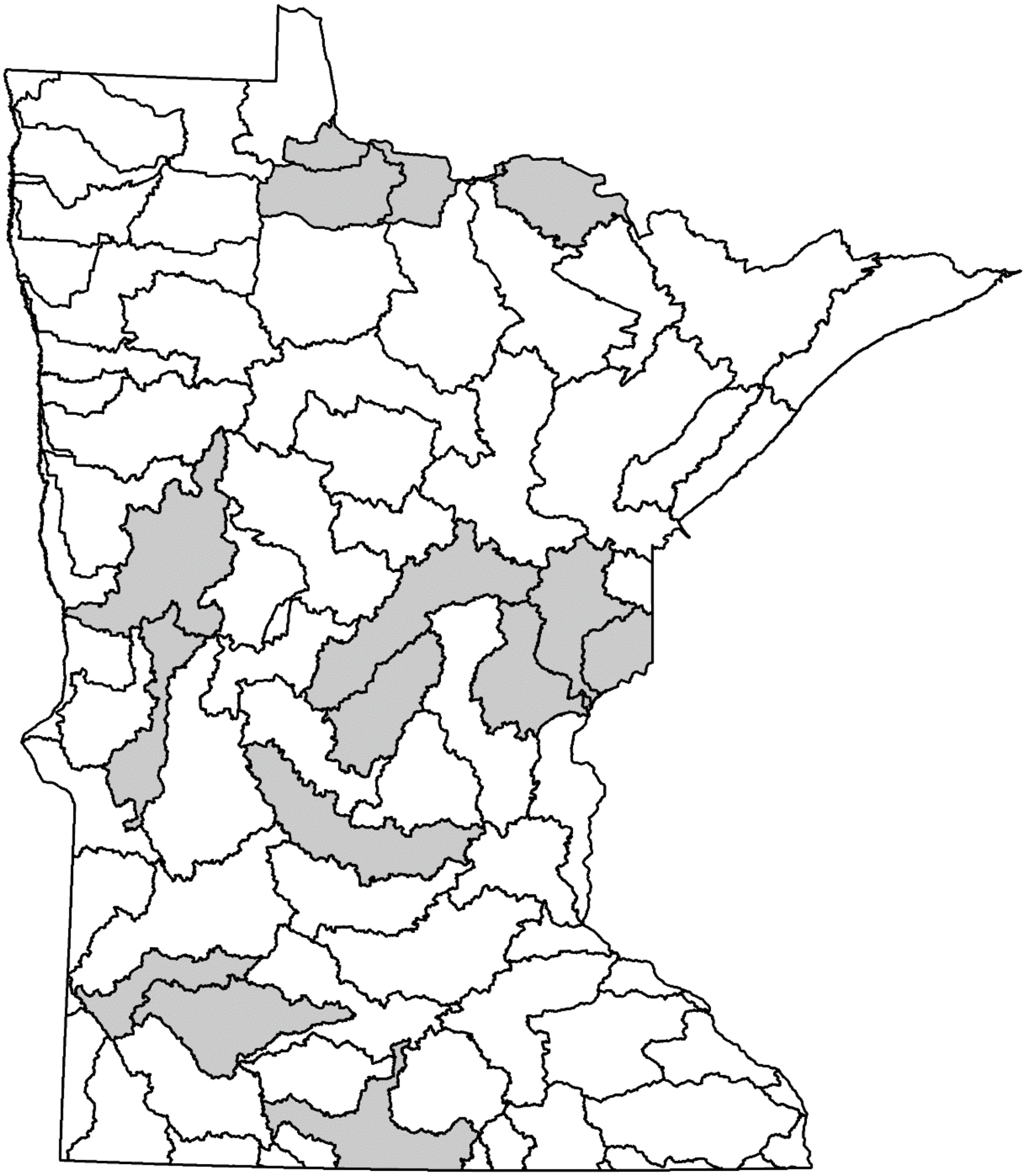
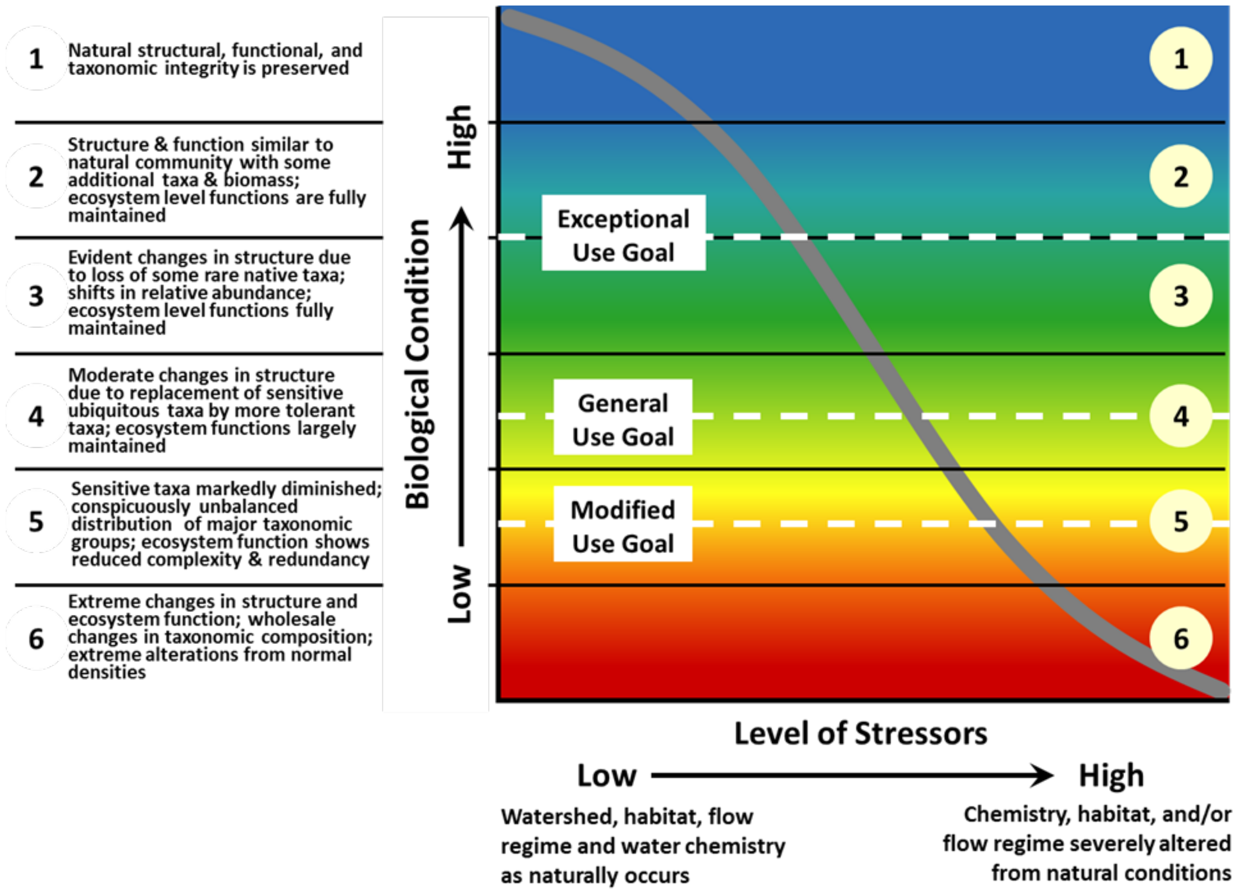


Figure 2.BCG illustrating the location of biocriteria for protection of Minnesota's tiered aquatic life use goals.



For each TALU designation, supporting evidence is documented in the "Descriptions of proposed use designations" section of this document. This includes documenting the UAA steps relevant to the specific use designation. For each TALU designation, the assessment and stressor identification results are also summarized. In addition to providing a narrative description of the TALU use designation reviews in the "Descriptions of proposed use designations" section, detailed habitat and biological information is tabulated. For each WID, the IBI scores (MPCA 2017a, b) are summarized for the biological stations on that stream reach. These results are color coded (Table 3) in relation to the tiered biocriteria (Table 4; MPCA 2014a). Habitat scores are also provided in these summary tables for each WID. The habitat scores include the number of good habitat attributes, the number of poor habitat attributes, the ratio of good to poor habitat attributes, and the MPCA Stream Habitat Assessment (MSHA) score (MPCA 2014b). The habitat scores are color coded (Table 3) based on predictions of the probability that the respective biological assemblage will attain the General Use biocriterion for that station. Table 5 provides the habitat assessment thresholds used for determining habitat limitation. This table includes the 25% and 50% biological criteria attainment probabilities for each stream class, biological assemblage, and habitat metric. These thresholds were used as part of an MPCA assessment to determine if habitat was limiting the attainment of the biological criteria as required in the UAA (MPCA 2015). Three habitat tool outputs are considered jointly and the MSHA output is considered separately (Table 6). For example, if any one of the habitat tool metric models and the MSHA model predict less than a 25% probability of attaining the General Use biocriterion, the biological assemblage in the reach is considered to be limited by physical habitat structure. When probabilities are between 25% and 50% or the results are mixed between the metrics, additional information will need to be considered in this analysis. This information includes biological performance (e.g., proximity of IBI score to biocriterion), performance of the other assemblage, chemical data, and the stream's physical characteristics (i.e., recovery status, atypical features). See MPCA (2015) for a detailed description of this analysis.

Table 3: Color coding for biological and habitat metric scores used in the summary tables for each proposed use designation. ***Description of table: The numeric thresholds for Index of Biological Integrity scores are provided in Table 4 and the habitat metrics are provided in Table 5. Abbreviations: Good = number of good habitat attributes, Poor = number of poor habitat attributes, P/G = ratio of Poor+1 and Good+1 habitat attributes, MSHA = Minnesota Stream Habitat Assessment***

Biological Score	**Score in Relation to Tiered Biological Criteria**			
Index of Biological Integrity Score	Above Exceptional Use	Between General and Exceptional Use	Between Modified and General Use	Below Modified Use
Habitat Metric	**Probability of Meeting General Use**			
Good	>75%	50-75%	25-50%	<25%
Poor	>75%	50-75%	25-50%	<25%
P/G	>75%	50-75%	25-50%	<25%
MSHA	>75%	50-75%	25-50%	<25%

Table 4. Biological criteria for Exceptional, General, and Modified uses (MPCA 2014a; Abbreviations: RR = high gradient, GP = low gradient).

Class #	Class Name	Exceptional Use	General Use	Modified Use
		Fish		
1	Southern Rivers	71	49	NA
2	Southern Streams	66	50	35
3	Southern Headwaters	74	55	33
4	Northern Rivers	67	38	NA
5	Northern Streams	61	47	35
6	Northern Headwaters	68	42	23
7	Low Gradient Streams	70	42	15
10	Southern Cold Water	82	50	NA
11	Northern Cold Water	60	35	NA
Macroinvertebrates				
1	Northern Forest Rivers	77	49	NA
2	Prairie Forest Rivers	63	31	NA
3	Northern Forest Streams RR	82	53	NA
4	Northern Forest Streams GP	76	51	37
5	Southern Streams RR	62	37	24
6	Southern Forest Streams GP	66	43	30
7	Prairie Streams GP	69	41	22
8	Northern Cold Water	52	32	NA
9	Southern Cold Water	72	43	NA

Table 5: Physical habitat structure assessment thresholds based on logistic regression models (see MPCA [2015]). Description of table fields: "<25%" and "<50%" are model predictions for habitat metrics where there is a <25% or <50% probability of attaining the General Use biocriterion. For example, the logistic regression models for the southern streams predict less than a 25% probability that the fish General Use biocriterion is attained when there are seven or fewer good habitat attributes. Abbreviations: Good = number of positive habitat attributes; Poor = number of negative habitat attributes; P/G = the ratio of Poor and Good habitat attributes; MSHA = MPCA Stream Habitat Assessment.

Assemblage	Type	Habitat Metric	<25%	<50%
Fish	Southern Streams	Good	**≤7**	**≤15**
Fish	Southern Streams	Poor	**≥10.5**	**≥4.5**
Fish	Southern Streams	P/G	**≥1.57**	**≥0.32**
Fish	Southern Streams	MSHA	**≤45**	**≤64**
Fish	Southern Headwaters	Good	**≤3.5**	**≤9**
Fish	Southern Headwaters	Poor	**≥6.5**	**≥2**
Fish	Southern Headwaters	P/G	**≥1.68**	**≥0.25**
Fish	Southern Headwaters	MSHA	**≤38**	**≤62**
Fish	Northern Streams	Good	**≤2.5**	**≤8.5**
Fish	Northern Streams	Poor	**≥16.5**	**≥10**
Fish	Northern Streams	P/G	**≥3.48**	**≥1.07**
Fish	Northern Streams	MSHA	**≤29**	**≤53**
Fish	Northern Headwaters	Good	**≤5.5**	**≤11.5**
Fish	Northern Headwaters	Poor	**≥13**	**≥8.5**
Fish	Northern Headwaters	P/G	**≥2.02**	**≥0.71**
Fish	Northern Headwaters	MSHA	**≤45**	**≤61**
Fish	Low Gradient Streams	Good	**≤3.5**	**≤7**
Fish	Low Gradient Streams	Poor	**≥10**	**≥5**
Fish	Low Gradient Streams	P/G	**≥2.65**	**≥0.74**
Fish	Low Gradient Streams	MSHA	**≤41**	**≤55**
Macroinvertebrates	High Gradient Northern Forest Streams	Good	**-**	**≤4**
Macroinvertebrates	High Gradient Northern Forest Streams	Poor	**≥11.5**	**≥7.5**
Macroinvertebrates	High Gradient Northern Forest Streams	P/G	**≥4.81**	**≥1.56**
Macroinvertebrates	High Gradient Northern Forest Streams	MSHA	**≤35**	**≤53**
Macroinvertebrates	High Gradient Southern Streams	Good	**≤5**	**≤9**
Macroinvertebrates	High Gradient Southern Streams	Poor	**≥6**	**≥2.5**
Macroinvertebrates	High Gradient Southern Streams	P/G	**≥1.12**	**≥0.28**
Macroinvertebrates	High Gradient Southern Streams	MSHA	**≤45**	**≤72**
Macroinvertebrates	Low Gradient Southern Forest Streams	Good	**≤4.5**	**≤9**
Macroinvertebrates	Low Gradient Southern Forest Streams	Poor	**≥7.5**	**≥2.5**
Macroinvertebrates	Low Gradient Southern Forest Streams	P/G	**≥1.25**	**≥0.36**
Macroinvertebrates	Low Gradient Southern Forest Streams	MSHA	**≤41**	**≤60**
Macroinvertebrates	Low Gradient Prairie Streams	Good	**≤12**	**≤17.5**
Macroinvertebrates	Low Gradient Prairie Streams	Poor	**≥10**	**≥5**
Macroinvertebrates	Low Gradient Prairie Streams	P/G	**≥0.88**	**≥0.32**
Macroinvertebrates	Low Gradient Prairie Streams	MSHA	**≤54**	**≤72**

Table 6: Decision matrix for determining habitat limitation based on probabilities of attaining the General Use.

	Attainment Probability	MSHA <25%	MSHA 25-50%	MSHA >50%
Habitat Tool Metrics	<25%	Yes	Probable	Possible
	25-50%	Probable	Possible	Unlikely
	>50%	Possible	Unlikely	No

ii. Cold water and warm/cool water reviews

The MPCA is recommending amendments to Class 2A[9] use classifications in Minn. R. 7050.0470 based on new information and changes to DNR's list of designated trout waters (Minn. R. 6264.0050). In many cases, the use designations in this document are based on changes to the DNR's trout waters list and the MPCA is simply updating its use designations to match these changes. However, some the use designations are a departure from the DNR's trout water designations. In some cases, these differences reflect differences in management or in the rules each agency implements. In other cases, use designation differences are administrative and reflect different time lines for updating designated uses in rule for each agency.

The MPCA's use designation methodology for cold water habitats was updated in 2020 (State of Minnesota 2020a) with the adoption of revised language in Minn. R. 7050.0420. With this update, differences in management goals between the MPCA and DNR in designating cold water systems were addressed. A small number of waters in Minn. R. 6264.0050 are not appropriate for the MPCA to manage as cold water and there are some waters not included on the DNR trout waters list that the MPCA should manage as cold water habitats. The MPCA's designation of cold water habitats is focused on identifying and protecting existing aquatic life uses which often aligns with the DNR's trout waters list. Some differences in goals for streams between the MPCA and DNR are a result of DNR's designation process, which can be impacted by property owner requests, fishing regulation considerations, and the designation of trout protection waters, which may or may not reflect the type of community that can be naturally supported in these systems. In addition, certain stream reaches may have been given the default Class 2B[9] designation because it had not been previously assessed by DNR and new data now indicates that the water body supports a cold water community. In some cases, the DNR may remove trout water from their list due to a change in management goals for that water. However, if it is demonstrated that the water body is an existing use (i.e., it supported cold water habitat on or after November 28, 1975), the MPCA is required to retain that designation (Minn. R. 7050.0255). As a result, the specific amendments to use designations in this document result in the designation of beneficial uses that are in alignment with the CWA and Minn. R. ch. 7050 and result in appropriate management of these systems.

The Class 2A and 2B/2Bd designations in this document are the result of either 1) MPCA biological monitoring from IWM efforts, 2) amendments to DNR's trout waters list (State of Minnesota 2008, 2018, 2021), or 3) both. The first group is the result of aquatic life use reviews that took place as part of MPCA's surface-water assessments. These recommended designations are independent of Minn. R. 6264.0050 and represent needed designations to align these reaches with MPCA's beneficial use framework. The destinations arising from amendments to DNR's trout waters list largely follows

[9] In this section, "Class 2A" broadly refers to all cold water habitats including Classes 2Ag and 2Ae and "Class 2B" broadly refers to all warm/cool water habitats including Classes 2Bd, 2Bde, 2Bdg, 2Bdm, 2B, 2Be, 2Bg, and 2Bm.

MPCA's historical practice of using Minn. R. 6264.0050 to update Minn. R. 7050.0470. However, the use designations listed in this document have gone through a use review by the MPCA to ensure that the designation complies with Minnesota rule and the CWA. In addition, there are a number of rule corrections made by the DNR that the MPCA is also proposing to make which did not undergo additional review since they are corrections to the current designations and in most cases, they are short reaches without additional data. In some cases, use designations are triggered by both MPCA IWM efforts and amendments to the DNR trout waters list.

Designation from cold water (Class 2A) to cool or warm water (Class 2B/2Bd)[10] or vice versa, requires a comprehensive review of biological, chemical, and physical measures as well as other data are used to determine the natural and existing use of a water body. Biological data are the primary source of information used to demonstrate if a cold water use is an existing use. Reviews of fish and macroinvertebrate data focus on the presence or absence and the proportion of cold water species (e.g., trout, sculpin, the amphipod *Gammarus*, and the small minnow mayfly *Baetis tricaudatus*). These reviews include assessments of contemporary and historical data. Of particular importance for use designation is the demonstration that these waters currently support or have supported sustained trout reproduction and/or that they have good year-to-year carry over (e.g., stocked trout survive over the winter). Some streams that do not support trout due to barriers, stream size constraints, or poor fish habitat should also be designated Class 2A based on the presence of a cold water macroinvertebrate community.

Temperature data are also important when reviewing the thermal designation of a water body. Temperature logger data (i.e., measurements recorded continuously every 15-30 min) are especially useful as they provide a more comprehensive estimate of summer conditions and can be used to estimate the percent of the time temperatures are suitable for supporting and maintaining cold water biota. For example, trout are unlikely to be sampled in streams where average July water temperatures exceed 20°C or less than 40% of the summer (June through August) is below 20°C (Figure 3, Table 7).

Other physical and chemical characteristics (e.g., habitat, flow, dissolved oxygen, presence of beaver dams, and migration barriers) of the water body are also used as part of the review to determine the existing use. In all cases, the objective of the use review is to determine whether or not a designated use is an existing use. This holds that uses attained in a surface water on or after November 28, 1975 must be protected (see 40 CFR 131.3). Cold water reviews are also done with consultation from DNR staff in order to compile all available information, consider DNR's management goals for the water, and to align class 2A waters with DNR's trout waters list when feasible.

[10] The Class 2A, 2Ag, and 2Ae designations also carry Class 1B (see Minn. R. 7050.0420). As a result the addition of a Class 2A, 2Ag, or 2Ae designation results in the addition of a 1B designation. However, the linkage between Classes 2A, 2Ag, and 2Ae and Class 1B is currently under review. As a result, draft designations from cold water habitat to cool/warm water habitat in this document will at this time retain the Class 1B designation and be designated cool/warm water habitat also protected as a source of drinking water (Class 2Bd or 2Bdg).

Figure 3.Probability of occurrence of trout species (brook, brown, and rainbow) in Minnesota streams as a function of A) average July water temperature and B) proportion of summer (June through August) exceeding 20°C. Fits are generalized additive model (GAM) logistic regressions.

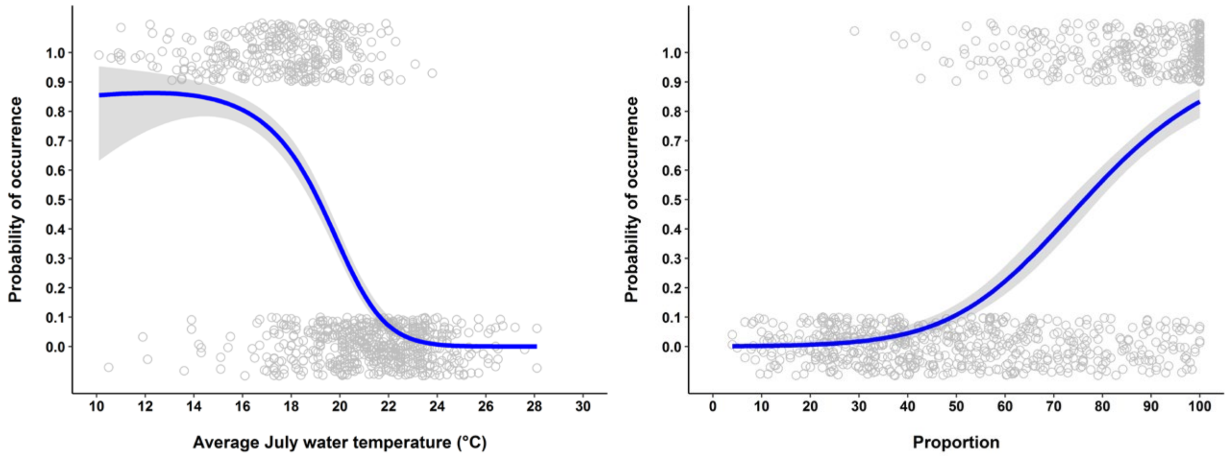


Table 7. Criteria used by DNR and MPCA for brook trout growth, stress, and lethal temperature ranges (from Brown [1974])

Classification	Temperature Range (°C)	Description
Growth	7.8 to 20.0°C	Temperature range favorable for growth
Stress	>20.0 to 25.0°C	Stress and avoidance behaviors
Lethal	>25.0°C	Mortality can be expected at prolonged exposure

In cases where MPCA monitoring data triggered the use review, it was the result of an initial screening of fish, macroinvertebrate, and temperature data that indicated the current use designation may not be appropriate (MPCA 2015). For use designations triggered by DNR rule amendments, all available data were reviewed as described. This may have included a review of DNR data alone or both DNR and MPCA data. In cases where only DNR was available, a determination to retain the current use was sometimes made because sufficient data were not available to determine the existing use. For these reaches, additional data would need to be collected for the MPCA to propose a use designation in a future rulemaking.

The outcomes of the review process include: 1) retain the current designated use, 2) designate a different use for the entire reach, or 3) designate a different use for part of the reach. In cases where the evidence is insufficient to support changing the designated use, no change is proposed. In these cases, a recommendation to collect additional data may occur to determine the appropriate use designation. In general, it will be the MPCA's responsibility to build the case for a use designation. Overall, the use designations in this document are only a portion of the water bodies that have been scrutinized for use designations, but the outcome of many of these reviews is to retain the current use designation.

C. Rule language changes

As part of this rule, there will be amendments to the documents incorporated by reference in Minn. R. 7050.0470, which list the specific use designations. No other changes to rule language is currently under consideration for these rule amendments.

D. Descriptions of proposed use designations

The following documentation of the recommended use designations correspond to the list of water bodies in Table 2. The streams are identified by WID (i.e., water body assessment identifier) code, which identifies the HUC 8 watershed where the streams are located and assigns a unique, 3-digit code to the reach. As with Table 2, the WIDs are organized by major watershed, HUC 8, and then by WID number within the HUC 8. At the beginning of each HUC 8 watershed, there is a link to the MPCA webpage for that watershed which includes available reports and other information.

The abbreviations and symbols used in the use designation descriptions and TALU tables are as follows:

Use designations

2Be = Exceptional cool and warm water aquatic life and habitat

2Bg = General cool and warm water aquatic life and habitat

2Bdg = General cool and warm water aquatic life and habitat also protected as a source of drinking water

2Bm = Modified cool and warm water aquatic life and habitat

2Ae = Exceptional cold water aquatic life and habitat

2Ag = General cold water aquatic life and habitat

TALU table abbreviations

Type = stream type code (see Table 4)

IBI = Index of Biological Integrity score

ND = No data because fish or macroinvertebrates were not sampled or the sample was not assessable

Good = number of good habitat attributes

Poor = number of poor habitat attributes

P/G = ratio of Poor+1 and Good+1 habitat attributes

MSHA = Minnesota Stream Habitat Assessment

1. Lake Superior Basin

a. Lake Superior – North Watershed (04010101)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/lake-superior-north

Wilson Creek (04010101-692): The reach of Wilson Creek from the west line of Public Land Survey (PLS) System[11] section of T60 R6W S24 to Cross River is recommended to be designated Class 2Bdg. MPCA biological monitoring from one station (13LS041) did not sample any cold water fish species and only a single cool water fish species (longnose dace) was sampled. The macroinvertebrate sample included 1 cold water taxa (*Leuctra*) which comprised 0.6% of the sample. Temperature logger data had an average July water temperature of 20.9°C and temperatures were in the growth range for brook trout only 49.3% of the summer. This stream is the outlet for Wilson Lake and would not be expected to support a cold water habitat. The DNR does not manage this stream as a trout water and it was designated as a

[11] *The convention for identifying land units is the PLS or PLS System established by the U.S. Department of the Interior.*

trout protection water for the Cross River. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior - North Watershed (04010101).

Mooring station 13LS041 (04010101-692)

Unnamed creek (Greenwood River Tributary) (04010101-A01): The reach of an unnamed creek (Greenwood River Tributary) from its headwaters (Redcoat Lake [16-0058-00]) to an unnamed creek is recommended to be designated Class 2Bdg. The DNR does not classify this reach as a trout water or trout protection water (Minn. R. 6264.0050) because it is not connected to a trout water within the same PLS System section. This reach is located in PLS section T63 R2E S15 which is included as part of the trout water designation for an unnamed creek (Greenwood River Tributary) (04010101-765). However, 04010101-A01 is considered to be jurisdictionally disconnected from 04010101-765 because it flows to a different Greenwood River tributary (04010101-D98). In addition, 04010101-A01 is separated from any downstream cold water habitats by a wetland. As a result, this reach does not currently support and would not be expected to support cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior - North Watershed (04010101).

Unnamed creek (Sugar Loaf Creek) (04010101-D87[12]): The reach of an unnamed creek (Sugar loaf Creek) within the PLS System section T58 R5W S19 is recommended to be designated Class 2Bdg. The DNR does not classify the portion of this stream in PLS System section T58 R5W S18 as a trout water or trout protection water (Minn. R. 6264.0050). This reach is intermittent and when the DNR reviewed the trout water designation for Sugarloaf Creek, this section was not included. In addition, 04010101-A01 is separated from any downstream cold water habitats by a wetland. As a result, this reach does not currently support and would not be expected to support cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior - North Watershed (04010101).

Unnamed creek (Greenwood River Tributary) (04010101-D97): The reach of an unnamed creek (Greenwood River Tributary) from its headwaters to the south line of PLS System section T63 R2W S15 is recommended to be designated Class 2Bdg. The DNR does not classify this reach as a trout water or trout protection water (Minn. R. 6264.0050) because it is not connected to a trout water within the same PLS System section. This reach is located in PLS sections T63 R2E S14, 15 which are part of the trout water designation for an unnamed creek (Greenwood River Tributary) (04010101-765). However,

[12] *The draft use designation does not change the use for the entire reach, but only the portion in PLS System section T58 R5W S18. As a result the boundaries of 04010101-D87 will be modified to reflect this revision.*

04010101-D97 is considered to be jurisdictionally disconnected from 04010101-765 because it flows to the Greenwood River (04010101-528). In addition, 04010101-A01 is separated from any downstream cold water habitats by a wetland. As a result, this reach does not currently support and would not be expected to support cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior - North Watershed (04010101).

b. Lake Superior – South Watershed (04010102)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/lake-superior-south

Nicadoo Creek (04010102-985): The reach of Nicadoo Creek from the west line of PLS System section T57 R8W S26 to the south line of PLS System section T57 R8W S26 is recommended to be designated Class 2Ag. The DNR inadvertently did not include the reach of this river in the PLS System sections T58 R5W S18 and T58 R5W S19 off the list of PLS sections in Minn. R. 6264.0050 and rectified this omission in 2020 through rule making (State of Minnesota 2020b). This reach is currently designated Class 2Bg by default in the beneficial use table for the Lake Superior – South Watershed (04010102) incorporated by reference in Minn. R. 7050.0470. There is no assessable[13] MPCA biological data from this reach to perform a full cold water use review. However, because this reach was erroneously designated, it is short (0.17 mi), and it is an extension of existing Class 2Ag reaches (04010102-984, 04010102-986, 04010102-987, and 04010102-988), it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior – South Watershed (04010102). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Skunk Creek Tributary) (04010102-A25[14]): The reach of an unnamed creek (Skunk Creek Tributary) in PLS System section T54 R9W S18 is recommended to be designated Class 2Bdg. The DNR clarified the trout water designation for this this reach in 2020 through rule making (State of Minnesota 2020b). This reach was included under the Skunk Creek (04010102-551, 04010102-552) designation, but the 2020 rule now includes this reach separately as an "unnamed stream." This designation in Minn. R. 6264.0050 does not include PLS System section T54 R9W S18 and therefore the DNR does not classify this reach as a trout water or trout protection water because it is not connected to a trout water within the same PLS System section. This reach was designated Class 2Ag by default in the beneficial use table for the Lake Superior – South Watershed (04010102) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior – South Watershed (04010102). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Split Rock River Tributary) (04010102-A39): The reach of an Unnamed creek (Split Rock River Tributary) from its headwaters to the south line of PLS System section T55 R9W S28 is

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[13] Assessable biological data are data that are collected following MPCA standard protocols from habitats that are appropriate for the data collection method and for the biological assessment tool (i.e., IBIs).

[14] The draft use designation does not change the use for the entire reach, but only the portion in PLS System section T54 R9W S18. As a result the boundaries of 04010102-A25 will be modified to reflect this revision. The lower portion of 04010102-A25 (west line of T54 R9W S17 to Skunk Creek) will retain its Class 2Ag designation.

recommended to be designated Class 2Bdg. This reach was designated as a trout protection water due to its PLS section affiliation with the Split Rock River (04010102-519). However, the DNR inadvertently included PLS System section T55 R9W S28 in the list of PLS sections for the Split Rock River (04010102-519) in [Minn. R. 6264.0050] and rectified this in 2020 through rule making (State of Minnesota 2020b). As part of this rule, the DNR also added an unnamed creek (West Split Rock River Tributary) (04010102-A63) which includes PLS System section T55 R9W S28. However, 04010102-A39 is not a tributary to 04010102-519 or 04010102-A63 and it is therefore jurisdictionally disconnected from these trout waters. As a result, the DNR does not classify this reach as a trout water or trout protection water. This reach (04010102-A39) is currently designated Class 2Ag by default in the beneficial use table for the Lake Superior – South Watershed (04010102) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior – South Watershed (04010102). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (04010102-B70): The reach of an unnamed creek from its headwaters to the south line of PLS System section T55 R8W S21 is recommended to be designated Class 2Bdg. The DNR inadvertently included PLS System section T55 R8W S21 in the list of PLS sections for an unnamed creek[15] (04010102-537, 04010102-B69) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2019). This reach was designated as a trout protection water due to its PLS section affiliation with this unnamed creek (04010102-537, 04010102-B69). As a result, the DNR does not classify this reach as a trout water or trout protection water. This reach (04010102-B70) is currently designated Class 2Ag by default in the beneficial use table for the Lake Superior – South Watershed (04010102) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior – South Watershed (04010102). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Encampment River Tributary) (04010102-C46): The reach of an unnamed creek (Encampment River Tributary) from the west line of PLS System section T54 R10W S8 to an unnamed creek is proposed to be designated Class 2Ag. The MPCA inadvertently left this reach off the list of designated waters in Minn. R. 7050.0470 due to a lack of line work in the GIS layer. New line work has been created to sync this designation with the DNR's trout waters list (Minn. R. 6264.0050). There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, because this reach was erroneously designated and it is an extension of an existing Class 2Ag reach (04010102-678), it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag.. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior – South Watershed (04010102). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

[15] *This creek is called "Shipwreck Creek" by the DNR.*

Stony Creek (04010102-C48): The reach of Stony Creek from the south line of PLS System section T55 R10W S22 to the east line of PLS System section T55 R10W S22 is recommended to be designated Class 2Ag. The DNR inadvertently included PLS System section T55 R10W S22 with the Stoney (Rock) Creek trout waters designation in Minn. R. 6264.0050. Instead section T55 R10W S22 should have been included on the list of PLS sections for Stoney (Rock) Creek. The DNR rectified this in 2020 through rule making (State of Minnesota 2020b). The portion of this reach within section T55 R10W S22 is currently designated Class 2Bg by default in the beneficial use table for the Lake Superior – South Watershed (04010102) incorporated by reference in Minn. R. 7050.0470. The portion of this reach in section T55 R10W S27 is currently designated Class 2Ag. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, because this reach was erroneously designated and it is an extension of existing Class 2Ag reaches (04010102-A36 and the portion of this reach in section T55 R10W S27), it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior – South Watershed (04010102). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Encampment River Tributary) (04010102-C53): The reach of an unnamed creek (Encampment River Tributary) from its headwaters to the south line of PLS System section T54 R10W S9 is recommended to be designated Class 2Bdg. The MPCA is correcting the use designation and line work for this stream based on the DNR's trout waters list. The DNR does not classify this reach as a trout water or trout protection water (Minn. R. 6264.0050). This reach is a tributary to a trout stream, but the upper section is jurisdictionally disconnected from this reach because it is not connected to a trout water within the same PLS System section. This reach was incorrectly designated Class 2Ag by default in the beneficial use table for the Lake Superior – South Watershed (04010102) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Lake Superior – South Watershed (04010102). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

c. St. Louis River Watershed (04010201)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/st-louis-river

Spider Creek (Spider Muskrat Creek) (04010201-617): The reach of Spider Creek (Spider Muskrat Creek) from an unnamed creek to Whiteface River is recommended to be designated Class 2Bdg. The DNR removed Spider Creek from the trout waters list (Minn. R. 6264.0050) in 2008 (State of Minnesota 2008) for two main reasons: (1) three years (2003-2005) of temperature logger data indicate that it is not suitable to support a cold water fish assemblage and (2) since its designation in the 1960's there has been no evidence of trout reproduction or any return from trout stocking efforts. Data collected by the MPCA in 2009 support DNR's sampling result of no trout sampled in any visits from 1947 to 2009 in the lower portions of this stream (04010201-617, 04010201-862, 04010201-863, 04010201-864, and 04010201-865). A single cold water fish species (mottled sculpin) and five cool-water fish species (brassy minnow, brook stickleback, northern redbelly dace, longnose dace, and burbot) were sampled. One macroinvertebrate sample included three cold water taxa (*Brachycentrus, Lype, and Ephemerella*) in low numbers (1.8% of sample) and a second sample contained no cold water taxa. Water temperature logger data was collected from two stations in 2003, 2004, 2005, and 2009 had average July water temperatures of 17.8.-21.9°C and temperatures in the growth range for brook trout 52-87% of the summer. These data indicate that water temperatures in these stream reaches are marginally cold, but during some periods and years it is unsuitable for cold water biota. The biological data in the lower portion of Spider Creek were also marginal and are indicative of a cool or warm water habitat. The Class 2Ag designation for the upper portions of Spider Creek (04010201-866, 04010201-867, and 04010201-869) will be retained based on the presence of brook trout in the 2015 Barr Engineering electrofishing sample. No water temperature data were available for the upper reaches of the Spider Creek and no cold water macroinvertebrate taxa were collected. Additional study is needed to determine if the upper reaches of Spider Creek are an existing cold water habitat and if so what is the extent of that habitat. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. See Appendix A for a detailed description of this use designation review. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the St. Louis River Watershed (04010201). In addition to this reach, a number of tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the St. Louis River Watershed (04010201): 04010201-870, 04010201-871, 04010201-872, 04010201-874, and 04010201-875.

Monitoring station 98LS049 (04010201-617)

Unnamed creek (Peters Creek) (04010201-823): The reach of an unnamed creek (Peters Creek) from the north line of PLS section T54 R22W S23 to unnamed creek (04010201-825) is recommended to be designated Class 2Bdg. This stream was stocked by the DNR with brook trout in 1974 and 1977. A survey in 1977, 5 days after stocking, collected 11 trout. Most of the trout collected in this survey had signs of fin rot indicating that this stream is not suitable for trout management. A survey in the fall of 1980 did not collect any trout. Two DNR reports indicate that dense alder thickets, mucky substrate, limited flow, and low gradient result in marginal trout habitat in this stream. As a result, the DNR concluded that Peter's Creek has limited potential for trout management. This reach was removed from the trout waters list (Minn. R. 6264.0050) by the DNR in 2018 (State of Minnesota 2018). See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the St. Louis River Watershed (04010201).

Unnamed creek (Peters Creek) (04010201-824): The reach of an unnamed creek (Peters Creek) from unnamed creek (04010201-825) to Pancake Lake is recommended to be designated Class 2Bdg. See 04010201-823 (Unnamed creek [Peters Creek]) for a complete description of the use change proposal. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the St. Louis River Watershed (04010201). In addition to this reach, a tributary was designated Class 2Ag as a trout protection water due to its PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the St. Louis River Watershed (04010201): 04010201-825.

Spider Creek (Spider Muskrat Creek) (04010201-862): The reach of Spider Creek (Spider Muskrat Creek) from an unnamed creek to an unnamed creek is recommended to be designated Class 2Bdg. See 04010201-617 (Spider Creek [Spider Muskrat Creek]) for a complete description of the use change proposal. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the St. Louis River Watershed (04010201). In addition to this reach, a tributary was designated Class 2Ag as a trout protection water due to its PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the St. Louis River Watershed (04010201): 04010201-872.

Spider Creek (Spider Muskrat Creek) (04010201-863): The reach of Spider Creek (Spider Muskrat Creek) from an unnamed creek to an unnamed creek is recommended to be designated Class 2Bdg. See 04010201-617 (Spider Creek [Spider Muskrat Creek]) for a complete description of the use change proposal. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the St. Louis River Watershed (04010201). In addition to this reach, a tributary was designated Class 2Ag as a trout protection water due to its PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the St. Louis River Watershed (04010201): 04010201-871.

Spider Creek (Spider Muskrat Creek) (04010201-864): The reach of Spider Creek (Spider Muskrat Creek) from an unnamed creek to an unnamed creek is recommended to be designated Class 2Bdg. See 04010201-617 (Spider Creek [Spider Muskrat Creek]) for a complete description of the use change proposal. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the St. Louis River Watershed (04010201). In addition to this reach, a tributary was designated Class 2Ag as a trout protection water due to its PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the St. Louis River Watershed (04010201): 04010201-870.

Spider Creek (Spider Muskrat Creek) (04010201-865): The reach of Spider Creek (Spider Muskrat Creek) from an unnamed creek to an unnamed creek is recommended to be designated Class 2Bdg. See 04010201-617 (Spider Creek [Spider Muskrat Creek]) for a complete description of the use change proposal. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the St. Louis River Watershed (04010201). In addition to this reach, a tributary was designated Class 2Ag as a trout protection water due to it PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the St. Louis River Watershed (04010201): 04010201-875.

Monitoring station 19LS006 (04010201-865)

d. Cloquet River Watershed (04010202)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/cloquet-river

Unnamed creek (Carey Creek) (04010202-617): The reach of an unnamed creek (Carey Creek) from its headwaters to Island Lake Reservoir is recommended to be designated Class 2Bdg. Carey Creek was stocked with trout from 1955 through 1989. A three year (2010-2012) temperature study was performed by the DNR to determine thermal conditions and this stream's ability to support trout. Summer (June-September) water temperatures were above the threshold for stress for brook trout 50% or more of the summer season indicating that this stream is too warm for trout. A DNR fish survey in 2010 did not collect any trout. As a result, the DNR concluded that Carey Creek is not suitable for management of trout. This reach was removed from the designated trout waters list (Minn. R. 6264.0050) by the DNR in 2018 (State of Minnesota 2018). See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Cloquet River Watershed (04010202).

Pine Creek (04010202-657): The reach of Pine Creek from unnamed creek to unnamed creek (04010202-565) is proposed to be designated Class 2Ag. This reach of Pine Creek was reviewed because fish samples had good proportions of cold water fish species, indicating the ability to support these assemblages. Two stations (10EM029 and 15LS012) were sampled for fish on this reach in 2015 and 10EM029 was also sampled in 2010. One of the 2010 visits included brook trout. In 2010, the DNR also conducted a fish survey and sampled three locations on this reach. Both adult and young-of-the-year brook trout were sampled at all three of these stations indicating natural reproduction of trout. The DNR also deployed four temperature loggers, but only one was indicative of a cold water thermal regime. However the measured thermal variability is plausibly the result of fluctuating water levels of the upstream lake. Despite inconclusive temperature logger data, the observed biological communities indicate that this reach supports a cold water habitat. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Cloquet River Watershed (04010202).

Monitoring stations 15LS012 (left) and 10EM029 (right) (04010202-657)


Hellwig Creek (04010202-672): The reach of Hellwig Creek from unnamed creek to the east line of PLS section T52 R17 S15 is recommended to be designated Class 2Bdg. This reach was originally designated by the DNR as a trout water due to stocking efforts in the 1960's. The DNR surveyed this reach in 2006 and did not sample any trout in 04010202-672. Brook and brown trout were sampled downstream of this WID. Fish and macroinvertebrates were sampled by the MPCA from one station (98LS019) in 1998, 2015, and 2016. Two fish visits did not sample any cold or cool water fish species. One visit did sample one cold water fish species (mottled sculpin) and 2 cool water species (brook stickleback and finescale dace). No trout were sampled. Cold water fish species individuals comprised 0-3.7% (0-11.1% of taxa) of the fish samples. Macroinvertebrates we sampled twice (1998 and 2015) and neither included any cold water taxa. Temperature logger data was collected from the biological station in 2015 had an average July water temperature of 20.1°C and temperatures were in the growth range for brook trout 67.4% of the summer.

Monitoring station 98LS019 (04010202-672)

Temperature logger data were collected by the DNR near Hwy 53 (mile 3.1) in this reach during 2002, 2003, and 2004. These data were similar to the MPCA temperature logger data with 57-75% of the summer in the stressful or lethal range for brook trout. The DNR is considering removing the trout water designation above the first Hwy 53 crossing and maintaining in the downstream reaches. This possible change to the DNR's designation matches the MPCA's recommended designation. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470](#) by updating the beneficial use table for the Cloquet River Watershed (04010202). In addition to this reach, three tributaries were designated Class 2Ag as trout protection waters due to PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the Cloquet River Watershed (04010202): 04010202-541, 04010202-638, and 04010202-639.

e. Nemadji River Watershed (04010301)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/nemadji-river

Spring Creek (04010301-763): Spring Creek from its headwaters to the north line of PLS System section T46 R17W S8 is recommended to be designated Class 2Bdg. The DNR does not classify this reach as a trout water or trout protection water (Minn. R. 6264.0050). This reach is located in PLS section T46 R17W S8 which is included in the trout waters designation for Nemadji Creek (04010301-545) and Nemadji River (04010301-757). However, Spring Creek (04010301-763) is considered to be jurisdictionally disconnected because it flows to Spring Creek (04010301-764). As a result, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA proposes to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Nemadji River Watershed (04010301).

Unnamed creek (Skunk Creek Tributary) (04010301-765): An unnamed creek (Skunk Creek Tributary) from it headwaters to the north line of PLS System section T46 R17W S8 is recommended to be designated Class 2Bdg. The DNR does not classify this reach as a trout water or trout protection water (Minn. R. 6264.0050). This reach is located in PLS section T46 R17W S8 which is included in the trout waters designation for Nemadji Creek (04010301-545) and Nemadji River (04010301-757). However, this unnamed creek (Skunk Creek Tributary) (04010301-765) is considered to be jurisdictionally disconnected because it flows to Skunk Creek (04010301-504). As a result, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, [40 CFR § 131.10(g)(1)] applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA proposes to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Nemadji River Watershed (04010301).

Unnamed creek (Skunk Creek Tributary) (04010301-767): An unnamed creek (Skunk Creek Tributary) from it headwaters to the north line of PLS System section T46 R17W S8 is recommended to be designated Class 2Bdg. The DNR does not classify this reach as a trout water or trout protection water (Minn. R. 6264.0050). This reach is located in PLS section T46 R17W S8 which is included in the trout waters designation for Nemadji Creek (04010301-545) and the Nemadji River (04010301-757). However, this unnamed creek (Skunk Creek Tributary) (04010301-767) is considered to be jurisdictionally disconnected because it flows to Skunk Creek (04010301-504). As a result, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Nemadji River Watershed (04010301).

2. Lake of the Woods Basin

a. Rainy River - Headwaters Watershed (09030001)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/rainy-river-headwaters

Hog Creek (09030001-676): The reach of Hog Creek from unnamed creek to unnamed creek is recommended to be designated Class 2Ag. The DNR currently classifies the entire reach of Hog Creek, from Hog Lake (16-0653-00) to Perent Lake (38-0220-00), as warm water. Only limited information regarding the past management of Hog Creek was available. A survey by the DNR was conducted in 1968 that included watershed information, physical characteristics, and aquatic plant diversity. The US Forest Service (USFS) conducted four community-based fish surveys at mile 6.7 (47.8142, -91.0345) in 2010 and 2011. The fish community sampled in these surveys were dominated by species typically found in cold water streams and included cool water (longnose dace, northern redbelly dace) and cold water (mottled sculpin) species. A more recent biological monitoring survey was conducted by the MPCA in 2014 and 2015 and sampled burbot, longnose dace, and northern redbelly dace. Macroinvertebrates were also sampled during this effort and contained several cold water obligates, including a state threatened species (*Boyeria grafiana*). Temperature data was collected from mile 6.7 and indicated that the thermal regime is supportive of a brook trout fishery, with summer (June-August) water temperatures in the growth range for brook trout 78.3-89.6% of the summer and average July temperatures of 17.8-19.8°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg classification and replace it with the use assigned to Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001).

Monitoring stations 14RN100 (left) and 05RN071 (right) (09030001-676)

Unnamed creek (Ash River Tributary) (09030001-874): The reach of an unnamed creek (Ash River Tributary) from its headwaters to unnamed creek is recommended to be designated Class 2Bdg. The DNR inadvertently included PLS System section T68 R20W S27 in the list of PLS sections for the Blackduck River (09030001-820) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2020b). This reach was designated as a trout protection water due to its PLS section affiliation with the Blackduck River. However, the DNR does not manage this reach as a trout water or trout protection water. This reach (09030001-874) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ash River Tributary) (09030001-875): The reach of an unnamed creek (Ash River Tributary) from an unnamed creek to an unnamed creek is recommended to be designated Class 2Bdg. The DNR inadvertently included PLS System section T68 R20W S27 in the list of PLS sections for the Blackduck River (09030001-820) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2020b). This reach was designated as a trout protection water due to its PLS section affiliation with the Blackduck River. However, the DNR does not manage this reach as a trout water or trout protection water. This reach (09030001-875) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ash River Tributary) (09030001-876): The reach of an unnamed creek (Ash River Tributary) from its headwaters to an unnamed creek is recommended to be designated Class 2Bdg. The DNR inadvertently included PLS System section T68 R20W S27 in the list of PLS sections for the

Blackduck River (09030001-820) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2020b). This reach was designated as a trout protection water due to its PLS section affiliation with the Blackduck River. However, the DNR does not manage this reach as a trout water or trout protection water. This reach (09030001-876) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ash River Tributary) (09030001-877): The reach of an unnamed creek (Ash River Tributary) from its headwaters to an unnamed creek is recommended to be designated Class 2Bdg. The DNR inadvertently included PLS System section T68 R20W S27 in the list of PLS sections for the Blackduck River (09030001-820) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2020b). This reach was designated as a trout protection water due to its PLS section affiliation with the Blackduck River. However, the DNR does not manage this reach as a trout water or trout protection water. This reach (09030001-877) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Blackduck River Tributary) (09030001-887): The reach of an Unnamed creek (Blackduck River Tributary) from its headwaters to the north line of the PLS System section T67 R20W S2 is recommended to be designated Class 2Bdg. The DNR inadvertently included PLS System section T67 R20W S2 in the list of PLS sections for the Blackduck River (09030001-820) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2020b). As part of this rule, the DNR also designated the downstream reaches of this creek (09030001-858) as a trout water. However, the DNR does not manage this reach (09030001-887) as a trout water or trout protection water. This reach (09030001-887) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ninemile Creek Tributary) (09030001-924): The reach of an unnamed creek (Ninemile Creek Tributary) from its headwaters to Chub Lake is recommended to be designated Class 2Bdg. The MPCA is correcting the use designation based on the DNR's trout waters list (Minn. R. 6264.0050). This reach is a tributary to a Ninemile Creek (09030001-827), but PLS system section T67 R19W S27 is not part of the designation for Ninemile Creek and Chub Lake (69-0815-00) is between this reach and Ninemile Creek. Therefore the upper section of this tributary (09030001-924) is jurisdictionally disconnected from the Ninemile Creek designation. As a result, the DNR does not manage this stream reach as a trout water or trout protection water. This reach (09030001-924) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ninemile Creek Tributary) (09030001-929): The reach of an unnamed creek (Ninemile Creek Tributary) from its headwaters to an unnamed creek is recommended to be designated Class 2Bdg. The MPCA is correcting the use designation based on the DNR's trout waters list (Minn. R. 6264.0050). The reach of this tributary in PLS system section T67 R19W S18 was formerly part of the DNR's trout waters designation for Ninemile Creek (09030001-827). With the DNR's recent revision of its list of trout waters (State of Minnesota 2020b), the tributary to Ninemile Creek was designated as a separate trout water. In this revision, PLS system section T67 R19W S18 is not included in the Ninemile Creek tributary designation. In addition, there is a lake (69-0813-00) between the upstream and downstream reaches of this tributary. Therefore the upper section of this tributary (09030001-929) is jurisdictionally disconnected from the unnamed creek (Ninemile Creek Tributary) (09030001-928) designation. As a result, the DNR does not manage this stream reach as a trout water or trout protection water. This reach (09030001-929) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ninemile Creek Tributary) (09030001-932): The reach of an unnamed creek (Ninemile Creek Tributary) from its headwaters to the east line of PLS System section T67 R19W S18 is recommended to be designated Class 2Bdg. The MPCA is correcting the use designation based on the DNR's trout waters list (Minn. R. 6264.0050). The reach of this tributary in PLS system section T67 R19W S18 was formerly part of the DNR's trout waters designation for Ninemile Creek (09030001-827). With the DNR's recent revision of its list of trout waters (State of Minnesota 2020b), the tributary to Ninemile Creek was designated as a separate trout water. In this revision, PLS system section T67 R19W S18 is not included in the Ninemile Creek tributary designation. In addition, there is a Class 2Bg stream reach and a lake (69-0813-00) between the upstream and downstream reaches of this tributary. Therefore the upper section of this tributary (09030001-932) is jurisdictionally disconnected from the unnamed creek (Ninemile Creek Tributary) (09030001-928) designation. As a result, the DNR does not manage this stream reach as a trout water or trout protection water. This reach (09030001-932) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, [40 CFR § 131.10(g)(1)]() applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Monitoring station 14RN084 (09030001-979)

Larch Creek (09030001-974): The reach of Larch Creek from its headwaters to the BWCA boundary is recommended to be designated Class 2Ag. No information regarding the past management of Larch Creek was available from the DNR. A more recent biological monitoring survey was conducted at mile 1.5 by the MPCA in 2014 and 2015. Two fish surveys were conducted during the summer of 2014 and sampled a community with some cold (mottled sculpin) and cool (burbot) water species. In addition, the MPCA macroinvertebrate survey from 2014 contained 3 cold water obligate taxa, and one from the summer of 2015. Beaver activity was noted during the summer of 2015 and may be a plausible explanation for the reduced number of cold water taxa observed in 2015. A continuous-recording stream temperature logger was deployed in this reach by the MPCA during the summer of 2014 and 2015. Although only 78.3% of the summer (June-August) was recorded in 2014, a high percentage (97.7%) of this time was within the growth range for brook trout and demonstrated that the thermal regime may be supportive of a brook trout fishery. Furthermore, thermal stress for brook trout was low and was recorded only 2.3% of the time with the lethal threshold never exceeded during the deployment period. Temperature data from 2015 was incomplete, with only the month of June and 3 days of July recorded, with 100% of the measurements within the growth range for brook trout. The summer average temperatures for 2014 and 2015 were 16.3°C and 15.4°C, respectively. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001).

Harriet Creek (09030001-979): The reach of Harriet Creek from Harriet Lake to Silver Island Lake is recommended to be designated Class 2Ag. The DNR currently classifies the section of Harriet Creek, from Harriet Lake to Silver Island Lake, as a warm water stream. DNR fish surveys in 1968 and 2002 did not collect any cold water fish species. Additional information regarding past DNR management of Harriet Creek is limited. Both the MPCA fish and macroinvertebrate surveys, along with continuous temperature data, indicate a reasonable potential for this reach to support cold water biological communities. The MPCA macroinvertebrate survey from 2014 contains 6 cold water taxa, including a state threatened species (*Boyeria grafiana*). The 2015 macroinvertebrate sample contained 2 of these same taxa. Although not strongly indicative of a cold water community, fish samples were dominated by cool (longnose and pearl dace) and cold (mottled sculpin) water species. Fish community surveys by the US Forest Service from two additional stations in 2010 and 2011 were similar to the samples collected by the MPCA. Temperature data was collected from mile 1.30 and indicated that the thermal regime is potentially sufficient to support brook trout, with thermal stress recorded 27.7% of the time and the lethal threshold reached 1.5% of the time during the summer (June through August) of 2015. The summer average temperature during 2015 was 18.1°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001).

Dunka River (09030001-987): The reach of Dunka River from unnamed ditch to Birch Lake is recommended to be designated Class 2Ag. The DNR currently classifies the entire Dunka River, from the headwaters to Birch Lake, as a warm water stream. Community-based fish surveys were completed by the DNR in 1968 and 1975, which indicated that the lower reaches contained some cold water fish species (mottled sculpin), while the upper reaches were dominated by cool/warm water species. More recent biological monitoring surveys conducted by the MPCA in 2014, 2015, and 2019, sampled brook trout at most stations. Some young-of-the-year brook trout were sampled, indicating that natural reproduction of trout is occurring in the lower reaches of the Dunka River. Mottled sculpin and several other cool water fish species (longnose dace, brook stickleback, northern redbelly dace, finescale dace, and pearl dace) were also present in this reach. The MPCA also collected temperature data from mile 1.9 and 2.6 during the summers of 2014 and 2015. Temperature data from mile 1.9 indicates that the thermal regime is supportive of a brook trout fishery with water temperatures in the growth range for brook trout 82.5% of the summer (June through August) in 2014. The thermal regime at miles 1.9 and 2.6 during 2015 were more marginal for trout with temperature in the growth range for brook trout 52.6-52.9% of the summer. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001).

Monitoring stations 15RN035 (left) and 14RN006 (right) (09030001-987)

Unnamed creek (Ash River Tributary) (09030001-A29): The reach of an unnamed creek (Ash River Tributary) from an unnamed creek to the north line of PLS System section T68 R20W S27 line is recommended to be designated Class 2Bdg. This reach was designated as a trout protection water due to its PLS section affiliation with the Blackduck River. The DNR inadvertently included PLS System section T68 R20W S27 in the list of PLS sections for the Blackduck River (09030001-820) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2020b). As a result, the DNR does not manage this stream reach as a trout water or trout protection water. This reach (09030001-A29) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Blackduck River Tributary) (09030001-A30): The reach of an unnamed creek (Blackduck River Tributary) from its headwaters to the south line of PLS System section T68 R20W S27 is recommended to be designated Class 2Bdg. This reach was designated as a trout protection water due to its PLS section affiliation with the Blackduck River. The DNR inadvertently included PLS System section T67 R20W S2 in the list of PLS sections for the Blackduck River (09030001-820) in Minn. R. 6264.0050 and rectified this in 2020 through rule making (State of Minnesota 2020b). As part of this rule the DNR also separately designated the stream reach downstream of 09030001-A30 as a trout water. However, the DNR does not manage 09030001-A30 as a trout water or trout protection water. This reach (09030001-A30) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ash Creek Tributary) (09030001-A32): The reach of an unnamed creek (Ash River Tributary) from the south line to east line of PLS System section T67 R20W S31 is recommended to be designated Class 2Bdg. The MPCA is correcting the use designation based on the DNR's trout waters list (Minn. R. 6264.0050). This reach is a tributary to the Ash River (09030001-819), but PLS system section T67 R20W S31 is not part of the DNR's designation for the Ash River. Therefore, the upper section of this reach (09030001-A32) is jurisdictionally disconnected from the Ash River designation and the DNR does not manage 09030001-A32 as a trout water or trout protection water. This reach (09030001-A32) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Ninemile Creek Tributary) (09030001-A34): The reach of an unnamed creek (Ninemile Creek Tributary) from it headwaters to the east line of PLS System section T67 R20W S24 is recommended to be designated Class 2Bdg. The MPCA is correcting this use designation based on the DNR's trout waters list. This reach is a tributary to a Ninemile Creek (09030001-827), but PLS system section T67 R20W S24 is not part of the DNR's trout waters designation for Ninemile Creek (Minn. R. 6264.0050). Therefore, the upper section of this reach (09030001-A34) is jurisdictionally disconnected from the Ninemile Creek designation and the DNR does not manage 09030001-A32 as a trout water or trout protection water. This reach (09030001-A34) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

b. Vermilion River Watershed (09030002)

MPCA website: https://www.pca.state.mn.us/water/watersheds/vermilion-river

Monitoring station 15RN029 (09030002-648)

East Two River (09030002-648): The reach of East Two River from an unnamed creek to the west line of PLS section T62 R15W S32 is recommended to be designated Class 2Bdg. MPCA macroinvertebrate and fish surveys in 2016 did not sample any cold water species from this portion of East Two River. The MPCA's survey results are supported by a 1992 DNR survey which only collected sculpin from the same reach. A temperature logger deployed in 2015 at 15RN029, measured a mean July water temperature of 21.2°C and water temperatures in the stressful range for trout for 44.3% of the summer. Both DNR and MPCA data indicate that the upstream WID (09030002-647) at least supports a marginal cold water habitat and as such the Class 2A should be maintained for the upstream section of East Two River. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Vermilion River Watershed (04010202). In addition to this reach, two tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Vermilion River Watershed (04010202): 09030002-538, 09030002-628.

c. Rainy Lake Watershed (09030003)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/rainy-river-rainy-lake

No draft use designations.

d. Little Fork River Watershed (09030005)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/little-fork-river

Unnamed creek (Lost River Tributary) (09030005-545[16]): The reach of an unnamed creek (Lost River Tributary) in PLS System section T66 R20W S36 is recommended to be designated Class 2Bdg. The MPCA is correcting the use designation based on the DNR's trout waters list (Minn. R. 6264.0050). This reach is a tributary to a Lost River Tributary (09030005-543), but PLS system section T66 R20W S36 is not part of the designation for the Lost River Tributary. Therefore the upper section of this reach (09030001-545) is jurisdictionally disconnected from the Lost River Tributary (09030005-543) designation and the DNR does not manage this reach as a trout water or trout protection water. This reach (09030001-545) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

Unnamed creek (Lost River Tributary) (09030005-546[17]): The reach of an unnamed creek (Lost River Tributary) in PLS System section T65 R20W S12 is recommended to be designated Class 2Bdg. The MPCA is correcting the use designation based on the DNR's trout waters list (Minn. R. 6264.0050). This reach is a tributary to a Lost River Tributary (09030005-543), but PLS system section T65 R20W S12 is not part of the designation for Lost River Tributary. Therefore the upper section of this reach (09030001-546) is jurisdictionally disconnected from the Lost River Tributary (09030005-543) designation and the DNR does not manage this reach as a trout water or trout protection water. This reach (09030001-546) is currently designated Class 2Ag by default in the beneficial use table for the Rainy River - Headwaters Watershed (09030001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Rainy River - Headwaters Watershed (09030001). Due to the lack of assessable biological data, this reach will remain an unconfirmed Class 2Bg in the beneficial use table.

e. Rapid River Watershed (09030007)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/rapid-river

No draft use designations.

f. Rainy River - Lower Watershed (09030008)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/lower-rainy-river

No draft use designations.

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[16] *The draft use designation does not change the use for the entire reach, but only the portion in PLS System section T66 R20W S36. As a result the boundaries of 09030005-545 will be modified to reflect this revision.*

[17] *The draft use designation does not change the use for the entire reach, but only the portion in PLS System section T65 R20W S12. As a result the boundaries of 09030005-546 will be modified to reflect this revision.*

3. Red River of the North Basin

a. Otter Tail River Watershed (09020103)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/otter-tail-river

Toad River (09020103-526): The reach of Toad River from Little Toad Lake to the southwest corner of PLS section T138 R38W S30 is recommended to be designated Class 2Bdg. No cold water fish species were observed at either MPCA biological monitoring station. No cold water macroinvertebrate taxa were observed in the sample from station 16RD026 and 3 taxa (7 individuals) were sampled at 16RD025. Temperature logger data indicated a summer (June-August) thermal regime that is marginal to not conducive to support a cold water community. Conditions during this period were in the lethal or stressful range for trout 30.6-56.8% of the summer. This included lethal temperatures for 4% of the recording time at 16RD026. The DNR recognizes that conditions may not be conducive to support a self-sustaining population of trout in this reach of the Toad River. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Otter Tail River Watershed (09020103). In addition to this reach, several tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Otter Tail River Watershed (09020103): 09020103-667, 09020103-668, 09020103-669, 09020103-670, 09020103-671, 09020103-672, 09020103-673, 09020103-674, 09020103-675, 09020103-676, 09020103-677, 09020103-678, 09020103-679, 09020103-680, 09020103-681, 09020103-682, 09020103-683, 09020103-684, 09020103-685, 09020103-686, 09020103-687, 09020103-688, 09020103-689, 09020103-690, 09020103-691, 09020103-692, 09020103-693, 09020103-694, 09020103-695, 09020103-696, 09020103-697, 09020103-698, 09020103-699, 09020103-700, 09020103-701, 09020103-702, 09020103-703, 09020103-704, 09020103-705, 09020103-706, 09020103-707, 09020103-708, 09020103-709, 09020103-710, 09020103-711, 09020103-712, 09020103-713, 09020103-714, 09020103-715, 09020103-716, 09020103-717, 09020103-718, 09020103-719, 09020103-720, 09020103-721, 09020103-722, 09020103-723, 09020103-724, 09020103-725, 09020103-726, 09020103-727, 09020103-728, 09020103-729, 09020103-730, 09020103-731, 09020103-732, 09020103-733, 09020103-734, 09020103-735, 09020103-736, 09020103-737, 09020103-738, 09020103-739, 09020103-740, 09020103-741, 09020103-742, 09020103-743.

Monitoring stations 16RD025 (left and right) (09020103-526)

Unnamed creek (Toad River Tributary)[18] (09020103-665): The reach of an unnamed creek (Toad River Tributary) from Toad River to Dead Lake is recommended to be designated Class 2Bdg. No MPCA biological monitoring data were available from this reach, but see the use designation review for 09020103-526 and Appendix A for a detailed description of this use designation review. Based on the information in this review, 09020103-665 would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Otter Tail River Watershed (09020103).

Monitoring station 16RD009 (09020103-764)

Judicial Ditch 2 (09020103-764): The reach of Judicial Ditch 2 from an unnamed ditch along 190th Street to the Otter Tail River is proposed to be designated Class 2Bm. Biological data from both fish and macroinvertebrates collected from one station in 2016 demonstrated that it does not meet the fish or macroinvertebrate aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Lower Judicial Ditch No 2 watershed (HUC 12: 090201031002) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. This reach met ammonia, chloride, Secchi tube, and pH standards and exceeded dissolved oxygen standards. Water quality data were not sufficient for assessment of any other aquatic life WQS (eutrophication and Total Suspended Solids (TSS)) due to small sample sizes. Stressor identification determined that the fish impairment is associated with a loss of longitudinal connectivity, flow regime instability, insufficient physical habitat, and to a lesser extent, high suspended sediment and low dissolved oxygen. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign the Class 2Bm designation. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Red River of the Otter Tail River Watershed (09020103).

[18] *The DNR calls this reach "Toad River" as well as the trout protection tributary in PLS section T138 R38W S31 (part of 09020103-769). Based on historical maps it appears that 09020103-665 was a tributary to Toad River, but the construction of a ditch flowing out of the south end of Dead Lake has reversed the flow of this tributary such that most of the flow from Toad River now goes through 09020103-665. The original Toad River channel (part of 09020103-769) is still present, but it may only have substantial flow during high water levels.*

Judicial Ditch 2 (09020103-764) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16RD009	2016	Fish	2	35	6.5	11.5	1.7	38
16RD009	2016	Macroinvertebrates	7	28	2	17.5	6.2	22

b. Wild Rice River Watershed (09020108)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/wild-rice-river

Monitoring station 05RD100 (09020108-534)

Buckboard Creek (09020108-534): The reach of Buckboard Creek from its headwaters to the north line of PLS system section T144 R38W S11 is recommended to be designated Class 2Bdg. Buckboard Creek was managed by the DNR as a cold water stream from 1970 to 1983. Brook trout and brown trout have been collected during DNR stream surveys after stocking events, but no natural reproduction has been documented. In addition, the DNR indicates that beaver activity impacts flow and water temperature and makes these reaches unsuitable to support trout. Trout management on Buckboard Creek was dropped by the DNR after the 1983 stream survey. Water temperature data collected at 15 min intervals during the summer of 2014 also indicate that conditions in this stream are not favorable for supporting a cold water community (average July water temperature = 20.2 °C). Fish and macroinvertebrate data collected by the MPCA further indicate this lower reach is a warm/cool water habitat. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Wild Rice River Watershed (09020108).

c. Upper/Lower Red Lake (09020302)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/upperlower-red-lake

Mud River (09020302-540): The reach of Mud River from the west line of PLS system section T150 R33W S28 to the north line of PLS survey section T150 R33W S21 is recommended to be designated Class 2Bdg. Survival and carryover of stocked fish has been documented as poor and as a result, stocking and management activities by the DNR have been discontinued. In 2014, the MPCA collected fish and macroinvertebrate community data from one monitoring station located on this reach. Two fish samples were collected. No cold water fish species were present in either sample and a single cool water species was present in one sample. Two cold water macroinvertebrate taxa (8 individuals) were present in a sample collected in 2014. Water temperature data was collected in 15 minute intervals from the monitoring station during 2014. The water temperature data indicate that conditions in Mud River are marginal for supporting a cold water community. Stressful to lethal thermal conditions for trout were recorded for 46.0% of the summer (June through August). See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper/Lower Red Lake (09020302). In addition to this reach, three tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Upper/Lower Red Lake (09020302): 09020302-583, 09020302-584, and 09020302-585.

Monitoring station 14RD107 (09020302-540)

Meadow Creek (09020302-542): The reach of Meadow Creek from the east line of PLS system section T151 R30W S6 to the west line of PLS system section T151 R31W S2 is recommended to be designated Class 2Bdg. Stocking reports indicate that brook trout fingerlings were last stocked in 1975. After a 1977 population assessment documented no trout were present, a recommendation was made to remove Meadow Creek from the designated trout waters list due to poor habitat, warm temperatures, and beaver activity. The DNR removed Meadow Creek from the trout waters list (Minn. R. 6264.0050) in 2018 (State of Minnesota 2018). In 2014, the MPCA collected fish and macroinvertebrate community data from one monitoring station on this reach. No cold water fish or macroinvertebrate taxa were sampled. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper/Lower Red Lake (09020302). In addition to this reach, five tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Upper/Lower Red Lake (09020302): 09020302-578, 09020302-579, 09020302-580, 09020302-581, and 09020302-582.

Monitoring station 14RD107 (09020302-542)

O'Brien Creek (09020302-544): The reach of O'Brien Creek from the south line of PLS system section T149 R32W S2 to the north line of PLS system section T150 R32W S23 is recommended to be designated Class 2Bdg. DNR surveys in the 1970s and 1980s indicated that water temperatures were marginal for trout due to the presence of beaver ponds on this reach. There is no indication of natural reproduction or good carryover of trout in this reach. Brown trout were last stocked in O'Brien Creek in 1985. The DNR removed O'Brien Creek from the trout waters list (Minn. R. 6264.0050) in 2018 (State of Minnesota 2018) because management of trout was deemed to not be feasible. No MPCA monitoring data on this stream reach is present. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470](#) by updating the beneficial use table for the Upper/Lower Red Lake (09020302). In addition to this reach, nine tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Upper/Lower Red Lake (09020302): 09020302-586, 09020302-587, 09020302-588, 09020302-589, 09020302-590, 09020302-591, 09020302-592, 09020302-596, and 09020302-597.

Spring Creek (09020302-546): The reach of Spring Creek from the south line of PLS system section T149 R30W S10 to the north line of PLS system section T149 R30W S5 is recommended to be designated Class 2Bdg. A reconnaissance survey by the DNR in 1970 indicated that flows were too low in Spring Creek to support trout. There is no indication of natural reproduction or good carryover of trout in this reach. Trout were last stocked in Spring Creek in 1979. The DNR removed Spring Creek from the trout waters list (Minn. R. 6264.0050) in 2018 (State of Minnesota 2018) because management of trout was deemed to not be feasible. Reasons for removal of the trout waters designation included poor habitat, low flows, beaver activity, and warm water temperatures. MPCA biological monitoring corroborates the DNR's decision due to the lack of cold water fish or macroinvertebrate taxa. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper/Lower Red Lake (09020302). In addition to this reach, three tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Upper/Lower Red Lake (09020302): 09020302-593, 09020302-594, and 09020302-595.

Monitoring station 05RD082 (09020302-546)

d. Clearwater River Watershed (09020305)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/clearwater-river

Lost River (09020305-530): The reach of Lost River from an unnamed creek to the north line of PLS system section T148 R38W S20 is recommended to be designated Class 2Bdg. The MDNR currently classifies this section of the Lost River as marginal trout water. Stocking reports indicate that brook trout fingerlings were stocked from 1947 to 1975. No official report or documentation regarding the cessation of stocking could be located. No DNR survey data for this reach was available. The MPCA collected fish community data from two monitoring stations located on this reach. One station was sampled in 2014 and 2015 and the other station was sampled in 2005. All fish samples consisted of predominantly warm water species. Water temperature data was collected in 15 minute intervals at both sampling stations. The water temperature data indicate that conditions in the Lost River are marginal for supporting a cold water community (average July water temperature 19.9-23.1°C). Thermal stress was recorded 33.6-40.0% of the summer (June through August) at both stations with the lethal threshold exceeded for 18.5% of the summer at one station. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Clearwater River Watershed (09020305). In addition to this reach, several tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Clearwater River Watershed (09020305): 09020305-545, 09020305-621, 09020305-622, 09020305-623, 09020305-624, 09020305-625, 09020305-626, 09020305-627, 09020305-628, 09020305-629, 09020305-630, 09020305-631, 09020305-632, 09020305-633, 09020305-634, and 09020305-635.

Monitoring station 05RD106 (09020305-530)

Clearwater River (09020305-654): The reach of the Clearwater River from an unnamed creek to Clearwater Lake is recommended to be designated Class 2Bdg. The DNR currently classifies the section of the Clearwater River, from an unnamed creek (09020305-654) to Clearwater Lake, as a marginal trout water. According to the DNR, trout are occasionally captured by anglers from this reach and are likely migrants from the active management area located 10 miles upstream. The DNR does not actively manage this section of the Clearwater River for trout and has indicated that water temperatures are not conducive to trout survival. There is no evidence of natural reproduction of trout in this stream reach. In 2011 and 2015, the MPCA collected fish and macroinvertebrates community data from one monitoring station located on this reach. Both fish samples consisted of a diverse, predominantly warm water community with low numbers of a cold water species (mottled sculpin). No trout were collected by the MPCA. No cold water macroinvertebrate taxa were present in either the 2011 or 2015 samples. Water temperature data was collected in 15 minute intervals from the monitoring station during 2016. The water temperature data indicate that conditions in the Clearwater River are marginal for supporting a cold water community. Thermal stress was recorded 52.8% of the time during the summer and the average July temperature was 20.9°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Clearwater River Watershed (09020305). In addition to this reach, six tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg

Monitoring station 10EM085 (09020305-654)

in the beneficial use table for the Clearwater River Watershed (09020305): 09020305-608, 09020305-609, 09020305-610, 09020305-611, 09020305-612, and 09020305-613.

Unnamed creek (Spring Lake Creek) (09020305-900): The reach of the Clearwater River from its headwaters to the north line of PLS system section T148 R35W S34 is recommended to be designated Class 2Bdg. A 1970 DNR reconnaissance survey report recommended removal of the trout water designation. Stocking of trout ceased in 1977. The DNR removed this unnamed creek from the trout waters list (Minn. R. 6264.0050) in 2018 (State of Minnesota 2018) because management of trout was deemed to not be feasible. Reasons for removal of the trout waters designation included poor habitat, low flows, beaver activity, and warm water temperatures. No MPCA monitoring data is available for this stream reach. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Clearwater River Watershed (09020305). In addition to this reach, a tributary was designated Class 2Ag as a trout protection water due to its PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the Clearwater River Watershed (09020305): 09020305-637.

4. Upper Mississippi River Basin

a. Leech Lake River Watershed (07010102)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/leech-lake-river

Pokety Creek (07010102-527): The reach of Pokety Creek from the north line of PLS System section T144 R33W S24 to the Necktie River is recommended to be designated Class 2Bdg. The DNR removed this stream from the trout waters list (Minn. R. 6264.0050) in 2018 (State of Minnesota 2018) because management of trout was deemed to not be feasible. Stocking reports indicated that brook trout fingerlings were stocked in years 1958-63, 1965-68, and 1970-1975. A 1959 MDNR winter reconnaissance report noted that trout would likely not survive the winter unless they resided near spring holes found in section 24 or 25. The report also noted that Pokety Creek was a possible candidate for put-and-take stocking management. DNR sampling was conducted during the early 1990s and no trout were sampled. Temperature data were collected by the DNR at two locations on Pokety Creek during 2012 and 2013. Thermal stress was recorded 19.8-41.5% of the summer (June through September). The lethal threshold was also reached 7.7% of the summer. Fish community data was collected by the MPCA at one station on Pokety Creek during 2012. No cold water fish species were sampled and four cool water fish species were sampled. Macroinvertebrates were also sampled in 2012 and no cold water taxa were collected. Water temperature data collected by the MPCA at 15-minute intervals during the summer of 2012 indicated that conditions are not suitable for supporting trout with an average July temperature of 21.4°C and summer (June through August) temperatures in the growth range only 43.9% of the time. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make

Monitoring station 12UM097 (07010102-527)

this change in Minn. R. 7050.0470 by updating the beneficial use table for the Leech Lake River Watershed (07010102). In addition to this reach, three tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bg in the beneficial use table for the Leech Lake River Watershed (07010102): 07010102-603, 07010102-604, and 07010102-605.

b. Mississippi River – Grand Rapids Watershed (07010103)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/mississippi-river-grand-rapids

Sand Creek (07010103-594): The reach of Sand Creek from Lammon Aid Lake to the Swan River is recommended to be designated Class 2Bdg. No trout and a single cold water fish species (mottled sculpin) were observed at three biological monitoring stations monitored in 2015. A single cold water macroinvertebrate taxon (4 individuals) was sampled a one station. Temperature logger data indicated that the summer (June-August) thermal regime is not conducive for the maintenance of a cold water community. Temperature loggers were deployed at 3 locations in 2014 and 2015 and measured water temperatures that were in the lethal or stressful range for trout 33-55% of the summer. This also included lethal temperatures for 1-9% of the recording period at these stations. Average July temperatures ranged from 20.1 to 22.7°C. The DNR recognizes that conditions are not conducive to support a self-sustaining population of trout in this reach of the Sand Creek and that conditions are more indicative of a warm water habitat. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103). In addition to this reach, two tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103): 07010103-668 and 07010103-669.

Monitoring stations 15UM074 (left) and 15UM106 (right) (07010103-594)

Warba Creek (07010103-595): The reach of Warba Creek from its headwaters to the Swan River is recommended to be designated Class 2Bdg. This reach was removed from the trout waters list (Minn. R. 6264.0050) by the DNR in 2018 (State of Minnesota 2018). Survival and carryover of stocked fish had been documented as poor and as a result, stocking and management activities by the DNR had been discontinued in 1971. In 1999, 2015, and 2016, the MPCA collected fish and macroinvertebrates community data from three monitoring stations located on this reach. Four fish samples were collected. No cold water fish species were present in these samples and low numbers of four cool water species were present. Three cold water macroinvertebrate taxa (8 individuals) were present in among 2 samples, accounting for 10 total individuals. Water temperature data was collected using temperature loggers from the monitoring stations during 2014-2016. The water temperature data indicate that conditions in Warba Creek are marginal for supporting a cold water community. Stressful to lethal thermal conditions for trout accounted for 24-42% of the summer (June through August). One of these logger deployments indicated water temperatures that may be suitable for trout (76% of the summer in the growth range) however, the average July temperature for this deployment and the others was at or above 20°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103). In addition to this reach, several tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103): 07010103-684, 07010103-685, 07010103-686, 07010103-687, and 07010103-688.

Monitoring stations 15UM083 (upper left), 99UM056 (upper right), and 15UM082 (lower) (07010103-595)

Michaud Brook (07010103-599): The reach of Michaud Brook from its headwaters to Michaud Lake is recommended to be designated Class 2Bdg. This reach was removed from the trout waters list ([Minn. R. 6264.0050]) by the DNR in 2018 (State of Minnesota 2018). There is no documentation regarding why this reach was listed as a trout water or if it was ever managed for trout. In 2015 and 2016, the MPCA collected fish and macroinvertebrate community data from one monitoring station located on this reach. Three fish samples were collected. No cold water fish species were present in these samples and a single cool water species was present. A single cold water macroinvertebrate taxon (1 individual) was present in one of two samples collected from this stream reach. Water temperature data was collected using temperature loggers from the biological monitoring station during 2015-2016 The data collected from 2015 was incomplete and is not considered here. The water temperature data from 2016 indicated that conditions in Michaud Brook are marginal for supporting a cold water community. Stressful to lethal thermal conditions for trout accounted for 44% of the summer (June through August) and average July temperature was 20.5°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103).

Monitoring station 15UM031 (07010103-599)

Unnamed creek (Libby Brook) (07010103-601): The reach of Unnamed creek (Libby Brook) from its headwaters to an unnamed lake (01-0037-00) is recommended to be designated Class 2Bdg. This reach was removed from the trout waters list (Minn. R. 6264.0050) by the DNR in 2018 (State of Minnesota 2018). In 2015 and 2016, the MPCA collected fish and macroinvertebrate community data from one monitoring station located on this reach. Two fish samples were collected. No cold water fish species were present in these samples and three cool water species were sampled. A single cold water macroinvertebrate taxon (*Lype diversa*) was present in the sample collected from this stream reach. Water temperature data was collected using temperature loggers from the biological monitoring station from 2014 through 2016. The water temperature data indicated that conditions in Libby Brook are marginal for supporting a cold water habitat. Stressful to lethal thermal conditions for trout accounted for 37-41% of the summer (June through August) and the average July temperature was 20.2-20.7°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103).

Unnamed creek (Libby Brook) (07010103-602): The reach of Unnamed creek (Libby Brook) from an unnamed lake (01-0037-00) to the Mississippi River is recommended to be designated Class 2Bdg. See 07010103-601 (Unnamed creek [Libby Brook]) and Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103).

Monitoring station 15UM017 (07010103-602)

Hasty Brook (07010103-603): The reach of Hasty Brook from an unnamed ditch to Prairie Lake is recommended to be designated Class 2Bdg. The DNR has recommended removal of Hasty Brook from the trout waters list (Minn. R. 6264.0050). This stream was stocked with trout in 1961 and 1963 most likely to determine if it could support a trout fishery. DNR surveys in in 1991 and 1997 collected no trout and determined that water temperatures were too warm most years for trout survival. In 2020 and 2015, the MPCA collected fish and macroinvertebrates community data from one monitoring station located on this reach. No cold or cool water fish species were present in these samples and a single cold water macroinvertebrate taxon (2 individuals) was present in one of two samples collected from this stream reach. Water temperature data was collected in 2010, 2014 and 2015 from three locations using temperature loggers. Water temperature data indicated that conditions in Hasty Brook are marginal for supporting a cold water community. Stressful to lethal thermal conditions for trout accounted for 33-56% of the summer (June through August) and average July temperature was 20.1-21.3°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103). In addition to this reach, a number of tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bg in the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103): 07010103-653, 07010103-654, 07010103-655, 07010103-656, 07010103-657, and 07010103-658.

Monitoring station 09UM088 (07010103-603)

Hasty Brook (07010103-606): The reach of Hasty Brook from its headwaters to an unnamed ditch is recommended to be designated Class 2Bdg. See 07010103-603 (Hasty Brook) and Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand

Rapids Watershed (07010103). In addition to this reach, a number of tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bg in the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103): 07010103-649, 07010103-650, 07010103-651, and 07010103-652.

Bruce Creek (07010103-608): The reach of Bruce Creek from its headwaters (unnamed lake [31-0015-00]) to the south line of PLS system section T54 R23W S25 is recommended to be designated Class 2Bdg. The DNR removed this stream from the trout waters list (Minn. R. 6264.0050) in 2018 (State of Minnesota 2018) because management of trout was deemed to not be feasible. Stocking reports indicated that brook trout were stocked from 1951 to 1997. DNR surveys in 1977, 1981, and 1990 did not collect any trout. The cessation of trout management and delisting of Bruce Creek was the result channelization, numerous beaver dams, and low gradient creating unsuitable trout habitat. One biological station was sampled for fish and macroinvertebrates in 2015. No cold water fish species (mottled sculpin) were sampled and a four cool water taxa (northern redbelly dace, finescale dace, pearl dace, brook stickleback) were sampled. No cold water macroinvertebrate taxa were sampled by the MPCA although a 1982 survey indicated the presence of *Gammarus* near this reach. Overall, the fish and macroinvertebrate communities observed lacked cold water taxa. Continuously-recording stream temperature loggers were deployed at two locations during the summers of 2014, 2015, and 2016. Water temperatures were in the growth range for brook trout 65-80% of the summer and average July temperatures 19.0-20.3°C. Although water temperatures in Bruce Creek are marginally suitable to support cold water taxa, DNR and MPCA monitoring indicate that a cold water community is not present in this stream. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103). In addition to this reach, two tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bg in the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103): 07010103-647 and 07010103-648.

Monitoring station 15UM081 (07010103-608)

Bruce Creek (07010103-609): The reach of Bruce Creek from the wests line of PLS system section T54 R22W S31 to the west line of PLS system section T53 R22W S7 is recommended to be designated Class 2Bdg. See 07010103-608 (Bruce Creek) and Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103).

Trib. To Mississippi River (Two River Springs) (07010103-623): The reach of Bruce Creek from an unnamed creek to the west line of PLS system section T51 R24W S26 is recommended to be designated Class 2Bdg. This stream reach (07010103-623) is managed as a warm water feeder by the DNR. There is no evidence indicating that this reach is naturally a cold water habitat or that trout reproduction occurs in this reach. In 2015, the MPCA sampled fish and macroinvertebrates from one monitoring station located on this reach. No cold or cool water fish species were present and no cold water macroinvertebrate taxa were present in these samples. Water temperature data were collected using temperature loggers from the biological monitoring station during 2014 through 2016. Water temperature data indicated that conditions in Two River Springs are not indicative of a cold water habitat. Stressful to lethal thermal conditions for trout accounted for 56-67% of the summer (June through August) and average July temperature was 21.4-22.5°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103).

Monitoring station 15UM056 (07010103-722)

Unnamed creek (07010103-722): The reach of an unnamed creek from an unnamed creek to Bray Lake is recommended to be designated Class 2Ag. This reach was removed from the trout waters list (Minn. R. 6264.0050) by the DNR in 1980 because it was determined that it could not support a trout fishery. In 2016, the MPCA collected fish and macroinvertebrates community data from one monitoring station located on this reach. A single cool water fish species (finescale dace) was present. Five cold water macroinvertebrate taxa (*Doncricotopus bicaudatus, Glossosoma intermedium, Goera, Isoperla*, and *Lype diversa*) was present and comprised to 3.7% of the sample. Water temperature data was collected using temperature loggers from the biological monitoring station during 2016. The water temperature data from 2016 indicated that conditions in the tributary to Bray Lake could support a cold water community. Stressful to lethal thermal conditions for trout accounted for 36% of the summer (June through August) and average July temperature was 19.8°C. Although, no cold water fish were encountered during surveys, in-stream habitat suggests that non-trout cold and cool water fish (i.e. burbot, longnose dace, and pearl dace) could utilize this habitat. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103).

Monitoring station 09UM087 (07010103-762)

Morrison Brook (07010103-762): The reach of Morrison Brook from an unnamed creek to the south line of PLS system section T52 R26W S14 is recommended to be designated Class 2Bdg. There is no evidence of trout reproduction or presence of trout in the lower section (07010103-762) of Morrison Brook. In 2010, 2015, and 2016, the MPCA sampled fish from one monitoring station located on this reach. One cold water species (mottled sculpin) was present. Macroinvertebrates were sampled in 2009 and 2015 and no cold water macroinvertebrate taxa were present in these samples. Water temperature data was collected using temperature loggers from the biological monitoring station during 2010, 2014, 2015, and 2016. Water temperature data indicated that conditions in this section of Morrison Brook are marginal for a cold water habitat. Stressful to lethal thermal conditions for trout accounted for 25-38% of the summer (June through August) and average July temperature was 19.4-21.0°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103). In addition to this reach, a tributary was designated Class 2Ag as trout protection water due to its PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bg in the beneficial use table for the Mississippi River – Grand Rapids Watershed (07010103): 07010103-665.

c. Mississippi River - Brainerd Watershed (07010104)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/mississippi-river-brainerd

Monitoring station 99UM015 (07010104-590)

Unnamed ditch (07010104-590): The reach of an unnamed ditch from an unnamed ditch to an unnamed ditch is recommended to be designated Class 2Bm. Biological data collected from one station in 1999 demonstrated that it does not meet the fish or macroinvertebrate aquatic life use goals for Class 2B. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that this reach was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Gun Lake watershed (HUC 12: 070101040107) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. No additional water quality data are available from this reach. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Unnamed ditch (07010104-590) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
99UM015	1999	Fish	7	0	3	10	2.8	39
99UM015	1999	Macroinvertebrates	4	18	0.5	10.5	7.7	39

Ripple River (07010104-666): The reach of the Ripple River from an unnamed wetland (01-0394-00) to Lingroth Lake outlet is recommended to be designated Class 2Bm. Biological data collected from one station in 2016 and 2017 demonstrated that it does not meet the fish aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Mallard Lake-Ripple River watershed (HUC 12: 070101040203) which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm. Dissolved oxygen was not assessed due to the possible influence of upstream wetlands. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Monitoring station 16UM040 (07010104-666)

Ripple River (07010104-666) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16UM040	2016	Fish	5	40	9.5	12	1.2	39
16UM040	2017	Fish	5	40	5	16	2.8	40
16UM040	2017	Macroinvertebrates	4	57	0	12	13.0	40

Unnamed creek (07010104-679): The reach of an unnamed creek from its headwaters to Sand Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2016 and 2017 demonstrated that it does not meet the macroinvertebrate aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper Sand Creek watershed (HUC 12: 070101040504) which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Ammonia, TSS, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus, dissolved oxygen, and Secchi tube, had at least one sample that exceeded standards, but data were not sufficient for assessment. Stressor identification determined that the macroinvertebrate

Monitoring station 16UM042 (07010104-679)

impairment is associated with elevated nutrients, low dissolved oxygen, and physical habitat. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Unnamed creek (07010104-679) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16UM042	2016	Fish	7	71	2.5	7.5	2.4	32
16UM042	2016	Fish	4	17	0	12	13.0	29
16UM042	2017	Macroinvertebrates	4	20	2	12	4.3	20

Unnamed creek (07010104-683): The reach of Unnamed creek from its headwaters to Hay Creek is recommended to be designated Class 2Be. Biological data from both macroinvertebrates and fish collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Exceptional Use. The channel in this reach is natural and habitat assessment demonstrated that it has fair to good habitat (MSHA = 65-67). Considering this information, it is reasonable to remove the Class 2Bg designation assigned to Class 2Bg and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River - Brainerd Watershed (07010104).

Monitoring station 16UM060 (07010104-683)

Unnamed creek (07010104-683) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16UM060	2016	Fish	6	88	13.5	8	0.6	65
16UM060	2016	Macroinvertebrates	6	67	12	2	0.2	67

Unnamed creek (07010104-684): The reach of an unnamed creek from an unnamed outlet to the Mississippi River is recommended to be designated Class 2Bm. Biological data collected from one station in 2016 demonstrated that it does not meet the fish or macroinvertebrate aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the City of Little Falls-Mississippi River watershed (HUC 12:

Monitoring station 16UM056 (07010104-684)

070101040906) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Dissolved oxygen was assessed as not meeting standards. Phosphorus, ammonia, TSS, and Secchi tube data were not sufficient for assessment, but all measurements met WQS thresholds. There was a single pH sample that exceeded standards, but data were not sufficient for assessment. Stressor identification determined that the macroinvertebrate impairment is associated with low dissolved oxygen and physical habitat. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Unnamed creek (07010104-684) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16UM056	2016	Fish	7	24	4	11.5	2.5	37
16UM056	2016	Macroinvertebrates	6	14	3	11	3.0	36

Unnamed creek (07010104-685): The reach of an unnamed creek from an unnamed outlet to the Mississippi River is recommended to be designated Class 2Bm. Biological data collected from one station in 2016 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Swan River watershed (HUC 12: 070101040805) which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as supporting the aquatic life use goals for Class 2Bm. Dissolved oxygen was not assessed due to the possible influence of upstream wetlands. Phosphorus, ammonia, TSS, pH, and Secchi tube data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Monitoring station 16UM007 (07010104-685)

Unnamed creek (07010104-685) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16UM007	2016	Fish	7	35	6.5	8	1.2	45
16UM007	2016	Macroinvertebrates	6	50	5	7	1.3	58

Unnamed ditch (07010104-691): The reach of an unnamed ditch from Little Willow Ditch (old channel) to Mississippi River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet the aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Big Logan-Mississippi River and Little Willow River watersheds (HUC 12s: 070101040401 and 070101040304) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. No additional water quality data are available from this reach. Stressor identification determined that the macroinvertebrate impairment is associated with poor habitat, low flows, and low dissolved oxygen caused by upstream wetlands. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Monitoring station 17UM200 (07010104-691)

Unnamed ditch (07010104-691) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17UM200	2017	Fish	7	39	2	10.5	3.8	39
17UM200	2017	Macroinvertebrates	4	33	2	7	2.7	46

Unnamed ditch (07010104-697): The reach of an unnamed ditch from Blind Lake to a Mississippi River flood diversion channel is recommended to be designated Class 2Bm. Biological data collected from two stations in 1999 and 2016 demonstrated that it does not meet the aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Blind Lake watershed (HUC 12: 070101040303) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as supporting the aquatic life use goals for Class 2Bm. Phosphorus, dissolved oxygen, ammonia, TSS, and Secchi tube data were not sufficient for assessment, but all measurements met WQS thresholds. Available pH data were not sufficient for assessment, but one measurement did not met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Unnamed ditch (07010104-697) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16UM063	2016	Fish	6	24	11.5	13	1.1	48
99UM035	1999	Fish	6	0	6	16	2.4	47
99UM035	1999	Fish	6	36	6	18	2.7	38
16UM063	2017	Macroinvertebrates	4	60	0	12	13.0	43
99UM035	1999	Macroinvertebrates	4	44	1	10	5.5	38
99UM035	1999	Macroinvertebrates	4	59	1	10	5.5	38

Monitoring stations 16UM063 (left) and 99UM035 (right) (07010104-697)

Little Willow River (old channel) (07010104-701): The reach of the Little Willow River (old channel) from an unnamed ditch to a flood diversion channel is recommended to be designated Class 2Bm. Biological data collected from one station in 2016 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Little Willow River watershed (HUC 12: 070101040304) and adjacent watersheds which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Chloride, ammonia, and pH was assessed as meeting WQS. Ammonia and TSS, data were not sufficient for assessment, but all measurements met WQS thresholds. Phosphorus, dissolved oxygen, and Secchi tube data were not sufficient for assessment, but each had at least one measurement that exceeded WQS thresholds. Stressor identification concluded that the biological impairment was not caused by a pollutant and this reach was assigned to Category 4C of the impaired waters list. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class

Monitoring station 16UM007 (07010104-701)

2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Brainerd Watershed (07010104).

Little Willow River Old Channel (07010104-701) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16UM020	2016	Fish	7	28	4	10	2.2	28
16UM020	2017	Fish	7	0	5	13	2.3	21
16UM020	2017	Macroinvertebrates	4	47	2.5	11.5	3.6	37

d. Pine River Watershed (07010105)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/pine-river

Monitoring station 12UM140 (07010105-525)

Brittan Creek (07010105-525): The reach of Brittan Creek from Dabill Creek to the South Fork of Pine River is recommended to be designated Class 2Bdg. No DNR sampling data from Brittan Creek (07010105-525) could be located. Historically Dabill Creek (07010105-526), upstream of Brittan Creek (07010105-525), was managed for brook trout in the headwaters region located upstream of County State Aid Highway (CSAH) 2. In 2003 the trout water designation was extended downstream through Brittan Creek (07010105-525). No documentation could be located to provide rationale for this change. Available information indicates that Brittan Creek was never managed for trout and was thought to be very marginal for trout survival due to the lack of trout habitat and high water temperatures. Fish and macroinvertebrates were sampled during 2012 and 2013 at one monitoring station located on Brittan Creek. All samples consisted of communities indicative of a warm water, low gradient stream. No trout were collected and a single cold water fish species (mottled sculpin) was collected in low numbers. The macroinvertebrate samples only included a single cold water taxon (*Doncricotopus bicaudatus*) which comprised 0-2.1% of the individuals in the samples. In 2012, water temperature was measured continuously using a temperature logger located within the MPCA's biological sampling reach. The average temperature for July was very marginal for trout survival (22.2°C) with temperatures only in the growth range 50.1% of the summer (June through August). Temperatures were lethal to brook trout 3.2% of the summer. See Appendix A for a detailed description of this use designation review. Considering this information it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Pine River Watershed (07010103).

Bungo Creek (07010105-528): The reach of Bungo Creek from an unnamed creek to the east line of the PLS System section T138 R30W S31 is recommended to be designated Class 2Bdg. The DNR removed this stream from the trout waters list (Minn. R. 6264.0050) in 2018 (State of Minnesota 2018) because management of trout was deemed to not be feasible. Limited information regarding the past management of Bungo Creek was available, but the DNR believes that Bungo Creek likely supported a brook trout fishery before 1975. No documentation of brook trout natural reproduction within Bungo Creek or its tributaries could be found. Only one stocking record, documenting the release of 2000 brook trout yearlings in 1971, could be found. In 1975, the DNR sampled two sites on Bungo Creek and no trout were sampled at either site. Evidence of any additional DNR surveys or management activities conducted on Bungo Creek could not be found. The MPCA sampled the fish community data from two stations on Bungo Creek in 2012 and 2013. All samples consisted of predominantly warm water species. During both years of sampling, one cold water species (mottled sculpin) was sampled in low numbers at one station. No cold water macroinvertebrates were collected from either biological station. Water temperature data was collected at 15 minute intervals using data loggers from both sampling stations in 2012 and 2013. Average July water temperatures ranged from 20.8-23.5°C and were in the growth range for brook trout 38.4-49.2% of the summer (June through August). The lethal threshold for brook trout was reached 4.1-10.1% of the summer. See Appendix A for a detailed description of this use designation review. Considering this information it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Pine River Watershed (07010103). In addition to this reach, a number of tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Pine River Watershed (07010105): 07010105-565, 07010105-566, 07010105-567, and 07010105-568.

Monitoring stations 12UM139 (left) and 12UM132 (right) (07010105-528)

Bungo Creek (07010105-535): The reach of Bungo Creek from the south line of the PLS System section T137 R31W S23 to an unnamed creek is recommended to be designated Class 2Bdg. See 07010105-535 (Bungo Creek) and Appendix A for a detailed description of this use designation review. Considering this information it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Pine River Watershed (07010103). In addition to this reach, a tributary was designated Class 2Ag as a trout protection water due to its PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reach will be changed to Class 2Bdg in the beneficial use table for the Pine River Watershed (07010105): 07010105-568.

e. Mississippi River - Sartell Watershed (07010201)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/mississippi-river-sartell

Platte River (07010201-545): The reach of the Platte River from an unnamed creek (above railroad bridge) to the Mississippi River is recommended to be designated Class 2Be. Biological data from both macroinvertebrates and fish collected in 2003, 2017, and 2017 from three stations demonstrated that this reach meets the aquatic life use goals for Exceptional Use. The channel in this reach is natural and habitat assessment demonstrated that two stations have fair to good habitat (MSHA = 63-81). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with

Class 2Be. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the beneficial use table for the Mississippi River - Sartell Watershed (07010201).

Platte River (07010201-545) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
03UM003	2003	Fish	5	67	-	-	-	-
03UM003	2017	Fish	5	59	15.5	9	0.6	72
03UM004	2003	Fish	5	78	-	-	-	-
03UM004	2016	Fish	5	74	19	6	0.4	73
16UM122	2017	Fish	5	88	-	-	-	-
03UM003	2017	Macroinvertebrates	7	86	15.5	6	0.4	63
03UM004	2017	Macroinvertebrates	5	85	13.5	3.5	0.3	81
16UM122	2017	Macroinvertebrates	5	71	12	3.5	0.3	75

Monitoring stations 03UM003 (upper left), 03UM004 (upper right), and 16UM122 (lower) (07010201-545)

Unnamed creek (07010201-622): The reach of the Little Willow River (old channel) from an unnamed ditch to a flood diversion channel is recommended to be designated Class 2Bm. Biological data collected from one station in 2010 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Rice Creek watershed (HUC 12: 070102010407) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm and macroinvertebrates were not assessed. Phosphorus, TSS, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen and Secchi tube data were not sufficient for assessment, but each had at least one measurement that exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Mississippi River - Sartell Watershed (07010201).

Monitoring station 10EM166 (07010201-622)

Unnamed creek (07010201-622) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
10EM166	2010	Fish	7	36	4	10.5	2.3	31
10EM166	2010	Macroinvertebrates	6	7	1.5	11	4.8	31

Unnamed creek (07010201-632): The reach of an unnamed creek from its headwaters to an unnamed creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2015 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Two River Lake watershed (HUC 12: 070102010102) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate

Monitoring station 15EM008 (07010201-632)

assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrates assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm and the fish were not assessed due to the small size of the stream. Dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but two measurements exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Sartell Watershed (07010201).

Unnamed creek (07010201-632) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
15EM008	2015	Fish	6	0	11	10.5	1.0	52
15EM008	2015	Fish	6	0	10.5	7.5	0.7	56
15EM008	2015	Macroinvertebrates	5	34	2.5	8.5	2.7	49

Unnamed creek (07010201-640): The reach of an unnamed creek from an unnamed creek to geographic coordinates (decimal degrees NAD83) 45.782, -94.149 is recommended to be designated Class 2Bm. Biological data collected from one station in 1999 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Zuleger Creek watershed (HUC 12: 070102010503) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was not assessed because the sample was expired (i.e., more than 10 years old at the time of assessment). Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Mississippi River - Sartell Watershed (07010201).

Monitoring station 99UM043 (07010201-640)

Unnamed creek (07010201-640) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
99UM043	1999	Fish	6	36	3.5	16.5	3.9	43

Little Rock Creek (07010201-652): The reach of Little Rock Creek from the south line of PLS system section T39 R30W S22 to the west line of PLS system section T38 R31W S23 is recommended to be designated Class 2Bdg. Portions of Little Rock Creek support or have supported natural reproduction of brown trout. However, evidence indicates that a section of the reach designated as a trout water (07010201-652) is naturally a warm water habitat. The upstream portion of the DNR's trout water designation (above 230th Avenue) is lower gradient with finer substrates (i.e., sand and silt) compared to the downstream portion of the creek. There are also springs which add ground water and cool water temperatures below 230th Avenue. Observations of the upstream reach indicate that this portion is intermittent, frequently having no flow or only pools of stagnant water. MPCA and DNR biological and water temperature data, including historic data, indicates that the upstream portions of Little Rock Creek (upstream of 230th Avenue) could not support trout. MPCA monitoring of fish and macroinvertebrates in 1999, 2015 and 2016 did not collect any cold water species. Water temperature data was collected using a temperature logger from the biological monitoring station during 2015 and indicated that conditions in this reach of Little Rock Creek are too warm to support a cold water community. Stressful to lethal thermal conditions for brook trout accounted for 47.5% of the summer (June through August) and average July temperature was 21.0°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River - Sartell Watershed (07010201). In addition to this reach, a number of tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliations with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Mississippi River - Sartell Watershed (07010201): 07010201-600, 07010201-601, 07010201-602, 07010201-603, 07010201-604, and 07010201-605.

Monitoring station 99UM058 (07010201-652)

f. Sauk River Watershed (07010202)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/sauk-river

Tributary to Sauk River (07010202-660): The reach of a tributary of the Sauk River from an unnamed creek to the Sauk River is recommended to be designated Class 2Ag. This tributary is not currently listed as a designated trout water by the DNR (Minn. R. 6264.0050), but MPCA temperature and biological data indicate that this stream is a cold water habitat. The MPCA deployed water temperature loggers on this reach in 2018, 2019, and 2021 at two stations. Average July water temperatures ranged from 16.9-18.6°C and summer (June through August) temperatures were in the growth range for brook trout 96-98% of the time. The fish community was not indicative of a cold water habitat although two cool water species were sampled (brook stickleback, northern redbelly dace). The lack of cold water fish species may be due to the isolated nature of this stream which prevents colonization. The macroinvertebrate community was indicative of a cold water habitat with seven cold water taxa (*Aquarius*, *Diplocladius cultriger*, *Glossosoma*, *Heterotrissocladius*, *Limnephilus*, *Odontomesa*, *Prodiamesa*). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Sauk River Watershed (07010202).

Monitoring stations 08UM016 (left) and 21UM001 (right) (07010202-660)

Monitoring station 08UM024 (07010202-725)

Stony Creek (07010202-725): The reach of Stony Creek from the geographic coordinates (decimal degrees NAD83) 45.550, -94.836 to the east line of the PLS System section T124 R33W S22 is recommended to be designated Class 2Ag. Stony Creek is not currently listed as a designated trout water by the DNR ([Minn. R. 6264.0050](https://www.revisor.mn.gov/rules/6264.0050/)), but this stream was a DNR designated trout stream from 1950 until 1977. Little information is available regarding the trout population status in Stony Creek between 1948 and 1977, other than anecdotal evidence from landowners that brook trout were common in the creek. DNR removed the trout stream designation in 1977 due to degradation, low populations of trout, little fishing pressure, and requests for water appropriation. Improvement to land use management and temperature measurements in the early 2000s indicated that Stony Creek may be able to support trout. Brook trout fingerlings were stocked in 2002 and yearlings were stocked in 2004. A DNR fish survey in 2003, collected five yearling trout displaying excellent growth. A DNR fish survey in 2004 collected 21 trout (all from the April stocking) and a DNR fish survey in 2005 collected 25 adults from the 2004 stocking. In 2006, 5 young-of-the-year and 2 adult trout were captured, indicating natural reproduction of brook trout in Stony Creek. A MPCA fish survey in 2008 also collected brook trout although the 2018 MPCA survey did not collect any trout. The MPCA deployed water temperature loggers on this reach of Stony Creek in 2003 and 2018 at two different locations. Average July water temperatures ranged from 18.2-19.5°C and summer (June through August) temperatures were in the growth range for brook trout 76.2-81.0% of the time. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it Class 2Ag. The MPCA will propose to make this change in [Minn. R. 7050.0470](https://www.revisor.mn.gov/rules/7050.0470/) by updating the beneficial use table for the Sauk River Watershed (07010202).

g. North Fork Crow River Watershed (07010204)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/north-fork-crow-river

County Ditch 47 (07010204-532): The reach of County Ditch 47 from its headwaters to the Middle Fork of the Crow River is recommended to be designated Class 2Bm. Biological data collected from two stations in 2007, 2015, and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No 47 watershed (HUC 12: 070102040209) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but at least one measurement for each parameter exceeded WQS thresholds. Although data were not sufficient for assessment, nutrients and dissolved oxygen are potential biological stressors in this ditch. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring stations 15EM035 (left) and 07UM016 (right) (07010204-532)

County Ditch 47 (07010204-532) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
15EM035	2015	Fish	6	14	7	14	1.9	40
07UM016	2007	Fish	7	23	3.5	11	2.7	43
07UM016	2017	Fish	7	31	1.5	12.5	5.4	26
15EM035	2015	Macroinvertebrates	7	36	5.5	14	2.3	50
07UM016	2007	Macroinvertebrates	7	32	6	17.5	2.6	43
07UM016	2017	Macroinvertebrates	7	39	1	22.5	11.8	29

Unnamed creek (07010204-548): The reach of an unnamed creek from an unnamed creek to an unnamed creek is recommended to be designated Class 2Bm. Fish data collected from one station in 2000 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the City of Kingston-North Fork Crow River watershed (HUC 12: 070102040306) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was not assessed in assessment year 2019 because these data were expired (i.e., more than 10 years old at the time of assessment). No water quality data were available. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 00UM057 (07010204-548)

Unnamed creek (07010204-548) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
00UM057	2000	Fish	7	0	1	13	7	31

Unnamed creek (County Ditch 4) (07010204-553): The reach of an unnamed creek (County Ditch 4) from an unnamed creek to Lake Koronis is recommended to be designated Class 2Bm. Fish data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Lake Koronis-North Fork Crow River watershed (HUC 12: 070102040108) which cannot be feasibly restored. Some of the WID channel is natural, but these reaches are short and overall this system is ditched upstream of 07010204-553. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The water quality parameters with a sufficient datasets for assessment were TSS, Secchi tube, and pH and all were below WQS thresholds. Although not exceeding standards, TSS and Secchi tube are elevated and sedimentation is a potential stressor.

Monitoring station 07UM041 (07010204-553)

Ammonia and dissolved oxygen data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Unnamed creek (County Ditch 4) (07010204-553) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM041	2007	Fish	7	21	3.0	10.0	2.8	44
07UM041	2017	Fish	7	0	4.0	11.5	2.5	30
07UM041	2007	Macroinvertebrates	7	37	4.5	17.0	3.3	44
07UM041	2017	Macroinvertebrates	7	57	5.5	12.0	2.0	39

Monitoring station 07UM019 (07010204-557)

Silver Creek (07010204-557): The reach of Silver Creek from an unnamed creek to Collinwood Lake is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. The length of this ditch section is 4.25 mi and is part of a ditch network in adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but at least one measurement for each parameter exceeded WQS thresholds. Although not assessable, eutrophication and dissolved oxygen are potential biological stressors. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Silver Creek (07010204-557) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM019	2007	Fish	6	26	8.0	13.5	1.6	54
07UM019	2017	Fish	6	27	9.5	12.0	1.2	42
07UM019	2017	Macroinvertebrates	5	13	4.0	8.5	1.9	37

County Ditch 10 (07010204-563): The reach of County Ditch 10 from an unnamed ditch to an unnamed ditch is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Twelvemile Creek watershed (HUC 12: 070102040605) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed in assessment year 2019 because these data were expired (i.e., more than 10 years old at the time of assessment). Total phosphorus and chlorophyll-a data were not sufficient for assessment. Total phosphorus exceeded WQS thresholds, but available chlorophyll-a data were below thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in
Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 07UM099 (07010204-563)

County Ditch 10 (07010204-563) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM099	2007	Fish	6	30	6.0	14.0	2.1	54
07UM099	2007	Macroinvertebrates	6	27	7.5	6.0	0.8	54

County Ditch 32 (07010204-578): The reach of County Ditch 32 from an unnamed ditch to the North Fork of the Crow River is recommended to be designated Class 2Bm. Fish data collected from one station in 2007 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Headwaters of the North Fork Crow River watershed (HUC 12: 070102040102) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the

Monitoring station 07UM033 (07010204-578)

fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was not assessed in assessment year 2019 because these data were expired (i.e., more than 10 years old at the time of assessment). All water quality data assessments were inconclusive due to limited data. Total phosphorus, dissolved oxygen, TSS, and Secchi tube had at least one measurement exceeding WQS thresholds whereas all pH measurements met WQS thresholds. Although not assessable, eutrophication and TSS are potential biological stressors or threats. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

County Ditch 32 (07010204-578) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM033	2007	Fish	6	33	6.0	15.0	2.3	49

County Ditch 7 (07010204-580): The reach of County Ditch 7 from an unnamed ditch to the North Fork of the Crow River is recommended to be designated Class 2Bm. Fish data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No 7-North Fork Crow River watershed (HUC 12: 070102040104) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. Although this ditch had been recently cleaned before the 2017 sampling, the 2007 biological visit also demonstrated limiting habitat. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed in assessment year 2019 because the ditch had been recently cleaned at the time of biological sampling. Total phosphorus, dissolved oxygen, TSS, Secchi tube, and pH each had at least one measurement exceeding WQS thresholds whereas all ammonia measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 07UM038 (07010204-580)

County Ditch 7 (07010204-580) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM038	2007	Fish	6	0	7.0	14.0	1.9	46
07UM038	2017	Fish	6	19	5.0	20.0	3.5	32

Judicial Ditch 1 (07010204-584): The reach of Judicial Ditch 1 from an unnamed ditch to the North Fork of the Crow River is recommended to be designated Class 2Bm. Biological data collected from two stations in 2007, 2015, and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Headwaters of the North Fork Crow River watershed (HUC 12: 070102040102) which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus, dissolved oxygen, TSS and Secchi tube data were also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Judicial Ditch 1 (07010204-584) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM034	2007	Fish	6	11	13.0	10.5	0.8	61
07UM034	2017	Fish	6	44	5.0	17.0	3.0	41
15EM063	2015	Macroinvertebrates	7	24	5.0	14.5	2.6	34
07UM034	2017	Macroinvertebrates	7	27	2.0	17.5	6.2	34

Monitoring stations 07UM034 (left) and 15EM063 (right) (07010204-584)

Jewitts Creek (County Ditch 19, 18, and 17) (07010204-585): The reach of Jewitts Creek from its headwaters (Lake Ripley [47-0134-00]) to the North Fork of the Crow River is recommended to be designated Class 2Bm. Biological data collected from five stations in 2000, 2001, 2007, 2008, and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Jewitts Creek watershed (HUC 12: 070102040305) which cannot be feasibly restored. In addition, no evidence indicates that the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. One macroinvertebrate sample was above the Class 2Bg threshold, but overall, macroinvertebrate data indicate that this assemblage does not meet Class 2Bg goals. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Chloride, dissolved oxygen, and eutrophication parameters were also not sufficient for assessment or data were inconclusive, but at least one measurement exceeded WQS thresholds. This reach is listed for chloride and dissolved oxygen impairments. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring stations 07UM031 (upper left), 01UM002 (upper right) 01UM001, (middle left), 00UM097 (middle right), and 07UM028 (lower) (07010204-585)

Jewitts Creek (County Ditch 19, 18, and 17) (07010204-585) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM031	2007	Fish	7	0	3.0	7.5	2.1	47
07UM031	2008	Fish	7	0	3.0	7.0	2.0	43
01UM002	2001	Fish	6	1	7.0	14.5	1.9	55
01UM002	2008	Fish	6	0	8.0	16.0	1.9	37
01UM001	2001	Fish	6	0	3.5	19.5	4.6	41
01UM001	2008	Fish	6	0	7.0	11.0	1.5	51
00UM097	2000	Fish	7	21	6.0	5.0	0.9	50
00UM097	2008	Fish	7	33	12.5	3.0	0.3	63
07UM028	2007	Fish	7	32	6.0	6.0	1.0	49
07UM028	2007	Fish	7	32	4.5	5.0	1.1	63
07UM028	2008	Fish	7	9	6.5	5.5	0.9	61
07UM028	2017	Fish	7	24	5.5	4.5	0.8	46
07UM031	2008	Macroinvertebrates	7	23	4.5	13.5	2.6	43
01UM002	2001	Macroinvertebrates	7	13	2.5	13.5	4.1	55
01UM002	2008	Macroinvertebrates	7	19	7.5	13.5	1.7	37
01UM001	2001	Macroinvertebrates	7	16	2.0	14.0	5.0	41
01UM001	2008	Macroinvertebrates	7	51	7.5	9.0	1.2	51
00UM097	2000	Macroinvertebrates	7	16	6.0	12.5	1.9	50
00UM097	2008	Macroinvertebrates	7	9	15.0	6.5	0.5	63
07UM028	2007	Macroinvertebrates	7	31	8.0	9.0	1.1	49
07UM028	2008	Macroinvertebrates	7	15	11.5	10.0	0.9	61
07UM028	2017	Macroinvertebrates	7	24	5.5	20.0	3.2	40

Unnamed creek (07010204-600): The reach of an unnamed creek from an unnamed ditch to the Middle Fork of the Crow River is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 and 2018 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Jewitts Creek watershed (HUC 12: 070102040305) which cannot be feasibly restored. In addition, no evidence indicates that the fish and macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019.The macroinvertebrates were not assessed in 2019 due to the impact of hydrological modifications during sampling which resulted from management of waterfowl habitat upstream. Dissolved oxygen, TSS, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and Secchi tube data were also not sufficient for assessment, but at least one measurement exceeded WQS thresholds.

Monitoring station 07UM006 (07010204-600)

Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Unnamed creek (07010204-600) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
07UM006	2007	Fish	6	26	9.5	12.0	1.2	57
07UM006	2018	Fish	6	33	8.0	10.0	1.2	52
07UM006	2007	Macroinvertebrates	7	27	10.0	6.0	0.6	57

County Ditch 19 (07010204-614): The reach of County Ditch 19 from Chicken Lake to Jewitts Creek is recommended to be designated Class 2Bm. Fish data collected from one station in 2008 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Jewitts Creek watershed (HUC 12: 070102040305) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed in assessment year 2019 because these data were expired (i.e., more than 10 years old at the time of assessment). No water quality data were available for assessment. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 08UM067 (07010204-614)

County Ditch 19 (07010204-614) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
08UM067	2008	Fish	6	8	8.0	12.0	1.4	63
08UM067	2008	Macroinvertebrates	7	16	11.5	9.0	0.8	63

County Ditch 26 (07010204-643): The reach of County Ditch 26 from an unnamed lake to Long Lake is recommended to be designated Class 2Bm. Fish and macroinvertebrate data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Long Lake watershed (HUC 12: 070102040301) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Water quality data were not sufficient for assessment. All measurements of ammonia, TSS, and pH met WQS thresholds and total phosphorus, dissolved oxygen, and Secchi tube had at least one measurement which exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 07UM017 (07010204-643)

County Ditch 26 (07010204-643) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM017	2017	Fish	6	0	5.0	18.0	3.2	25
07UM017	2017	Macroinvertebrates	7	7	3.0	21.5	5.6	34

County Ditch 26 (07010204-652): The reach of County Ditch 26 from an unnamed ditch to an unnamed ditch is recommended to be designated Class 2Bm. Fish data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Lake Calhoun-Middle Fork Crow River watershed (HUC 12: 070102040207) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Assessable macroinvertebrate data was not collected in 2007 or 2017 due to low water levels. Water quality data were not sufficient for assessment. All measurements of ammonia, TSS, Secchi tube, and pH met WQS thresholds and total phosphorus and dissolved oxygen had at least one measurement exceed WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 07UM005 (07010204-652)

County Ditch 26 (07010204-652) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM005	2007	Fish	7	31	3.0	9.0	2.5	38
07UM005	2017	Fish	7	0	8.0	8.5	1.1	39
07UM005	2007	Macroinvertebrates	7	-	6.5	9.0	1.3	55
07UM005	2017	Macroinvertebrates	7	-	7.5	18.0	2.2	39

Monitoring station 09UM057 (07010204-700)

County Ditch 36 (07010204-700): The reach of County Ditch 36 from County Ditch 38 to Sedan Brook is recommended to be designated Class 2Bm. Fish data collected from one station in 2009 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Sedan Brook watershed (HUC 12: 070102040101) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Water quality data were not sufficient for assessment. All measurements of ammonia, total phosphorus, TSS, Secchi tube, and pH met WQS thresholds and dissolved oxygen had at one measurement that exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

County Ditch 36 (07010204-700) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
09UM057	2009	Fish	6	25	7.5	17.5	2.2	33

Grove Creek (07010204-748): The reach of Grove Creek from an unnamed creek to the north line of PLS system section T120 R32W S36 is recommended to be designated Class 2Bm. Fish and macroinvertebrate data collected from one station in 2009 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Grove Creek watershed (HUC 12: 070102040302) and adjacent watersheds which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Water quality data were not sufficient for assessment. All measurements of ammonia, Secchi tube, and pH met WQS thresholds and total phosphorus, TSS, and dissolved oxygen had at least one measurement which exceeded WQS thresholds. This WID is currently listed as impaired for dissolved oxygen. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 09UM059 (07010204-748)

Grove Creek (07010204-748) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
09UM059	2009	Fish	7	11	3.0	5.5	1.6	39
09UM059	2009	Macroinvertebrates	7	31	4.5	14.0	2.7	39

Washington Creek (County Ditch 9) (07010204-751): The reach of Washington Creek (County Ditch 9) from geographic coordinates (decimal degrees NAD83) 45.108, -94.342 to 45.146, -94.314 is recommended to be designated Class 2Bm. Fish and macroinvertebrate data collected from one station in 2009 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Washington Creek watershed (HUC 12: 070102040404) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either

Monitoring station 07UM030 (07010204-751)

the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the Class 2Bm aquatic life use goal in assessment year 2019. Water quality data were not sufficient for assessment. All measurements of ammonia, TSS, Secchi tube, and pH met WQS thresholds and total phosphorus and dissolved oxygen had at least one measurement exceeding WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the North Fork Crow River Watershed (07010204).

Washington Creek (County Ditch 9) (07010204-751) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM030	2017	Fish	7	30	9.5	4.0	0.5	54
07UM030	2009	Macroinvertebrates	5	32	4.0	7.5	1.7	57
07UM030	2017	Macroinvertebrates	5	18	3.0	9.0	2.5	43

Washington Creek (County Ditch 9) (07010204-753): The reach of Washington Creek (County Ditch 9) from County Ditch 36 to the east line of PLS system section T120 R29W S27 is recommended to be designated Class 2Bm. Fish data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Washington Creek watershed (HUC 12: 070102040404) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and it is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the Class 2Bm aquatic life use goal in assessment year 2019. Macroinvertebrate data were not assessable because the sample reach was impounded at the time of sampling. Water quality data were not sufficient for assessment. All measurements of chloride and pH met WQS thresholds and total phosphorus, dissolved oxygen, TSS, and Secchi tube had at least one measurement exceeding WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 07UM014 (07010204-753)

Washington Creek (County Ditch 9) (07010204-753) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
07UM014	2017	Fish	5	18	5.5	14.0	2.3	37
07UM014	2017	Macroinvertebrates	6	-	4.0	12.0	2.6	37

County Ditch 36 (07010204-755): The reach of County Ditch 36 from Powers Lake outlet to geographic coordinates (decimal degrees NAD83) 45.167, -94.333 is recommended to be designated Class 2Bm. Fish and macroinvertebrate data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 36 watershed (HUC 12: 070102040403) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as not supporting the Class 2Bm aquatic life use goal in assessment year 2019. Water quality data were not sufficient for assessment. All measurements of ammonia, dissolved oxygen, TSS, Secchi tube, and pH met WQS thresholds and total phosphorus had at least one measurement exceeding WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring station 07UM020 (07010204-755)

County Ditch 36 (07010204-755) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
07UM020	2007	Fish	6	14	10.0	12.0	1.2	57
07UM020	2017	Fish	6	7	9.5	15.0	1.5	39
07UM020	2017	Macroinvertebrates	6	25	7.0	10.0	1.4	48

Unnamed creek (Battle Creek) (07010204-757): The reach of an unnamed creek (Battle Creek) from the south line of PLS system section T120 R31W S32 to geographic coordinates (decimal degrees NAD83) 45.203, -94.542 is recommended to be designated Class 2Bm. Fish data collected from two stations in 2008 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Lake Mary watershed (HUC 12: 070102040304) which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. In addition, biological data from 08UM069 was not assessable due to low water levels at the time of sampling. Water quality data were not sufficient for assessment. All measurements of chloride, TSS, and pH met WQS thresholds and total phosphorus, BOD_5, and dissolved oxygen had at least one measurement exceeding WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)](40 CFR § 131.10(g)(3)) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Unnamed creek (Battle Creek) (07010204-757) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
08UM071	2008	Fish	6	0	8.0	13.5	1.6	59
08UM069	2008	Fish	7	-	1.0	15.0	8.0	33
08UM071	2008	Macroinvertebrates	7	46	13.5	10.0	0.8	59

Monitoring stations 08UM071 (left) and 08UM069 (right) (07010204-757)

French Creek (07010204-759): The reach of French Creek from French Lake to the west line of PLS system section T120 R28W S15 is recommended to be designated Class 2Bm. Fish and macroinvertebrate data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the French Lake-North Fork Crow River watershed (HUC 12: 070102040602) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as not supporting the aquatic life

Monitoring station 07UM048 (07010204-759)

use goals for Class 2Bm in assessment year 2019. Water quality data were not sufficient for assessment. All measurements of total phosphorus, ammonia, TSS, Secchi tube, and pH met WQS thresholds and dissolved oxygen had two measurements exceeding WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

French Creek (07010204-759) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07UM048	2007	Fish	6	23	7.0	12.5	1.7	38
07UM048	2017	Fish	6	0	6.0	15.5	2.4	30
07UM048	2017	Macroinvertebrates	5	8	6.0	7.0	1.1	42

Sucker Creek (07010204-761): The reach of Sucker Creek from its headwaters to 53rd Street SW is recommended to be designated Class 2Bm. Fish and macroinvertebrate data collected from two stations in 2007 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Cokato Lake watershed (HUC 12: 070102040603) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. Water quality data were not sufficient for assessment. All measurements of ammonia, chloride, TSS, Secchi tube, and pH met WQS thresholds and total phosphorus and dissolved oxygen had at least one measurement exceed WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Monitoring stations 07UM058 (left) and 07UM100 (right) (07010204-761)

Sucker Creek (07010204-761) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
07UM058	2007	Fish	6	7	1.5	17.0	7.2	39
07UM100	2007	Fish	6	21	8.0	10.5	1.3	45
07UM058	2007	Macroinvertebrates	6	24	4.5	8.0	1.6	39
07UM100	2007	Macroinvertebrates	6	23	3.5	10.0	2.4	45

Monitoring station 07UM084 (07010204-763)

Crow River, North Fork (07010204-763): The reach of the North Fork of the Crow River from its headwaters (Grove Lake [61-0023-00]) to County Ditch 32 is recommended to be designated Class 2Bm. Fish and macroinvertebrate data collected from two stations in 2007 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Headwaters of the North Fork Crow River watershed (HUC 12: 070102040102) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. Water quality data were not sufficient for assessment. All measurements of total phosphorus, ammonia, chloride, and pH met WQS thresholds and TSS, Secchi tube, and dissolved oxygen had at least one measurement exceed WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the North Fork Crow River Watershed (07010204).

Crow River, North Fork (07010204-763) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
07UM084	2007	Fish	6	43	10.0	13.0	1.3	49
07UM084	2007	Fish	6	28	4.0	12.0	2.6	39
07UM032	2007	Fish	7	37	2.0	12.0	4.3	45
07UM032	2007	Fish	7	35	4.0	11.0	2.4	51
07UM084	2007	Macroinvertebrates	7	26	3.5	14.5	3.4	39
07UM032	2007	Macroinvertebrates	7	29	4.5	15.5	3.0	51

5. Minnesota River Basin

a. Pomme de Terre River Watershed (07020002)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/pomme-de-terre-river

County Ditch 22 (07020002-515): The reach of County Ditch 22 from an unnamed ditch to an unnamed creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2001, 2007, and 2016 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the County Ditch No. 22 watershed (HUC 12: 070200020501) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus was also not sufficient for assessment, but one measurement exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Pomme de Terre River Watershed (07020002).

Monitoring station 01MN001 (07020002-515)

County Ditch 22 (07020002-515) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
01MN001	2001	Fish	7	0	1.5	15	6.4	25
01MN001	2007	Fish	7	0	1.5	13.5	5.8	29
01MN001	2016	Fish	7	0	1.5	14.5	6.2	22

Unnamed creek (07020002-545): The reach of an unnamed creek from an unnamed creek to the Pomme de Terre River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 and 2018 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Lake Oliver watershed (HUC 12: 070200020603) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019.

Monitoring station 17MN005 (07020002-545)

Macroinvertebrates were not assessed because the sample was collected a few days after a large rain event. Secchi tube and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen and TSS were also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. Total phosphorus also exceeded WQS thresholds, but measurements of chlorophyll-*a* indicated that the eutrophication standard was not exceeded. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Pomme de Terre River Watershed (07020002).

Unnamed creek (07020002-545) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN005	2018	Fish	7	18	2	7	2.7	42
17MN005	2017	Macroinvertebrates	7	5	3.5	18	4.2	44

Unnamed creek (07020002-547): The reach of an unnamed creek from an unnamed creek to the Pomme de Terre River is recommended to be designated Class 2Bm. Biological data collected from one station in 2007, 2017, and 2018 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Judicial Ditch No 2-Pomme de Terre River watershed (HUC 12: 070200020602) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. A single total phosphorus measurement exceeded WQS thresholds, but too few samples were collected for assessment and response variables were not sampled. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to

Monitoring station 07MN024 (07020002-547)

assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Pomme de Terre River Watershed (07020002).

Unnamed creek (07020002-547) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07MN024	2007	Fish	3	0	2	8.5	3.2	29
07MN024	2018	Fish	3	18	6	8	1.3	42
07MN024	2017	Macroinvertebrates	7	4	3.5	14.5	3.4	41

Unnamed creek (07020002-566): The reach of an unnamed creek from an unnamed creek to Artichoke Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 and 2018 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Artichoke Creek watershed (HUC 12: 070200020502) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Macroinvertebrates were not assessed because the stream was dry preceding the macroinvertebrate sampling visit. Secchi tube, TSS, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen was also not sufficient for assessment, but at least one measurement exceeded the WQS threshold. Total phosphorus and chlorophyll-*a* exceeded WQS and this reach is listed for eutrophication. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Pomme de Terre River Watershed (07020002).

Monitoring station 17MN002 (07020002-566)

Unnamed creek (07020002-566) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN002	2018	Fish	7	28	1	13.5	7.3	28
17MN002	2017	Macroinvertebrates	7	-	0	19.5	20.5	22

Unnamed creek (07020002-576): The reach of an unnamed creek from an unnamed creek to geographic coordinates (decimal degrees NAD83) 45.545, -95.964 is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 and 2016 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Muddy Creek watershed (HUC 12:

070200020404) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, chloride, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Three total phosphorus measurements exceeded WQS thresholds, but too few samples were collected for assessment and response variables were not sampled. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Pomme de Terre River Watershed (07020002).

Monitoring station 07MN017 (07020002-576)

Unnamed creek (07020002-576) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07MN017	2007	Fish	7	20	4	7	1.6	49
07MN017	2016	Fish	7	0	1	14	7.5	31

b. Redwood River Watershed (07020006)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/redwood-river

Redwood River (07020006-513): The reach of Redwood River from the south line of PLS System section T110 R42W S17 to the east line of PLS System section T111 R42W S32 is recommended to be designated Class 2Bdg. This reach of the Redwood River is currently classified by the DNR as a designated trout stream (Minn. R. 6264.0050). Current DNR management consists of annual stocking of harvestable size trout for a put-and-take fishery. The DNR manages this water as a marginal trout water which has is little expectation for trout carryover between years and natural reproduction. As such, there is no evidence of natural reproduction and only anecdotal information suggesting some carryover of trout. Low numbers of brown trout were present in some non-reportable (inconsistent methods) MPCA fish samples from the early 1990s. Most MPCA fish samples did not include any cold water fish species and only a single cool water fish species (brassy minnow) was present. A single cold water

Monitoring station 90MN029 (07020006-513)

macroinvertebrate individual (*Eukiefferiella*) was collected from 2 samples. Both fish and macroinvertebrate communities are indicative of a warm or cool water community in this stream reach. Water temperatures measured by continuous data loggers (2010 and 2017) in this stream reach are too high to support cold water aquatic life with water temperatures in the growth range for brook trout only 3.6-28.4% of the summer and lethal temperatures measured 11.9-19.5% of the summer. Average July water temperatures were also high and ranged from 23.3 to 24.3°C. Degradation within the watershed has occurred, but no evidence of a historical cold water community has been found. Furthermore, the water temperatures are very high for a cold water habitat indicating that the stream is not a degraded cold water habitat. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Redwood River Watershed (07020006). In addition to this reach, a number of tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliation with this reach. Many of these tributaries are spring fed and as a result, the Class 2Ag designation for the following reaches will be retained in the beneficial use table for the Redwood River Watershed (07020006): 07020006-541, 07020006-542, 07020006-543, 07020006-544, 07020006-545, 07020006-546, 07020006-547, and 07020006-548.

Monitoring station 17MN213 (07020006-517)

Judicial Ditch 14 & 15 (07020006-517): The reach of Judicial Ditch 14 and 15 from its headwaters to Clear Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 14 and 15 watershed (HUC 12: 070200060502) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish and macroinvertebrate assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Redwood River Watershed (07020006).

Judicial Ditch 14 & 15 (07020006-517) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN213	2017	Fish	3	43	8.5	3	0.4	48
17MN213	2017	Macroinvertebrates	7	36	2	15.5	5.5	32

Judicial Ditch 33 (07020006-518): The reach of Judicial Ditch 33 from County Ditch 35 to an unnamed creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2001 and 2006 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 33 watershed (HUC 12: 070200060602) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. No water quality data were available. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 01MN053 (07020006-518)

Judicial Ditch 33 (07020006-518) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
01MN053	2001	Fish	7	0	1.5	13.5	5.8	34
01MN053	2006	Fish	7	15	1	13.5	7.3	19
01MN053	2001	Macroinvertebrates	7	9	1	22.5	11.8	34

Judicial Ditch 33 (07020006-520): The reach of Judicial Ditch 33 from Judicial Ditch 32 to Ramsey Creek is recommended to be designated Class 2Bm. Biological data collected from two stations in 2005 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 33 watershed (HUC 12: 070200060602) and adjacent watersheds which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage

Monitoring station 17MN224 (07020006-520)

maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Redwood River Watershed (07020006).

Judicial Ditch 33 (07020006-520) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN224	2017	Fish	2	0	5	11	2.0	40
17MN224	2017	Fish	2	7	4.5	16.5	3.2	32
92MN046	2005	Fish	2	0	6.5	15.5	2.2	34
17MN224	2017	Macroinvertebrates	7	39	9	12.5	1.4	48
17MN224	2017	Macroinvertebrates	7	48	9	12.5	1.4	48

Ramsey Creek (07020006-521): The reach of Redwood River from the south line of PLS System section T110 R42W S17 to the east line of PLS System section T111 R42W S32 is recommended to be designated Class 2Bdg. This reach is managed as a put-and-take trout water and brown trout are stocked annually. There is no evidence of natural reproduction and only limited indication of some carry over. Low numbers of brown trout were present in some MPCA fish samples, but these were fish stocked by the DNR. A no cold water macroinvertebrate species have been collected from this reach. Both fish and macroinvertebrate communities in this stream reach are indicative of a warm or cool water community. Water temperatures in this stream reach are too high to support cold water aquatic life with water temperatures in the growth range for brook trout only 39.1-47.4% of the summer. Temperature logger data also demonstrated that water temperatures are above the lethal threshold for brook trout 7.6-15.0% of the time and July average water temperatures are over 23°C. Stream degradation is present for this system, but there is no indication that the stream was naturally a cold water habitat. Although this stream is managed as an annual put and take fishery by the DNR, and is an important resource as such in the area, the thermal regime and lack of trout carryover demonstrates this stream should be designated a warm water habitat by the MPCA to better reflect the fish and macroinvertebrate community naturally present in the stream. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Redwood River Watershed (07020006).

Monitoring station 92MN047 (07020006-521)

Ramsey Creek (07020006-524): The reach of Ramsey Creek from Judicial Ditch 33 to the east line of PLS System section T113 R36W S34 is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Ramsey Creek watershed (HUC 12: 070200060603) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. No water quality data were available. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 07MN075 (07020006-524)

Ramsey Creek (07020006-524) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07MN075	2007	Fish	2	14	6.5	11.5	1.7	50
07MN075	2007	Macroinvertebrates	7	19	5.5	10.5	1.8	50

County Ditch 33 (07020006-529): The reach of County Ditch 33 from its headwaters to Redwood River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of extensive ditching in the upper reaches of the County Ditch No. 33-Redwood River watershed (HUC 12: 070200060703) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds.

Monitoring station 91MN040 (07020006-529)

Dissolved oxygen was also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

County Ditch 33 (07020006-529) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
91MN040	2017	Fish	3	47	4	7.5	1.7	42
91MN040	2017	Macroinvertebrates	7	20	0	16.5	17.5	23

Monitoring station 17MN227 (07020006-540)

Judicial Ditch 32 (07020006-540): The reach of Judicial Ditch 32 from an unnamed creek to Judicial Ditch 33 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 32 watershed (HUC 12: 070200060601) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen was also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Judicial Ditch 32 (07020006-540) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN227	2017	Fish	3	46	3.5	9.5	2.3	26
17MN227	2017	Macroinvertebrates	7	18	0	20	21.0	19

Unnamed creek (07020006-553): The reach of an unnamed creek from an unnamed creek to Ramsey Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that this reach does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Ramsey

Monitoring station 17MN222 (07020006-553)

Creek watershed (HUC 12: 070200060603) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen was also not sufficient for assessment, but at least one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Unnamed creek (07020006-553) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN222	2017	Fish	7	15	2.5	10	3.1	31
17MN222	2017	Macroinvertebrates	7	22	2.5	17	5.1	39

Judicial Ditch 30 (07020006-554): The reach of Judicial Ditch 30 from an unnamed ditch to Coon Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Upper Coon Creek watershed (HUC 12: 070200060203) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus,

Monitoring station (07020006-554) photos: 17MN231

dissolved oxygen, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Judicial Ditch 30 (07020006-554) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN231	2017	Fish	3	29	3.5	9.5	2.3	30
17MN231	2017	Macroinvertebrates	7	29	3	17.5	4.6	31

County Ditch 7 (07020006-556): The reach of County Ditch 7 from County Ditch 40 to an unnamed creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Judicial Ditch No. 12 watershed (HUC 12: 070200060102) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. Macroinvertebrates were not sampled from this ditch due to the lack of sampleable habitat indicating that habitat is also limiting the macroinvertebrate community. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, dissolved oxygen, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN209 (07020006-556)

County Ditch 7 (07020006-556) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN209	2017	Fish	3	40	6.5	6	0.9	39

Unnamed creek (07020006-558): The reach of an unnamed creek from an unnamed ditch to Threemile Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the lower reaches of the Runholt-Mellenthin Dam watershed (HUC 12: 070200060402) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Total phosphorus, dissolved oxygen, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN215 (07020006-558)

Unnamed creek (07020006-558) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN215	2017	Fish	3	43	2.5	11.5	3.6	23
17MN215	2017	Macroinvertebrates	7	19	1	20.5	10.8	25

Monitoring station 17MN221 (07020006-559)

Unnamed creek (07020006-559): The reach of an unnamed creek from its headwaters to the Redwood River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the County Ditch No 19-Redwood River watershed (HUC 12: 070200060303) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, dissolved oxygen, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The

MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Unnamed creek (07020006-559) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN221	2017	Fish	3	0	3	10	2.8	33

Judicial Ditch 3 (07020006-560): The reach of Judicial Ditch 3 from its headwaters to the Redwood River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Judicial Ditch No 3-Redwood River watershed (HUC 12: 070200060701) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen measurements were also not sufficient for assessment, but one measurement each exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN223 (07020006-560)

Judicial Ditch 3 (07020006-560) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN223	2017	Fish	7	19	2	10.5	3.8	17
17MN223	2017	Macroinvertebrates	7	17	0	21.5	22.5	18

Unnamed creek (07020006-561): The reach of an unnamed creek from its headwaters to the Redwood River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Judicial Ditch No 3-Redwood River watershed (HUC 12: 070200060701) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, dissolved oxygen, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN218 (07020006-561)

Unnamed creek (07020006-561) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN218	2017	Fish	3	46	4.5	3.5	0.8	41
17MN218	2017	Macroinvertebrates	7	31	1	19	10.0	29

Threemile Creek (07020006-565): The reach of Threemile Creek from the west line of PLS System section T113 R41W S34 to the east line of PLS System section T112 R41W S12 is recommended to be designated Class 2Bm. Biological data collected from one station in 2005 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of extensive ditching in portions of the Lower Threemile Creek watershed (HUC 12: 070200060404) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28,

Monitoring station 92MN036 (07020006-565)

1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, chloride, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen, TSS, and Secchi tube was also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. This reach was listed as impaired for turbidity. Total phosphorus concentrations also exceeded WQS thresholds, but measurements of chlorophyll-*a* indicated that the eutrophication standard was not exceeded. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Threemile Creek (07020006-565) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
92MN036	2005	Fish	2	37	4	12.5	2.7	45
92MN036	2017	Fish	2	42	11	10.5	1.0	47
92MN036	2017	Macroinvertebrates	5	25	4.5	7.5	1.5	47

Clear Creek (07020006-567): The reach of Clear Creek from its headwaters to geographic coordinates (decimal degrees NAD83) 44.466, -95.323 is recommended to be designated Class 2Bm. Biological data collected from three stations in 2005, 2007, and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Upper Judicial Ditch No 31 and Lower Judicial Ditch No 31 watersheds (HUC 12s: 070200060501 and 070200060503) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. This reach was listed as impaired for TSS. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Clear Creek (07020006-567) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN214	2017	Fish	7	26	5	8	1.5	38
07MN071	2007	Fish	2	25	10	12	1.2	46
92MN042	2005	Fish	2	32	5	14	2.5	39
17MN214	2017	Macroinvertebrates	7	27	1	18.5	9.8	32
07MN071	2007	Macroinvertebrates	7	18	7	13.5	1.8	46

Monitoring stations 17MN214 (left) and 07MN071 (right) (07020006-567)

Unnamed creek (07020006-572): The reach of an unnamed creek from geographic coordinates (decimal degrees NAD83) 44.532, -95.888 to 44.535, -95.855 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No 63 watershed (HUC 12: 070200060403) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN226 (07020006-572)

Unnamed creek (07020006-572) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN226	2017	Fish	3	40	8.5	3.5	0.5	48
17MN226	2017	Fish	3	46	5.5	0.5	0.2	52
17MN226	2017	Macroinvertebrates	5	29	5	7.5	1.4	59

Unnamed creek (07020006-574): The reach of an unnamed creek from an unnamed creek to the south line of PLS System section T109 R44W S20 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of extensive ditching in portions of the Judicial Ditch No 12 watershed (HUC 12: 070200060102) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN206 (07020006-574)

Unnamed creek (07020006-574) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN206	2017	Fish	7	23	1	15	8.0	35
17MN206	2017	Macroinvertebrates	7	2	2	19	6.7	28

County Ditch 31 (07020006-576): The reach of County Ditch 31 from an unnamed creek to geographic coordinates (decimal degrees NAD83) 44.262, -96.035 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is part of extensive ditching in the upper reaches of the Judicial Ditch No 31-Redwood River watershed (HUC 12: 070200060103) which cannot be feasibly restored. Habitat

Monitoring station 17MN210 (07020006-576)

assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

County Ditch 31 (07020006-576) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN210	2017	Fish	3	32	2	10.5	3.8	19
17MN210	2017	Macroinvertebrates	7	16	1	19.5	10.3	32

County Ditch 60 (07020006-578): The reach of County Ditch 60 from an unnamed creek to geographic coordinates (decimal degrees NAD83) 44.496, -95.698 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No 60 watershed (HUC 12: 070200060302) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and it is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN217 (07020006-578)

County Ditch 60 (07020006-578) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN217	2017	Fish	3	14	6.5	4	0.7	44
17MN217	2017	Fish	3	59	8.5	3.5	0.5	49
17MN217	2017	Macroinvertebrates	5	15	1	10	5.5	35

Unnamed creek (07020006-580): The reach of an unnamed creek from an unnamed creek to geographic coordinates (decimal degrees NAD83) 44.288, -95.996 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is part of extensive ditching in the upper reaches of the Judicial Ditch No 31-Redwood River watershed (HUC 12: 070200060103) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus was also not sufficient for assessment, but one measurement exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Redwood River Watershed (07020006).

Monitoring station 17MN211 (07020006-580)

Unnamed creek (07020006-580) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN211	2017	Fish	3	42	5.5	3	0.6	42
17MN211	2017	Macroinvertebrates	7	28	7	11.5	1.6	48

c. Minnesota River - Mankato Watershed (07020007)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/minnesota-river-mankato

Unnamed creek (Minnesota River Tributary) (07020007-627): The reach of an unnamed creek (Minnesota River Tributary) from its headwaters to Sevenmile Creek is recommended to be designated Class 2Bdg. This reach was originally designated Class 2Ag as a trout protection water because it is located in PLS System sections T109 R27W S11, 12. This was based on the section affiliation with Sevenmile Creek (07020007-562) which is a designated trout water. However, this unnamed creek (07020007-627) flows to the Minnesota River and does not flow into Sevenmile Creek. As a result, 07020007-627 is jurisdictionally disconnected from the trout water designation on Sevenmile Creek and the DNR does not manage this reach as a trout water or trout protection water. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, this reach was erroneously designated and would not be expected to support a cold water habitat consistent with Class 2A. Considering this information, 40 CFR § 131.10(g)(1) applies to this reach and it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Minnesota River - Mankato Watershed (07020007).

Unnamed Creek (07020007-668): The reach of an unnamed creek from its headwaters to the Minnesota River is recommended to be designated Class 2Ag. Macroinvertebrate sampling by the MPCA collected *Diplectrona*, a rather rare, sensitive and obligate cold water invertebrate species. Four other cold water invertebrate taxa were also collected (*Gammarus, Hesperophylax, Parachaetochladius,* and *Prodiamesa*). In total, the cold water macroinvertebrate taxa individuals comprised 20.3% of the sample. MPCA fish sampling identified a species-poor fish community with no cold or cool water species present. A reconnaissance survey by the DNR observed as similar fish community. The poor fish community could be the result of poor connectivity with the Minnesota River and because this stream is a small headwater stream without habitat to support a more diverse community. Furthermore, temperatures in this stream are very cold which also likely limits the fish species which can colonize this stream. A water temperature data logger was deployed at the biological station in 2015. Water temperatures were in the growth range for brook trout 99.9% of the summer with an average July temperature of 16.1°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Minnesota River - Mankato Watershed (07020007).

Monitoring station 13MN003 (07020007-668)

d. Cottonwood River Watershed (07020008)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/cottonwood-river

Judicial Ditch 30, West Branch (07020008-530): The reach of the West Branch of Judicial Ditch 30 from an unnamed creek to the East Branch of Judicial Ditch 30 is recommended to be designated Class 2Bm. Biological data collected from one station in 2001 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 30 watershed (HUC 12: 070200080801) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. No water quality data were available. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach

Monitoring station 01MN038 (07020008-530)

and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Judicial Ditch 30, West Branch (07020008-530) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
01MN038	2001	Fish	7	0	1	11.5	6.3	36
01MN038	2001	Macroinvertebrates	7	15	0	17	18.0	36

County Ditch 38 (07020008-537): The reach of County Ditch 38 from its headwaters to the north line of PLS System section T107 R37W S32 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 (17MN176) demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of extensive ditching in the Augusta Lake watershed (HUC 12: 070200080504) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. No water quality data were available. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN176 (07020008-537)

County Ditch 38 (07020008-537) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN176	2017	Fish	7	20	1	13.5	7.3	29
17MN176	2017	Macroinvertebrates	7	18	0	22.5	23.5	30

Monitoring station 91MN068 (07020008-543)

County Ditch 54 (07020008-543): The reach of County Ditch 54 from its headwaters to Sleepy Eye Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 54-Sleepy Eye Creek watershed (HUC 12: 070200080702) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but one measurement for each parameter exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

County Ditch 54 (07020008-543) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
91MN068	2017	Fish	3	46	3	10.5	2.9	31
91MN068	2017	Macroinvertebrates	7	24	1	19	10.0	34

County Ditch 24 (07020008-550): The reach of County Ditch 24 from an unnamed creek to Sleepy Eye Creek is recommended to be designated Class 2Bm. Biological data collected from two stations in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 24 watershed (HUC 12: 070200080704) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

County Ditch 24 (07020008-550) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
07MN073	2007	Fish	3	4	4	8.5	1.9	35
17MN114	2017	Fish	3	33	3	11.5	3.1	22
17MN114	2017	Fish	3	25	2.5	9.5	3.0	22
07MN073	2007	Macroinvertebrates	7	10	1	17.5	9.3	35
17MN114	2017	Macroinvertebrates	7	35	1	19	10.0	31

Monitoring stations 07MN073 (left) and 17MN114 (right) (07020008-550)

County Ditch 38 (07020008-557): The reach of County Ditch 38 from its headwaters to County Ditch 85 is recommended to be designated Class 2Bm. Biological data collected from two stations in 2010, 2015, and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 38-Sleepy Eye Creek watershed (HUC 12: 070200080705) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. One fish sample was above the Class 2Bg biocriterion, but it was only one point above and is within the confidence interval for this fish stream type. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Ammonia, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus, TSS, and dissolved oxygen data were also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Cottonwood River Watershed (07020008).

County Ditch 38 (07020008-557) biological and habitat data

		Biology				Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
10EM007	2010	Fish	3	39	6	7.5	1.2	37
10EM007	2015	Fish	3	56	8.5	7.5	0.9	36
10EM007	2015	Fish	3	48	7	6	0.9	33
17MN116	2017	Fish	3	38	4.5	7	1.5	37
10EM007	2010	Macroinvertebrates	7	12	4	17.5	3.7	37
10EM007	2015	Macroinvertebrates	7	21	4	17.5	3.7	29
10EM007	2015	Macroinvertebrates	7	10	4	17.5	3.7	29
17MN116	2017	Macroinvertebrates	7	29	8.5	10	1.2	48

Monitoring stations 10EM007 (left) and 17MN116 (right) (07020008-557)

County Ditch 68 (07020008-561): The reach of County Ditch 68 from its headwaters to Sleepy Eye Creek is recommended to be designated Class 2Bm. Biological data collected from two stations in 2015 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 38-Sleepy Eye Creek watershed (HUC 12: 070200080705) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. One fish sample was above the Class 2Bg biocriterion, but it was only one point above and is within the confidence interval for this fish stream type. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but at least one measurement exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Cottonwood River Watershed (07020008).

County Ditch 68 (07020008-561) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN117	2017	Fish	3	43	4	8.5	1.9	26
15EM071	2015	Fish	3	56	9	2	0.3	59
17MN117	2017	Macroinvertebrates	7	34	1.5	18	7.6	41

Monitoring stations 17MN117 (left) and 15EM071 (right) (07020008-561)

County Ditch 60 (07020008-564): The reach of County Ditch 60 from an unnamed ditch to Judicial Ditch 30 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 30 watershed (HUC 12: 070200080801) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN108 (07020008-564)

County Ditch 60 (07020008-564) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN108	2017	Fish	3	39	11	3.5	0.4	42
17MN108	2017	Macroinvertebrates	7	31	6	10	1.6	44

Monitoring station 17MN106 (07020008-565)

County Ditch 5 (07020008-565): The reach of County Ditch 5 from County Ditch 5 to Judicial Ditch 30 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 30 watershed (HUC 12: 070200080801) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data was also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

County Ditch 5 (07020008-565) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN106	2017	Fish	7	29	2.5	11.5	3.6	27

Unnamed ditch (07020008-569): The reach of an unnamed ditch from an unnamed ditch to County Ditch 44 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Lake Marion watershed (HUC 12: 070200080201) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN171 (07020008-569)

Unnamed ditch (07020008-569) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN171	2017	Fish	7	37	1	14	7.5	22
17MN171	2017	Macroinvertebrates	7	13	0	19	20.0	31

Unnamed creek (07020008-573): The reach of an unnamed creek from an unnamed creek to Lake Marshall is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of extensive ditching in the lower reaches of the Lake Marshall watershed (HUC 12: 070200080202) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the

Monitoring station 17MN170 (07020008-573)

macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was not assessed due to the impact of a nearby lake on the fish community. Dissolved oxygen, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Cottonwood River Watershed (07020008).

Unnamed creek (07020008-573) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN170	2017	Macroinvertebrates	7	11	0	20.5	21.5	24
17MN170	2017	Macroinvertebrates	7	16	0	20.5	21.5	24

Monitoring station 17MN164 (07020008-576)

Unnamed creek (07020008-576): The reach of an unnamed creek from Heck Slough to an unnamed creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of extensive ditching in the Town of Amirdt watershed (HUC 12: 070200080203) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was not assessed due to the impact of a rain event before fish sampling. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but two measurements exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Cottonwood River Watershed (07020008).

Unnamed creek (07020008-576) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN164	2017	Fish	3	25	3	11	3.0	33
17MN164	2017	Macroinvertebrates	7	6	7	18	2.4	33

Unnamed creek (07020008-586): The reach of an unnamed creek from Robbins Slough to Plum Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 20A watershed (HUC 12: 070200080301) which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but two measurements exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN148 (07020008-586)

Unnamed creek (07020008-586) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN148	2017	Fish	3	71	11	3	0.3	50
17MN148	2017	Fish	3	61	10	3	0.4	57
17MN148	2017	Macroinvertebrates	5	21	2	8.5	3.2	47

County Ditch 19 (07020008-589): The reach of County Ditch 19 from its headwaters to Dutch Charley Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Upper Dutch Charley Creek watershed (HUC 12: 070200080501) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The

Monitoring station 17MN139 (07020008-589)

poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

County Ditch 19 (07020008-589) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN139	2017	Fish	3	53	4.5	6	1.3	39
17MN139	2017	Macroinvertebrates	7	27	3	14	3.8	45

Unnamed ditch (07020008-594): The reach of an unnamed ditch from an unnamed ditch to Sleepy Eye Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 54-Sleepy Eye Creek watershed (HUC 12: 070200080702) which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN122 (07020008-594)

Unnamed ditch (07020008-594) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN122	2017	Fish	3	51	7.5	2.5	0.4	40
17MN122	2017	Macroinvertebrates	7	43	12.5	6.5	0.6	49

Unnamed creek (07020008-595): The reach of an unnamed creek from an unnamed creek to Sleepy Eye Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Headwaters of Sleepy Eye Creek watershed (HUC 12: 070200080701) which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and TSS data were also not sufficient for assessment, but at least one measurement for each parameter exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN124 (07020008-595)

Unnamed creek (07020008-595) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN124	2017	Fish	3	53	6.5	4	0.7	39
17MN124	2017	Macroinvertebrates	7	42	4	11	2.4	41

Judicial Ditch 35 (07020008-596): The reach of County Ditch 35 from an unnamed ditch to Sleepy Eye Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No 35 watershed (HUC 12: 070200080706) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat

Monitoring station 17MN113 (07020008-596)

assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and it is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Judicial Ditch 35 (07020008-596) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN113	2017	Fish	3	53	4.5	9	1.8	31
17MN113	2017	Macroinvertebrates	7	28	5	14.5	2.6	35

Monitoring station 17MN118 (07020008-597)

County Ditch 26 (07020008-597): The reach of County Ditch 26 from its headwaters to Sleepy Eye Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 38-Sleepy Eye Creek watershed (HUC 12: 070200080705) and upstream watersheds which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Secchi tube and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

County Ditch 26 (07020008-597) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN118	2017	Macroinvertebrates	7	13	0	19	20.0	31

Sleepy Eye Creek (07020008-598): The reach of Sleepy Eye Creek from its headwaters to the east line of the PLS System section T109 R33W S6 is recommended to be designated Class 2Bm. Biological data collected from five stations in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Sleepy Eye Creek watershed (HUC 10: 0702000807) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Ammonia, chloride, eutrophication (total phosphorus and chlorophyll-*a*), TSS, Secchi tube, and pH WQS standards were met. Dissolved oxygen data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Cottonwood River Watershed (07020008).

Sleepy Eye Creek (07020008-598) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN123	2017	Fish	2	0	1.5	14	6.0	26
17MN119	2017	Fish	2	30	8.5	12.5	1.4	43
17MN115	2017	Fish	2	33	4	18	3.8	28
07MN072	2007	Fish	2	46	4	14	3.0	41
97MN014	2017	Fish	2	54	5.5	18	2.9	29
17MN123	2017	Macroinvertebrates	7	26	1	17.5	9.3	21
17MN119	2017	Macroinvertebrates	5	25	2	12	4.3	46
17MN115	2017	Macroinvertebrates	5	29	2	10.5	3.8	45
07MN072	2007	Macroinvertebrates	7	22	3	16.5	4.4	41
97MN014	2017	Macroinvertebrates	5	25	3	9	2.5	40

Monitoring stations 17MN123 (top left), 17MN119 (top right), 17MN115 (middle left), 07MN072 (middle right), and 97MN014 (bottom) (07020008-598)

Plum Creek (Judicial Ditch 20A) (07020008-602): The reach of Plum Creek (Judicial Ditch 20A) from Robbins Slough to Plum Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 20A watershed (HUC 12: 070200080301) which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, dissolved oxygen, TSS, and Secchi tube data were not sufficient for assessment, but all measurements met WQS thresholds. Available pH data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. This reach is listed as impaired for turbidity. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 07MN085 (07020008-602)

Plum Creek (Judicial Ditch 20A) (07020008-602) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07MN085	2007	Fish	3	0	5.5	3.5	0.7	58
07MN085	2017	Fish	3	57	7.5	1	0.2	48
07MN085	2017	Fish	3	58	6.5	2	0.4	44
07MN085	2017	Macroinvertebrates	7	26	8	13	1.6	47

Coal Mine Creek (07020008-604): The reach of Coal Mine Creek from its headwaters to the south line of PLS System section T109 R35W S22 is recommended to be designated Class 2Bm. Biological data collected from two stations in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Coal Mine Creek watershed (HUC 12: 070200080604) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Ammonia, chloride, eutrophication (total phosphorus [exceeds] and chlorophyll-*a* [meets]), Secchi tube, and pH WQS standards were met. Available TSS data were not sufficient for assessment, but all measurements met the WQS threshold. Dissolved oxygen data were also not sufficient for assessment, but three measurements exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Coal Mine Creek (07020008-604) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN126	2017	Fish	7	30	1	13.5	7.3	24
17MN109	2017	Fish	2	38	7.5	13	1.6	34
17MN126	2017	Macroinvertebrates	7	10	0	19.5	20.5	30
17MN109	2017	Macroinvertebrates	7	40	6	14	2.1	30

Monitoring stations 17MN126 (left) and 17MN109 (right) (07020008-604)

Unnamed creek (07020008-606): The reach of an unnamed creek from an unnamed creek to geographic coordinates (decimal degrees NAD83) 44.134, -95.095 is recommended to be designated Class 2Bm. Biological data collected from one station in 2001, 2010, and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of extensive ditching in the Mound Creek watershed (HUC 12: 070200080602) which cannot be feasibly restored. During one macroinvertebrate sampling visit, macroinvertebrates were not sampled from this ditch due to the lack of sampleable habitat which indicated that habitat is limiting the macroinvertebrate community. Habitat assessments further demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Ammonia, TSS, Secchi tube, and pH data were

Monitoring station 91MN065 (07020008-606)

not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but at least one measurement for each parameter exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Unnamed creek (07020008-606) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
91MN065	2001	Fish	3	8	8.5	5	0.6	54
91MN065	2010	Fish	3	82	7	3	0.5	47
91MN065	2017	Fish	3	60	3	7.5	2.1	27
91MN065	2010	Macroinvertebrates	7	11	9	13	1.4	47
91MN065	2017	Macroinvertebrates	7	-	1.5	21	8.8	28

Judicial Ditch 30 (07020008-609): The reach of Judicial Ditch 30 from the west line of PLS System section T110 R33W S15 to the east line of PLS System section T110 R33W S36 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 30 watershed (HUC 12: 070200080801) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Secchi tube, pH, and eutrophication (total phosphorus [exceeds] and chlorophyll-*a* [meets]) WQS standards were met. Dissolved oxygen data were not sufficient for assessment, but at least one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN107 (07020008-609)

Judicial Ditch 30 (07020008-609) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN107	2017	Fish	2	0	4.5	15.5	3.0	33
17MN107	2017	Macroinvertebrates	7	34	2	11.5	4.2	29

Highwater Creek (07020008-610): The reach of Highwater Creek from its headwaters to geographic coordinates (decimal degrees NAD83) 43.990, -95.395 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of extensive ditching in the upper reaches of the Upper Highwater Creek watershed (HUC 12: 070200080503) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. No water quality data were available. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 01MN007 (07020008-610)

Highwater Creek (07020008-610) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
01MN007	2001	Fish	3	33	2	14.5	5.2	35
01MN007	2001	Macroinvertebrates	7	5	0	19.5	20.5	35

Unnamed creek (07020008-613): The reach of an unnamed creek from the west line of PLS System section T110 R40W S6 to Meadow Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of extensive ditching in the lower reaches of the Lake Marshall watershed (HUC 12: 070200080202) which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to

Monitoring station 17MN168 (07020008-613)

recover naturally due to drainage maintenance. The macroinvertebrate assemblage was not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. Dissolved oxygen, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Unnamed creek (07020008-613) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN168	2017	Macroinvertebrates	7	10	2	15.5	5.5	27

Unnamed creek (07020008-615): The reach of Highwater Creek from the south line of PLS System section T1110 R40W S9 to an unnamed creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of extensive ditching in the lower reaches of the Town of Amirdt watershed (HUC 12: 070200080203) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN165 (07020008-615)

Unnamed creek (07020008-615) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN165	2017	Fish	3	56	11	1.5	0.2	53
17MN165	2017	Fish	3	63	11.5	1.5	0.2	57
17MN165	2017	Macroinvertebrates	5	17	1	12.5	6.8	40

Unnamed creek (07020008-623): The reach of an unnamed creek from the west line of PLS System section T109 R39W S14 to Plum Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is consists of a >3 mile section of ditch and other hydrologically connected ditch sections which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Cottonwood River Watershed (07020008).

Monitoring station 17MN146 (07020008-623)

Unnamed creek (07020008-623) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN146	2017	Fish	3	59	10.5	1.5	0.2	48
17MN146	2017	Macroinvertebrates	5	29	3	6.5	1.9	48

e. Blue Earth River Watershed (07020009)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/blue-earth-river

Judicial Ditch 8 (07020009-545): The reach of Judicial Ditch 8 from its headwaters to Judicial Ditch 3 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 3 watershed (HUC 12: 070200090906) which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was not assessed due to low flows at the time of sampling. Secchi tube and pH data were not sufficient for assessment, but all

Monitoring station 17MN335 (07020009-545)

measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Judicial Ditch 8 (07020009-545) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN335	2017	Macroinvertebrates	7	11	0.5	17.5	12.3	38

Unnamed ditch (07020009-551): The reach of an unnamed ditch from its headwaters to the Blue Earth River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Middle Branch Blue Earth River watershed (HUC 12: 070200090303) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but at least one measurement for each parameter exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN351 (07020009-551)

Unnamed ditch (07020009-551) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN351	2017	Fish	3	44	3	11	3.0	18
17MN351	2017	Macroinvertebrates	7	26	0	20.5	21.5	14

Foster Creek (07020009-556): The reach of Foster Creek from the east line of PLS System section T103 R24W S35 to the west line of the PLS System section T102 R24W S6 is recommended to be designated Class 2Bm. Biological data collected from two stations in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Foster Creek watershed (HUC 12: 070200090502) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and it is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Foster Creek (07020009-556) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN367	2017	Fish	2	34	5.5	11.5	1.9	44
92MN076	2007	Fish	2	37	10	12.5	1.2	45
92MN076	2017	Fish	2	41	2	16.5	5.8	33
17MN367	2017	Macroinvertebrates	7	32	4	13.5	2.9	34
17MN367	2017	Macroinvertebrates	7	36	4	13.5	2.9	34
92MN076	2017	Macroinvertebrates	7	18	3	13.5	3.6	38

Monitoring stations 17MN367 (left) and 92MN076 (right) (07020009-556)

Elm Creek, North Fork (07020009-567): The reach of the North Fork of Elm Creek from its headwaters to Elm Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Headwaters of the Elm Creek watershed (HUC 12: 070200090901) which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN321 (07020009-567)

Elm Creek, North Fork (07020009-567) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
17MN321	2017	Fish	3	29	8	3.5	0.5	39

Judicial Ditch 14 (Badger Creek) (07020009-568): The reach of Judicial Ditch 14 (Badger Creek) from the west line of PLS System section T101 R28W S18 to Little Badge Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Badger Creek watershed (HUC 12: 070200090802) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition

Monitoring station 17MN345 (07020009-568)

cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen were also not sufficient for assessment, but one measurement for each parameter exceeded WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Judicial Ditch 14 (Badger Creek) (07020009-568) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN345	2017	Fish	3	38	4	9	2.0	28
17MN345	2017	Macroinvertebrates	7	14	4	16.5	3.5	37

Judicial Ditch 13 Branch A (07020009-571): The reach of Judicial Ditch 13 Branch A from the Minnesota/Iowa border to Judicial Ditch 13 is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No 13. (Branch A) watershed (HUC 12: 070200090402) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The Secchi tube WQS standard was met. Total phosphorus, ammonia, dissolved oxygen, TSS, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN356 (07020009-571)

Judicial Ditch 13 Branch A (07020009-571) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07MN061	2007	Fish	7	20	5	7	1.3	52
17MN356	2017	Fish	3	42	4	6	1.4	34
17MN356	2017	Macroinvertebrates	7	22	2	20.5	7.2	30

Unnamed ditch (07020009-599): The reach of an unnamed ditch from an unnamed creek to the East Branch of the Blue Earth River is recommended to be designated Class 2Bm. Biological data collected from one station in 2010 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Upper East Branch of the Blue Earth River watershed (HUC 12: 070200090503) and upstream watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 10EM119 (07020009-599)

Unnamed ditch (07020009-599) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
10EM119	2010	Fish	3	49	7	3	0.5	49
10EM119	2010	Macroinvertebrates	7	34	3	11	3.0	49

County Ditch 25 (07020009-603): The reach of County Ditch 25 from its headwaters to County Ditch 5 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 5 watershed (HUC 12: 070200090506) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28,

Monitoring station 17MN360 (07020009-603)

1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

County Ditch 25 (07020009-603) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN360	2017	Fish	3	32	3	11	3.0	18
17MN360	2017	Macroinvertebrates	7	22	1	21.5	11.3	29

County Ditch 5 (07020009-605): The reach of County Ditch 5 from Judicial Ditch 6 to the East Branch of the Blue Earth River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 5 watershed (HUC 12: 070200090506) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN358 (07020009-605)

County Ditch 5 (07020009-605) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN358	2017	Fish	7	32	3	10	2.8	41
17MN358	2017	Macroinvertebrates	7	28	0	18.5	19.5	26

Judicial Ditch 98 (07020009-610): The reach of Judicial Ditch 98 from its headwaters to Sager Lake is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the East Chain Lake watershed (HUC 12: 070200090603) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen were also not sufficient for assessment, but one measurement for each parameter exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN332 (07020009-610)

Judicial Ditch 98 (07020009-610) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN332	2017	Fish	3	50	5	6	1.2	46
17MN332	2017	Macroinvertebrates	7	16	5.5	9	1.5	52

Judicial Ditch 7 (07020009-611): The reach of Judicial Ditch 7 from the Minnesota/Iowa border to the West Branch of the Blue Earth River is recommended to be designated Class 2Bm. Biological data collected from two stations in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No 7 watershed (HUC 12: 070200090202) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and TSS data were also not sufficient for assessment, but at least one measurement for each parameter exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the use designation table for the Blue Earth River Watershed (07020009).

Judicial Ditch 7 (07020009-611) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN344	2017	Fish	2	39	14	8	0.6	59
17MN372	2017	Fish	2	33	10	6.5	0.7	52
17MN344	2017	Macroinvertebrates	5	20	4	9.5	2.1	56
17MN372	2017	Macroinvertebrates	7	26	11.5	9	0.8	47

Monitoring stations 17MN344 (left) and 17MN372 (right) (07020009-611)

Monitoring station 17MN353 (07020009-612)

County Ditch 31 (07020009-612): The reach of County Ditch 31 from the Minnesota/Iowa border to Coon Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 31-Coon Creek watershed (HUC 12: 070200090404) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)]() applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in

Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

County Ditch 31 (07020009-612) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN353	2017	Fish	2	25	4	16	3.4	28
17MN353	2017	Macroinvertebrates	7	3	5	20.5	3.6	36

Judicial Ditch 14 (07020009-614): The reach of Judicial Ditch 14 from its headwaters to Judicial Ditch 14 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Badger Creek watershed (HUC 12: 070200090802) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN346 (07020009-614)

Judicial Ditch 14 (07020009-614) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN346	2017	Fish	3	36	9.5	3	0.4	44
17MN346	2017	Macroinvertebrates	7	39	1	15.5	8.3	35

Judicial Ditch 14 (07020009-615): The reach of Judicial Ditch 14 from County Ditch 14 to the East Branch of the Blue Earth River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Lower East Branch Blue Earth River watershed (HUC 12: 070200090507) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Secchi tube, TSS, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but one measurement for each parameter exceeded WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN352 (07020009-615)

Judicial Ditch 14 (07020009-615) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN352	2017	Fish	3	54	5.5	5.5	1.0	22
17MN352	2017	Macroinvertebrates	7	26	4	18	3.8	36
17MN352	2017	Macroinvertebrates	7	22	4	18	3.8	36

County Ditch 17 (07020009-616): The reach of County Ditch 17 from its headwaters to the Blue Earth River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the City of Blue Earth-Blue Earth River watershed (HUC 12: 070200090803) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate

Monitoring station 17MN350 (07020009-616)

assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)]() applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the use designation table for the Blue Earth River Watershed (07020009).

County Ditch 17 (07020009-616) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN350	2017	Fish	3	38	6.5	4.5	0.7	34
17MN350	2017	Macroinvertebrates	7	33	1.5	17	7.2	27

Judicial Ditch 116 (07020009-619): The reach of Judicial Ditch 116 from its headwaters to Willow Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No 116 watershed (HUC 12: 070200091001) and adjacent watersheds which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)]() applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN342 (07020009-619)

Judicial Ditch 116 (07020009-619) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN342	2017	Fish	3	57	7.5	3.5	0.5	46
17MN342	2017	Macroinvertebrates	7	33	1.5	13	5.6	23

County Ditch 89/Judicial Ditch 24 (07020009-620): The reach of County Ditch 89/Judicial Ditch 24 from its headwaters to Willow Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 116 watershed (HUC 12: 070200091001) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN343 (07020009-620)

County Ditch 89/Judicial Ditch 24 (07020009-620) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN343	2017	Fish	3	16	3	10	2.8	24
17MN343	2017	Macroinvertebrates	7	27	0.5	15.5	11.0	30

Unnamed creek (07020009-621): The reach of an unnamed creek from its headwaters to Foster Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Foster Creek watershed (HUC 12: 070200090502) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the

Monitoring station 17MN366 (07020009-621)

aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Unnamed creek (07020009-621) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN366	2017	Fish	3	50	6	4	0.7	34
17MN366	2017	Macroinvertebrates	7	23	1	17.5	9.3	24

Thisius Branch (07020009-622): The reach of Thisius Branch from County Ditch 1 to Foster Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the County Ditch No. 1 watershed (HUC 12: 070200090501) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN365 (07020009-622)

Thisius Branch (07020009-622) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN365	2017	Fish	3	36	3.5	5	1.3	33
17MN365	2017	Macroinvertebrates	7	17	1	20.5	10.8	23

Judicial Ditch 14 (07020009-623): The reach of Judicial Ditch 14 from an unnamed creek to Foster Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Foster Creek watershed (HUC 12: 070200090502) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN368 (07020009-623)

Judicial Ditch 14 (07020009-623) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN368	2017	Fish	3	37	5	5	1.0	43
17MN368	2017	Fish	3	48	6.5	10.5	1.5	34
17MN368	2017	Macroinvertebrates	7	13	5	12	2.2	39

Unnamed creek (07020009-624): The reach of an unnamed creek from the Minnesota/Iowa border to Brush Creek is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Brush Creek watershed (HUC 12: 070200090504) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or

Monitoring station 17MN363 (07020009-624)

macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Unnamed creek (07020009-624) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN363	2017	Fish	3	37	5.5	5	0.9	39
17MN363	2017	Macroinvertebrates	7	20	2	16	5.7	33

County Ditch 26 (07020009-628): The reach of County Ditch 26 from its headwaters to County State-Aid Highway 13 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Lower East Branch of the Blue Earth River watershed (HUC 12: 070200090507) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN357 (07020009-628)

County Ditch 26 (07020009-628) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN357	2017	Fish	3	36	2	10.5	3.8	35
17MN357	2017	Macroinvertebrates	7	4	4.5	14.5	2.8	35

Dutch Creek (07020009-634): The reach of Dutch Creek from its headwaters to County State-Aid Highway 13 is recommended to be designated Class 2Bm. Biological data collected from one station in 2007 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Dutch Creek watershed (HUC 12: 070200090701) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. No water quality data were available. This reach is listed as impaired for turbidity. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 07MN078 (07020009-634)

Dutch Creek (07020009-634) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
07MN078	2007	Fish	3	26	8.5	0.5	0.2	52
07MN078	2007	Macroinvertebrates	7	29	7	9.5	1.3	52

Dutch Creek (07020009-636): The reach of Dutch Creek from the south line of PLS System section T102 R31W S13 to the south line of PLS System section T102 R31W S18 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Dutch Creek watershed (HUC 12: 070200090701) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor

Monitoring station 17MN328 (07020009-636)

habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. This reach is listed as impaired for turbidity. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Dutch Creek (07020009-636) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN328	2017	Fish	3	27	12.5	2.5	0.3	40
17MN328	2017	Macroinvertebrates	7	41	7.5	10.5	1.4	32

South Creek (07020009-639): The reach of South Creek from the geographic coordinates (decimal degrees NAD83) 43.642, -94.337 to 43.661, -94.300 is recommended to be designated Class 2Bm. Biological data collected from two stations in 2015 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Lower South Creek watershed (HUC 12: 070200090604) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

South Creek (07020009-639) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN338	2017	Fish	2	36	13	8.5	0.7	49
15EM040	2015	Fish	2	33	7.5	11	1.4	38
17MN338	2017	Macroinvertebrates	7	10	4	10	2.2	25
15EM040	2015	Macroinvertebrates	5	25	4	8.5	1.9	32

Monitoring stations 17MN338 (left) and 15EM040 (right) (07020009-639)

Blue Earth River, West Branch (07020009-643): The reach of the West Branch of the Blue Earth River from the Minnesota/Iowa border to 15th Street is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the West Branch of the Blue Earth River watershed (HUC 12: 070200090203) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm. Ammonia, chloride, Secchi tube, and pH WQS standards were met. Available TSS data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but at least one measurement for each parameter exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN312 (07020009-643)

Blue Earth River, West Branch (07020009-643) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN312	2017	Fish	2	26	5.5	16.5	2.7	28
17MN312	2017	Macroinvertebrates	7	25	10	9	0.9	33

Blue Earth River, Middle Branch (07020009-645): The reach of the Middle Branch of the Blue Earth River from the Minnesota/Iowa border to the geographic coordinates (decimal degrees NAD83) 43.514, -94.104, is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Middle Branch of the Blue Earth River watershed (HUC 12: 070200090303) which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, chloride, Secchi tube, and pH WQS standards were met. Available TSS data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and dissolved oxygen data were also not sufficient for assessment, but at least one measurement for each parameter exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN311 (07020009-645)

Blue Earth River, Middle Branch (07020009-645) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN311	2017	Fish	2	34	5.5	18	2.9	31
17MN311	2017	Macroinvertebrates	7	41	7.5	15	1.9	31

Coon Creek (07020009-647): The reach of the Coon Creek from its headwaters to the north line of PLS System section T101 R27W S4 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Judicial Ditch No. 13 (HUC 12: 070200090403) and County Ditch No. 31-Coon Creek (HUC 12: 070200090404) watersheds which cannot be feasibly restored. In addition, no evidence

Monitoring station 17MN355 (07020009-647)

indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, dissolved oxygen, ammonia, chloride, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Coon Creek (07020009-647) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN355	2017	Fish	2	37	9.5	12	1.2	45
17MN355	2017	Macroinvertebrates	7	32	5	16.5	2.9	32

Blue Earth River, East Branch (07020009-650): The reach of the East Branch of the Blue Earth River from the geographic coordinates (decimal degrees NAD83) 43.624, -93.663 to 43.654, -93.73 is recommended to be designated Class 2Bm. Biological data collected from three stations in 2001 and 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Upper East Branch of the Blue Earth River watershed (HUC 12: 070200090503) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. There was one sample from both the fish and macroinvertebrate assemblages (macroinvertebrate sample was within confidence limits) that scored above the General Use threshold, but overall biological data indicates that the General Use is not attainable. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, dissolved oxygen, ammonia, chloride, TSS, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Secchi tube data were also not sufficient for assessment, but four measurements exceeded the WQS threshold. This stream reach is listed for turbidity. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Blue Earth River, East Branch (07020009-650) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN373	2017	Fish	3	52	8	4.5	0.6	48
01MN054	2001	Fish	3	68	6	1	0.3	41
17MN364	2017	Fish	2	31	9.5	7.5	0.8	56
17MN373	2017	Macroinvertebrates	7	39	2	14.5	5.2	34
17MN373	2017	Macroinvertebrates	7	41	2	14.5	5.2	34
01MN054	2001	Macroinvertebrates	5	35	2	8.5	3.2	41
17MN364	2017	Macroinvertebrates	7	51	3.5	12	2.9	34

Monitoring stations 17MN373 (top), 01MN054 (middle), and 17MN364 (bottom) (07020009-650)

Blue Earth River, East Branch (07020009-652): The reach of the East Branch of the Blue Earth River from the north line of the PLS System section T102 R25W S23 to an unnamed ditch is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Upper East Branch of the Blue Earth River watershed (HUC 12: 070200090503) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, chloride, Secchi tube, and pH WQS standards were met. Total phosphorus data were not

Monitoring station 17MN301 (07020009-652)

sufficient for assessment, but all measurements met WQS thresholds. Available TSS data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. This stream reach is listed for turbidity. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Blue Earth River, East Branch (07020009-652) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN301	2017	Fish	2	46	4	11	2.4	43
17MN301	2017	Fish	2	50	6	14	2.1	33

Brush Creek (07020009-655): The reach of the Coon Creek from an unnamed creek to the East Branch of the Blue Earth River is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Brush Creek watershed (HUC 12: 070200090504) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, chloride, Secchi tube, and pH WQS standards were met. Total phosphorus and TSS data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but four measurements exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN300 (07020009-655)

Brush Creek (07020009-655) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN300	2017	Fish	2	38	14	7.5	0.6	58
17MN300	2017	Macroinvertebrates	7	26	1	20.5	10.8	21

Cedar Creek (Cedar Run Creek) (07020009-657): The reach of the Cedar Creek (Cedar Run Creek) from 60th Avenue to Cedar Lake is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Cedar Creek watershed (HUC 12: 070200090904) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. No water chemistry data were available. This reach is listed as impaired for dissolved oxygen. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN326 (07020009-657

Cedar Creek (Cedar Run Creek) (07020009-657) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN326	2017	Fish	3	47	9.5	3	0.4	50
17MN326	2017	Macroinvertebrates	7	36	9	12	1.3	41

Badger Creek (07020009-658): The reach of Badger Creek from Little Badger Creek to the geographic coordinates (decimal degrees NAD83) 43.640, -94.136 is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Badger Creek watershed (HUC 12: 070200090802) and adjacent watersheds which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, chloride, and pH WQS standards were met. Total phosphorus, TSS, and Secchi tube data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but one measurement exceeded the WQS threshold.

Monitoring station 17MN302 (07020009-658)

Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Badger Creek (07020009-658) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN302	2017	Fish	2	34	11	11	1.0	35
17MN302	2017	Macroinvertebrates	7	48	5	11	2.0	26

Judicial Ditch 38 (07020009-660): The reach of the Judicial Ditch 38 (Cedar Run Creek) from its headwaters to 245th Avenue is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the Upper South Creek watershed (HUC 12: 070200090602) and adjacent watersheds which cannot be feasibly restored. In addition, no evidence indicates that the fish assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The fish assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN334 (07020009-660)

Judicial Ditch 38 (07020009-660) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN334	2017	Fish	3	27	3	10.5	2.9	24

Unnamed creek (07020009-663): The reach of an unnamed creek from the west line of PLS System section T101 R30W S35 to the Minnesota/Iowa border is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the Upper South Creek watershed (HUC 12: 070200090602) and adjacent watersheds which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Ammonia, dissolved oxygen, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Total phosphorus and TSS data were also not sufficient for assessment, but one measurement for each parameter exceeded the WQS threshold. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN333 (07020009-663)

Unnamed creek (07020009-663) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN333	2017	Fish	3	46	3	6.5	1.9	36
17MN333	2017	Macroinvertebrates	7	24	1	19	10.0	22

County Ditch 72 (07020009-667): The reach of County Ditch 72 from an unnamed ditch to 196th Avenue is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Martin Lake-Elm Creek watershed (HUC 12: 070200090905) which cannot be feasibly restored. In addition, no evidence indicates that the macroinvertebrate assemblage attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the macroinvertebrate assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were assessed as supporting the aquatic life use goals for Class 2Bm in assessment year 2019. Total phosphorus, ammonia, dissolved oxygen, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring station 17MN330 (07020009-667)

County Ditch 72 (07020009-667) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN330	2017	Fish	3	55	7.5	0.5	0.2	51
17MN330	2017	Macroinvertebrates	7	23	3.5	14	3.3	44

County Ditch 8 (07020009-669): The reach of County Ditch 8 from its headwaters to the geographic coordinates (decimal degrees NAD83) 43.618, -94.054 to the Minnesota/Iowa border is recommended to be designated Class 2Bm. Biological data collected from one station in 2017 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. This ditch is also part of an extensive ditch network in the upper reaches of the Lower East Branch of the Blue Earth River watershed (HUC 12: 070200090507) which cannot be feasibly restored. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. Habitat assessments demonstrated that poor habitat is limiting the fish and macroinvertebrate assemblages. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The macroinvertebrate assemblage was assessed as not supporting the aquatic life use goals for Class 2Bm in assessment year 2019. The fish assemblage was assessed as supporting the aquatic life use goals for Class 2Bm. Total phosphorus, ammonia, TSS, Secchi tube, and pH data were not sufficient for assessment, but all measurements met WQS thresholds. Dissolved oxygen data were also not sufficient for assessment, but one measurement exceeded the WQS threshold. Considering this information, [40 CFR § 131.10(g)(3)] applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the use designation table for the Blue Earth River Watershed (07020009).

Monitoring stations 17MN354 (07020009-669)

County Ditch 8 (07020009-669) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
17MN354	2017	Fish	3	48	5	5.5	1.1	39
17MN354	2017	Macroinvertebrates	7	19	1	18.5	9.8	31

f. Minnesota River – Lower Watershed (07020012)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/lower-minnesota-river

Bluff Creek (07020012-710): The reach of an unnamed creek from its headwaters to the Minnesota River is recommended to be designated Class 2A. Temperature data collected by the MPCA, Metropolitan Council Environmental Services (MCES), and Riley Purgatory Bluff Creek Watershed District (RPBCWD) demonstrated that water temperatures in Bluff Creek are driven by groundwater inputs and are consistently cold. In nine years (2004-2012) of temperature logger data collected by the MCES, the mean July water temperature was below 18°C. The macroinvertebrate community included six cold water taxa (*Hesperophylax*, *Eukiefferiella*, *Erioptera*, *Gammarus*, *Odontomesa*, and *Glossosoma*) and a high proportion of cold water individuals (13-25% of individuals in the samples). The presence of a fish barrier at the downstream end of Bluff Creek, impedes migration of cold water fish species, and is the primary reason that fish are not considered an indicator of cold water habitat for this reach. However, the fish species present in the reach above the barrier included brook stickleback and fathead minnows. Both of these taxa are tolerant of cold water conditions and are common in streams that have low water temperatures but lack cold water obligate taxa (e.g., trout and sculpin). As such, these taxa are supportive of a cold water designation despite their ability to tolerate poor stream conditions. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Minnesota River – Lower Watershed (07020012).

Monitoring stations 00MN008 (left) and 00MN009 (right) (07020007-710)

Unnamed creek (07020012-866): The reach of an unnamed creek from its headwaters to Long Meadow Lake is recommended to be designated Class 2Ag. Historical information indicates that this stream supported a brook trout population until the early 1940s, but at some point in the 1940s, this population was extirpated. In the 2000s, the DNR collected water temperature data that indicated conditions that could support brook trout. As a result, brook trout fingerlings were stocked in this creek in 2007. This stocking established a naturally reproducing population of brook trout. Based on cold water temperatures and the presence of a brook trout population, this stream supports a cold water habitat. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Minnesota River – Lower Watershed (07020012).

6. Saint Croix River Basin

a. Upper St. Croix River Watershed (07030001)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/upper-st-croix-river

Redhorse Creek, West Fork (07030001-520): The reach of the West Fork of the Redhorse Creek from its headwaters to Redhorse Creek is recommended to be designated Class 2Be. Biological data from both macroinvertebrates and fish collected in 1996 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The channel in this reach is natural and habitat assessment demonstrated that the biological station has good habitat (MSHA = 81). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Redhorse Creek, West Fork (07030001-520) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
96SC073	1996	Fish	6	70	22	3	0.2	81
96SC073	1996	Macroinvertebrates	4	84	6	2	0.4	81

Crooked Creek (07030001-541): The reach of Crooked Creek from the north line of PLS system section T41 R17W S32 to the St Croix River is recommended to be designated Class 2Be. Biological data from both macroinvertebrates and fish collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The channel in this reach is natural and habitat assessment demonstrated that the biological station has good habitat (MSHA = 76-81). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Monitoring station 16SC121 (07030001-541)

Crooked Creek (07030001-541) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16SC121	2016	Fish	5	81	13.5	8	0.6	76
16SC121	2016	Fish	5	82	12.5	8	0.7	80
16SC121	2016	Macroinvertebrates	3	77	8.5	4	0.5	80

Bangs Brook (07030001-545): The reach of Bangs Brook from the east line of PLS system section T41 R17W S15 to Crooked Creek is recommended to be designated Class 2Ae. Biological data from both macroinvertebrates and fish collected in 2010 and 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Ae Use. The channel in this reach is natural and habitat assessment demonstrated that the biological station has good habitat (MSHA = 80-87). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ae. The

Monitoring station 10SC002 (07030001-545)

MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Bangs Brook (07030001-545) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
10SC002	2010	Fish	11	65	25.5	3	0.2	87
10SC002	2010	Fish	11	73	22.5	6	0.3	80
10SC002	2016	Fish	11	35	20	7	0.4	85
10SC002	2010	Macroinvertebrates	8	53	25.5	2	0.1	87
10SC002	2016	Macroinvertebrates	8	58	22.5	2.5	0.1	85

Little Sand Creek (07030001-554): The reach of Little Sand Creek from an unnamed creek to Sand Creek is recommended to be designated Class 2Be. Biological data from both macroinvertebrates and fish collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The channel in this reach is natural and habitat assessments demonstrated that the biological station has fair to good habitat (MSHA = 61-73). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Little Sand Creek (07030001-554) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
16SC201	2016	Fish	6	66	12.5	9	0.7	61
16SC201	2016	Macroinvertebrates	4	88	8.5	4.5	0.6	73

Little Sand Creek (07030001-555): The reach of Little Sand Creek from Zimbrick Creek to an unnamed creek is recommended to be designated Class 2Be. Biological data from both macroinvertebrates and fish collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The macroinvertebrate sample was one point below the Exceptional Use threshold, but this sample was collected during a period of drought in this watershed, indicating that under normal conditions the Exceptional Use can be met. In addition, the downstream WID (07030001-554) also demonstrated that the Exceptional Use aquatic life use goals are met for both fish and macroinvertebrates. The channel in this reach is natural and habitat assessment demonstrated that the biological station has good habitat (MSHA = 68). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Monitoring station 06SC035 (07030001-555)

Little Sand Creek (07030001-555) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
06SC035	2006	Fish	7	82	8.5	3	0.4	68
06SC035	2006	Fish	7	72	11.5	4	0.4	68
06SC035	2006	Macroinvertebrates	4	75	4.5	3.5	0.8	68

Kenney Brook (07030001-562): The reach of Kenney Brook from the north line of PLS section T41 R17W S20 to Crooked Creek is recommended to be designated Class 2Bdg. Data collected by the MPCA indicated that Kenny Brook supports warm water fish and macroinvertebrate assemblages. One cold water (slimy sculpin) and five cool water (northern red belly dace, redside dace pearl dace, burbot, and brook stickleback) fish species were collected, but the fish community is dominated by warm water fish species. The DNR sampled trout in a 1918 survey, but did not sample trout during a 1981 survey. In 1981 survey, the DNR concluded that Kenny Book is incapable of supporting trout. Temperature logger data from 2016 had a July average water temperature of 20.9°C and temperatures were in the growth range for brook trout 45.3% of the summer. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Monitoring station 16SC120 (07030001-562)

Upper Tamarack River (07030001-613): The reach of the Upper Tamarack River from the Minnesota/Wisconsin State border to an unnamed creek is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected from 1996 through 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. Although the macroinvertebrate samples were mixed, most samples were above or near the Exceptional Use threshold indicating the Exceptional Use is attainable. The channel in this reach is natural and habitat assessment demonstrated that the biological station has good habitat (MSHA = 71-85). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA pro will propose to make this change in [Minn. R. 7050.0470]() by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

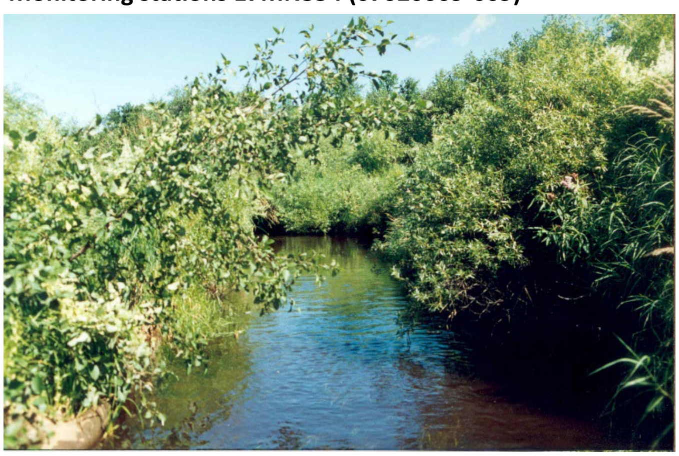
Monitoring station 96SC037 (07030001-613)

Upper Tamarack River (07030001-613) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
96SC037	1996	Fish	5	82	24	0	0.0	80
96SC037	1996	Fish	5	77	22	2	0.1	71
96SC037	1997	Fish	5	85	21	2	0.1	78
96SC037	1998	Fish	5	63	24	0.5	0.1	75
96SC037	1999	Fish	5	76	22	2	0.1	79
96SC037	2000	Fish	5	90	26	0.5	0.1	77
96SC037	2014	Fish	5	97	21.5	2	0.1	84
96SC037	2016	Fish	5	97	24	2	0.1	83
96SC037	1996	Macroinvertebrates	3	82	14.5	0	0.1	71
96SC037	1998	Macroinvertebrates	3	96	14	0	0.1	75
96SC037	1999	Macroinvertebrates	3	77	15.5	0	0.1	79
96SC037	2000	Macroinvertebrates	3	86	16	0	0.1	77
96SC037	2014	Macroinvertebrates	3	56	17	0	0.1	85
96SC037	2016	Macroinvertebrates	3	80	15	1	0.1	81
96SC037	2019	Macroinvertebrates	3	64	-	-	-	-

Crooked Creek, East Fork (07030001-615): The reach of the East Fork of Crooked Creek from its headwaters to County State Aid Highway (CSAH) 32 is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected from 1996 through 2000 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. One macroinvertebrate sample was 1 point below the Exceptional Use threshold, but given that 5 other samples were above this threshold and this sample was close, the Exceptional Use is attainable. The channel in this reach is natural and habitat assessment demonstrated that the biological station has good habitat (MSHA = 81). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Monitoring stations 17MN354 (07020009-669)



Crooked Creek, East Fork (07030001-615) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
96SC079	1996	Fish	6	71	24.5	2	0.1	81
96SC079	1996	Macroinvertebrates	3	87	10.5	4	0.4	81
96SC079	1996	Macroinvertebrates	3	85	-	-	-	-
96SC079	1997	Macroinvertebrates	3	83	-	-	-	-
96SC079	1998	Macroinvertebrates	3	92	-	-	-	-
96SC079	1999	Macroinvertebrates	3	87	-	-	-	-
96SC079	2000	Macroinvertebrates	3	81	-	-	-	-

Sand Creek (07030001-618): The reach of Sand Creek from an unnamed creek to the St Croix River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected from 1996 through 2016 from three stations demonstrated that this reach meets the aquatic life use goals for Class 2Be. One macroinvertebrate sample was below the Exceptional Use threshold, but two other samples were above this threshold and this sample is BCG level 3, indicating the Exceptional Use is attainable. The channel in this reach is natural and habitat assessment demonstrated that three stations have fair to good habitat (MSHA = 63-85). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper St. Croix River Watershed (07030001).

Sand Creek (07030001-618) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16SC101	2016	Fish	5	86	9.5	11	1.1	70
96SC090	1996	Fish	5	89	18	8.5	0.5	76
96SC090	2016	Fish	5	86	18.5	6	0.4	85
96SC090	2016	Fish	5	77	18	6	0.4	85
06SC019	2006	Fish	5	80	18	4.5	0.3	75
16SC101	2016	Macroinvertebrates	4	84	7	4.5	0.7	73
96SC090	1996	Macroinvertebrates	3	96	11	5	0.5	76
96SC090	2016	Macroinvertebrates	3	64	8.5	7	0.8	63

Monitoring stations 16SC101 (top left), 96SC090 (top right), and 06SC019 (bottom) (07030001-618)



b. Kettle River Watershed (07030003)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/kettle-river

Monitoring station (07030003-503): 06SC020

Kettle River (07030003-503): The reach of the Kettle River from the Willow River to the Pine River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected from 2006 through 2017 from two stations demonstrated that this reach meets the aquatic life use goals for Class 2Be. One macroinvertebrate sample was below the Exceptional Use threshold, but four other samples were above this threshold and this sample was BCG level 3, indicating the Exceptional Use is attainable. In addition, the next two upstream WIDs (07030003-505 and 07030003-506) also demonstrated an ability to meet the Exceptional Use. The channel in this reach is natural and habitat assessment demonstrated that two stations have fair to good habitat (MSHA = 61-79). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Kettle River Watershed (07030003).

Kettle River (07030003-503) biological and habitat data

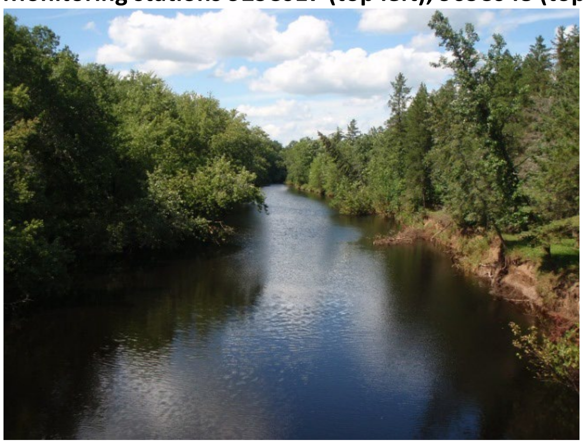
		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
06SC020	2006	Fish	4	77	-	-	-	73
06SC020	2014	Fish	4	83	-	-	-	79
06SC020	2017	Fish	4	85	-	-	-	63
92SC015	2016	Macroinvertebrates	1	84	-	-	-	61
92SC015	2017	Macroinvertebrates	1	98	-	-	-	68
06SC020	2016	Macroinvertebrates	1	81				68
06SC020	2006	Macroinvertebrates	1	82	-	-	-	-
06SC020	2006	Macroinvertebrates	1	82	-	-	-	-
06SC020	2014	Macroinvertebrates	1	64	-	-	-	67

Kettle River (07030003-505): The reach of the Kettle River from the Moose Horn River to the Willow River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected from 1996 through 2017 from three stations demonstrated that this reach meets the aquatic life use goals for Class 2Be. In addition, the upstream (07030003-506) and downstream (07030003-503) WIDs also demonstrated an ability to meet the Exceptional Use. The channel in this reach is natural and habitat assessment demonstrated that three stations have good habitat (MSHA = 77-90). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Kettle River Watershed (07030003).

Kettle River (07030003-505) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
92SC017	2017	Fish	5	82	11.5	9	0.8	65
96SC048	1996	Fish	5	81	16	10	0.6	62
16SC063	2017	Fish	4	84	-	-	-	67
92SC017	2017	Macroinvertebrates	1	77	-	-	-	-
96SC048	1996	Macroinvertebrates	3	90	9.5	7	0.8	62
16SC063	2016	Macroinvertebrates	1	84	-	-	-	59

Monitoring stations 92SC017 (top left), 96SC048 (top right), and 16SC063 (bottom) (07030003-505):



Kettle River (07030003-506): The reach of the Kettle River from Birch Creek to the Moose Horn River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected from 1996 through 2006 from three stations demonstrated that this reach meets the aquatic life use goals for Class 2Be. One macroinvertebrate sample was below the Exceptional Use threshold, but four other samples were above this threshold and this sample was BCG level 3, indicating the Exceptional Use is attainable. In addition, the next two downstream WIDs (07030003-503 and 07030003-505) also demonstrated an ability to meet the Exceptional Use. The channel in this reach is natural and habitat assessments demonstrated that the two stations have good habitat (MSHA = 77-90). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Kettle River Watershed (07030003).

Kettle River (07030003-506) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
06SC008	2006	Fish	5	80	15.5	5.5	0.4	70
06SC008	2006	Fish	5	86	13	6.5	0.5	64
96SC046	1996	Fish	5	84	16	11.5	0.7	63
06SC008	2006	Macroinvertebrates	3	84	12.5	2	0.2	64
06SC008	2006	Macroinvertebrates	3	79	12.5	2	0.2	64
96SC046	1998	Macroinvertebrates	3	88	13.5	3	0.3	63
96SC046	1996	Macroinvertebrates	3	93	13.5	3	0.3	63
96SC046	1996	Macroinvertebrates	3	95	13.5	3	0.3	63

Monitoring stations 06SC008 (left) and 96SC046 (right) (07030003-506)

Little Pine Creek (07030003-560): The reach of the Little Pine Creek from Little Pine Lake to the Pine River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The macroinvertebrate sample was 4 points below the Exceptional Use threshold, but this sample was collected shortly after flooding which impacted the sample. Under normal flow conditions the Exceptional Use is attainable for macroinvertebrates in this reach. The channel in this reach is natural and habitat assessments demonstrated that the biological station has fair to good habitat (MSHA = 65-72). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Kettle River Watershed (07030003).

Monitoring station 16SC010 (07030003-560)

Little Pine Creek (07030003-560) biological and habitat data

		Biology			Habitat			
Station	Year	Assemblage	Type	IBI	Good	Poor	P/G	MSHA
16SC010	2016	Fish	6	72	15.5	5	0.4	72
16SC010	2016	Macroinvertebrates	4	72	4.5	3	0.7	65

Skunk Creek (07030003-618): The reach of Skunk Creek from an unnamed creek to the Kettle River is recommended to be designated Class 2Ag. Summer water temperate data collected by the DNR in Skunk Creek averaged near 16°C with a maximum water temperatures below 19°C. As a result, temperatures are within the growth range for brook trout 100% of the summer and may be suitable to support trout. No cold water fish were sampled by the MPCA or DNR, but the community largely consists of species that are tolerant of low water temperatures even if they are not cold water obligates. The macroinvertebrate community included eight cold water species (*Ephemerella*, *Limnephilus*, *Lype diversa*, *Glossosoma*, *Diamesa*, *Eukiefferiella*, *Odontomesa*, and *Pagastia*) which comprised 2.8-11.8% of individuals in the samples. Although this stream is not a designated trout water, it is considered by the DNR to be a cold water feeder stream and stocking brook trout may be considered in the future. Based on the presence of a cold water macroinvertebrate community and water temperatures adequately low to support trout reproduction, Skunk Creek is capable of supporting a cold water habitat. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Kettle River Watershed (07030003).

Monitoring station 16SC007 (07030003-618)

Willow River (07030003-622): The reach of the Willow River from Big Slough Lake outlet to the Kettle River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The downstream WID (07030003-505), also demonstrated an ability to meet the Exceptional Use. The channel in this reach is natural and habitat assessment demonstrated that the single biological station has fair to good habitat (MSHA = 63-67). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Kettle River Watershed (07030003).

Monitoring station 16SC074 (07030003-622)

Willow River (07030003-622) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16SC074	2016	Fish	5	79	9.5	10.5	1.1	63
16SC074	2016	Macroinvertebrates	4	93	6	4	0.7	67

Pine River (07030003-624): The reach of the Pine River from Bremen Creek to the Kettle River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected from 1996 to 2016 from four stations demonstrated that this reach meets the aquatic life use goals for Class 2Be. One macroinvertebrate sample was below the Exceptional Use threshold, but four other samples were above this threshold and this sample was BCG level 3, indicating the Exceptional Use is attainable. In addition, the downstream WID (07030003-503), also demonstrates an ability to meet the Exceptional Use. The channel in this reach is natural and habitat assessment demonstrated that the biological stations have fair to good habitat (MSHA = 61-87). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Kettle River Watershed (07030003).

Pine River (07030003-624) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16SC062	2016	Fish	5	74	10.5	7	0.7	61
96SC043	1996	Fish	5	70	14.5	7	0.5	79
10EM072	2010	Fish	5	72	15.5	6	0.4	87
10EM072	2015	Fish	5	84	16	6	0.4	80
98SC021	1998	Fish	5	88	-	-	-	-
98SC021	2016	Fish	5	87	17	7	0.4	72
16SC062	2016	Macroinvertebrates	4	83	3	3	1.0	68
96SC043	1996	Macroinvertebrates	3	89	7.5	3	0.5	79
10EM072	2010	Macroinvertebrates	3	77	10.5	6	0.6	87
10EM072	2015	Macroinvertebrates	3	87	10.5	1	0.2	83
98SC021	2016	Macroinvertebrates	3	69	10.5	4	0.4	77

Monitoring stations 16SC062 (top left), 96SC043 (top right), 10EM072 (bottom left), and 98SC021 (bottom right) (07030003-624)

Unnamed creek (07030003-626): The reach of an unnamed creek from its headwaters to the Kettle River is recommended to be designated Class 2Bm. Fish data collected from one station in 2007 demonstrated that it does not meet aquatic life use goals for Class 2Bg. This reach has been altered for drainage and available evidence (e.g., aerial imagery) indicates that it was maintained for drainage before November 28, 1975. In addition, no evidence indicates that either the fish or macroinvertebrate assemblages attained the aquatic life use goals for Class 2Bg on or after November 28, 1975. This ditch is also part of an extensive ditch network in the City of Willow River-Kettle River watershed (HUC 12: 070300030601) which cannot be feasibly restored. Habitat assessments demonstrated that poor habitat is limiting the fish assemblage. The poor habitat condition cannot be reversed at this time and is not likely to recover naturally due to drainage maintenance. The biological assemblages were not assessed because these data were expired (i.e., more than 10 years old) at the time this watershed was assessed. No additional water quality data are available from this reach. Considering this information, 40 CFR § 131.10(g)(3) applies to this reach and it is reasonable to assign Class 2Bm. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the use designation table for the Kettle River Watershed (07030003).

Unnamed creek (07030003-626) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
06SC082	2007	Fish	7	28	1	14	7.5	22
06SC082	2007	Macroinvertebrates	4	-	0	13	14.0	22

Moose Horn River, West Branch (07030003-628): The reach of the West Branch of the Moose Horn River from an unnamed creek to the Moose Horn River is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The channel in this reach is natural and habitat assessments demonstrated that the biological station has good habitat (MSHA = 75-76). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Kettle River Watershed (07030003).

Monitoring station 16SC034 (07030003-628)

Moose Horn River, West Branch (07030003-628) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16SC034	2016	Fish	6	83	18.5	3	0.2	76
16SC034	2016	Macroinvertebrates	3	82	15	4	0.3	75

Moose Horn River (07030003-629): The reach of the Moose Horn River from the north line of PLS section T47 R18W S4 to unnamed creek is recommended to be designated Class 2Be. Both macroinvertebrate and fish data collected in 2016 from one station demonstrated that this reach meets the aquatic life use goals for Class 2Be. The channel in this reach is natural and habitat assessments demonstrated that the biological station has fair habitat (MSHA = 57-63). Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Be. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Kettle River Watershed (07030003).

Monitoring station 16SC056 (07030003-629)

Moose Horn River (07030003-629) biological and habitat data

		Biology			Habitat			
Station	**Year**	**Assemblage**	**Type**	**IBI**	**Good**	**Poor**	**P/G**	**MSHA**
16SC056	2016	Fish	6	77	10	12.5	1.2	57
16SC056	2016	Macroinvertebrates	4	90	5.5	5.5	1.0	63

c. Snake River (St. Croix) Watershed (07030004)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/snake-river-st-croix-basin

Spring Brook (07030004-515): The reach of Spring Brook from its headwaters to the Snake River is recommended to be designated Class 2Ag. No temperature logger data are available, but water temperature grab samples were generally cold (06SC114: 11.3-17.3°C; 96SC078: 22.5°C). Water temperatures may to be higher in 96SC078 because this stream section appears to be impounded. This reach was previously managed for trout by the DNR, but this stream was removed from the trout waters list due to poor trout habitat. No cold water fish were sampled by the MPCA. The macroinvertebrate community included several cold water species (*Gammarus, Amphinemura, Glossosoma, Diplectrona modesta, Limnephilus*, *Lype diversa,* and *Heterotrissocladius*) which comprised 2-21% of individuals (06SC114) in the sample. A single cold water macroinvertebrate taxon (*Gammarus*) was sampled from 96SC078. Review of temperature and macroinvertebrate data indicate that this stream supports a cold water macroinvertebrate community in its upper sections (i.e., upstream of large wetland complex). A combination of factors, largely natural, preclude the establishment and maintenance of a cold water fish community, including beaver activity, lack of coarse substrates, predation by northern pike, and surrounding land use practices. The continued presence of cold water macroinvertebrates suggests that the thermal

Monitoring station 06SC114 (07030003-618)

regime of the stream is sufficient to support cold water aquatic life. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Snake River (St. Croix) Watershed (07030004).

7. Lower Mississippi River Basin

a. Zumbro River Watershed (07040004)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/zumbro-river

Unnamed Creek (07040004-763): No use designation change is proposed for the reach of an unnamed creek to Spring Creek. This reach was designated Class 2Ag as a trout protection water for Spring Creek (07040004-568). However, biological monitoring by the MPCA indicated that this stream supports a cold water habitat. Brown trout were collected in 2015 during two visits, including young-of-the-year fish. The young-of-the-year fish indicate natural reproduction of trout in this stream. A macroinvertebrate sample was also collected which included several cold water taxa (*Gammarus, Glossosoma intermedium,* and *Pagastia*) with individuals of these taxa comprising 17% of the sample. No temperature loggers were deployed, but three grab samples from July and August ranged from 13.3-13.9°C. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to confirm the Class 2Ag designation. The MPCA proposes to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Zumbro River Watershed (07040004).

Monitoring station 15LM300 (07040004-763)

Unnamed Creek (07040004-764): The reach of an unnamed creek from an unnamed creek to an unnamed creek is recommended to be designated Class 2Bdg. This reach is not managed as a trout water, but it is designated as a trout water because it falls within the PLS section which includes Spring Creek. Based on MPCA surveys, 07040004-764 does not support a cold water habitat. Both fish and macroinvertebrate communities are indicative of a warm water community. Available water temperature measurements in this stream reach indicated that it is too warm to support cold water aquatic life. In addition, a biological sampling visit in 2015 could not be performed due to inadequate flow. Although there is anthropogenic disturbance in this watershed, there is no evidence that these activities have resulted in the loss of a cold water habitat (e.g.,

Monitoring station 12LM017 (07040004-764)

increased temperature, reduced flows). A sampling station approximately 1.2 miles downstream of 12LM017 on a different WID (07040004-763) has much colder water temperatures and does support cold water aquatic life. These stations have similar contributing watersheds which indicates that there is a source of cold water between these stations and that the land use has not cause the loss of the cold water habitat in the downstream community. As a result, the evidence indicates that cold water habitat is not an existing or attainable use in 07040004-764. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Ag designation and replace it with Class 2Bdg. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Zumbro River Watershed (07040004). In addition to this reach, a number of tributaries were designated Class 2Ag as trout protection waters due to their PLS section affiliation with this reach. As a result, the Class 2Ag designation for the following reaches will be changed to Class 2Bdg in the beneficial use table for the Zumbro River Watershed (07040004): 07040004-762, 07040004-765, and 07040004-766.

Tompkins Creek (07040004-950): The reach of Tompkins Creek from an unnamed creek to the Middle Fork of the Zumbro River is recommended to be designated Class 2Ag. Based on DNR surveys, Tompkins Creek currently supports a naturally reproducing population of brook trout. The stream was managed for trout in the 1950s, but surveys in 1989 and 1995 did not collect any trout. However, temperature data in 1995 indicated that the thermal regime may be suitable to support to trout. A reintroduction stocking was recommended and brook trout fingerlings were stocked in 1999 and 2000. Three subsequent surveys have collected brook trout with multiple year classes indicating natural reproduction. The size of the trout population and the size of adult trout in this creek has been somewhat hampered by poor trout habitat (i.e., few deep pools) and limited forage fish in the upper reaches. However, the thermal regime is cool enough to support trout and should be capable of supporting other cold water organisms (e.g., sculpin, macroinvertebrates). Based on the DNR's surveys which demonstrated that this stream reach supports a naturally reproducing population of brook trout, this reach should be designated Class 2Ag. Although not listed as a trout water, the MPCA will also propose to include the section of this stream in PLS system section T107 R16W S24 due to its close proximity to a DNR station with brook trout and the presence of an unconfirmed spring in this reach of Tompkins Creek. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Zumbro River Watershed (07040004).

Tompkins Creek (07040004-951): The reach of Tompkins Creek from an unnamed creek to an unnamed creek is recommended to be designated Class 2Ag. See 07040004-950 (Tompkins Creek) and Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Zumbro River Watershed (07040004).

Unnamed spring (Tompkins Creek) (07040004-A00): The reach of an unnamed spring (Tompkins Creek) from the south line of PLS system section T107 R16W S24 to an unnamed creek is recommended to be designated Class 2Ag. See 07040004-950 (Tompkins Creek) and Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Zumbro River Watershed (07040004).

b. Mississippi River - La Crescent Watershed (07040006)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/mississippi-river-la-crescent

Pine Creek (07040006-576): The reach of Pine Creek from the north line of PLS System section T104 R5W S4 to Highway 16 is recommended to be designated Class 2Ag. This stream section is not a designated trout water, but the DNR considers it a marginal trout water due to higher water temperatures measured in 1991. Brown trout were collected by the MPCA during most surveys. This included young-of-the-year trout which indicated that natural reproduction is occurring in this reach. The macroinvertebrate community included five cold water taxa (*Baetis tricaudatus, Brachycentrus occidentalis, Eukiefferiella, Gammarus,* and *Heterotrissocladius*) and in more than half of the samples cold water taxa individuals comprised more than 15% of the sample. Temperature logger data from 2015 and 2016 had average July water temperatures ranging from 18.7-20.6°C and temperatures were in the growth range for brook trout 56.5-70.7% of the summer. There are also several springs along this stream reach and the upstream reach (07040006-507) and a tributary (Rose Valley Creek - 07040006-511) are cold water streams. Although previous data indicated marginal conditions in this stream section, more recent biological and temperature data indicate that trout populations have expanded into this stream section. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in [Minn. R. 7050.0470](https://www.revisor.mn.gov/rules/7050.0470/) by updating the beneficial use table for the Mississippi River - La Crescent Watershed (07040006).

Monitoring station 15LM040 (upper) and brown trout (lower) (07040006-576)

Monitoring stations 04LM061 (upper left), 15LM043 (upper right), 15LM039 (bottom left), and 04LM034 (bottom right) (07040006-576)

c. Mississippi River - Reno Watershed (07060001)

MPCA website: https://www.pca.state.mn.us/water/watersheds/mississippi-river-reno

Crooked Creek, North Fork (07060001-521): The reach of the North Fork of Crooked Creek in PLS System section T102 R5W S16 and a short loop in section T102 R5W S21 is recommended to be designated Class 2Ag. This stream reach was previously designated a trout water by the DNR, but it was accidently removed when language in [Minn. R. 6264.0050]() was altered to allow winter ice fishing for non-trout species in Shamrock Reservoir. This reach was redesignated as a trout water by the DNR in 2018 (State of Minnesota 2018). This reach is currently designated Class 2Bg by default in the beneficial use table for the Mississippi River - Reno Watershed (07060001) incorporated by reference in [Minn. R. 7050.0470](). There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, because this reach was erroneously designated and it is an extension of existing Class 2Ag reaches (07060001-522, 07060001-520), it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. See Appendix A for a detailed description of this use designation review. The MPCA will propose to make this change in [Minn. R. 7050.0470]() by updating the beneficial use table for the Mississippi River - Reno Watershed (07060001).

Winnebago Creek (07060001-693): The reach of Winnebago Creek from the west line of PLS System section T101 R4W S27 to the south line of the same section is recommended to be designated Class 2Ag. This stream is not a designated trout water, but the upstream WID (07060001-508) is a designated cold water stream and is stocked with trout. MPCA biological monitoring sampled both brown and rainbow trout which comprised 10.7% of the sample. Some brown trout individuals were young-of-the-year indicating natural reproduction in this stream. The macroinvertebrate sample included 3 cold water taxa (*Gammarus, Baetis tricaudatus,* and *Brachycentrus occidentalis*) which comprised 13.4% of the sample. Temperature logger data had an average July water temperature of 17.4°C and temperatures were in the growth range 92.4% of the summer. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in [Minn. R. 7050.0470] by updating the beneficial use table for the Mississippi River - Reno Watershed (07060001).

Monitoring station 15LM028 (07060001-693)

Unnamed Creek (Shamrock Creek) (07060001-696): The reach of an unnamed creek (Shamrock Creek) from its headwaters to Shamrock Impoundment is recommended to be designated Class 2Ag. This stream reach was previously designated a trout water by the DNR, but it was accidently removed when language in Minn. R. 6264.0050 was altered to allow winter ice fishing for non-trout species in Shamrock Reservoir. The DNR surveyed Shamrock Creek in 1991, 2000, and 2016 in the downstream reach (07060001-698) and sampled both brown and brook trout in all three surveys. This reach was redesignated as a trout water by the DNR in 2018 (State of Minnesota 2018). This reach is currently designated Class 2Bg by default in the beneficial use table for the Mississippi River - Reno Watershed (07060001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, because this reach was erroneously removed from the trout waters list and DNR surveys indicate the presence of brown and brook trout populations, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. See Appendix A for a detailed description of this use designation review. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River - Reno Watershed (07060001).

Unnamed Creek (Shamrock Creek) (07060001-698): The reach of an unnamed creek (Shamrock Creek) from Shamrock Impoundment to Crooked Creek is recommended to be designated Class 2Ag. This stream reach was previously designated a trout water by the DNR, but it was accidently removed when language in Minn. R. 6264.0050 was altered to allow winter ice fishing for non-trout species in Shamrock Reservoir. The DNR surveyed Shamrock Creek in 1991, 2000, and 2016 and sampled both brown and brook trout in all three surveys. This reach was redesignated as a trout water by the DNR in 2018 (State of Minnesota 2018). Water temperature monitoring by the DNR in 1992 indicates that temperatures may be a limiting factor for trout in this reach, but the presence of young fish indicate that the stream may support natural reproduction or serve as a nursey for trout. This reach is currently designated Class 2Bg by default in the beneficial use table for the Mississippi River - Reno Watershed (07060001) incorporated by reference in Minn. R. 7050.0470. There is no assessable MPCA biological data from this reach to perform a full cold water use review. However, because this reach was erroneously designated and DNR surveys indicate the presence of brown and brook trout populations, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. See Appendix A for a detailed description of this use designation review. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Mississippi River - Reno Watershed (07060001).

d. Upper Iowa River Watershed (07060002)

MPCA webpage: https://www.pca.state.mn.us/water/watersheds/upper-iowa-river

Unnamed creek (07060002-535): The reach of an unnamed creek from an unnamed creek to the Minnesota/Iowa border is recommended to be designated Class 2Ag. MPCA biological monitoring sampled both brook trout and mottled sculpin in this stream reach. These cold water species comprised 45.7% of the biomonitoring sample. The macroinvertebrate samples included 3 cold water taxa (*Eukiefferiella, Brachycentrus occidentalis, Baetis tricaudatus,* and *Limnephilus*) which comprised 2.9-8.0% of the samples. Temperature logger data had an average July water temperature of 16.0°C and temperatures were in the growth range for brook trout 97.2% of the summer. South of the Minnesota/Iowa border, Iowa has designated part of this creek a trout stream. In addition, this creek is a tributary to North Bear Creek in Iowa which is a designated trout stream. Iowa stocks North Bear Creek with catchable brook and rainbow trout and this stream supports a population of naturally reproducing brown trout. See Appendix A for a detailed description of this use designation review. Considering this information, it is reasonable to remove the Class 2Bg designation and replace it with Class 2Ag. The MPCA will propose to make this change in Minn. R. 7050.0470 by updating the beneficial use table for the Upper Iowa River Watershed (07060002).

Monitoring station 15LM005 (07060002-535)

8. Cedar-Des Moines Rivers Basin

No draft designations

9. Missouri River Basin

No draft designations

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Appendix A: Detailed descriptions of thermal habitat use designation reviews

See attached documents

Appendix B: Confirmed general use designations

In addition to the proposed Exceptional and Modified use designations in this document, the TALU reviews also determined that 374 stream WIDs (3530 miles) should be confirmed as General Use waters (Table 8). As described in MPCA (2015), General Use designations are based on a review of the biological communities, habitat, channel condition, and other attributes relevant to the use designation process. To be designated as an Exceptional Use, the only primary line of evidence needed is the biology although other relevant evidence may also be considered. The designation of Modified Use waters requires a UAA, and as a result the evidence needed to support these decisions is more stringent. Modified Use stream reaches need to at a minimum have 1) biology which does not attain the General Use thresholds, 2) habitat which is limiting biological attainment of the General Use, and 3) legally altered channel which is contributing to the poor habitat condition. As a result, the list of General Use waters consist of stream reaches that do not meet the Exceptional Use biological thresholds and one or more attributes make it ineligible for a Modified Use. Some reaches are not eligible to be designated as a Modified Use due to stream type including rivers and cold water habitat or those classified as northern, high-gradient invertebrate habitat. These stream types do not have a Modified Use category. The specific evidence (i.e., biology, habitat, and channel conditions) used to confirm the General Use for each stream reach is provided in Table 8.

Table 8. List of stream reaches from the 2016 and 2017 Intensive Watershed Monitoring framework watersheds with confirmed General Use designations. Abbreviations: WID = waterbody identification code; X = evidence used to confirm General Use designation; CW = General Use confirmed due to cold water designation; R = General Use confirmed due to river classification designation; 2Bg = General Use cool/warm water habitat; 2Bdg = General Use cool/warm water habitat also protected as a source for drinking water; 2Ag = General Use cold water habitat.

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Kettle	07030003-501	Grindstone River	2Bg	both	X	X	X
Kettle	07030003-502	Kettle River	2Bg	both	X		X
Kettle	07030003-509	Gillespie Brook	2Bg	both		X	X
Kettle	07030003-510	Kettle River	2Bg	both	X	X	X
Kettle	07030003-511	Kettle River	2Bg	both	X		X
Kettle	07030003-512	Kettle River, West Branch	2Bg	both		X	X
Kettle	07030003-513	Split Rock River	2Bg	both	X	X	
Kettle	07030003-514	Birch Creek	2Bg	both	X	X	X
Kettle	07030003-516	Grindstone River, South Branch	2Bg	both	X	X	X
Kettle	07030003-517	Kettle River	2Bg	both	X		X
Kettle	07030003-518	Unnamed creek	2Bg	both			X
Kettle	07030003-520	Unnamed creek	2Bg	both	X	X	X
Kettle	07030003-521	Moose Horn River	2Bg	both	X	X	X
Kettle	07030003-522	Deer Creek	2Bg	both		X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Kettle	07030003-523	Unnamed creek	2Bg	fish only	X	X	X
Kettle	07030003-524	Wolf Creek	2Bg	inverts only	X	X	
Kettle	07030003-525	Cane Creek	2Bg	both		X	X
Kettle	07030003-526	Judicial Ditch 1	2Bg	fish only	X	X	
Kettle	07030003-528	Kettle River	2Bg	both	X		X
Kettle	07030003-529	Kettle River	2Bg	both	X	X	X
Kettle	07030003-531	Moose Horn River	2Bg	both	X	X	X
Kettle	07030003-535	Moose Horn River	2Ag	both	CW		X
Kettle	07030003-537	Dead Moose River	2Bg	both	X	X	X
Kettle	07030003-539	Unnamed creek	2Bg	both	X		
Kettle	07030003-540	County Ditch 2	2Bg	fish only	X		
Kettle	07030003-543	Grindstone River, North Branch	2Bdg	both		X	X
Kettle	07030003-544	Grindstone River, North Branch	2Bg	both	X	X	X
Kettle	07030003-547	King Creek	2Ag	both	CW	X	X
Kettle	07030003-548	Larsons Creek	2Ag	both	CW	X	X
Kettle	07030003-550	Spring Creek	2Ag	both	CW		X
Kettle	07030003-552	Kettle River	2Bg	both	X	X	X
Kettle	07030003-564	Unnamed creek	2Bg	fish only	X	X	X
Kettle	07030003-566	Little Bremen Creek	2Bg	fish only	X	X	X
Kettle	07030003-568	Bremen Creek	2Bg	fish only	X	X	X
Kettle	07030003-569	Unnamed creek	2Bg	fish only	X		
Kettle	07030003-575	Little Willow River	2Bg	both	X	X	X
Kettle	07030003-592	Silver Creek	2Bg	both	X	X	X
Kettle	07030003-598	Unnamed creek	2Bg	fish only	X		X
Kettle	07030003-604	Unnamed creek	2Bg	fish only	X	X	X
Kettle	07030003-609	Rhine Creek	2Bg	both	X	X	X
Kettle	07030003-615	Unnamed ditch	2Bg	both	X		
Kettle	07030003-616	Heikkila Creek	2Bg	both	X	X	X
Kettle	07030003-617	Friesland Ditch	2Bg	both		X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Kettle	07030003-618	Skunk Creek	2Ag	both	CW	X	X
Kettle	07030003-619	Hay Creek	2Bg	both		X	X
Kettle	07030003-620	Bremen Creek	2Bg	both		X	X
Kettle	07030003-621	Willow River	2Bg	both		X	X
Kettle	07030003-623	Pine River	2Bg	both		X	X
Kettle	07030003-625	Unnamed creek	2Bg	both		X	
Kettle	07030003-630	Moose Horn River	2Bg	both	X	X	X
Mississippi River - Brainerd	07010104-502	Swan River	2Bg	both	X		X
Mississippi River - Brainerd	07010104-505	Rice River	2Bg	fish only		X	
Mississippi River - Brainerd	07010104-509	Nokasippi River	2Bg	both		X	X
Mississippi River - Brainerd	07010104-510	Nokasippi River	2Bg	fish only	X	X	X
Mississippi River - Brainerd	07010104-521	Little Elk River	2Bg	both	X		X
Mississippi River - Brainerd	07010104-522	Pike Creek	2Bg	both			X
Mississippi River - Brainerd	07010104-529	Little Elk River	2Bg	both	X	X	X
Mississippi River - Brainerd	07010104-530	Little Elk River	2Bg	both		X	X
Mississippi River - Brainerd	07010104-532	Little Nokasippi River	2Bg	both	X		X
Mississippi River - Brainerd	07010104-534	Daggett Brook	2Bg	both	X		X
Mississippi River - Brainerd	07010104-536	Wakefield Brook	2Bg	both	X		X
Mississippi River - Brainerd	07010104-543	Unnamed ditch	2Bg	both	X	X	
Mississippi River - Brainerd	07010104-566	Spring Branch	2Bg	fish only	X	X	X
Mississippi River - Brainerd	07010104-570	Little Swan River	2Bg	both		X	
Mississippi River - Brainerd	07010104-580	Sand Creek	2Bdg	both			X
Mississippi River - Brainerd	07010104-589	Whiteley Creek	2Ag	both	CW	X	X
Mississippi River - Brainerd	07010104-610	Buffalo Creek	2Bg	both		X	X
Mississippi River - Brainerd	07010104-627	Schwanke Creek	2Bg	both			X
Mississippi River - Brainerd	07010104-641	Cedar Creek	2Bg	both	X		X
Mississippi River - Brainerd	07010104-649	Rice River	2Bg	both		X	X
Mississippi River - Brainerd	07010104-659	Sisabagamah Creek	2Bg	both		X	
Mississippi River - Brainerd	07010104-660	Ripple River	2Bg	both	X	X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Mississippi River - Brainerd	07010104-661	Ripple River	2Bg	both	X	X	X
Mississippi River - Brainerd	07010104-677	Sisabagamah Creek	2Bg	both		X	X
Mississippi River - Brainerd	07010104-678	Dean Brook	2Bg	both		X	X
Mississippi River - Brainerd	07010104-681	Unnamed creek	2Bg	both		X	X
Mississippi River - Brainerd	07010104-682	Hay Creek	2Bg	both		X	
Mississippi River - Brainerd	07010104-687	Little Swan River	2Bg	both	X	X	X
Mississippi River - Brainerd	07010104-688	Rabbit Creek	2Bg	both		X	X
Mississippi River - Brainerd	07010104-689	Little Willow River	2Bg	fish only	X	X	X
Mississippi River - Brainerd	07010104-692	Rice River	2Bg	both		X	X
Mississippi River - Brainerd	07010104-693	Rice River	2Bg	both	X	X	X
Mississippi River - Brainerd	07010104-695	Buffalo Creek (Little Buffalo Creek)	2Bg	both			X
Mississippi River - Brainerd	07010104-699	Hay Creek	2Bg	both		X	X
Mississippi River - Sartell	07010201-507	Platte River	2Bg	both	X	X	X
Mississippi River - Sartell	07010201-511	Bunker Hill Creek	2Ag	both	CW	X	X
Mississippi River - Sartell	07010201-516	Little Two River	2Bg	both	X		X
Mississippi River - Sartell	07010201-520	Skunk River	2Bg	both	X	X	X
Mississippi River - Sartell	07010201-521	Skunk River	2Bg	both	X		X
Mississippi River - Sartell	07010201-523	Two River	2Bg	both			X
Mississippi River - Sartell	07010201-524	North Two River	2Bg	both	X	X	X
Mississippi River - Sartell	07010201-525	Spunk Creek	2Bg	both			X
Mississippi River - Sartell	07010201-526	Watab River	2Bg	both	X		X
Mississippi River - Sartell	07010201-528	Watab River	2Bg	both		X	X
Mississippi River - Sartell	07010201-529	Watab River, North Fork	2Bg	both	X		X
Mississippi River - Sartell	07010201-532	South Two River	2Bg	fish only			X
Mississippi River - Sartell	07010201-537	County Ditch 12	2Bg	both	X		
Mississippi River - Sartell	07010201-539	Zuleger Creek	2Bg	both			X
Mississippi River - Sartell	07010201-546	Platte River	2Bg	fish only			X
Mississippi River - Sartell	07010201-554	Watab River, South Fork	2Bg	both			X
Mississippi River - Sartell	07010201-569	Hazel Creek	2Bg	both		X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Mississippi River - Sartell	07010201-613	Krain Creek	2Bg	both	X	X	
Mississippi River - Sartell	07010201-618	Rice Creek	2Bg	both			X
Mississippi River - Sartell	07010201-625	Unnamed creek	2Bg	fish only		X	
Mississippi River - Sartell	07010201-630	Hay Creek	2Bg	both	X	X	X
Mississippi River - Sartell	07010201-633	Unnamed creek	2Bg	both	X		X
Mississippi River - Sartell	07010201-634	Unnamed creek	2Bg	both		X	X
Mississippi River - Sartell	07010201-636	Unnamed creek	2Bg	both	X	X	X
Mississippi River - Sartell	07010201-637	Unnamed creek	2Bg	both	X	X	X
Mississippi River - Sartell	07010201-639	Hillman Creek	2Bg	both	X	X	X
Mississippi River - Sartell	07010201-643	South Two River	2Bg	both			X
Mississippi River - Sartell	07010201-645	Little Mink Creek	2Bg	both	X	X	
Mississippi River - Sartell	07010201-647	Big Mink Creek	2Bg	both			X
Mississippi River - Sartell	07010201-649	Stony Creek	2Bg	both	X		X
Mississippi River - Sartell	07010201-651	Unnamed creek	2Bg	both			X
Mississippi River - Sartell	07010201-652	Little Rock Creek	2Bdg	both			X
Mississippi River - Sartell	07010201-653	Little Rock Creek	2Ag	both	CW		X
Otter Tail	09020103-502	Otter Tail River	2Bdg	both	R	R	X
Otter Tail	09020103-504	Otter Tail River	2Bdg	both	R	R	X
Otter Tail	09020103-506	Otter Tail River	2Bdg	both	R	R	X
Otter Tail	09020103-521	Otter Tail River	2Bdg	both	R	R	X
Otter Tail	09020103-526	Toad River	2Bdg	both			X
Otter Tail	09020103-529	Otter Tail River	2Bdg	both	X	X	X
Otter Tail	09020103-532	Otter Tail River	2Bdg	both	X		X
Otter Tail	09020103-561	Brandborg Creek	2Ag	both	CW		X
Otter Tail	09020103-563	Dead Horse Creek	2Ag	both	CW		X
Otter Tail	09020103-565	Solid Bottom (Elbow Lake Creek)	2Ag	both	CW	X	X
Otter Tail	09020103-574	Otter Tail River	2Bdg	both	R	R	X
Otter Tail	09020103-611	Otter Tail River	2Bg	both	X	X	X
Otter Tail	09020103-622	Unnamed creek	2Bg	both		X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Otter Tail	09020103-653	Reed Creek	2Bg	both	X	X	X
Otter Tail	09020103-767	Pelican River	2Bg	both			X
Otter Tail	09020103-768	Pelican River	2Bg	both	R	R	X
Otter Tail	09020103-770	Toad River	2Bg	both	X		X
Otter Tail	09020103-772	Pelican River	2Bg	both		X	
Otter Tail	09020103-773	Otter Tail River	2Bdg	both	R	R	X
Otter Tail	09020103-774	Otter Tail River	2Bdg	both	R	R	X
Upper St. Croix	07030001-510	Lower Tamarack River	2Bdg	both	X	X	X
Upper St. Croix	07030001-511	Hay Creek	2Bdg	both	X	X	X
Upper St. Croix	07030001-512	Lower Tamarack River	2Bg	both	X	X	X
Upper St. Croix	07030001-513	McDermott Creek	2Bg	both		X	X
Upper St. Croix	07030001-514	Lower Tamarack River	2Bg	both	X	X	X
Upper St. Croix	07030001-518	Bear Creek	2Bg	both	X	X	X
Upper St. Croix	07030001-519	Redhorse Creek	2Bg	both	X	X	X
Upper St. Croix	07030001-522	Crooked Creek	2Ag	both	X	X	X
Upper St. Croix	07030001-528	Squib Creek	2Bg	both		X	X
Upper St. Croix	07030001-529	Keene Creek	2Bg	inverts only	X		X
Upper St. Croix	07030001-532	Keene Creek	2Bg	both	X	X	X
Upper St. Croix	07030001-533	Crooked Creek, East Fork	2Ag	both	CW	X	X
Upper St. Croix	07030001-535	Crooked Creek, West Fork	2Ag	both	CW	X	X
Upper St. Croix	07030001-537	Crooked Creek, West Fork	2Ag	both	CW	X	X
Upper St. Croix	07030001-546	Hay Creek	2Ag	both	CW		X
Upper St. Croix	07030001-548	Wolf Creek	2Ag	both	CW		X
Upper St. Croix	07030001-553	Partridge Creek	2Bg	both		X	X
Upper St. Croix	07030001-562	Kenney Brook	2Bdg	both		X	X
Upper St. Croix	07030001-579	Little Bear Creek	2Bg	fish only		X	
Upper St. Croix	07030001-581	Little Bear Creek	2Bg	both	X	X	X
Upper St. Croix	07030001-604	Sand Creek	2Ag	both	CW	X	
Upper St. Croix	07030001-605	Sand Creek	2Ag	both	CW	X	

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Upper St. Croix	07030001-606	Sand Creek	2Ag	both	CW	X	
Upper St. Croix	07030001-614	Upper Tamarack River	2Bdg	both	X	X	X
Upper St. Croix	07030001-616	Crooked Creek, East Fork	2Bg	both		X	X
Upper St. Croix	07030001-617	Sand Creek	2Bg	both	X	X	X
Upper St. Croix	07030001-619	St Croix River	2Bdg	both	R	R	X
Upper St. Croix	07030001-902	Little Hay Creek	2Ag	both	CW		X
Blue Earth	07020009-501	Blue Earth River	2Bg	fish only	R	R	X
Blue Earth	07020009-502	Elm Creek	2Bg	both			X
Blue Earth	07020009-503	Center Creek	2Bg	both			X
Blue Earth	07020009-504	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-507	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-508	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-509	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-514	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-515	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-516	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-518	Blue Earth River	2Bg	both	R	R	X
Blue Earth	07020009-521	Cedar Creek (Cedar Run Creek)	2Bg	both		X	X
Blue Earth	07020009-522	Elm Creek	2Bg	both			X
Blue Earth	07020009-553	Blue Earth River, East Branch	2Bg	both			X
Blue Earth	07020009-561	Elm Creek, South Fork	2Bg	both			X
Blue Earth	07020009-565	Blue Earth River	2Bg	both	R	R	
Blue Earth	07020009-566	Unnamed creek	2Bg	both			X
Blue Earth	07020009-577	Willow Creek	2Bg	both			X
Blue Earth	07020009-617	Unnamed creek	2Bg	both			X
Blue Earth	07020009-625	Unnamed creek	2Bg	both			X
Blue Earth	07020009-627	Judicial Ditch 3	2Bg	both			X
Blue Earth	07020009-631	Elm Creek	2Bg	both			X
Blue Earth	07020009-633	Lily Creek	2Bg	both			X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Blue Earth	07020009-640	South Creek	2Bg	both	X	X	
Blue Earth	07020009-642	Little Badger Creek	2Bg	both		X	X
Blue Earth	07020009-644	Blue Earth River, West Branch	2Bg	both			X
Blue Earth	07020009-646	Blue Earth River, Middle Branch	2Bg	both			X
Blue Earth	07020009-648	Coon Creek	2Bg	both			X
Blue Earth	07020009-654	Brush Creek	2Bg	both		X	X
Blue Earth	07020009-665	Judicial Ditch 13	2Bg	both		X	
Cottonwood	07020008-501	Cottonwood River	2Bg	both	R	R	X
Cottonwood	07020008-502	Cottonwood River	2Bg	both			X
Cottonwood	07020008-503	Cottonwood River	2Bg	both			X
Cottonwood	07020008-504	Cottonwood River	2Bg	both			X
Cottonwood	07020008-507	Cottonwood River	2Bg	both	R	R	X
Cottonwood	07020008-508	Cottonwood River	2Bg	both	R	R	X
Cottonwood	07020008-509	Cottonwood River	2Bg	both	R	R	X
Cottonwood	07020008-517	Dutch Charley Creek	2Bg	both			X
Cottonwood	07020008-518	Dutch Charley Creek	2Bg	both			X
Cottonwood	07020008-519	Highwater Creek	2Bg	both		X	X
Cottonwood	07020008-520	Dry Creek	2Bg	both			X
Cottonwood	07020008-521	Mound Creek	2Bg	both			X
Cottonwood	07020008-523	Pell Creek	2Bg	both			X
Cottonwood	07020008-527	County Ditch 38	2Bg	both		X	
Cottonwood	07020008-529	Unnamed creek	2Bg	both			X
Cottonwood	07020008-545	Unnamed creek	2Bg	both			X
Cottonwood	07020008-548	Judicial Ditch 9	2Bg	both		X	X
Cottonwood	07020008-551	Willow Creek	2Bg	both		X	
Cottonwood	07020008-563	Unnamed creek	2Bg	both		X	
Cottonwood	07020008-574	Unnamed creek	2Bg	both			X
Cottonwood	07020008-578	Unnamed creek	2Bg	both	X		X
Cottonwood	07020008-581	Unnamed creek	2Bg	both			X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Cottonwood	07020008-584	Unnamed creek	2Bg	both	X		
Cottonwood	07020008-587	Unnamed creek	2Bg	both	X		X
Cottonwood	07020008-588	Judicial Ditch 3	2Bg	both			X
Cottonwood	07020008-590	Unnamed creek	2Bg	both			X
Cottonwood	07020008-591	Unnamed creek	2Bg	both			X
Cottonwood	07020008-592	Unnamed creek	2Bg	both			X
Cottonwood	07020008-593	Unnamed creek	2Bg	both			X
Cottonwood	07020008-599	Sleepy Eye Creek	2Bg	both		X	X
Cottonwood	07020008-601	Meadow Creek	2Bg	both	X		
Cottonwood	07020008-603	Plum Creek (Judicial Ditch 20A)	2Bg	both		X	X
Cottonwood	07020008-617	Judicial Ditch 22	2Bg	both		X	X
Cottonwood	07020008-619	Unnamed creek	2Bg	both			X
Cottonwood	07020008-621	Unnamed creek	2Bg	both		X	X
Lower Rainy	09030008-502	Winter Road River	2Bg	both	X	X	X
Lower Rainy	09030008-506	Winter Road River	2Bg	both	X	X	X
Lower Rainy	09030008-507	Peppermint Creek	2Bg	both	X	X	X
Lower Rainy	09030008-510	Unnamed ditch (Pitt Creek)	2Ag	fish only	CW	X	
Lower Rainy	09030008-511	Silver Creek	2Bg	both	X	X	X
Lower Rainy	09030008-514	Unnamed creek	2Bg	both		X	
Lower Rainy	09030008-515	Baudette River, West Fork	2Bg	both		X	X
Lower Rainy	09030008-521	Unnamed ditch	2Bg	fish only	X		X
Lower Rainy	09030008-528	Little Peppermint Creek	2Bg	fish only	X	X	X
Lower Rainy	09030008-534	Silver Creek, East Branch	2Bg	inverts only			X
Lower Rainy	09030008-535	Baudette River	2Bg	fish only	X	X	X
Lower Rainy	09030008-536	Baudette River	2Bg	both			X
Lower Rainy	09030008-543	Black River, West Fork	2Bg	both	X	X	
Lower Rainy	09030008-545	Black River	2Bg	both		X	
Lower Rainy	09030008-546	Black River	2Bg	both	X	X	X
Lower Rainy	09030008-563	Unnamed creek	2Bg	both		X	

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
North Fork Crow	07010204-502	Crow River	2Bg	both	R	R	X
North Fork Crow	07010204-503	Crow River, North Fork	2Bg	both	R	R	X
North Fork Crow	07010204-504	Crow River, North Fork	2Bg	both		X	
North Fork Crow	07010204-506	Crow River, North Fork	2Bg	both	R	R	X
North Fork Crow	07010204-507	Crow River, North Fork	2Bg	both	R	R	X
North Fork Crow	07010204-509	Eagle Creek	2Bg	both		X	
North Fork Crow	07010204-511	Crow River, Middle Fork	2Bg	both		X	
North Fork Crow	07010204-515	Mill Creek	2Bg	both			X
North Fork Crow	07010204-524	Mill Creek	2Bg	both			X
North Fork Crow	07010204-536	County Ditch 37	2Bg	both	X		
North Fork Crow	07010204-537	Crow River, Middle Fork	2Bg	both	X		X
North Fork Crow	07010204-539	Crow River, Middle Fork	2Bg	both			X
North Fork Crow	07010204-542	Unnamed creek (Regal Creek)	2Bg	both			X
North Fork Crow	07010204-543	Unnamed creek	2Bg	both		X	X
North Fork Crow	07010204-554	Sucker Creek	2Ag	both	CW	X	
North Fork Crow	07010204-556	Crow River, North Fork	2Bg	both	R	R	X
North Fork Crow	07010204-572	Stag Brook	2Bg	both			X
North Fork Crow	07010204-577	County Ditch B6	2Bg	both	X		
North Fork Crow	07010204-581	County Ditch 7	2Bg	both	X		
North Fork Crow	07010204-604	Collinwood Creek	2Bg	both	X	X	
North Fork Crow	07010204-642	Grove Creek	2Bg	both		X	X
North Fork Crow	07010204-667	Unnamed creek	2Bg	both			X
North Fork Crow	07010204-679	Twelvemile Creek	2Bg	both		X	X
North Fork Crow	07010204-682	Sucker Creek	2Bg	inverts only		X	X
North Fork Crow	07010204-696	Unnamed creek	2Bg	both		X	X
North Fork Crow	07010204-749	Grove Creek	2Bg	both		X	
North Fork Crow	07010204-758	Unnamed creek (Battle Creek)	2Bg	both		X	X
North Fork Crow	07010204-762	Sucker Creek	2Bg	both		X	X
North Fork Crow	07010204-764	Crow River, North Fork	2Bg	both	X	X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Pomme de Terre	07020002-501	Pomme de Terre River	2Bg	both	R	R	X
Pomme de Terre	07020002-504	Pomme de Terre River	2Bg	both	X	X	X
Pomme de Terre	07020002-505	Pomme de Terre River	2Bg	both	X	X	X
Pomme de Terre	07020002-506	Pelican Creek	2Bg	both			X
Pomme de Terre	07020002-514	Pomme de Terre River	2Bg	both		X	X
Pomme de Terre	07020002-518	Unnamed creek	2Bg	both		X	X
Pomme de Terre	07020002-534	Unnamed creek	2Bg	both			X
Pomme de Terre	07020002-540	Unnamed creek	2Bg	both		X	X
Pomme de Terre	07020002-542	Unnamed creek	2Bg	both		X	X
Pomme de Terre	07020002-549	Judicial Ditch 2	2Bg	both		X	
Pomme de Terre	07020002-551	Unnamed creek	2Bg	fish only		X	X
Pomme de Terre	07020002-556	Dry Wood Creek	2Bg	both			X
Pomme de Terre	07020002-562	Pomme de Terre River	2Bg	both			X
Pomme de Terre	07020002-563	Pomme de Terre River	2Bg	both			X
Pomme de Terre	07020002-565	Pomme de Terre River	2Bg	both			X
Rainy Lake	09030003-632	Rat Root River, East Branch	2Bg	fish only	X	X	X
Rainy Lake	09030003-633	Rat Root River, East Branch	2Bg	both	X	X	X
Rainy Lake	09030003-634	Rat Root River	2Bg	both		X	X
Rainy Lake	09030003-635	Rat Root River	2Bg	fish only	X	X	X
Rapid	09030007-502	Rapid River	2Bg	both	R	R	X
Rapid	09030007-503	Rapid River, North Branch	2Bg	both		X	X
Rapid	09030007-504	Rapid River	2Bg	both	X	X	X
Rapid	09030007-506	Rapid River	2Bg	both	X	X	
Rapid	09030007-508	Troy Creek	2Bg	both	X	X	X
Rapid	09030007-509	Rapid River, East Branch	2Bg	both	X	X	X
Rapid	09030007-510	Bartons Brook	2Bg	both	X		
Rapid	09030007-511	Rapid River, East Branch	2Bg	both	X	X	X
Rapid	09030007-512	Moose Creek	2Bg	both	X	X	X
Rapid	09030007-513	Christy Creek	2Bg	fish only	X	X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Rapid	09030007-523	Miller Creek	2Bg	fish only	X	X	X
Rapid	09030007-528	Unnamed creek	2Bg	both	X	X	X
Rapid	09030007-529	Unnamed ditch	2Bg	fish only	X		
Redwood	07020006-501	Redwood River	2Bg	both	R	R	X
Redwood	07020006-502	Redwood River	2Bg	both			X
Redwood	07020006-503	Redwood River	2Bg	both			X
Redwood	07020006-505	Redwood River	2Bg	both			X
Redwood	07020006-509	Redwood River	2Bg	both	R	R	X
Redwood	07020006-510	Redwood River	2Bg	both	X	X	X
Redwood	07020006-513	Redwood River	2Bdg	both	X	X	X
Redwood	07020006-521	Ramsey Creek	2Bdg	both		X	X
Redwood	07020006-527	Norwegian Creek	2Bg	both			X
Redwood	07020006-532	Unnamed creek	2Bg	both			X
Redwood	07020006-555	Unnamed creek	2Bg	fish only		X	X
Redwood	07020006-562	Unnamed creek	2Bg	fish only	X	X	
Redwood	07020006-564	Threemile Creek	2Bg	both			X
Redwood	07020006-568	Clear Creek	2Bg	both		X	X
Redwood	07020006-570	Coon Creek	2Bg	both			X
Redwood	07020006-573	Unnamed creek	2Bg	both		X	X
Snake	07030004-503	Snake River	2Bg	both	R	R	X
Snake	07030004-505	Snake River	2Bg	both	R	R	X
Snake	07030004-506	Snake River	2Bg	both	X	X	X
Snake	07030004-507	Chelsey Brook	2Bg	both	X	X	X
Snake	07030004-508	Snake River	2Bg	both		X	X
Snake	07030004-509	Hay Creek	2Bg	both	X	X	X
Snake	07030004-511	Ann River	2Bg	both		X	X
Snake	07030004-512	Groundhouse River	2Bg	both	X	X	X
Snake	07030004-513	Groundhouse River	2Bg	both		X	X
Snake	07030004-514	Bear Creek	2Bg	both		X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Snake	07030004-515	Spring Brook	2Ag	both	CW		X
Snake	07030004-516	Unnamed creek	2Bg	inverts only	X	X	X
Snake	07030004-517	Cowans Brook	2Bg	both	X	X	
Snake	07030004-518	Little Ann River	2Bg	both	X	X	X
Snake	07030004-520	Unnamed creek	2Bg	inverts only	X	X	X
Snake	07030004-523	Snake River	2Bg	both		X	X
Snake	07030004-524	Snake River	2Bg	both	R	R	X
Snake	07030004-525	Snake River	2Bg	both		X	X
Snake	07030004-530	Pokegama Creek	2Bg	fish only	X	X	X
Snake	07030004-531	East Pokegama Creek	2Bg	both		X	X
Snake	07030004-532	Pokegama Creek	2Bg	both		X	X
Snake	07030004-534	Unnamed creek	2Bg	fish only		X	X
Snake	07030004-537	Dry Run	2Bg	fish only		X	X
Snake	07030004-538	Groundhouse River, West Fork	2Bg	both		X	X
Snake	07030004-541	Bergman Brook	2Bg	fish only		X	X
Snake	07030004-546	Mission Creek	2Ag	both	CW		X
Snake	07030004-547	Mission Creek	2Bdg	both			X
Snake	07030004-548	Mission Creek	2Bg	fish only			X
Snake	07030004-549	Knife River	2Bg	both		X	X
Snake	07030004-551	Knife River	2Bg	both		X	X
Snake	07030004-552	Bear Creek	2Bg	both		X	X
Snake	07030004-557	Unnamed creek	2Bg	both		X	X
Snake	07030004-558	Snowshoe Brook	2Bg	both	X	X	X
Snake	07030004-559	Unnamed creek	2Bg	both	X	X	X
Snake	07030004-560	Bean Brook	2Bg	fish only	X	X	X
Snake	07030004-562	Unnamed creek	2Bg	fish only	X	X	
Snake	07030004-563	Unnamed creek	2Bg	both		X	
Snake	07030004-566	Mud Creek (County Ditch 10)	2Bg	both			X
Snake	07030004-567	Mud Creek (County Ditch 10)	2Bg	both		X	X

Watershed	WID	Waterbody name	Use	Assemblage	Biology	Habitat	Channel
Snake	07030004-568	County Ditch 4	2Bg	both		X	
Snake	07030004-569	Unnamed creek	2Bg	fish only		X	X
Snake	07030004-570	Unnamed creek	2Bg	fish only	X	X	X
Snake	07030004-571	Camp Creek	2Bg	fish only	X	X	X
Snake	07030004-573	Groundhouse River, South Fork	2Bg	both	X	X	
Snake	07030004-574	Unnamed creek	2Bg	fish only	X		
Snake	07030004-577	Unnamed creek	2Bg	fish only		X	X
Snake	07030004-587	Snake River	2Bg	both	R	R	X
Snake	07030004-591	Unnamed creek	2Bg	fish only		X	X
Snake	07030004-593	Unnamed creek	2Bg	fish only		X	
Snake	07030004-596	Unnamed creek	2Bg	fish only	X	X	X
Snake	07030004-597	Unnamed creek	2Bg	fish only	X	X	X

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Critical technical elements of state bioassessment programs: a process to evaluate program rigor and comparability

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Abstract We developed a systematic process to evaluate state/tribal bioassessment programs to provide information about the rigor of the technical approach. This is accomplished via on-site interviews to produce an evaluation that assigns one of four levels of rigor as an outcome. Level 4 is the most rigorous and reflects a technical capacity to accurately determine incremental condition and support management programs. The remaining three levels are less able to assess incremental condition and are appropriate for only some management support needs. Accurately determining impairment and diagnosing pollution-specific stressors are fundamental tasks that states/tribes must accomplish to provide management support. This goal is fulfilled to varying degrees by most states/tribes. The evaluation employs a checklist and a sliding scale of rigor for 13 technical elements. Feedback is provided to each state/tribe via a technical memorandum that describes the technical components of the monitoring program, highlights strengths, and recommends improvements for specific technical issues. This can be used to refine the bioassessment and monitoring programs to better support management programs. The results of 14 state/tribal evaluations are included here. The majority (nine states, one tribe) revealed that most operate at level 2 with developmental activities that will elevate the level of program rigor already underway. Two states operate level 4 programs and each have numeric biocriteria and refined designated uses in their water quality standards. This is the ultimate goal of the process of engaging states in the development of bioassessment programs in the U.S.

Keywords Aquatic life uses · Designated uses · Biological assessments · Biological criteria · Tiered uses · State/tribal programs

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Introduction

Biological assessments have been a part of state and tribal water quality monitoring and assessment programs for more than three decades. However, the technical rigor of each varies widely and among a variety of technical components and attributes that we term here as critical technical elements. Few U.S. states have adopted narrative biocriteria and only three have adopted numeric biological criteria and refined designated uses in

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their water quality standards (WQS). Their experiences, along with those of federal agencies (U.S. Environmental Protection Agency [U.S. EPA] and U.S. Geological Survey [USGS]) and national initiatives such as the National Water Quality Monitoring Council (NWQMC), and its predecessor the Intergovernmental Task Force on Monitoring Water Quality (ITFM), have underscored the need to better define the underlying technical and programmatic components of an adequate program (ITFM 1992, 1995; Yoder 1998).

It is an important national goal to have state and tribal programs adopt refined designated aquatic life uses and numeric biocriteria in their state water quality standards (WQS). This will not only lead to more accurate identifications and descriptions of impaired waters via the use of numeric biocriteria, but lead to better planning and management decisions via more specific and complete WQS. In 2000 U.S. EPA convened a process that produced a general framework and detailed technical and implementation guidance to states and tribes for using biological data to achieve two objectives; (1) refine designated aquatic life uses based on numeric biological criteria, and (2) integrate each within a monitoring and assessment program that is designed to support multiple water quality management program needs (U.S. EPA 2005). This process also revealed a need to review and evaluate the technical approaches being employed by states and tribes as a baseline for determining what types of improvements would be needed to attain these objectives. Taken together the EPA guidance and the critical elements process provide detailed guidelines and milestones by which states, tribes, and U.S. EPA can evaluate and track progress in the development and implementation of more rigorous biological assessment programs in support of reaching the goal of having tiered aquatic life uses (TALU) and numeric biocriteria in state and tribal WQS.

This initiative also recognizes that biological assessment is an essential component of adequate state and tribal water quality monitoring and assessment programs that includes the integration of other chemical, physical, and environmental measures and indicators (ITFM 1992, 1995; Yoder 1998). The term "adequate" was deliberately chosen to describe the type of monitoring that is needed to support a TALU-based approach[1] and to provide important context about what is expected of state and tribal monitoring and assessment programs, i.e., employing a cost-effective array of parameters and indicators following a systematic process for their inclusion depending on programmatic needs (Yoder 1998). It attempts to avoid a digression towards a rote set of "minimum" requirements where the inclusion of certain indicators can be viewed as a non-essential luxury or an open ended process suggested by "comprehensive" in which cost-effectiveness can easily become lost in the pursuit of more indicators and data points.

While the critical elements process does not directly assess the technical components of allied chemical and physical assessment, their integration with biological assessment is expected and is crucial to meeting important state, tribal, and national water quality management goals and objectives. The question of *how* biological data should be integrated with chemical and physical assessment tools and indicators is addressed as part of the overall state or tribal monitoring and assessment and WQS program review of which the critical elements evaluation is an important part (e.g., MBI 2004). Biological assessments and biocriteria are intended to serve as a direct measure of designated aquatic life use attainment and to aid in the diagnosis of the causes of biological impairment and their sources (U.S. EPA 2005). A sufficiently rigorous biological assessment program fosters a more effective diagnosis of causal associations and their targeting by management programs. This is but one incentive for states and tribes to develop the capacity for delivering a high level of biological assessment that is based on reasonably available methods and best practices.

Taken together the overarching goal of what has become known as the EPA TALU-based

[1]The TALU based approach includes tiered aquatic life uses (TALU) based on numeric biological criteria and implementation via an adequate monitoring and assessment program that includes biological, chemical, and physical measures, parameters, indicators and a process for stressor identification.

approach is to achieve the better integration of monitoring and assessment and WQS (U.S. EPA 2005). Presently, each program can be implemented in an independent manner and be viewed as an acceptable structure for water quality management under the U.S. Clean Water Act. However, the synergy that is fostered by the TALU-based process in these two major program areas provides the underlying support for producing better management outcomes. This was strongly implied by the NRC (2001) in their review of the EPA TMDL (total maximum daily load) process and it involved the same fundamentals that are addressed by the TALU-based approach to water quality management.

Critical technical elements of state bioassessment programs

To fulfill the need for a systematic, baseline evaluation of state and tribal bioassessment programs we developed the *Critical Technical Elements of Bioassessment Program* (Barbour and Yoder 2007). While a variety of technical approaches and methods are used throughout the U.S., it is the purpose of the critical elements process to evaluate and reveal the overall level of rigor of a state or tribal program. While we recognize here that different technical approaches can achieve similar levels of rigor, it is likely that some will produce differences in the level of rigor that are revealed by the technical elements. The critical elements consist of 13 technical attributes of a biological assessment program and these can be grouped into three distinct areas; program design, methods, and data interpretation (Table 1). The result of the critical elements evaluation is a determination of the overall level of rigor with level 4 being the most desirable and effective for supporting the multiple management issues that are common to state or tribal water quality management programs. Written feedback is provided to the state or tribe via a technical memorandum and critical elements checklist that describes the status of each technical element and what is needed to elevate those that are below the highest possible score. Ongoing developmental efforts within the state or tribe are especially highlighted as to their potential to affect the current status of each element and the overall level of rigor.

In developing the methodology, we consulted several sources of information and experience. Key among these are the U.S. EPA *Comprehensive Assessment and Listing Methodology (CALM)* process guidelines (U.S. EPA 2002b), *Important Elements and Concepts of an Adequate Watershed Monitoring and Assessment Program* (Yoder 1998), the most recent national survey of state and tribal biological assessment programs (U.S. EPA 2002a), the *Region V State Bioassessment and Ambient Monitoring Programs: Initial Evaluation and Review* (MBI 2004), the NWQMC

Table 1 The critical technical elements of a bioassessment program or protocol showing a sliding scale of associated resolution and degree of development for each

			LOWEST →			HIGHEST
Design	1.	Index Period	1.5	2.5	3.5	4.5
	2.	Spatial coverage	1.5	2.5	3.5	4.5
	3.	Natural Classification	2	3	4	5
	4.	Reference conditions	1	2	3	4
	5.	Criteria for reference sites	2	3	4	5
Methods	6.	Taxonomic Resolution	2	3	4	5
	7.	Sample collection	2	3	4	5
	8.	Sample processing	2	3	4	5
	9.	Data Management	2	3	4	5
Interpretation	10.	Ecological attributes	1.5	2.5	3.5	4.5
	11.	Biological endpoints	1	2	3	4
	12.	Diagnostic capability	1	2	3	4
	13.	Professional review	1.5	2.5	3.5	4.5
		Total Score	**21**	**34**	**47**	**60**

Data Collection Methods Board (Federal Register No. 66(52): 15273–15275), and contemporary technical literature on bioassessments and biocriteria. The critical elements process also builds upon existing technical guidance documents for streams (U.S. EPA 1996), lakes and reservoirs (U.S. EPA 1998), and estuaries (U.S. EPA 2000), the Rapid Bioassessment Protocols (U.S. EPA 1999), the U.S. EPA Environmental Monitoring and Assessment Program (EMAP), and leading state programs (U.S. EPA 2005). Thus far we have focused on how states and tribes assess the biota of flowing waters, wadeable perennial streams in particular as these are the most in common waterbody type that is routinely sampled by all states and tribes. However, we have piloted evaluations of other waterbody types (e.g., non-wadeable rivers, wetlands) when these are routinely included in a state or tribal program. As such the technical evaluation is specific to a waterbody ecotype (e.g., wadeable streams, non-wadeable large rivers, wetlands, lakes, estuaries, etc.).

The guiding principles of the critical elements approach are intended to help state and tribal monitoring and assessment programs achieve levels of standardization, rigor, reliability, and reproducibility that are *reasonably attainable* under current technology and reasonable levels of funding. In turn, this will produce an accurate, comparable, comprehensive, and cost-effective monitoring and assessment program that is capable of meeting the broad goal of supporting all relevant water quality management programs (Fig. 1). An important goal of this process, in concert with the other activities of the national biological criteria program, is an adherence to the following principles:

Accuracy biological assessments should produce sufficiently accurate delineations of condition so that type I and II assessment errors are minimized;

Comparability bioassessment programs that utilize different technical approaches should produce comparable assessments in terms of biological condition ratings, detection of impairments, and diagnostic properties (Houston et al. 2002; Bonada et al. 2006);

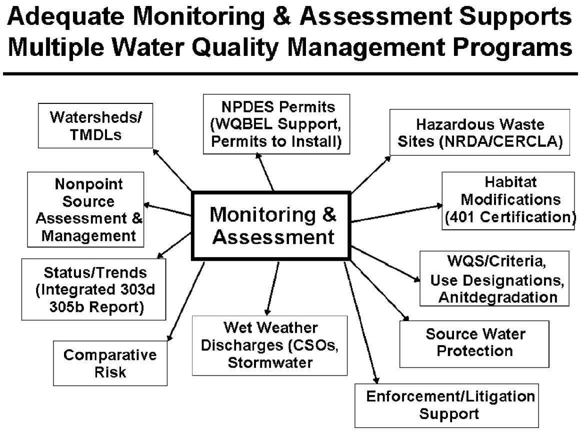

Fig. 1 The multiple uses of monitoring and assessment information in support of specific water quality management programs that are expected as an outcome of the critical elements and state/tribal review process

Comprehensiveness biological assessments should be integrated with chemical, physical, and other stressor and exposure indicators, each used in their respective indicator roles (Yoder and Rankin 1998) to demonstrate the relationship between human caused impacts and biological response; and,

Cost-effectiveness the term as used here means that the benefits of having a rigorous and reliable biological assessment program to support making better management decisions outweighs the intrinsic costs of program development and implementation (NRC 2001).

The critical elements process is intended primarily for use by state and tribal program managers and staff who are responsible for the monitoring and assessment and WQS programs and in cooperation with their regional EPA counterparts. First, states and tribes can use the guidelines to determine where they are in the biological assessment and criteria development process and how to develop, structure, and, if necessary, modify their programs. Examples of this already exist in selected states and are described in the critical elements documentation (Barbour and Yoder 2007). U.S. EPA envisions a process by which the critical elements process will provide an opportunity to better engage states and tribes regarding methods and approaches, design and implementation issues, and resource needs (U.S. EPA 2005).

The critical elements process should also provide useful information for communicating the quality of the bioassessment and biocriteria program to EPA and state and tribal program managers, and for identifying attainable milestones, allocating resources, and tracking progress.

Methods

The review of a state or tribal monitoring and assessment program requires an understanding of the current program elements—both technical and programmatic—and a 3-day site visit to discuss and evaluate the monitoring and assessment and WQS programs with managers and staff. The review is structured in accordance with a general outline that includes the baseline technical and management programs of a state or tribal water quality program. A detailed agenda is developed in advance of each visit with the appropriate state/tribe and EPA regional participants. All of the guidance and methods documents and supporting materials are supplied to the participants in advance of each review.

Purpose of program evaluation

The 3 day evaluation is intended to gather baseline information about the state or tribal monitoring and assessment and WQS programs. It includes an assessment of the technical approaches and how each is used to support and water quality management programs and assess their outcomes. As a result, recommendations for enhancements dealing with the design, methodology, and execution of the monitoring and assessment and WQS programs are made to the state or tribe. An important goal is for the state or tribe to produce credible data as a basis for making informed decisions regarding the ecological condition of the aquatic resources based on the development and implementation of a TALU-based process.

Attendance at the program review

Managers and staff who can speak to the operation and management of the WQS, reporting and listing (305b/303d integrated report and listings, TMDL development and implementation), watershed planning, nonpoint source assessment and management, dredge and fill (CWA 404/401), and NPDES permitting programs are asked to participate. The evaluation process consists of direct interactions with the respective program management and staff to evaluate the status of their bioassessment, monitoring and assessment, and WQS programs and to describe how each is presently used to support water quality management.

Basis for program evaluation

Since 2000, EPA has been developing and implementing a process for incorporating tiered aquatic life uses (TALUs) and numeric biocriteria in state and tribal monitoring and assessment and WQS programs. Successfully implementing a TALU-based approach is directly dependent on the rigor, comprehensiveness, and integration of the monitoring and assessment and WQS programs. TALUs play a key role in determining not only the WQS that are applied in a given management scenario, but also in determining the extent and severity of impaired waters through the application of numeric biocriteria via adequate monitoring and assessment. Hence, the development and implementation of TALUs may alter prior determinations and actions that were based on general uses and less than adequate monitoring and assessment.

An important task for each state and tribe and EPA in general will be to manage the transition to a TALU-based approach to water quality management while fulfilling programmatic obligations that are already in place. This is especially true in states with TMDL consent decrees in which the present determination of impaired waters was based on WQS consisting of general or non-TALU use designations and less rigorous biological assessments or stand alone chemical monitoring and indicators. Nevertheless, EPA believes that the long term benefits of developing and implementing TALU-based WQS and monitoring and assessment will result in more accurate decisions about impaired waters and better water quality management programs in general.

Overview and summary of the state's or tribe's programs

To put the evaluation into perspective, a summary of the current program is prepared that addresses aspects of; (1) the state or tribal surface water monitoring and assessment program, (2) the structure of the existing WQS (emphasizing designated aquatic life uses), (3) the development of bioassessment tools (indicators, assemblages, indices, models), (4) how biological data is presently used to delineate impaired waters, determine associated stressor effects, and foster the integration of WQS and monitoring and assessment, and, (5) the relationship of biological data to other chemical/physical data and indicators and water quality management program uses of this information including regulatory (e.g., NPDES permits) and other management applications (e.g., TMDLs, watershed management). This summary includes appropriate references to the state or tribal regulations and administrative codes and a description of the structure and content of aquatic life designated uses. If applicable, the structure and content of state or tribal biological criteria are also described as are any provisions relating to the use of ambient monitoring and assessment data and results. It also includes a description of any guidance or similar documentation for conducting use attainability analyses if applicable. Any aspects of the WQS that deal with data quality objectives including references to standard operating procedures are also described.

Bioassessment program evaluation

The technical components of the bioassessment program are reviewed and evaluated as part of the critical elements process. An evaluation of the 13 technical elements is completed using a standardized checklist (Appendix Table 1) and scoring methodology of which the results are reported as part of the technical memorandum. This is accomplished by proceeding through the critical elements checklist with the state or tribal technical staff and in accordance with the methodology (Barbour and Yoder 2007). The process attempts to reach a consensus among all participants about the score awarded to each technical element by finding which level of rigor description best fits the current program. It is important here to exclude developmental activities that have not been fully implemented, but also recognize how these will advance the program in the technical memorandum. The evaluation yields a raw score that is converted to a percentage, which is then used to derive the overall level of rigor of the state or tribal program based on established scoring ranges. The percent score is the quantitative output of the evaluation process and serves as a score for making comparisons between different points in time based on subsequent evaluations. As such the critical elements process can serve as a monitoring and progress documentation tool for the states and tribes and EPA.

Recommendations

A summary of recommendations for elevating the level of rigor by each of the 13 critical technical elements is provided in the technical memorandum. The overall review process is aimed at the ultimate goal of the state or tribe adopting a TALU-based approach to monitoring and assessment and WQS (including numeric biocriteria) based on the development and maintenance of a level 4 bioassessment program (U.S. EPA 2005; Barbour and Yoder 2007). Many states have ongoing developmental activities that will directly affect some or all of the critical elements. Based on information garnered from the state and tribal review process these are described about how each will eventually change the critical element score. This is where the critical elements process serves as a tool for predicting and monitoring state and tribal progress. It also serves as a place to highlight where such developmental activities are needed to fill gaps in the existing program.

Results

Critical technical elements reviews of 14 states and one tribe were conducted between January 2004 and July 2007. Generally these were accomplished as part of the same 3-day review of the overall monitoring and assessment and WQS programs that was described in "Methods" section.

Table 2 Critical technical elements review results and specific recommendations for elevating scores to the highest level of rigor for an individual state

Element	Comment
Element 1: Index period Maximum score = 4.5 Score assigned = 3.0	The score of 3.0 reflects a varied adherence to a seasonal index period. Logistical bottlenecks seem to be the principal reason for deviations that can extend into the following spring of each year. Elevating the score for this element will require a strict adherence to the prescribed index period.
Element 2: Spatial coverage Maximum score = 4.5 Score assigned = 3.0	The current score of 3.0 conservatively reflects the synoptic design and spatial density of sampling sites that is currently employed. Elevating the current score to the maximum of 4.5 will require increased spatial density within watershed assessment units particularly going beyond the "pour point" as the primary sampling site on a particular river or stream.
Element 3: Natural classification Maximum score = 5.0 Score assigned = 3.5	The CE score of 3.5 should be elevated to 5.0 with the developments that are already underway including the addition of new regional reference sites and the fuller inclusion of the other bioregions.
Element 4: Criteria for reference sites Maximum score = 5.0 Score assigned = 4.5	As the criteria (site-scoring process) for reference site screening is refined, the CE score of 4.5 should improve to 5.0 as it is being employed in the selection of new regional reference sites.
Element 5: Reference conditions Maximum score = 4.0 Score assigned = 3.0	The CE score of 3.0 should improve to 4.0 with the additional regional reference sites that are being established as part of the ongoing improvements described for elements 3 and 4.
Element 6: Taxonomic resolution Maximum score = 5.0 Score assigned = 4.5	The CE score of 4.5 reflects the full development of the macro-invertebrate assemblage and the in progress development of second and third assemblages. Reaching the CE score of 5.0 is contingent on the full development and use of a second assemblage.
Element 7: Sample collection Maximum score = 5.0 Score assigned = 4.5	The CE score of 4.5 reflects the full development of the macro-invertebrate assemblage (i.e., for one bioregion only) and the in-progress development of a second and third assemblage. Reaching the CE score of 5.0 is contingent on the full development and use of a second assemblage and for all applicable bioregions.
Element 8: Sample processing Maximum score = 5.0 Score assigned = 4.5	The CE score of 4.5 reflects the full development of the macroinvertebrate assemblage for a single bioregion and the in-progress development of the other bioregions and a second and third assemblage. Reaching the CE score of 5.0 is contingent on the full development and use of a second assemblage.
Element 9: Data management Maximum score = 5.0 Score assigned = 4.0	The CE score of 4.0 can be improved to 5.0 once the current data management system includes all data (i.e., habitat and fish) and is readily accessible.
Element 10: Ecological attributes Maximum score = 4.5 Score assigned = 3.0	The CE score of 3.0 should increase with the development of the macroinvertebrate index for all bioregions. A descriptive analysis of the biological condition gradient (BCG) for each representative bioregion and application of these concepts to the full development of the biological indicators and assemblages will improve the score to 4.5.
Element 11: Biological endpoints & thresholds Maximum score = 4.0 Score assigned = 2.5	The CE score of 2.5 will be increased to at least 3.0 with the full development of the macroinvertebrate index and the derivation of appropriately detailed numeric biocriteria. Achieving a score of 4.0 will require that this also be accomplished for a second biological assemblage.

Table 2 (continued)

Element	Comment
Element 12: Diagnostic capability Maximum score = 4.0 Score assigned = 2.5	The comparatively low CE score of 2.5 is a common characteristic of bioassessment programs that are in development and/or which have singularly been focused on status assessments. Improving the score for this element will occur as a result of addressing preceding elements 2, 3, 6, 10, and 11 and gaining a familiarity with how diagnostic capacity is developed. This will require some dedication to exploratory analyses in which the response of the biological assemblages is evaluated along the stressor axis of the BCG.
Element 13: Professional review Maximum score = 4.5 Score assigned = 2.5	The CE score of 2.5 can be elevated to 4.5 by instituting a more formal peer review process and also by publishing some of the ongoing developments in peer reviewed journals.

All of 14 states and one tribe were visited at least once between 2004 and 2007 with six being visited on multiple occasions. The review process was initiated in 2002 for pilot testing in EPA Region V and included all six of the states in that region (MBI 2004). For those states that were reviewed more than once, the most recent CE evaluation results are reported here. The other states and one tribe were evaluated either as part of a similar regional process, in response to direct requests by a state, tribe, or the EPA regional office. As such, the collection of reviewed states and single tribe does not represent a random sample, but it does include a geographical representation of the Midwestern, Eastern, and Western U.S. One general observation that we can make is that the specific technical and management issues faced by each state and tribe is strongly influenced by specific regional issues and phenomena.

Supporting documentation that is reviewed about these programs includes the state or tribal monitoring strategy, technical procedures, technical reports, and WQS, and these are utilized prior to, during, and following each review. A technical memorandum is then produced within 10–15 weeks by a two person review team and provided to the state or tribe and the EPA regional staff for review and comment. A summary of the critical technical elements review results of a single state appears in Table 2.

The results of the 14 case example reviews indicate that nine states and one tribe function at a technical rigor consistent with a level 2 program (Fig. 2; identities are anonymous). Of the remaining states two are consistent with level 4, two are at level 3, and one at level 1. There were no strong geographic or jurisdictional patterns evident in the results. One observation that we made during these evaluations is that the higher level programs have their monitoring and assessment and WQS programs either functionally or administratively merged. In the case of the two level 4 states, the WQS and monitoring and assessment programs were overseen by the same senior level manager.

A frequency plot of the scores for each of the 13 technical elements reveals a wide range of results among the states particularly in the design and interpretation elements (Fig. 3). The median and upper quartile (75th percentile) scores were the

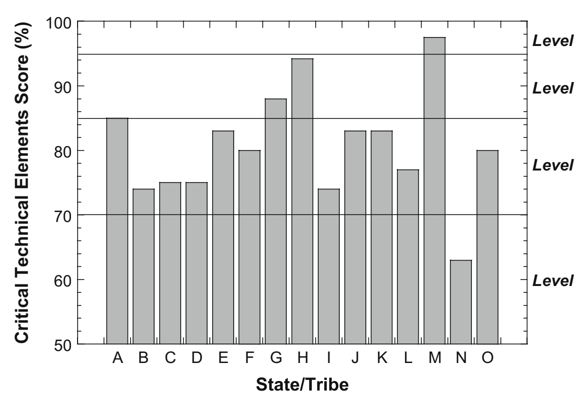

Fig. 2 Results of the most recent critical technical elements reviews of 14 state and one tribal bioassessment program conducted between January 2004 and July 2007. The results are expressed as a percentile of the total possible score and indexed to the four levels of rigor

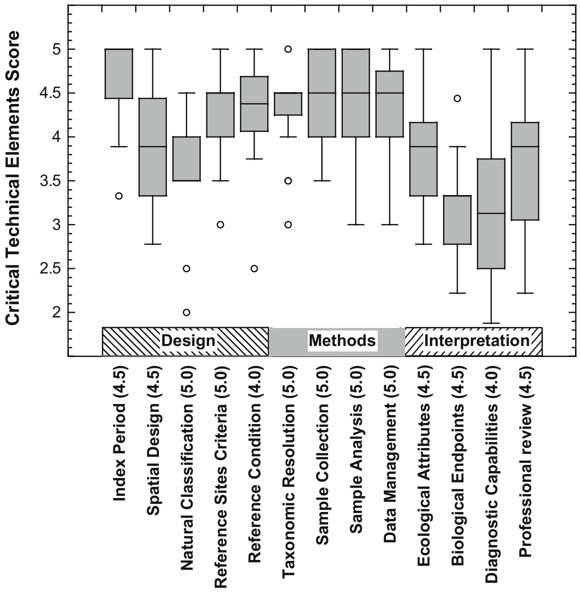

Fig. 3 Box-and-whisker plot of the range of scores assigned to 14 states and one tribe for each of 13 critical technical elements listed on the *x*-axis (maximum score for each element is indicated) and further aggregated by the three functional categories (design, methods, or interpretation) that each element occupies. The scores for each element are pro-rated to yield equivalent scores for comparison purposes

highest for the methods elements and the index period element and lowest for the interpretation elements, especially for the biological endpoints and diagnostic capacity elements. These results are not surprising given that a program would be the most developed for methods first and then followed by the design and interpretation elements. The latter is a good example of the dependency of the interpretation elements on having the methods and design elements addressed and in place. Diagnostic capacity used here means the ability to determine categorical stressors based on the "signatures" of response found in the biological data (Simon 2003). While some working examples of applying such tools exist (Eagleson et al. 1990; Yoder and Rankin 1998; Riva-Murray et al. 2002; Yoder and DeShon 2003) and are the basis of this element there is scant recognition or use of these principles in most state and tribal programs. The differential responses to categories of stressors (i.e., toxicity, habitat, nutrient enrichment, low D.O., etc.) are best exhibited at the most refined levels of taxonomy (e.g., genus/species for macroinvertebrates) and observation (e.g., anomalies on fish) and by monitoring programs that result in the development of long term databases that include sufficiently detailed gradients of stressors and biological responses across sufficiently detailed spatial and temporal scales. This directly depends on the technical elements dealing with spatial sampling design and coverage, sampling methods, level of taxonomy, ecological attributes, biological endpoints and thresholds, and data management. Better development of diagnostic capacity is dependent on these other basic elements and it ultimately affects how effectively biological assessments are used in supporting water quality management. As such, the interdependency and order of the critical technical elements is amply demonstrated in the diagnostic capacity of a bioassessment program.

Discussion

The review and evaluation of the 14 state and single tribe bioassessment programs reveals that most are in various stages of development towards the type of program that is envisioned by U.S. EPA (2005). Achieving and maintaining a level 4 program is the desired status for states and tribes to have the capacity for employing tiered aquatic life uses (TALU) and numeric biocriteria in support of water quality management programs at relevant spatial and temporal scales. Given that standard, the state/tribal program review and critical elements process indicates that most have significant tasks to accomplish. It is encouraging to note that most have developmental programs underway that if sustained and completed should result in elevated program rigor in the next 5–10 years. Most are using their present bioassessment capabilities to accomplish doable tasks such as initial status assessments and making waterbody specific assessments. This illustrates that it is possible to accomplish a reasonable use of bioassessment as the program is being developed. Key to success, however, is in recognizing the inherent limitations of the current program and the types of decisions that may need to be deferred until the program rigor is improved.

The process and requirements for achieving a TALU-based approach to monitoring and assessment and WQS was recently described by U.S. EPA (2005). The critical technical elements review described herein is a critical part of that process by providing a baseline status assessment of a state or tribal bioassessment program that can be used to ascertain current status and support developmental efforts (Barbour and Yoder 2007). The feedback provided by the evaluation process and as memorialized in specific recommendations (e.g., Table 2) made via a technical memorandum can be used to develop a detailed plan for attaining a level 4 program. Once a sufficient technical infrastructure is in place the development of TALU-based WQS can proceed culminating in more refined tools, criteria, and broader support for all relevant water quality management programs. While the attainment of a level 4 bioassessment program does not guarantee similar improvements in WQS and other management programs, there is thus far a co-occurrence of attaining level 4 and also having numeric biocriteria and TALU codified in the state WQS.

Our experience gained during these evaluations indicates that while no two states are exactly alike, the challenges facing each in the improvement of their bioassessment programs are largely of a similar origin. While resource constraints in terms of personnel and funding are an in common theme in each state, we believe that how Clean Water Act management programs have been implemented and managed is an equally important and largely unrecognized factor. It consists of how individual programs have been independently developed by different EPA offices that collectively shape state priorities and which are almost exclusively measured by their administrative *outputs.* Ideally, the effectiveness or "success" of a water quality management program would be based on measures of the environmental *outcomes* that are produced by the aggregate of program activities i.e., *outputs.* In fact this is one of the most important and fundamental roles of ambient monitoring and assessment. However, successfully measuring environmental outcomes requires that sufficient indicators be developed that accurately represent not only the attributes and quality of the resource that is affected by these programs, but that also link back to the stressors that these programs are attempting to manage. However, what we find most frequently is that the "success" of these management programs is wholly based on *outputs,* i.e., what each program produces as measured by the administrative activities within a particular management program. For example, within the permits program the programmatic outputs are measured by the number and types of permits, their rate of issuance and renewal, parameters included, backlogs eliminated, compliance rates, and similar measures. Using environmental outcomes would entail conducting ambient monitoring and assessment before and after the issuance of a permit to determine the extent of any changes in the affected water body. However, this is seldom accomplished in a formal sense as the permit program was designed to be measured by outputs, with outcomes being an assumed by-product of the outputs driven process. This has been well documented by a number of government reviews (e.g., GAO 2003) and is illustrated in Fig. 4 by the administrative outputs based column in which the operational results of each management program are used to judge its effectiveness. What we and others (U.S. EPA 1995a, b; NRC 2001; Karr and Yoder 2004) are proposing is that the improved monitoring and assessment and refined WQS of a TALU-based approach be more fully employed to support an environmental

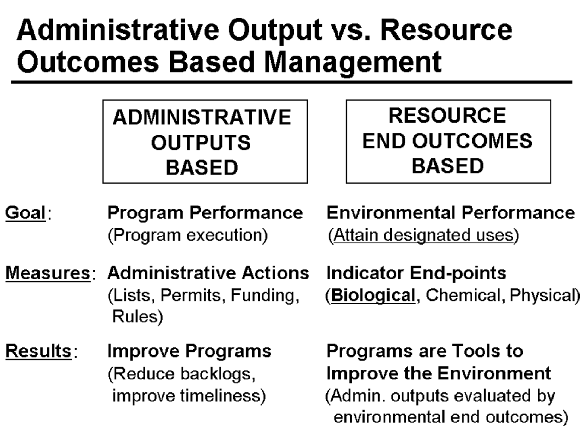

Fig. 4 The key goals, measures, and results of an administrative outputs based approach compared to an environmental outcomes-based approach to the management of state and tribal water quality management programs

outcomes based approach (Fig. 4, right column) in which the outputs of the management programs and their effectiveness are ultimately judged by the environmental outcomes that each produces. Under the administrative outputs approach, the character and quality of watersheds are simply the sum of the programs that affect them (Courtemanch 2007). This potentially results in a sub-optimization of watershed quality, especially if the programs are driven by incomplete information, inaccurate delineations of quality, failing to target limiting stressors, and the use of inaccurate standards and criteria, the latter of which can result from a reliance on general uses and univariate WQS. The opportunity to gain new insights from the feedback that a sufficiently rigorous assessment of the environmental indicator responses is oftentimes missed because the outputs are not dependent on such monitoring and assessment information. A TALU-based approach ensures that such information is available in time to affect the planning and permitting that is accomplished early on in the management process, thus providing a higher likelihood that positive outcomes will be produced. Hence, there is a natural sequence of information that drives the process towards an outcomes based approach.

A TALU-based approach delivers support at the front end of the management process by assuring that WQS are both appropriate and attainable prior to their use in developing abatement strategies and responses and it ensures that management efforts are targeting the places of greatest need and value. The essential and mostly missing ingredients are adequate monitoring and assessment that produces the types of data and waterbody specific assessments by which outcome assessments are made possible. The problem is that in most states neither the monitoring and assessment nor WQS programs are of a sufficient rigor to deliver these types of data, indicators, and criteria on a more widespread and day-to-day basis. However, examples of this do exist and are once again exemplified in the two level 4 state programs; these programs are described in more detail in U.S. EPA (2005).

The critical technical elements and the monitoring and assessment and WQS program evaluation process of which it is a part is a good start on getting states and tribes to the point where their management programs can be developed, managed, and evaluated by true environmental outcomes and at the same scale at which management is being applied. At present this is an evolving area of practice and policy within EPA, but several states are taking steps to follow the guidance in U.S. EPA (2005) to achieve the better use of bioassessments through a TALU-based approach to water quality management.

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Refining State Water Quality Monitoring Programs and Aquatic Life Uses: Evaluation of the Minnesota PCA Bioassessment Program

MBI Technical Memorandum 2015-1-1

Refining State Water Quality Monitoring Programs and Aquatic Life Uses: Evaluation of the Minnesota PCA Bioassessment Program

January 16, 2015

MBI Technical Memorandum MBI/2015-1-1

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Foreword

This report is the product of research conducted by the Midwest Biodiversity Institute (MBI), Center for Applied Bioassessment and Biocriteria (CABB) that is focused on State biological assessment programs and their continuing development. As such the conclusions and statements herein are the product of MBI research and that presented in this report may not necessarily reflect the policies or views of the Minnesota Pollution Control Agency (MPCA) past or present. The state program review process developed by U.S. EPA (2013) was used to evaluate technical aspects of the MPCA bioassessment program for rivers and streams using the critical technical elements evaluation process. This follow-up review was done to determine the level of rigor of the current program and to identify progress made by MPCA since 2002 towards attaining Level 4 status in support of the adoption, development, and eventual implementation of tiered aquatic life uses (TALUs) and biocriteria. However, this analysis does not obligate MPCA to adopting such an approach. It may or may not have implications for other parts of Minnesota programs that focus on other beneficial uses.

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EXECUTIVE SUMMARY

U.S. EPA, Region V has been working with state programs to systematically evaluate their biological assessment, monitoring and assessment, and water quality standards programs since 2002. A primary objective is to determine at what level of rigor, as described by U.S. EPA (2013), these programs operate and to determine how each supports water quality management decision-making. The goal is to improve the level of rigor such that each state provides for water body assessments, 303[d] and 305[b] reporting, tiered aquatic life uses (TALU), biological criteria, determining levels of impairment, and associated causes with a TALU based program[1]. This report is focused on the Minnesota Pollution Control Agency (MPCA) biological assessment program. It links to previous efforts to evaluate the MPCA program and aquatic life designated uses in the Minnesota Water Quality Standards (WQS; MBI 2004, 2010). Four critical technical elements evaluations of the MPCA bioassessment program for rivers and streams have been conducted since 2002. A critical technical element is a specific component that pertains to how biological data is collected, interpreted, and used to support biological assessment (U.S. EPA 2013). Recommendations accompanied each of the 2002, 2006, and 2012 reviews and included what was needed in the way of technical changes to elevate the score of each critical element that was below the maximum. Since the 2006 review MPCA has been engaged in a process to make technical improvements, and amass resources and organization to implement a TALU based approach for the assessment and protection of rivers and streams.

The December 2014 critical elements (CE) evaluation was the fourth for the MPCA program since 2002. The 2014 MPCA critical elements evaluation yielded a raw score of 50.5 which at 97.1% of the maximum possible score of 52 represents a Level 4 program (range 49-52). It shows a continuous improvement from the original CE score of 72.1% (Level 2) in 2002, 81.7% (Level 2+) in 2006, and 92.2% (Level 3+) in 2012. These technical improvements were achieved as a direct result of MPCA deciding to pursue the development of numeric biocriteria and TALUs. It also demonstrates that attaining a Level 4 program status and having full TALU program support are *mutually inclusive.* The technical gaps that were identified in the MPCA program in the series of critical elements evaluations spanning nearly 15 years have been successfully addressed such that MPCA now has the technical capacity to support the adoption and implementation of a TALU based approach.

Of the three elements that did not attain the maximum CE score of 4.0, all scored 3.5 and are sufficient to support TALU implementation. However, as the TALU based approach is implemented we expect that at least two elements, Stressor Associations (Element 12) and Professional Review (Element 13) will improve since active efforts to further develop each are underway. Increasing the Spatial Coverage (Element 2) score may also occur as follow-up assessments are conducted to fill gaps in the current spatial coverages as part of the assignment of TALU tiers to individual stream and river reaches.

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[1] The "TALU based approach" includes tiered aquatic life uses (TALU) based on numeric biological criteria and implementation via an adequate monitoring and assessment program that includes biological, chemical, and physical measures, parameters, indicators and a process for stressor identification.

TECHNICAL MEMORANDUM

Evaluation of the Minnesota PCA Bioassessment Program

January 16, 2015

Purpose

U.S. EPA, Region V has been working with state programs to systematically evaluate their biological assessment and water quality monitoring programs to support tiered aquatic life uses (TALUs) and biological criteria since 2002. A primary objective is to determine at what level of rigor, as defined by U.S. EPA (2013), these programs operate and to determine how each supports water quality management decision-making. The overarching goal is to improve the level of rigor such that each state provides for water body assessments, 303[d] and 305[b] reporting, refined aquatic life uses, developing biological criteria, determining degrees of impairment, and associated causes with a TALU based program. This process has been used since 2002 to evaluate the MPCA technical program and to make recommendations for enhancements relative to design, methodology, and execution for credible data for making informed decisions regarding the condition of Minnesota rivers and streams. This included a detailed description of a TALU framework for MPCA to follow in establishing a TALU based approach (MBI 2012).

Attendance

The December 16, 2014 review was the fourth in a 15 year period and it took place at MPCA in St. Paul, MN. Participants included 6 MPCA staff and managers in person and an additional 1 MPCA manager via Live Meeting. The list of participants follows:

Name	Representing	Email
Attending In Person		
Will Bouchard	EAO-WAS-WQS Unit	will.bouchard@state.mn.us
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Attending via Live Meeting		
Scott Niemela	EA&O-SWMS-North Biol. Mon. Unit	scott.niemela@mn.state.us

Basis for Evaluation

U.S. EPA has supported the development of state and tribal bioassessment programs via the production of methods documents, case studies, regional workshops, and evaluations of individual state and tribal programs since 1990. Since 2000, EPA has convened and maintained a developmental and implementation process for incorporating tiered aquatic life uses (TALUs) and numeric biocriteria in state and tribal water quality programs (U.S. EPA 2005). The development and implementation of TALUs is dependent on the rigor, comprehensiveness, and integration of the bioassessment program as an integral component of the monitoring and assessment (M&A) and water quality standards (WQS) programs. The quality and make-up of these programs ultimately determines the quality and accuracy of the outputs of the primary Clean Water Act management programs such as NPDES permitting, TMDLs, nonpoint source management (319), and watershed planning. A TALU based approach plays a key role in determining not only the WQS that are applied in a given management scenario, but also in determining the extent and severity of impaired waters through the application of numeric biocriteria via adequate M&A (Yoder 1998; Yoder and Rankin 1998). Hence the development and implementation of TALUs may alter prior determinations and actions that were based on general uses and less than adequate M&A.

MPCA Bioassessment Program Evaluation

Given the importance that is placed on the MPCA biological assessment program and the intentions to adopt TALU based biological criteria (MPCA 2014), an updated critical elements evaluation was requested by MPCA. The following is a description of the development of the biological program and current status based on the results of the series of critical elements evaluations performed since 2002.

Bioassessment Program Description: Streams and Rivers

Since the early 1990s, MPCA has utilized the Index of Biotic Integrity (IBI) and biocriteria concepts in its stream and river monitoring and assessment program. Narrative language within Minnesota Administrative Rule identifies an IBI calculation as the primary determinant for evaluating impairment of aquatic biota (Chapter 7050.0150, Subp. 6, Impairment of biological community and aquatic habitat). Adoption of the IBIs and biocriteria concepts into rule followed the Minnesota administrative process and were upheld on appeal (Minnesota Pollution Control Agency 1993 a,b,c; 2002a,b,c; U.S. EPA 1995, 2003).

Between 1993 and 2002, MPCA developed fish and macroinvertebrate IBIs for streams in specific ecoregions and major basins of Minnesota, and used them conduct aquatic life use assessments. IBIs were developed for rivers and streams with the Minnesota River Basin (Bailey et al. 1993), the Lake Agassiz Plain Ecoregion of the Red River Basin (Niemela et al. 1999), the St. Croix River Basin (Niemela and Feist 2000; Chirhart 2003), and the Upper Mississippi River Basin (Niemela and Feist 2002; Genet and Chirhart 2004). However, nearly half of Minnesota's streams and rivers were not covered by these existing IBIs.

Beginning in 2007, MPCA began using a 10-year, rotating watershed approach for comprehensive monitoring and assessment of Minnesota's waters. MPCA has used indices of biological integrity and chemical measures together to assess the integrity of streams since the mid-1990s. However, existing IBIs were insufficient to support the statewide monitoring and assessment effort. For example, no biological assessment tools had been developed for the many miles of streams within the Rainy River and Lake Superior Basins, the Lower Mississippi River Basin, and the Red River Basin outside of the Lake Agassiz Plain Ecoregion. Furthermore, existing IBIs had not been developed concurrently, and varied somewhat in terms of their analytical approaches, classification frameworks, scoring systems, and taxa attributes. To support comprehensive monitoring and assessment of Minnesota's streams, it was necessary to develop new indicators applicable to the entire state of Minnesota, using a consistent, standardized approach.

Development of the most recent F-IBI (MPCA 2013a) and M-IBI (MPCA 2013b) utilized a protocol developed by researchers from the United States Environmental Protection Agency and elsewhere (Whittier et al. 2007). For fish, Minnesota streams and rivers were first partitioned into nine distinct classes, and a unique F-IBI was developed for each. For macroinvertebrates, Minnesota's streams and rivers were first partitioned into nine distinct classes, and a unique M-IBI was developed for each. Within each stream class, biological metrics were sequentially ranked and eliminated by a series of tests, and selected for inclusion in each IBI. Among the most important tests was an evaluation of the ability of each metric to distinguish most-disturbed sites from least-disturbed sites.

Critical Elements Evaluation: Streams and Rivers

The CE process scores 13 elements about the technical aspects of the bioassessment program awarding scores from 1 to 4 (in 0.5 increments), with a 4 being the maximum score possible for an element. The element scores are summed to obtain the CE raw score which is normalized to a percentage score. Four levels of rigor are recognized and are further described in U.S. EPA (2013). The implied goal for any state program is to achieve Level 4 although states can operate a program at a lesser level of rigor. The data we have collected via 24 state program reviews clearly indicates that a Level 4 program is commensurate with having tiered aquatic life uses (TALU) and biocriteria in the state WQS (U.S. EPA 2013). The remaining three levels of bioassessment rigor may be appropriate for some, but not all of the TALU development and water quality management support needs of state programs. Delineating the extent and severity of aquatic life impairments and diagnosing categorical and parameter-specific stressors are the primary tasks for a TALU-based approach to monitoring and assessment that is intended to support multiple water quality management programs. A narrative summary of each critical element is indicated on a CE checklist which also communicates the rationale for each CE score. A second table summarizing recommendations for specific critical elements developmental tasks is also provided to support the development of a continuous improvement process.

MPCA Critical Elements Summary: Rivers and Streams

The December 2014 critical elements (CE) evaluation was the fourth for the MPCA program since 2002. The 2014 MPCA critical elements evaluation yielded a raw score of 50.5 which at

Table 1. Performance of the Minnesota PCA state bioassessment program scored by the critical elements process for lotic ecotypes over a 12 year time frame based on joint scoring with the state during program reviews in 2002 and 2006 and in 2012 as a result of the dedicated TALU developmental process. The 2014 scoring is based on a fourth review conducted December 16, 2014.

Critical Technical Element	2002	2006	2012	2014
1. Index Period	3.5	4.0	4.0	4.0
2. Spatial Coverage	2.5	3.0	3.5	3.5
3. Nat. Classification	2.5	2.5	3.0	4.0
4. Ref. Sites Criteria	3.5	3.5	3.5	4.0
5. Ref. Condition	3.0	3.0	4.0	4.0
6. Taxonomic Resolution	3.0	4.0	4.0	4.0
7. Sample Collection	3.5	4.0	4.0	4.0
8. Sample Processing	4.0	4.0	4.0	4.0
9. Data Management	3.0	4.0	4.0	4.0
10. Ecol. Attributes	3.0	3.0	3.5	4.0
11. Biol. Endpoints	2.0	2.5	3.5	4.0
12. Diagnostic Cap.	2.0	2.0	2.5	3.5
13. Professional Review	2.0	3.0	3.5	3.5
CE Raw Score [52 is max.] **CE % Score** **CE Level**	37.5 **72.1%** **L2**	42.5 **81.7%** **L2+**	47.0 **92.2%** **L3+**	50.5 **97.1%** **L4**

Table 2. A checklist for evaluating the degree of development for each technical element of a bioassessment program and associated comments on the elements for the Minnesota PCA lotic ecosystems bioassessment program. The point scale for each element ranges from lowest to highest resolution. Scores based on a Dec. 2014 evaluation are yellow shaded; green shading is CE score circa 2012 (if different).

Element 1	(Lowest) 1.0	1.5 2.0	2.5 3.0	3.5 4.0 (Highest)	Comments
Index Period [DESIGN]	Collection times are variable throughout the year, and sampling is performed without regard to seasonal influences.	An index period is conceptually recognized, but sampling may take place outside of this period for convenience or to match existing programs; sampling outside of the index is not adjusted for seasonal influences.	A well-documented seasonal index period(s) is calibrated with data for reference conditions, but sampling may take place outside of this period for convenience or to match existing programs; sampling outside of the index is adjusted for seasonal influences. Index periods are selected based on known ecology to minimize natural variability, maximize gear efficiency, and maximize the information gained about the assemblage.	Same as Level 3, but administrative needs and index periods fully reconciled. Scientific basis of temporal sampling influences management decision framework.	MPCA employs a standardized seasonal index period; mid-June – September 30 for fish and August-September for macro-invertebrates; no impetus to operate outside this period for management program support. **Points** **4.0**

Element 2	(Lowest) 1.0	1.5 2.0	2.5 3.0	3.5 4.0 (Highest)	Comments
Spatial Coverage [DESIGN]	An individual site is used for assessment of watershed condition; simple upstream/ downstream and fixed station designs prevail; assessments at local scale.	Multiple sites are used for watershed assessment; spatial coverage only for questions of general status or locally specific problem areas; synoptic (non-random) design at coarse scale (e.g., 8-digit HUC common); spatial extrapolation is based on "rules of thumb"; may be supplemented by simple upstream/downstream assessments.	Spatial network suitable for status assessments; statewide spatial design using rotating basins with single purpose design at coarse scale (e.g., 8 digit HUC); may be supplemented by occasional intensive surveys.	Comprehensive spatial network suitable for reliable watershed assessments in support of multiple water quality management programs at more detailed scale (e.g., 11-14 digit HUC); statewide rotating basin approach or similar scheme to complete statewide monitoring in a specified period of time; multiple spatial designs appropriate for multiple issues.	Rotating basin approach at 8-digit HUC level within which watershed scale assessments (12-14 digit HUC) are performed by sampling at "pour" points and selected watershed scale sites with follow-up surveys to resolve specific issues and stressor i.d. in a second year. Long-term reference sites established at fixed locations. Large rivers are treated as distinct assessment units. Statewide probabilistic network per level II ecoregions. **Points** **3.5**

Table 2. (continued)

Element 3	(Lowest) 1.0	1.5 2.0	2.5 3.0	3.5 4.0 (Highest)	Comments
Natural Variability [DESIGN]	No partitioning of natural variability in aquatic ecosystems. Minimal classification limited to individual watersheds or basins with generalized stratification on a regional basis; does not incorporate differences in stream characteristics such as size, gradient.	Classification recognizes one stratum, usually a geographical or other similar organization such as fishery based cold or warmwater, and is applied statewide; lacks other intra-regional strata such as watershed size, gradient, elevation, temperature, etc.	Classification is based on a combination of landscape features and physical habitat structure (inter-regional); achieves highest level of classification possible by considering all relevant intra-regional strata and subcategories of specific stream types.	Fully partitioned and stratified classification scheme based on a true regional approach that transcends jurisdictional (i.e., State) boundaries to strengthen inter-regional classification and recognizes zoogeographical aspects of assemblages.	Fully partitioned framework is developed for all lotic warmwater and cold water ecotypes and stream/river sizes including head-water, wadeable, and low gradient streams and boatable rivers. **Points** **4.0**

Element 4	(Lowest) 1.0	1.5 2.0	2.5 3.0	3.5 4.0 (Highest)	Comments
Reference Sites Selection [DESIGN]	No criteria, except informal BPJ selection of control sites. May be little documentation and supporting rationale.	Based on "best biology", i.e., BPJ on what the best biology is in the best waterbody; minimal non-biological data used.	Non-biological criteria supported by narrative descriptors only; combine BPJ with narrative description of land use and site characteristics; may use chemical and physical data thresholds as primary filters.	Quantitative descriptors used to support non-biological criteria; characteristics of sites are such that the best biological organization expected to be supported; chemical and physical characteristics of sites used only as secondary and tertiary filters to avoid circularity in other criteria.	Reference site criteria primarily consider abiotic indicators including land use of up-stream catchment, proportion of modified habitats, proximity to point sources, condition of stream channel, immediate land use, condition of upstream riparian corridor, buffer width; chemistry and habitat may be used as secondary filters. **Points** **4.0**

Table 2. (continued)

Element 5	(Lowest) 1.0	1.5	2.0	2.5 3.0 3.5	4.0 (Highest)	Comments
Reference Conditions [DESIGN]	No reference condition; presence and absence of key taxa or best professional judgment rather than established reference conditions may constitute the basis for assessment.	Reference condition based on biology of a 'best' site or waterbody; a site-specific control or paired watershed approach may be used for assessment; regional reference sites lacking.	Reference conditions based on site-specific data, but are used in watershed scale assessments; regional reference sites are conceptually recognized, but are too few in number and/or spatial density to support the derivation of biocriteria.	Applicable regional reference conditions are established within the applicable waterbody ecotypes and aquatic resource classes; consist of multiple sites that either represent reference or are along the BCG in such a manner to allow extrapolation of expected conditions for assessing and monitoring within waterbody ecotype. Re-sampling of reference sites done systematically over a period of years.	Regional reference conditions are defined by a consistent and quantitative process that is applied statewide and within the different strata of lotic ecotypes.	**Points** **4.0**

Element 6	(Lowest) 1.0	1.5	2.0	2.5 3.0 3.5	4.0 (Highest)	Comments
Taxa & Taxonomic Resolution [METHODS]	Gross observation of biota; single assemblage only; very low taxonomic resolution (e.g., order/family level for macro-invertebrates.; family for fish by non-biologists).	Single assemblage (usually macroinvertebrates); low taxonomic resolution (e.g., family level) by experienced biologists.	Single assemblage with high taxonomic resolution (e.g., "lowest practical" i.e., genus/species); if multiple assemblages, others are lower resolution or infrequently used.	Two or more assemblages with high taxonomic resolution (e.g., "lowest practical" i.e., genus/species); capacity to use each assemblage concurrently is maintained; practitioners are certified in accordance with available offerings (e.g., NABS, state credible data provisions).	For macroinvertebrates, POET taxa identified to species with remaining taxa identified to genus level including Chironomidae; fish to species; NABS certification required for macroinvertebrate taxonomists (as specified by contract).	**Points** **4.0**

Table 2. (continued)

Element 7	(Lowest) 1.0	1.5 / 2.0	2.5 / 3.0	3.5 / 4.0 (Highest)	Comments
Sample Collection [METHODS]	Approach is cursory and relies on operator skill and BPJ, producing highly variable and less comparable results; Training limited to that which is conducted annually for non-biologists who compose the majority of the sampling crew. Documentation of methods more as an overview.	Textbook methods are used rather than in-house development of detail of SOPs to specify methods; a QA/QC document may have been prepared; training consists of short courses (1-2 days) and is provided for new staff and periodically for all staff.	Methods are evaluated and refined (if needed) for State purposes; detailed and well documented; SOPs are updated periodically and supported by in-house testing and development; a formal QA/QC program is in place with field replication taken; rigorous training is for all professional staff, regardless of skill mix to raise skill levels and enhance interaction and consistency.	Same as Level 3, but methods cover multiple assemblages.	Program documentation, QA/QC, and SOPs are in place; field methods are tested and validated; in-house training and orientation for all field staff. **Points** **4.0**

Element 8	(Lowest) 1.0	1.5 / 2.0	2.5 / 3.0	3.5 / 4.0 (Highest)	Comments
Sample Processing [METHODS]	Biological samples are processed in the field using visual guides; sorting and identification are dependent on operator skill and effort.	Organisms are identified and enumerated primarily in the field prohibiting ample QC but done by trained staff; for fish cursory examination of presence and absence only; no in-house development of SOPs.	Laboratory processing of all samples (except for fish); A formal QA/QC program is in place; rigorous training is provided; vouchering of organisms done for ID verification.	Same as Level 3, but is applicable to multiple assemblages; subsampling level tested. Notations made on fish as to diseased, erosion, lesion, tumors.	Program documentation, QA/QC, and SOPs are in place; macroinvertebrates sorted and i.d. by external lab; fish i.d. in field by qualified staff; vouchers retained; DELT anomalies recorded. **Points** **4.0**

Table 2. (continued)

Element 9	(Lowest) 1.0 1.5	2.0 2.5	3.0 3.5	4.0 (Highest)	Comments
Data Management [METHODS]	Sampling event data organized in a series of spreadsheets e.g., (by year, by data-type, etc); QC cursory and mostly for transcription errors.	Separate quasi-databases for physical-chemical and biological data (Excel, Access, dBase, etc) with separate GIS shape files of monitoring stations; data-handling methods manuals available; QC for data entry, value ranges, and site locations.	True relational database containing biological and sampled site info (Oracle, etc); fully documented and implemented data QAPP; structure allows for data export and analysis and biocriteria development; includes dedicated database management.	Relational database of bioassessment data (including indices and biocriteria) with real-time connection to spatial data coverage showing monitored sites in relation to other relevant spatial data layers (population density; impervious surfaces; vegetation coverage, low-flight photos, nutrient concentrations, ecoregion, etc); fully documented and implemented data QAPP; data available from multiple assemblages to enable integrated analysis.	True relational database containing biological, chemical, physical habitat and sampled site information; data available from multiple assemblages to enable integrated analysis; external data access tool allowing public viewing of biological data and associated spatial location coverage. **Points** **4.0**

Element 10	(Lowest) 1.0 1.5	2.0 2.5	3.0 3.5	4.0 (Highest)	Comments
Ecological Attributes [INTERPRETATION]	Linkage to the BCG or adherence to the basic ecological attributes as a foundation is lacking; simple measures of presence/absence.	Only inferences can be made for a few of the comparatively simple ecological attributes, e.g., sensitive/tolerant taxa of a ubiquitous nature; single dimension measures used.	Ecological attributes used as a foundation for bioassessment, but may not be fully developed, or may be lacking. BCG incorporated into conceptual underpinnings.	The ecological attributes of the BCG form the conceptual foundation; level of rigor represents or extends to all underpinnings of the ecological attributes.	A formal BCG process was used for fish and macroinvertebrate assemblages and across all warmwater and cold water lotic ecotypes and bioregions. Bioassessment is fully incorporated into the waterbody assessment process. **Points** **4.0**

Table 2. (continued)

Element 11	(Lowest) 1.0 1.5	2.0 2.5	3.0 3.5	4.0 (Highest)	Comments
Discriminatory Capacity [INTERPRETATION]	Assessment may be based only on presence or absence of targeted or key species; (Some citizen monitoring groups use this level); attainment thresholds not specified; this approach may be sufficient for Coarse problem identification. Coarse method (low signal) and detects only high and low values.	A biological index or endpoint is established for specific water bodies, but is likely not calibrated to waterbody classes or statewide application; index is probably relevant only to a single assemblage; presence/absence based on all taxa; BPJ thresholds based on single dimension attributes. Limited to pass/fail determinations of attainment status that does not reflect incremental measurement along the BCG.	A biological index, or model, has been developed and calibrated for use throughout the State or region for the various classes of a given waterbody type; the index is relevant to a single assemblage; attainment thresholds are based on discriminant model or distribution of candidate reference sites, or some means of quantifying reference condition. Can distinguish 3-4 increments along the BCG; supports narrative evaluations based on multimetric or multivariate analysis that are relevant to the BCG.	Biological index(es), or model(s) for multiple assemblages is (are) developed and calibrated for use throughout the State or region and corresponds to the BCG; integrated assessments using the multiple assemblages are possible, thus improving both the assessment and diagnostic aspects of the process; multiple parameters for evaluation, based on integrated data calibrated to regional reference condition. Able to detect status (integrated signal) on a continuous scale along the BCG; power to detect at least 5-6 categories of condition.	Fish IBI and macroinvertebrate IBI development followed conventional process and latest procedural techniques; initially used to determine status using a single threshold for CWA goal attainment – TALUs being incorporated now; new indices are evaluated for ability to discriminate along BCG, can distinguish 5-6 categories of condition. Impairment decisions now based on TALUs. **Points** **4.0**

Element 12	(Lowest) 1.0 1.5	2.0 2.5	3.0 3.5	4.0 (Highest)	Comments
Stressor Associations [INTERPRETATION]	Diagnostic capability lacking.	Coarse indications of response via assemblage attributes at gross level, i.e., general indicator groups (e.g., EPT taxa); Supporting analysis across spatial and temporal scales limited.	More detailed development of indicator guilds and other aggregations to distinguish and support causal associations; usually involves refined taxonomy (at least genus level); supported by analysis of larger datasets and/or extensive case studies; patterns repeatable across different sources; developed for a single assemblage only.	Response patterns are most fully developed and supported by organized and extensive research and case studies across spatial and temporal scales; results are actively used in biological assessment and in assigning associated causes and sources for program support purposes; involves refined taxonomy; accomplished for two assemblage groups.	Formal development of diagnostic tools is underway; the database is sufficient to support detailed explora-tory analyses; development of biological response signatures is underway. **Points** **3.5**

Table 2. (continued)

Element 13	(Lowest) 1.0	1.5 / 2.0	2.5 / 3.0	3.5 / 4.0 (Highest)	Comments
Professional Review [INTERPRETATION]	Review limited to editorial aspects.	Internal scientific review only, Outside review for objectivity left for higher levels.	Outside review of documentation and reports conducted. However, selection of peer review can be subjective.	Formal process for technical review to include multiple reference and documented system for reconciliation of comments and issues. Process results in methods and reporting improvements. Can include peer-reviewed journal publications.	Review process includes informal review by outside sources; TALU development process is incorporating a formal external stakeholder process and we expect the new indices and BCG will result in peer reviewed publications. **Points** **3.5**

CE Score = 50.5
CE % = 97.1%
Level = Level 4

Level 4: >94.2%
Level 3+: 91.2-94.1%
Level 3: 85.8-91.1%
Level 3-: 82.7-85.7%
Level 2+: 79.6-82.6%
Level 2: 65.4-79.5%
Level 1: <65.3%

97.1% of the maximum possible score of 52 represents a Level 4 program (range 49-52). It shows a continuous improvement from the original CE score of 72.1% (Level 2) in 2002, 81.7% (Level 2+) in 2006, and 92.2% (Level 3+) in 2012. These technical improvements were achieved as a direct result of MPCA deciding to pursue the development of numeric biocriteria and TALUs. It also demonstrates that attaining a Level 4 program status and having full TALU program support are *mutually inclusive.* The technical gaps that were identified in the MPCA program in the series of critical elements evaluations spanning nearly 15 years have been successfully addressed such that MPCA now has the technical capacity to support the adoption and implementation of a TALU based approach.

Of the three elements that did not attain the maximum CE score of 4.0, all scored 3.5 and are sufficient to support TALU implementation. However, as the TALU based approach is implemented we expect that at least two elements, Stressor Associations (Element 12) and Professional Review (Element 13) will improve since active efforts to further develop each are underway. Increasing the Spatial Coverage (Element 2) score may also occur as follow-up assessments are conducted to fill gaps in the current spatial coverages as part of the assignment of TALU tiers to individual stream and river reaches.

TALU Development for Minnesota Rivers and Streams

The MPCA streams and rivers bioassessment program now operates at Level 4. This achievement is the result of a dedicated developmental process that included addressing the technical improvements needed to elevate the CE score, developmental projects to support a WQS rulemaking to include TALUs and biocriteria in the Minnesota WQS, and an implementation framework to direct the implementation and maintenance of a TALU based program. The latter consisted of a TALU development project beginning in 2008 to determine the key steps and attributes of a process for implementing TALU and biocriteria as part of the MPCA water quality regulatory and management programs. The framework and rationale outlined in this framework document (MBI 2012) was based, in part, on the TALU and biocriteria developmental experiences of other TALU states and guidance and methods documents that were produced by U.S. EPA. The process outlined in the TALU framework document (MBI 2012) is a collection of existing “best practices” in the development and implementation of state-based TALU frameworks. In addition, draft language for the Minnesota Water Quality Standards (WQS) was recommended to support a TALU rulemaking process that will take place in 2015.

Numeric biocriteria for Minnesota streams and rivers were developed using a multiple lines of evidence approach which relied most heavily on reference condition and the Biological Condition Gradient (BCG). Both were used in a complimentary manner to set numeric biocriteria. A biocriteria development support document (MPCA 2014) details the approach and how it was used to develop Exceptional, General, and Modified Use biocriteria for each class of Minnesota streams and rivers. Detailed descriptions of the bioassessment and TALU components related to the development of the numeric biocriteria include biological assessment guidance (MPCA 2012a), the stream and river classification scheme (MPCA 2013a,b), a human disturbance score (HDS; MPCA 2013c), and a Biological Condition Gradient (BCG) for Minnesota streams and rivers Gerritsen et al. 2012). This body of work represents the necessary preparation for positioning MPCA to conduct a rulemaking to incorporate TALUs and biocriteria into the Minnesota WQS and follow that with program implementation and maintenance.

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Appendix A: Key Characteristics of TALU Based Programs

A common observation made during nearly 12 years of conducting these types of reviews is that some states have focused exclusively on monitoring designs that support 305[b] reporting and 303[d] listing as a singular output. This contrasts with the states that meet the 305[b]/303[d] objectives, but which also provide day-to-day support for the mainstream CWA management programs such as WQS, NPDES permitting, TMDLs, NPS planning and implementation, 404/401 dredge and fill, compliance/enforcement, and any other program where surface water quality and aquatic life goals are at issue. These latter examples demonstrate that it is possible to do both, i.e., meet the 305[b]/303[d] obligations under the CWA *and* provide "value added" functions for CWA and non-CWA programs alike. Key to achieving the latter is the spatial design of the monitoring networks that are employed. This factor alone can determine whether a state M&A program becomes limited to 305[b]/303[d] or meets the broader goal of full CWA program support which is further buttressed by adherence to a TALU based approach.

The EPA critical technical elements process (U.S. EPA 2013) was used to evaluate the technical capabilities and needs of the MPCA biological assessment program and to identify logical next steps for overall program development. It is a fundamental tenet that attaining full TALU program support and implementation and attaining a Level 4 program status are mutually inclusive. Understanding the characteristics and programmatic capacity of a Level 4 program is therefore important. Appendix Table 1 describes these key program capabilities and outputs that are characteristic of Level 4 programs that in turn provide support to water quality management programs via a TALU based approach. These key program capabilities are:

1. Establish protective guidelines (e.g., refined designated uses) and thresholds (biological criteria) in the WQS to protect existing conditions and support continued improvements; and,
2. Integrate the determination of response (biological) and causal variables (water quality, habitat, etc.) as a matter of routine in producing assessments.

The integration of the monitoring program into the overall WQ program and development of a routine stressor identification process should be an integrated effort within the development of the biological assessment program. This way, as the technical rigor of a program is strengthened, the state can successively use the monitoring and assessment data to address increasingly complex issues. Furthermore, this practice is incorporated as an integral part of the assessment methodology and also accomplishing it in a reasonable time frame. A key attribute of these programs is to provide a cause or causes for all observed biological impairments to not only better support CWA 303[d] listing and Total Maximum Daily Load (TMDL) development, but all aspects of WQS, permitting, and assessment in general. This is an inherent outcome of a well-integrated monitoring and assessment program that routinely provides the right types of paired stressor/response data (U.S EPA 2013).

Appendix Table 1. Key program capabilities and outputs that are characteristic of a Level 4 state program that in turn provides support for a TALU based program.

Key Program Capabilities:

1. Establish protective guidelines (e.g., refined designated uses) and thresholds (biological criteria) in WQS to protect existing conditions and support improvements.
2. Integrate monitoring of response (biological) and causal variables (water quality, habitat, etc.).

Programmatic Output	Explanation
ALUs in WQS are sufficiently detailed to express differences in natural classification strata and levels of protection above CWA minimum thresholds.	Narrative descriptions of ALU classes and attendant numeric biological criteria incorporate elements of natural classification strata and are consistent with underlying distinctions of aquatic ecotypes and levels of restoration and protection including the minimum for CWA goal attainment and attainable levels of protection for higher levels of biological quality. Able to effectively deal with use attainability issues for impairments caused by legacy impacts.
Monitoring and assessment program is designed and conducted to support multiple WQM program objectives and includes multiple biological, chemical, and physical indicators and parameters that are used within defined roles as indicators of response, exposure, and stress.	Monitoring and assessment is integrated into the overall management of surface WQ beyond the determination of general condition or status. Spatial design is sufficient to detect and characterize both chemical and non-chemical pollution gradients at an appropriate scale and to support the assignment of ALUs to individual water bodies. Results are expressed to support multiple program uses including reporting, WQS attainment, and watershed, reach, and site-specific support (i.e., permit effectiveness, investigations, watershed planning, use attainability analysis [UAA] etc.).
Methods and tools are developed for stressor identification and are implemented as part of M&A program. Information is used to support multiple WQM program needs.	Empirical relationships between biological measures and chemical/physical parameters and indicators are well developed, providing a reasonable prediction of biological attainment. Information supports statewide and regional development and refinement of WQ and other criteria as well as moving the findings of biological impairment beyond generic listings (e.g., 4c category) by supporting stressor identification implicit in the M&A process.