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STATE OF MINNESOTA
POLLUTION CONTROL AGENCY

18 SR 2195

IN THE MATTER OF THE PROPOSED REVISIONS TO THE RULES GOVERNING THE CLASSIFICATION AND STANDARDS FOR WATERS OF THE STATE, MINNESOTA RULES CHAPTER 7050

STATEMENT OF NEED AND REASONABLENESS

April 27, 1993

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TABLE OF CONTENTS

I. INTRODUCTION

A. Minnesota Rules Chapter 7050

Minnesota Rules Chapter 7050 are the rules of the Minnesota Pollution Control Agency (hereinafter "Agency" or "MPCA") that establish water quality standards and the beneficial use classifications for all the waters of the state. These rules define the water quality standards for all water bodies consistent with the goals of the federal Clean Water Act to provide fishable and swimmable waters wherever attainable. The standards in general include narrative requirements such as nondegradation, mixing zone requirements, and general provisions applicable to all dischargers or to all waters of the state. Specific numerical water quality standards* are established to protect aquatic life and recreation, and other beneficial uses as well, such as water for drinking, industrial and agricultural uses. The numerical standards provide a measuring stick against which the Agency can assess the quality of the state's waters, determine the need for treatment or clean-up programs, measure the success of ongoing pollution abatement programs, and help establish priorities when planning for pollution control needs. Also, standards are the basis for effluent limitations in some permits.

Chapter 7050 also defines the levels of wastewater treatment that are applicable to industrial and municipal point source dischargers. Secondary treatment and federal technology-based minimum treatment requirements are generally required, although more advanced water quality based effluent limitations may be required if the technology-based effluent limitations are not adequate to maintain water quality standards.

*The term "standards" is used both in a broad sense to refer to all of Chapter 7050, and in a strict sense to refer to pollutant-specific numerical standards. The words "numerical standards" will be used when standards has the latter meaning, unless the meaning is clear from the context.

B. Scope of the Proposed Revisions

1. The major subjects of this hearing are the proposed revisions of Chapter 7050 as follows:

    a. Add water quality standards specifically for wetlands under parts 7050.0110; 7050.0130, items D and F; 7050.0185, subparts 1 and 9; 7050.0186; 7050.0210, subpart 13a; 7050.0222, subpart 6; 7050.0223, subpart 5; 7050.0224, subpart 4; 7050.0225; 7050.0410; 7050.0425; and 7050.0430. The proposed language will address the unique characteristics of wetlands.

b. Expand biological-criteria narrative and standards under parts 7050.0150; 7050.0200, subparts 3 and 8; and 7050.0222, subparts 2 to 7. The proposed language will be used to develop a biological criteria value from reference conditions that can be used to evaluate biological integrity through assessment.

c. Add an exemption to point source discharge requirements under part 7050.0212, subpart 2a, for return flows from dredge disposal facilities. The proposed exemption will allow return water from short-term dredge projects to be treated through best management practices (BMPs), best practicable technology (BPTs) and special site-specific conditions established under a State Disposal System permit.

d. Add eight new aquatic life standards for toxics under part 7050.0222, subparts 2 to 4. Standards are proposed for Alachlor, Antimony, Atrazine, Cobalt, Iron, Manganese, Naphthalene, and Thallium.

e. Update nine current aquatic life standards for toxics under part 7050.0222, subparts 2 to 4. The toxics standards proposed to be updated are for Arsenic, Benzene, Bromoform, Endosulfan, Fluoranthene, Hexachlorobenzene, Nickel, Pentachlorophenol, and Vinyl Chloride.

2. The minor subjects of this hearing are the proposed revisions of Chapter 7050 as follows:

   a. Clarify the language for natural water quality under part 7050.0170.

   b. Add one scientific and natural area called Falls Creek, in Washington County, as an Outstanding Resource Value Water under part 7050.0180, subpart 4.

   c. Add calcareous fens identified by the Minnesota Department of Natural Resources as Outstanding Resource Value Waters under part 7050.0180, subpart 6b.

   d. Revise the fen names under part 7050.0180, subpart 6b, to correspond to the names established by the Minnesota Department of Natural Resources.

   e. Add the location information (county, township, range and section) to the fens listed under part 7050.0180, subpart 6b.

   f. Add the term "specific pollutants or whole effluent toxicity" under the general standard for "water quality based effluent limitations," part 7050.0210, subpart 9.

   g. Change the requirement for discharges from feedlots that are not regulated by federal requirements from a five-day biochemical oxygen demand standard to a feedlot pollution rating under part 7050.0215, subpart 2.

h. Clarify the definition for "acute toxicity" under part 7050.0218, subpart 3, item B.

i. Add the words "or effluent" under the definition for "chronic criterion," part 7050.0218, subpart 3, item H.

j. Add a definition for "percent effluent" under part 7050.0218, subpart 3, item Z.

k. Add a definition for "toxic unit" under part 7050.0218, subpart 3, item EE.

l. Clarify the definition of "whole effluent toxicity test" under part 7050.0218, subpart 3, item HH.

m. Add the words "and narrative" under part 7050.0220, subpart 1.

n. Add tables under part 7050.0220 that summarize how the narrative and numerical standards for associated water use classifications, and provide updated drinking water standards.

o. Update the references to the federal drinking water standards and incorporate certain federal standards by reference to the Code of Federal Regulations under part 7050.0221, subparts 2 to 5.

p. Update reference to the Minnesota Department of Natural Resources Commissioner's Order under part 7050.0420 for trout waters and list all designated trout streams and trout lakes under part 7050.0470.

q. Classify additional waters identified as public drinking water supply sources by the Minnesota Department of Health as Class 1C under part 7050.0470.

r. Include or modify exclusionary references to certain waters listed in part 7050.0470 which are currently or which were designated trout streams identified by Minnesota Department of Natural Resources Commissioner's Order.

s. Make new entries and revise existing entries under part 7050.0470 to correspond with changes proposed under part 7050.0180.

t. Add the county name to the fen entries under part 7050.0470.

u. Change the class designation under part 7050.0470 for waters requested to be reclassified by persons outside the Agency and recommended by staff.

v. Change the class designation for fens listed under part 7050.0470 from Class 2B to Class 2D to correspond to Class 2D proposed under part 7050.0222, subpart 7, item C.

w. Make miscellaneous changes throughout the chapter to correct cross references and spelling, modify the structure of the rule to improve the readability of the language and make subpart and item number and letter changes to accommodate the proposed language.

C. Introduction of Proposed Wetland Water Quality Standards and Biological Criteria

The proposed wetland water quality standards and biological criteria require a more in-depth introduction.

1. Wetland Water Quality Standards.

There are many types of wetlands, just as there are a wide variety of types of lakes and rivers. Names associated with moving water include rivers, streams, creeks, brooks, and rills and those associated with standing water include lakes, ponds, reservoirs, and pools. In the same way, there are numerous names associated with wetlands, including marshes, fens, swamps, bogs, sloughs, and mires. Each of the different water resources has its own set of values, functions, and uses but all have a place in the fabric of the environment. These resources are treated with equal protection for their designated uses under the federal Clean Water Act and the Ch. 7050 Water Quality Standards.

Shallow seasonal wetlands are not more or less valuable in the landscape than deep open water wetlands, but their designated uses are as different as streams are different than rivers or lakes. It is recognized that damming a stream to form a ponded reservoir causes significant changes in the habitat, the hydrology and water quality downstream, and the plants and animals utilizing the resource.

In the same way, wetlands deserve careful consideration before they are converted to other types of wetlands or removed from the landscape altogether. Water resources are not isolated from each other or from the ecosystem. Wetland uses such as nutrient uptake, storm water storage, erosion control, low flow augmentation, wildlife habitat, and ground water recharge, are extremely valuable even in remote wetlands only distantly connected to the other resources in the watershed. And wetland removal will have reverberations throughout the fabric of the landscape. The poor water quality of the Minnesota River can be directly tied to the loss of small, seemingly insignificant, upland and riparian wetlands that cumulatively served the functions noted above. One major component of the restoration of the Minnesota River will be to restore the hydrologic and treatment capabilities lost with the reduction in wetlands. Exhibits W1 and W2.

Wetlands are "waters of the United States" and "waters of the State", just like lakes and rivers. "Waters of the State" are defined under Minnesota Statutes, section 115.01, subdivision 9, to mean:

"all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof."

The Agency's authority to protect waters of the state from pollution originated in 1967 with the establishment of the Agency. Pollutant and pollution are defined under Minnesota Statutes section 115.01, subdivisions 8, 9, 12, 13, and 17 as follows:

Subd. 8. "'Industrial waste' means any liquid, gaseous or solid waste substance resulting from any process of industry, manufacturing trade or business or from the development of any natural resource."

Subd. 9. " 'Other wastes' mean garbage, municipal refuse, decayed wood, sawdust, shavings, bark, lime, sand, ashes, offal, oil, tar, chemicals, dredged spoils, solid waste, incinerator residue, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, cellar dirt or municipal or agricultural waste, and all other substances not included within the definitions of sewage and industrial waste set forth in this chapter which may pollute or tend to pollute the waters of the state."

Subd. 12. " 'Pollutant' means any 'sewage', 'industrial waste', or 'other waste', as defined in this chapter, discharged into a disposal system or to waters of the state.

Subd. 13. " 'Pollution of water', 'water pollution', or 'pollute the water' means : (a) the discharge of any pollutant into any waters of the state or the contamination of any waters of the state so as to create a nuisance or render such waters unclean, or noxious, or impure so as to be actually or potentially harmful or detrimental or injurious to public health, safety or welfare, to domestic, agricultural, commercial, industrial, recreational or other legitimate uses, or to livestock, animals, birds, fish or other aquatic life; or (b) the alteration made or induced by human activity of the chemical, physical, biological, or radiological integrity of waters of the state."

> Subd. 17. "'Sewage' means the water-carried waste products from residences, public buildings, institutions or other buildings, or any mobile source, including the excrementitious of other discharge from the bodies of human beings or animals, together with such ground water infiltration and surface water as may be present.

The 1972 amendments to the Federal Water Pollution Control Act (now called the Clean Water Act, CWA) created the National Pollutant Discharge Elimination System (NPDES) program for point source discharges and CWA section 401 Water Quality Certifications. Exhibit W50. The Agency is the designated state agency for administrating these programs and issuing corresponding permits and certifications.

Significant adverse impacts to wetlands result in degraded water quality, both in the wetland and downstream. Exhibits W29 and W19. These impacts to water quality must be replaced to balance the loss of designated uses. Exhibit W30.

The U.S. Fish and Wildlife publication Circular 39 separates freshwater wetlands into eight types. Exhibit W31. These types range widely in characteristics. Some have saturated soils for only a few weeks a year while others are flooded all year. Some wetlands are treeless, containing only grasses and/or shrubs, while others are completely forested. Thus each wetland type provides its own individual set of characteristics, values, and uses, yet all wetlands, to some extent, provide the attributes described below.

To understand why wetlands provide these values, it is important to explain how wetlands enhance water quality. Filtering of pollutants by wetlands is an important function and benefit of wetlands. Exhibits W32, W33, W34 and W35. These pollutants are often buried by newer plant material, isolating them in the sediments.

The trapping of nutrients by wetlands also helps reduce excess plant growth in lakes and rivers. The main nutrients of concern are phosphorus and nitrogen. Exhibit W29. Common sources of nutrients in run-off are urban storm water, cultivated fields, and feedlots. Exhibit W1. If a lake becomes polluted because of excess nutrients or sediments, lake restoration must be undertaken. Most lake restoration methods are very costly, and this cost is usually borne by the public. Thus the value of upland wetlands that capture nutrients can be significant.

Sediments are trapped in wetlands in several ways. Exhibit W36. When the narrow channel of a stream widens into a wetland, water velocity slows. This allows the sediments time to drop out and settle in the wetland. This also occurs along the riparian border of a stream, which capture erosional sediments before they can get to the stream. Exhibit W37. When wetlands decrease stream velocity, downstream bank scouring is also diminished. This further decreases the sediment in the stream and enhances the water quality. These downstream water quality enhancements are an important public benefit provided by wetlands. Exhibits W38 and W39.

Also important are the losses in designated use from the cumulative loss of wetlands. Exhibits W40, W41 and W42. The Code of Federal Regulation 40 CFR 1508.7 defines a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Exhibits W43 and W45. Any one wetland loss may not significantly impair downstream water quality, but the cumulative impact from the loss of many wetlands in a basin may be large. Exhibit W44. The Minnesota River Basin has degraded water quality, partially as a result of the cumulative loss of wetlands in the basin. Exhibits W1 and W2. Also, one consideration before a Clean Water Act Section 401 Water Quality Certification can be issued by the Agency is cumulative impacts. Another type of potential cumulative impact to wetlands is the loss of variety of the natural wetland types that commonly exists in the landscape. Different wetland types provide a range of designated uses. If many of the wetlands in a watershed were to be converted to a single type, such as a shallow water marsh, many of the wide range of uses that were present in the watershed would be lost, even if the net acres remained relatively constant.

The concept of nondegradation of Minnesota's water resources is an integral part of the Water Quality Standards. Two of the major themes of the federal Clean Water Act are: 1) all waters of the nation are to be assigned uses and those uses must be protected (Section 303(c)(2)(A)), and 2) the water resources of the nation must be protected from degradation to either maintain or improve the water quality of the nation (Section 101(a)(2)). The nondegradation language in the water quality standards is designed to protect the existing uses of the waters of the state. Waters are protected from point source discharges by setting effluent limits which are designed to ensure designated uses are maintained.

In a parallel way, the designated uses of the state's wetlands are protected from significant adverse impacts to the designated uses by requiring a mitigative process before wetlands are physically altered. This process of wetlands replacing wetlands to maintain the overall wetland resource is called "no-net-loss". State Executive Order 91-3 orders that "(a)ll responsible departments and agencies of the State of Minnesota shall operate to the fullest extent of their authority under the strict concept of 'NO-NET-LOSS' of wetlands of the state in regard to projects under their jurisdiction." Exhibit W26. The concept of "no-net-loss" of wetlands also fits within the federal goal of nondegradation of the nation's water resources (40 CFR 131.12(a)(1)).

The mitigation sequence has been established in 40 CFR Sec. 1508.20, in the State Executive Order 91-3, and in the State Wetland Conservation Act, Exhibit W53, as the approach to evaluate the potential for reasonable alternatives development. The mitigative sequence, in descending order, is as follows: avoid wetland impacts, minimize unavoidance impacts, and mitigate for the remaining impacts to the wetland designated uses.

2. Biological Criteria.

Historically, the evaluation of water quality has primarily been driven by the need to determine compliance under pollution abatement and regulatory programs. This made regulatory agencies rely heavily on water chemistry to evaluate water quality. Even though water chemistry is an important element of the quality of a water resource, it does not directly measure the health of the plant and animal communities that are part of the resource. Therefore, it is an incomplete measure of quality.

A nationwide effort is beginning, under the guidance of U.S. Environmental Protection Agency (EPA), to improve the accuracy of water quality measurement by establishing and utilizing narrative biological criteria. Narrative biological criteria (biocriteria) are general statements that describe the biological integrity of aquatic communities inhabiting waters of a given aquatic life designated use such as Class 2A and 2B. Biological integrity can be defined as the condition of aquatic communities inhabiting natural, unimpaired waterbodies or habitats of a region as measured by their structure and function. These reference conditions provide the benchmark against which other waterbodies or sites can be judged.

At this time, the Agency is proposing to modify the descriptions of the aquatic life use classes and to include a statement indicating the intention to use reference conditions as the benchmark for evaluating the biological condition. The proposal includes a change in the description of the aquatic life use classes to emphasize biological communities as the focus of protection and biological condition determination. An additional aquatic life classification called Class 2D is proposed to address wetlands as a separate habitat type.

D. Solicitation for Comments

To establish an opportunity for public input about the major revision issues to be aired during the development of rule language, the Agency conducted two periods to solicit opinions and comments from persons outside the Agency.

The first solicitation period began on February 25, 1992, and ended on March 31, 1992. A notice announcing this period was published in the <u>State Register</u>. Exhibit G1. The Agency received seven letters and three comments by phone during this period. Exhibit G2.

Much concern was raised about the plan to establish water quality standards specifically for wetlands. A public meeting was held in May 1992 to explain the federal regulations that require the development of wetland water quality standards, explain staff's ideas for language development and discuss the confusion between the Agency's rule revision plans and the rule development work being completed by the Board of Water and Soil Resources.

The second solicitation period began on September 1, 1992, and ended on September 30, 1992. A notice announcing this period was published in the State Register. Exhibit G3. This notice included a list of the issues that staff planned to address with rule revisions. A fact sheet was produced for each issue. Exhibit G7.

Three Agency letters were also sent out during the September solicitation period. The first letter introduced all the revision issues identified by staff and was sent to persons that submitted a comment during the February solicitation period, members of the Board of Water and Soil Resources rule working committee, and persons that attended the May 1992 wetland issues meeting. Exhibits G4a and G4b. The second letter addressed the plan to propose statewide toxic standards for alachlor, atrazine, antimony, cobalt, iron, manganese, naphthalene, and thallium, and was sent to active members of the Toxics Technical Advisory Committee, which was established during the 1990 triennial review for Minn. Rules ch. 7050. Exhibits G5a and G5b. A third letter addressed the reclassification of drinking water sources, identified by the Minnesota Health Department, to Class 1C and was sent to property owners known to draw drinking water from the listed waters. Exhibits G6a and G6b.

The Agency received 18 letters and nine comments by phone during the September solicitation period.

On January 29, 1993, a preliminary draft of revisions to Chapter 7050 was sent to persons in other state agencies that were used as consultants during the development of draft language. The purpose of this advance review was to ensure that policies and rules from other state agencies would not be violated by MPCA's intended changes.

II. STATEMENT OF AGENCY'S STATUTORY AUTHORITY

The Agency's statutory authority to adopt water quality standards and to classify waters of the state is found in Minn. Stat. sec. 115.03 (1992), particularly subdivisions 1(b) and 1(c). Subdivision 1(b) authorizes the Agency to classify waters, while subdivision 1(c) authorizes the Agency to "establish and alter such reasonable pollution standards for any waters of the state in relation to the public use to which they are or may be put as it shall deem necessary for the purposes of this chapter and, with respect to the pollution of the waters of the state, chapter 116."

Additional authority for adopting standards is established under Minn. Stat. sec. 115.44, subds. 2 and 4 (1992). Subdivision 2 authorizes the Agency to "group the designated waters of the state into classes, and adopt classifications and standards of purity and quality." Subdivision 4 authorizes the Agency to "adopt and design standards of quality and purity for each such classification necessary for the public use or benefit contemplated by such classification. Such standards shall prescribe what qualities and properties of water shall indicate a polluted condition of the waters of the state which is actually or potentially deleterious, harmful, detrimental or injurious to the public health, safety or welfare, to terrestrial or aquatic life or to the growth and propagation thereof, or to the use of such waters for domestic, commercial and industrial, agricultural, recreational or other reasonable purposes, with respect to the various classes established..."

III. STATEMENT OF NEED

Minn. Stat. ch. 14 (1992) requires the Agency to make an affirmative presentation of facts establishing the need for and reasonableness of the rules as proposed. In general terms, this means that the Agency must set forth the reasons for its proposal, and the reasons must not be arbitrary or capricious. However, to the extent that need and reasonableness are separate, need has come to mean that a problem exists which requires administrative attention, and reasonableness means that the solution proposed by the Agency is appropriate. The need for the rule amendments is discussed below.

Rule revisions are needed at this time to meet requirements of the federal Clean Water Act (CWA). States are obligated by the Clean Water Act under section 303(c)(1) to review and revise their water quality standards at least once every three years. CWA sec. 303(c)(1) states:

> "The Governor of a State or the State water pollution control agency of such State shall from time to time (but at least once every three years period ...) 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 [U.S. Environmental Protection Agency (EPA)] Administrator."

Under section 303(c)(3) of the Clean Water Act, EPA has final approval of proposed standards. CWA sec. 303(c)(3) states:

> "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 Act, such standard shall thereafter be the water quality standard for the applicable waters of the State. If the Administrator determines that any such revised or new standard is not consistent with the applicable requirements of this Act, 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."

This review and approval process is called the triennial review. The Agency last reviewed its water quality standards in 1990. The current EPA deadline to have standard revisions adopted is September 30, 1993.

The EPA has provided the states with guidance on how to review and amend their water quality standards in the Water Quality Standards Handbook, July, 1990. Exhibit W3. The handbook discusses the states' obligation to review and amend their rules every three years and the federal authority to review and approve the states' standards after they are promulgated. The handbook requires the states to address water quality standards for wetlands and biocriteria during the 1993 review. Additional revisions are needed to address staff concerns that arose from their project work, to include information that has developed since the last revision, to make the rules easier to read by improving the structure and format, and to correct errors. The need for each major rule revision subject is discussed below.

A. Wetland water quality standards.

The EPA has directed that one of the major goals in this triennial review will be to emphasize wetlands protection. To guide the states in revising their Water Quality Standards for this triennium, U.S. EPA supplied National Technical Guidance, Exhibit W3, which require states to include the following:

- Include wetlands in the definition of 'State waters.'
- Designate uses for all wetlands.
- Adopt aesthetic narrative criteria (the 'free froms') and numeric criteria for wetlands.
- Adopt narrative biological criteria for wetlands.
- Apply the State's antidegradation policy* and implementation methods to wetlands."

*"Antidegradation" means the same as "nondegradation". "Nondegradation" in Chapter 7050 was revised during the 1981-1984 triennial review period. The term antidegradation first appeared in Federal regulation on November 8, 1983. The Agency saw no reason to change its terminology.

The Technical Guidance Executive Summary states that "(a)t a minimum, all wetlands must have uses designated that meet the goals of Section 101(a)(2) of the CWA by providing for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water, unless a use attainability analysis (UAA) shows that the Clean Water Act Section 101(a)(2) goals cannot be achieved." The guidance goes on to state that "(t)he Water Quality Standards Regulation (40 CFR 131.11(a)(1)) requires States to adopt criteria sufficient to protect designated uses that may include general statements (narrative) and specific numerical values (i.e. concentrations of contaminants and water quality characteristics)." 40 CFR 131.3 defines designated uses as "those uses specified for water quality standards for each water body or segment whether or not they are being attained." 40 CFR 131.3 defines use attainability analysis as "a structured scientific assessment of the use which may include physical, chemical, biological, and economic factors..."

Once the Agency received the Technical Guidance listing the federal requirements, an internal working group was formed to draft the water quality standards wetland revision. Exhibit W4. The proposed draft was written to clarify the role of wetlands in the standards under existing authority, which is already extensive. The draft document was first presented to a group of state and federal agencies in November, 1991, and then presented to a group of interest groups in May, 1992. Exhibits W6 and W7. There were also two public notice comment periods, in March and September, 1992.

B. Biological criteria.

Narrative biocriteria is needed to make progress toward fulfilling the requirements of the Clean Water Act and to establish a method of measuring water quality by examining biological communities structure and function.

MPCA establishes rules that define the goals for all waterbodies consistent with the federal Clean Water Act. The main objective of the CWA as stated in Section 101(a) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. To achieve the objective, Section 101(a)(2) sets, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water. In furthering both of these goals, the United States Environmental Protection Agency has directed states to adopt narrative biological criteria in EPA guidance dated April 1990. Exhibit B2. EPA considers the adoption of biocriteria into state water quality standards as an indication of intent to formally consider the status of biological communities in states' water quality management programs.

Sections 303 and 304 of the Clean Water Act give specific directives for the development of biological criteria. Section 303(c)(2)(B) requires development of criteria based on biological assessment methods when numerical criteria are not established for toxic pollutants listed pursuant to Section 307(a)(1). Section 304(a) requires EPA to develop water quality criteria, methods, and information for assessing 1) the effects of pollutants on aquatic community components such as fish, shellfish, wildlife, and plant life, 2) the effects of pollutants on biological community diversity, productivity, and stability and 3) the factors that are necessary to restore and maintain the physical, chemical, and biological integrity of all waters. In addition, biological criteria are seen as an aid to states in meeting requirements of the Clean Water Act under Section 305(b), 303(d), 304(l), 314 and 319.

The need to more explicitly address the biological integrity of waterbodies stems from the inadequacy of protecting and assessing biological condition primarily through a chemical approach. Historically, most pollution control programs have attempted to achieve the Clean Water Act goals by focusing regulatory efforts and assessment on the chemical condition of waters. In large part this has occurred because the initial regulatory thrust was to control chemical discharges from point sources. Standards were developed that set chemical specific criteria which are considered protective of aquatic life uses.

Significant improvements in water quality have been made using this chemical criteria approach. However, there are many factors that affect biological integrity which are not addressed by present numeric chemical criteria and chemical monitoring. Chemical toxicity tests have been completed on only a minority of suspected toxicants and laboratory testing cannot take into account all possible toxicity changes that can occur in the receiving water. Significant nutrient loadings typically associated with nonpoint source pollution can impact biological integrity as well by increasing primary production and altering the energy flow through the system, which can change the aquatic community structure. Biological condition can also be impacted by non-chemical factors such as habitat alteration, sedimentation, and hydrologic modifications.

Biological criteria and biological surveys provide a more direct means of assessing aquatic life use attainment. Chemical monitoring is an indirect method for judging biological integrity and is not always an effective tool to evaluate all impairments. The results of a study conducted by Ohio Environmental Protection Agency illustrate this point. The study compared aquatic life use impairment, as determined by an integrated biologically based assessment and by water column chemistry testing. Exhibit B1. The biological survey showed nonattainment to aquatic life uses in 49.8 percent of the 645 stream segments where water column parameters, that had corresponding criteria, indicated no impairment. In large part the causes of impairment were organic enrichment/low dissolved oxygen, habitat modification, or siltation.

If Agency water quality management programs and water quality rules are to further the goals of the Clean Water Act, then the Agency needs to ensure protection of biological communities by establishing biological criteria and assessing against that criteria. The Agency's proposed amendments do not infer that biological criteria are superior to existing criteria but that integrated chemical, physical, and biological tools are needed to assess attainment of designated uses.

The EPA has provided guidance to the states on how to develop biological criteria. Exhibit B2. The guidance outlines a phased process for implementation. The EPA first requires the adoption of narrative biological criteria. At a future date, the use of biological surveys will be required to derive biological criteria for all types of surface waters (rivers and streams, lakes, reservoirs, and wetlands) and designated aquatic life uses. EPA considers the adoption of narrative biological criteria in Chapter 7050 the legal and programmatic basis for using ambient biological assessments in the Agency's water quality management programs. Procedures on initiating narrative biological criteria have also been provided by EPA. Exhibit B3.

C. <u>Exemption for return waters from dredge disposal facilities.</u>

The Agency is proposing an exemption from the secondary effluent limitations for suspended solids and phosphorus for dredge disposal facilities. This exemption is needed to address the unique treatment problems associated with dredge spoils and the history of State Disposal System permit violations at these treatment facilities.

Minnesota has approximately 20 dredge disposal facilities that discharge excess water from dredge holding ponds into the state's waters and are unable to consistently meet water quality permit limitations for total suspended solids and phosphorous. Establishing permit limitations that are not achievable by the permittee sets up permit noncompliance situations that cause many problems for both the Agency and the regulated community. These problems include but are not limited to: penalties for noncompliance, the permittee's vulnerability to citizens lawsuits, the time and expense spent on enforcement actions, permit issuance backlogs and some loss of the Agency's ability to ensure minimization of water quality impacts.

D. Eight new aquatic life standards for toxics.

In 1990 the Agency adopted aquatic life water quality standards for 53 toxic pollutants. Also, a detailed procedure (Parts 7050.0217 and 7050.0218) was added to replace very general guidance on developing site-specific criteria for other pollutants. Since 1990, Agency staff has developed 17 site-specific criteria. The Agency is proposing to adopt eight of these as statewide standards. The eight proposed standards include alachlor, antimony, atrazine, cobalt, iron, manganese, naphthalene, and thallium.

The 17 criteria were developed in response to requests from staff in the Agency's Ground water and Solid Waste, Hazardous Waste, and Water Quality Divisions to protect surface waters threatened by pollution from a variety of sources, and by pollutants for which no numerical standards were available.

The eight criteria were selected for promulgation based on the quality and quantity of the toxicity data supporting the proposed standard and on the number of times the criterion was requested to be used at different locations. Once promulgated as standards these eight criteria can be applied statewide without the need for a time consuming site-specific review. These eight criteria are the ones most likely to be needed in the foreseeable future to help set goals for remedial actions at ground water contamination sites or to set effluent limitations for point source dischargers.

The following is a more detailed discussion of why each of the eight criteria was developed and selected for promulgation.

1. Alachlor and Atrazine.

Criteria for these herbicides were originally developed for the Huntting Elevator Spill Site near Lansing, Minnesota at the request of the Agency's Ground Water and Solid Waste Division. Atrazine is the most widely used herbicide in the U.S. for corn and sorghum production. Exhibit T10. Atrazine has been found as a contaminant in ground water and surface waters in many locations. Exhibits T32 and T34. With the greater emphasis being place on the control of nonpoint source pollution, including agricultural runoff, standards for atrazine and alachlor are needed to help assess the progress of these programs.

2. Antimony, Cobalt, Iron, Manganese and Thallium.

   Criteria for these elements were originally developed to set mine leachate permit limitations for the AMAX-Department of Natural Resources mine near Babbitt, MN.

   Subsequently, the cobalt criterion has been used to set permit limitations for leachate at LTV mining near Birch Lake, evaluate conditions at Eveleth Taconite Mining Co., Eveleth, and assess conditions at two landfill leachate sites and two contaminated ground water sites.

   The iron criterion has been used to assess the potential addition of coal ash leachate to the Red Wing municipal waste water treatment plant, and to assess the quality of landfill leachate at two sites. The manganese criterion has been used to assess leachate at the Flying Cloud, Kluver, and Dakhue sanitary landfills.

   The thallium criterion has been used to evaluate clean up activities at the Twin Cities Army Ammunition Plant (TCAAP) in New Brighton.

   These metals are common pollutants in mine leachate drainage, ash and landfill leachate and at some ground water clean up sites. The availability of statewide standards for these metals will expedite the review of potential pollution situations and the setting of site-specific effluent limitations in the future.

3. Naphthalene.

   This criterion was developed for Harvest States Site, a contaminated grain elevator area, at the request of the Agency's Ground Water and Solid Waste Division. Naphthalene is commonly associated with coal gasification production, petroleum activities, coking facilities and wood treatment processes. The standard is needed to address clean-up activities involving these activities.

   There is little or no evidence for any of the eight proposed standards that their toxicity changes significantly from one location to another. Therefore, site-by-site evaluation of the applicability of the criteria has not resulted in any changes to the original criteria. The same criterion is generally applicable at each new site. Promulgation of statewide standards for these common pollutants will facilitate the protection of Class 2 waters threatened by these pollutants.

E. <u>Update nine current aquatic life standards for toxics.</u>

   When the Agency adopted 53 Class 2 (aquatic life) numerical standards for toxic pollutants in 1990, Agency staff indicated that the standards could be updated as part of each subsequent triennial review of Ch. 7050. Also, part 7050.0218, subpart 1 states that: "the agency may adopt new standards according to Minnesota Statutes, chapter 14, to replace those listed in part 7050.0220 that are more stringent or less stringent if new scientific evidence shows that a change in the standard is justified".

At this time the Agency proposes to update nine standards. All of the standards proposed to be updated are human health-based for Class 2A and 2Bd waters. Six of the proposed Class 2B and 2C standards are human health-based and two are toxicity-based (nickel is both). The discussion in the reasonableness part of this document on the proposed eight new standards provides a brief description of how standards are determined.

These standards are being proposed for change because the reference doses or potency slopes used to calculate the standards in 1990 have changed. Revising these nine standards will bring them up to date with the latest EPA consensus on human health risk as represented by the current reference doses and potency slopes in the Integrated Risk Information System (IRIS), or as recorded in the Health Effects Assessment Summary Tables (HEAST) for 1991. IRIS is current as of September, 1992. Exhibit T54.

IV. STATEMENT OF REASONABLENESS

Section IV describes the Agency's rationale for the proposed changes in the rule. The Agency is required by Minn. Stat. ch. 14 to make an affirmative presentation of facts establishing the reasonableness of the proposed rules. Reasonableness is the opposite of arbitrariness or capriciousness. It means that there is a rational and factual basis for the Agency's proposed action. The reasonableness of the proposed rules is discussed below.

Reasonableness of Individual Rules. The following discussion addresses the specific provisions of the proposed rules.

A. Part 7050.0110 SCOPE.

The Scope has been amended to state that Chapter 7050 applies to the physical alterations of wetlands, as well as point and nonpoint source discharges. This is reasonable because wetlands are waters of the state and waters of the state are protected against pollution from both point source discharges and alterations that can have significant adverse impacts to the designated uses. This clarification is necessary to emphasize that wetlands face both chemical and physical impacts and must be protected against these specific threats. The new language is within the Agency's existing authority (found in Minn. Stat. sec. 115.03, subd. 1, items (a) and (c)) to protect waters of the state from these impacts.

The word "both" has also been proposed to be deleted. This word is no longer appropriate with the language proposed to be added under this part.

B. Part 7050.0130 DEFINITIONS.

The State Revisor of Statutes has directed the Agency to add items A to G under this part to better identify each definition. Items A to C, E and G contain language from the current rules.

1. Item C. Nonpoint source.

   The reference to Minn. Stat. sec. 115.01, subd. 15 is proposed to be changed to subd. 11 because the statute has been recodified.

2. Item D. Physical alterations of wetlands.

   A definition for "physical alteration" is proposed to be added as follows:

   "Physical alteration" means the dredging, filling, draining, or the permanent inundating of a wetland.

   This definition is needed to clarify the narrative standards being proposed for physical alterations of wetlands. The definition is reasonable because, although the Agency must maintain the chemical, physical, and biological integrity of wetlands, the four alterations that are likely to cause a significant adverse impact on the designated uses of wetlands are dredging, filling, draining, and permanent inundation.

   Dredging is defined as the excavation of the wetland bottom. Designated uses that could be adversely impacted or lost through dredging include wildlife habitat, recreation, aesthetics, and biological diversity.

   Filling is defined as any solid material added to or re-suspended in a wetland that would alter its cross-section or hydrological characteristics, obstruct flow patterns, change the wetland boundary, or convert the wetland to a non-wetland. Designated uses that could be adversely impacted or lost through fill activities include low flow augmentation, biological diversity, wildlife habitat, recreation, erosion control, floodwater retention, stream sedimentation reductions, ground water recharge, aesthetics and biological diversity.

   Draining is defined as the lowering of the water table by a method such as ditching, tiling, or lowering the outlet elevation. Another method to drain a wetland is to divert flow around it. Designated uses that could be adversely impacted or lost through draining activities include low flow augmentation, biological diversity, wildlife habitat, recreation, erosion control, floodwater retention, stream sedimentation reductions, ground water recharge, aesthetics and biological diversity.

   Permanent inundating is defined as the raising of the water table by a physical change caused by human activity. Designated uses that could be adversely impacted or lost through permanent inundations include wildlife habitat, recreation, floodwater retention, aesthetics, and biological diversity.

   Seasonal wetlands are accustomed to variations in flow. Draining or permanently inundating a wetland causes a loss of fluctuations, resulting in a decrease of plant and animal diversity and possibility a conversion to another wetland type. Exhibits W19, W20, W21 and W57. The loss of flood storage and erosion control may cause water quality impacts to downstream water bodies.

The 1987 MPCA Statement of Need and Reasonableness (SONAR) discussed the impacts of inundation on wetlands in some length. Exhibit W22. Although the contents were specific to calcareous fens, the point that even small permanent changes in water elevation can have significant adverse impacts to the designated uses of small seasonal wetlands was established.

A Biwabik Minnesota wetland is an example of how inundating can cause the gradual conversion of a bog to a marsh. The city uses a natural bog for final nutrient assimilation. The permanent inundation of the bog, the change in pH, and the introduction of nutrients from the wastewater caused the loss of Tamarack trees and the sphagnum moss that had predominated. In its place, cattails (a typical marsh plant) are growing profusely. Although total wetland acres are preserved, some of the designated uses of the natural bog have been lost.

The definition of "physical alteration" recognizes that filling, dredging, draining, and permanently inundating are the major causes of impacts in wetlands. However, as stated in part 7050.0185, subpart 9, the Agency is limiting application at this time to those activities where formal permitting or certification processes are in place in Chapter 7001. Currently, these are Section 401 Water Quality Certifications, National Pollutant Discharge Elimination System (NPDES) permits, and State Disposal System permits. Additional processes may be proposed in future revisions of this chapter if conditions warrant.

Several questions and statements from the public were received during the Agency's solicitation of outside opinion. The Agency's authority to control physical alterations of wetlands was questioned. Exhibits W13 and W23. Authority to prevent water pollution that includes physical alterations of a water's integrity is clearly contained in Minn. Stat. ch. 115.

3. Item F. Wetlands.

The definition for "wetlands" is proposed as follows:

> "Wetlands are those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Constructed wetlands designed for wastewater treatment are not waters of the state. Wetlands must have the following attributes:
>
> (1) A predominance of hydric soils;
> (2) Inundated or saturated by surface water or ground water at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in a saturated soil condition; and

(3) Under normal circumstances support a prevalence of such vegetation."

The proposed definition is reasonable because it is consistent with both federal law (40 CFR 230.41(a)(1)) and the Wetland Conservation Act. Exhibit W53. Stating that constructed wetlands designed for wastewater treatment are not waters of the state is in accordance with federal regulations. 40 CFR 232.3(q) states that "(w)aste treatment systems, including treatment ponds or lagoons ...are not waters of the United States." Storm water is a type of wastewater. "Constructed wetlands" are designed and created for the primary purpose of treating wastewater. However, when a natural wetland is converted to a wastewater treatment system, which is not a water of the state, there is the potential for significant adverse impacts to wetland designated uses. This conversion must be mitigated.

The Agency received several comments that the Agency definition of wetlands must be consistent with the Wetland Conservation Act. Exhibits W13, W24, and W25; W53. The definition is consistent with the Wetland Conservation Act and the applicable federal regulation noted in the previous paragraph.

C. Part 7050.0150 DETERMINATION OF COMPLIANCE.

The Agency proposes to change the heading of this part from "Determination of Compliance" to "Determination of Water Quality Condition and Compliance." This change is reasonable because the process proposed to be established under part 7050.0150 will determine the quality condition of a water resource as well as compliance. The term "water quality condition" is proposed to be added to this part for the same reason.

The Agency proposes to establish biological integrity as an indicator of water quality and is part of the Agency's effort to establish narrative biocriteria. "Biocriteria" is discussed under section C of part I, Introduction, and the need for biocriteria is explained in more detail in item 3 of part III, Statement of Need, of this document.

The Agency proposes to restate EPA guidance for developing biocriteria under this part by saying that the condition of a surface water is determined by its physical, chemical, and biological qualities. Exhibit B3, page 3. The Agency currently relies mostly on water chemistry to judge a waters support of its designated uses. However, the Agency will increasingly be placing more emphasis on biological information and evaluations of physical habitat along with water chemistry data to make these aquatic life use support evaluations.

Use of biological information for determining support characteristics of a water is not new to the Agency. Biological monitoring for fecal coliform organisms and Chlorophyll a is currently used to determine if a water can support a "swimmable" use. As the Agency develops reference conditions, it will integrate biological information with chemical information to make use support determinations.

The proposed language establishes that the biological quality of a water body will be assessed by comparison to reference conditions which best represent the most natural condition for a given water body type within a geographic region. It is reasonable that the Agency proposes to establish expectations of biological quality based on a reference condition approach because it is not possible to provide specific biological community expectations for the nation or state as a whole.

Biological communities vary considerably in their structure and function from region to region, and in various types of surface waters. It is also difficult to evaluate the biological condition of a site without comparing against a benchmark. Implicit in the definition of biocriteria is the notion of comparison. The reference condition provides the biological community characteristics against which other similar sites can be measured.

The preferred way in which the reference condition for a waterbody or site will be established is from biological information gathered from natural settings that are unimpacted or minimally impacted by physical alteration, development, or discharges. These reference sites will be regionally representative of the the same types of waterbodies or sites in terms of their intrinsic watershed characteristics. Reference sites for a region will be sought where there is natural vegetation, unaltered channel and bed morphometry, and a natural hydrology. In regions where data has not been gathered from reference sites or the area has been extensively degraded, historical records from the region and/or consensus of expert opinion may be alternatively used to determine the reference condition.

The reference condition will be used as one method for assessing designated aquatic life use attainment. If a waterbody or site deviates considerably from the characteristics of the reference condition, then the aquatic life use designation will not be supported from a biological perspective. For purposes of determining the impacts of specific activities or discharges, control sites will also be developed. Control sites may be "upstream" locations, "far field" transects, or paired watersheds that are similar to the site under investigation but without the impact under evaluation. The methods for establishing controls will follow procedures similar to those given in EPA's Rapid Bioassessment Protocols for Use in Streams and Rivers Chapter 8.3. Exhibit B4.

In developing the reference condition for each designated use and waterbody type, the entire aquatic community will not be evaluated. Indicative communities that are considered good indicators of the overall biological condition in specific surface water body types will be used instead. Indicative communities are groups of organisms such as fish, macroinvertebrates, macrophtyes, or algae. Evaluating one or more of these selected communities is seen as being cost effective, practical and provides sufficient information to determine overall biological condition.

In sampling the reference condition, control sites, and/or sites under investigation, consistent sampling methods will be used to determine community characteristics. Habitat structure will also be assessed because interpretation of biological data has to be considered in the context of habitat quality. The characteristics of the indicative communities will be analyzed through reliable measures of community structure and function, which are referred to as metrics. Structural metrics will be chosen that describe the composition of the assemblage such as number of species, number of specific species, composition of tolerant and intolerant species and biological diversity. Functional metrics will consider ecological processes such as community photosynthesis and respiration or proportion of various trophic levels. An example of an index that uses an array of structural and functional metrics is the Index of Biotic Integrity (IBI). Exhibit B5. The IBI is a fish community based index developed for midwestern streams and rivers. The index is comprised of 12 metrics. These metrics evaluate species richness and composition, indicator taxa (tolerant and intolerant), trophic guilds, fish abundance, and external anomalies.

Changes are being proposed to correct the rule citation that references effluent limitations for point source dischargers. The citation will be changed from "part 7050.0211, subpart 1" to "part 7050.0211 or 7050.0212."

This part was written to establish how compliance is determined for all types of point source dischargers. However, part 7050.0211, subpart 1, does not include the limitations for existing trickling filters, pond facilities or discharges of industrial or other wastes. The proposed citation identifies the spectrum of possible point source dischargers and their effluent limitations and, in turn, completes the list of options for considering dilution effects.

D. Part 7050.0170 NATURAL WATER QUALITY.

Part 7050.0170 deals with several important issues regarding natural background concentrations of pollutants. It provides guidance on the application of water quality standards when background concentrations approach or exceed the standards. Also, it provides general guidance on how background concentrations are used when water quality standards become the basis for setting effluent limitations.

The current language in this part is unnecessarily complex and convoluted, making it difficult for the reader to understand and apply it. The Agency proposes to clarify and simplify the wording without changing the meaning of the existing language.

Two minor substantive changes are being proposed as part of the effort to clarify this part. They are the addition of 1) a definition of natural conditions, and 2) references to the nondegradation parts in the current rule. The current language of part 7050.0170 does not define "natural (background) conditions", and a definition is needed to make this part more explicit. Secondly, one of the provisions of part 7050.0170 is in essence a nondegradation statement. The Agency proposes to link this statement to parts 7050.0180 and 7050.0185 so that the existing nondegradation procedures apply to this statement. The intent is to make these changes and simplify the wording without changing the primary meaning of this part.

The current language can be broken out into four separate provisions as follows:

1. Natural background concentrations of pollutants that are below applicable standards will be taken into account when determining allowable loadings from point or nonpoint sources.

2. When natural background concentrations are known and exceed the standard, the background concentrations can be used as the standard.

3. Natural background concentrations below (or better quality than) the standard may be used in lieu of the applicable standard, if the Commissioner can demonstrate the need for protecting the receiving water at its current high quality. This is essentially a nondegradation standard.

4. The adoption of standards will follow the guidance in the rule, but reasonable changes can be made to the standards based on evidence brought forth at a public hearing.

It is proposed to revise the current wording for provisions 1,2 and 3 listed above; no changes are proposed for number 4. The wording of the revised language is intended to preserve these meanings while making part 7050.0170 easier to understand.

The addition of a definition of "natural conditions" will clarify how this term is used in the context of this part. It is proposed to define natural conditions to mean water quality that:

a. is defined by monitoring programs,
b. is relatively unaffected by man-made sources of pollution, both point and nonpoint,
c. is not affected by physical alterations to wetlands, and
d. can be predicted based on data from a similar watershed when data are unavailable for the watershed of interest.

Most of these points are self explanatory. Point "b." will probably require more interpretation than the others. The Agency understands that no surface water in the state is entirely free from anthropogenic pollution. For example, atmospheric deposition of pollutants affects all waters in Minnesota. Careful evaluation will be needed to identify natural conditions affected only by ubiquitous pollution as opposed to natural conditions affected by identifiable local sources.

The provision of part 7050.0170 that allows the Commissioner, when there is sufficient justification, to preserve natural conditions that are better than the water quality standards (number 3 above), is a nondegradation clause. Therefore, the Agency believes it should be tied to existing nondegradation provisions and propose to add the statement: "The reasonable justification must meet the requirements under parts 7050.0180 and 7050.0185." These requirements will provide a process that limits the Commissioner's discretion and uses the same levels of protection, the same social and economic tests, and other nondegradation provisions that are in the nondegradation parts to justify protecting a given water at a higher level.

Neither this addition, nor the addition of the definition of natural conditions are intended to make the rule any more or less stringent than it is now.

E. Part 7050.0180 NONDEGRADATION FOR OUTSTANDING RESOURCE VALUE WATERS.

In 1984, the Agency revised its nondegradation policy in Chapter 7050 to include a special category of waters identified as Outstanding Resource Value Waters (ORVWs). As stated in part 7050.0180, subpart 2, item A, waters assigned the ORVW designation are waters of the state with "high water quality, wilderness characteristics, unique scientific or ecological significance, exceptional recreational value or other special qualities which warrant stringent protection from pollution."

Waters designated as ORVWs are assigned in one of the following protection level categories:

Prohibited Discharges. Waters listed under the prohibited discharges category are afforded the highest level of protection in that no new or expanded discharges are allowed to these waters. Discharges to waters in the prohibited discharges category, in existence at the time a given water is designated as an ORVW is permitted to continue discharging to these waters so long as they remain at or under their National Pollutant Discharge Elimination System (NPDES) permit mass loadings for regulated pollutants contained in the applicable permit and no new pollutants are discharged.

Restricted Discharges. Under the restricted discharges category, new or expanded discharges are prohibited from discharging to these waters, unless there is no prudent and feasible alternative to the discharge. If there is no feasible and prudent alternative, the discharge will be restricted to protect the natural water quality of the receiving water in order to preserve the functional integrity of the characteristics or features which contribute to the water's unique, scientific or recreational value.

When the nondegradation provisions for the ORVWs were first adopted into rule, the Agency recognized that its list of ORVWs was not all inclusive and that additional waters would likely be added through future rulemaking proceedings. Such is the case in this rulemaking proceeding in that additional waters are proposed as ORVWs under subpart 4 and subpart 6b.

1. Subpart 4. DNR designated scientific and natural areas.

Scientific and natural areas (SNA) are areas of the state that possess exceptional scientific or educational value with respect to various natural features. See Minn. Stat. sec. 86A.05, subd. 5 items (a) and (b) (1992). To be designated, each site must possess outstanding natural features of statewide significance such as unusual landforms, rare and endangered plant and animal communities, or other features of scientific and exceptional value. The MDNR manages these areas to preserve, perpetuate, and protect from unnatural influences the scientific and educational resources within them. Minn. Stat. sec. 86A.05, subd. 5, item (c) (1992). In support of these efforts to preserve and protect these resources, discharges to SNAs or other activities which would impair the natural features of the SNAs are prohibited under the provisions of part 7050.0180, subpart 3.

One SNA, identified by the MDNR as the Falls Creek SNA in Washington County, is proposed to be added as items M under part 7050.0180, subpart 4.

a. Item M. Falls Creek

The Falls Creek SNA, also referred to in certain references as the Cedar Bend White Pines site, has been described as one of the most diverse natural areas remaining in Washington County. The site includes two major physical geographical areas, a large ravine complex and a low terrace of the St. Croix River. Of particular significance is the fact that the area appears to contain a stand of virgin timber, which is reportedly quite rare for the St. Croix valley. The site contains a number diverse habitats ranging from cool, moist stream bottoms to very dry ridge tops. Two rare plant populations, kitten-tails (Besseya bullii) and bog bluegrass (Poa paludigena) occur on the site. Portions of Falls Creek, a designated trout stream, are also within the boundaries of this SNA. A further discussion of this site can be found in the Falls Creek SNA Project Evaluation report, Exhibit C1.

2. Subpart 6b. Calcareous fens.

The word "fen" has been used to describe a variety of different types of wetlands. In Europe, the terms has been applied to peatlands which have at least a portion of their source of water coming from ground water which has percolated through mineral soil or bedrock. In North America, similar types of peatlands are further differentiated into swamps, fens, and marshes, based primarily on their dominant vegetation. In the midwestern states, this terms has a narrower definition. In this region, a fen is considered to be a grassland on a wet and springy site, with an internal flow of water rich in calcium and magnesium bicarbonates and sometimes calcium and magnesium sulfates. "Springy" indicates the presence of peat deposits and "internal flow" refers to the availability of a constant supply of ground water.

Calcareous fens are a type of fen which can be characterized by a distinctive floristic species composition. Calcareous fens are typically grass-sedge dominated peatlands which apparently only develop where surface discharges of calcium and magnesium bicarbonate-rich ground water occur. The ground water is typically discharged from dolomitic bedrock and/or calcareous glacial deposits. These calcareous fens have a high pH (7.0 to 8.2) and high mineral content (Ca^{+2} 90-160 mg/l) and are maintained primarily by the ground water discharges.

Calcareous fens are dependent upon very localized water chemistry and hydrologic conditions. The circumstances producing the proper conditions necessary for the formation of calcareous fens are not common, making these fens a very rare and unique type of wetland. It has been theorized that as the ground water, supersaturated with calcium and magnesium bicarbonates, reaches the surface, its temperature increases and the calcium and magnesium bicarbonates precipitate out, thereby creating a harsh, alkaline soil condition. Since the cold internal ground water flows have low oxygen and nutrient concentrations, conditions are favorable for the formation and accumulation of peat. Many calcareous fens are noticeably raised in the middle, exhibiting a convex profile which reflects this build-up of peat.

Calcareous fen plant communities are characterized by a distinctive assemblage of plants adapted to the wet, calcareous peat soils. Many of these plants, called calcicoles, are rare in Minnesota. In this state, calcareous fens may be dominated by herbaceous plants (sedges, grasses and forbs) or by certain woody shrubs. Table I lists the calciphilic species found in Minnesota calcareous fens and that serve as indicator species for this plant community. Table II lists the endangered, threatened or special concern species found in these fens. Minn. Rules part 6134.0300 (1991) provides a list of endangered, threatened or special concern species.

TABLE I

Calciphilic Species Found in Minnesota Calcareous Fens

Scientific Name	Common Name
Aster junciformis	Rush aster
Valeriana edulis var. ciliata	Valerian
Betula pumila	Bog birch
Potentilla fruticosa	Shrubby cinquefoil
Lobelia kalmii	Brook lobelia
Parnassia glauca	Grass of Parnassus
Solidago riddellii	Riddell's goldenrod
Triglochin maritima	Arrowgrass
Gentiana procera	Lesser fringed gentian
Utricularia intermedia	Small bladderwort
Liparis loeselii	Yellow twayblade
Pedicularis lanceolata	Swamp lousewort
Carex sterilis	a sedge
Carex prairea	a sedge
Muhlenbergia glomerata	Fen muhly grass
Lysimachia quadriflora	Loosestrife
Cladium mariscoides	Twig-rush
Rhynchospora capillacea	Fen beak-rush
Scleria verticillata	Nut-rush
Gerardia paupercula	Pink gerardia

Source: MDNR Minnesota Natural Heritage Program

TABLE II

Rare Plant Species Found in Minnesota Calcareous Fens

Scientific Name	Common Name	Status
Carex sterilis	a sedge	State threatened1
Cladium mariscoides	Twig-rush	State special concern2
Scleria verticillata	Nut-rush	State threatened
Rhynchospora capillacea	Fen beak-rush	State threatened
Valerian edulis var. ciliata	Valerian	State threatened
Tofieldia glutinosa	False asphodel	State special concern
Eleocharis rostellata	Beaked spike rush	State threatened
Triglochin palustris	Arrowgrass	State special concern
Cypripedium candidum	White ladyslipper	State special concern

[1] Species listed as threatened by the state are species that may become endangered if their populations are significantly reduced. Species assigned to this category might be characterized by:

(1) Populations that have always been small and any decline in their numbers would be significant and/or,
(2) Populations that have already undergone an apparent decline and for which any further decline would be detrimental.

[2] Species listed as of special concern by the state are species that are not listed as threatened or endangered but do require special attention. Included are:

(1) Species subjected to species-specific exploitation; and
(2) Species whose habitats and habitats lend them to being particularly vulnerable to disturbance.

Source: MDNR Minnesota Natural Heritage Program

In Minnesota, calcareous fens have a sporadic distribution throughout the prairie region of the state. The calcareous fens in Minnesota occur in three broad geomorphic areas: 1) at the base of terrace escarpments in the major river valleys of southern Minnesota; 2) sides of glacial hills in the morainic uplands of western Minnesota; and 3) adjacent to Glacial Lake Agassiz beach ridges in northwestern Minnesota. The 31 calcareous fens already listed in subpart 6b of part 7050.0180 and the additional calcareous fens proposed for ORVW designation have been identified by the Natural Heritage Program of the Section of Wildlife, MDNR. The Natural Heritage Program identifies and locates significant examples of Minnesota's plant and animal species, plant community types, special wildlife habitats and special geologic features. Most of the information presented in this Statement of Need and Reasonableness (SONAR) on fens is directly from the Natural Heritage Program element abstract developed for the calcareous fen plant community. Exhibit C2.

Currently there are 31 calcareous fens identified as ORVWs in part 7050.0180, subp 6b. In addition to adding the 37 proposed calcareous fens to this list, the Agency is proposing some name changes for those fens currently in the rule to correspond to coding convention used by the MDNR to inventory these plant communities in its Natural Heritage data base. The number following the name of the fen is the assigned occurrence number which uniquely identifies the record of information for the particular fen. The following list of calcareous fens reflect these name changes.

Fens listed according to current rule under part 7050.0180, subpart 6b:

A. Spring Creek <u>WMA NHR</u> fen, <u>34;</u> Becker County <u>(T.142, R.42, S.13)</u>; proposed to be part 7050.0180, subpart 6b, item A.

B. ~~B-B-Ranch~~ <u>Felton Prairie</u> fen, <u>36;</u> Clay County <u>(T.141, R.46, S.13)</u>; proposed to be part 7050.0180, subpart 6b, item C, subitem (5).

C. Barnesville WMA fen, <u>10;</u> Clay County <u>(T.137, R.45, S.1)</u>; proposed to be part 7050.0180, subpart 6b, item C, subitem (2).

D. Felton <u>Prairie</u> fen, <u>28;</u> Clay County <u>(T.142, R.46, S.36)</u>; proposed to be part 7050.0180, subpart 6b, item C, subitem (4).

E. Spring Prairie fen, <u>37;</u> Clay County <u>(T.140, R.46, S.11)</u>; proposed to be part 7050.0180, subpart 6b, item C, subitem (9).

F. Clearbrook fen, <u>61;</u> Clearwater County <u>(T.149, R.37, S.17)</u>; proposed to be part 7050.0180, subpart 6b, item D.

G. Fort Snelling State Park fen, <u>25;</u> Dakota County <u>(T.027, R.23, S.4)</u>; proposed to be part 7050.0180, subpart 6b, item E, subitem (1).

H. Minnesota Valley <u>NWR</u> fen, <u>63;</u> Dakota County <u>(T.27, R.24, S.34)</u>; proposed to be part 7050.0180, subpart 6b, item E, subitem (2).

It should be noted that the entry for this fen currently under part 7050.0470, subpart 5, item C, subitem (6) includes section 27 in the legal description. The Agency is proposing to delete reference to section 27 because MDNR has designated the fen in this section as noncalcareous.

I. Nicols Meadow <u>fen</u>, <u>24;</u> Dakota County <u>(T.27, R.23, S.18)</u>; proposed to be part 7050.0180, subpart 6b, item E, subitem (3).

J. Perched Valley ~~WMA~~ <u>Wetlands</u> fen, <u>2;</u> Goodhue County <u>(T.112, R.13, S.8)</u>; proposed to be part 7050.0180, subpart 6b, item F, subitem (2).

K. Heron Lake fen, <u>45;</u> Jackson County <u>(T.103, R.36, S.29)</u>; proposed to be part 7050.0180, subpart 6b, item H, subitem (1).

L. Thompson <u>Prairie</u> fen, <u>20;</u> Jackson County <u>(T.103, R.35, S.7)</u>; proposed to be part 7050.0180, subpart 6b, item H, subitem (2).

M. Fish Hatchery fen, <u>60;</u> Le Sueur County <u>(T.110, R.26, S.14)</u>; proposed to be part 7050.0180, subpart 6b, item I, subitem (1).

N. ~~St. Peter~~ <u>Ottawa WMA</u> fen, <u>7;</u> Le Sueur County <u>(T.110, R.26, S.11)</u>; proposed to be part 7050.0180, subpart 6b, item I, subitem (3).

O. ~~Altona State Wildlife Management Area~~ Hole-in-the-Mountain Prairie fen, 6; Lincoln and Pipestone Counties (T.108, R.46, S.1, T.109, R.45, S.31); proposed to be part 7050.0180, subpart 6b, items J and T, subitem (2).

It should be noted that the legal description proposed under part 7050.0180 is the legal description currently identified for Altona State Wildlife Management Area under part 7050.0470, subpart 9, item B, subitem (3). Township 109, Range 45, Section 31, is not identified in the legal description on Exhibit C3 (MDNR Cal fen locations and ownership in MN) because the computer system used to generate the list will accept only information for one township.

P. Waubun WMA fen, 11; Mahnomen County (T.143, R.42, S.25); proposed to be part 7050.0180, subpart 6b, item K.

Q. ~~Truman~~ Perch Creek WMA fen, 33; Martin County (T.104, R.30, S.7); proposed to be part 7050.0180, subpart 6b, item M.

R. Fort Ridgely fen, 21; Nicollet County (T.111, R.32, S.6); proposed to be part 7050.0180. subpart 6b, item O, subitem (1).

S. Le Sueur fen, 32; Nicollet County (T.111, R.26, S.16); proposed to be part 7050.0180, subpart 6b, item O, subitem (2).

T. ~~Adrian~~ Westside fen, 59; Nobles County (T.102, R.43, S.11); proposed to be part 7050.0180, subpart 6b, item P.

U. ~~Primula Meadow (~~Faith Prairie fen~~)~~, 27; Norman County (T.144, R.43, S.25); proposed to be part 7050.0180, subpart 6b, item Q, subitem (4).

V. ~~Rock Dell~~ Nelson WMA fen, 5; Olmsted County (T.105, R.15, S.16); proposed to be part 7050.0180, subpart 6b, item R, subitem (2).

W. Burke ~~State Wildlife Management Area~~ WMA fen, 57; Pipestone County (T.106, R.44, S.28); proposed to be part 7050.0180, subpart 6b, item T, subitem (1).

X. Chicog ~~WMA~~ Prairie fen, 41; Polk County (T.148, R.45, S.20, 29); proposed to be part 7050.0180, subpart 6b, item U, subitem (3).

It should be noted that the entry for this fen under part 7050.0470, subpart 3, item C, subitem (3) includes section 33 in the legal description. The MDNR has assigned three occurrence numbers to the fens at this site: one in sections 20 and 29 (occurrence number 41) and one in section SWNE33 (occurrence number 40) and one in section NENE33 (occurrence numbers 42). Therefore, the Agency is proposing to make three separate entries under part 7050.0470 for the one existing entry. The second and third entries under part 7050.0180 are proposed as follows:

Chicog Prairie fen, 40; Polk County (T.148, R.45, S.33); proposed to be part 7050.0180, subpart 6b, item U, subitem (2).

Chicog Prairie fen, 42; Polk County (T.148, R.45, S.33); proposed to be part 7050.0180, subpart 6b, item U, subitem (4).

Y. ~~Kertsonville WMA~~ Tympanuchus Prairie fen, 38; Polk County (T.149, R.45, S.16); proposed to be part 7050.0180, subpart 6b, item U, subitem (7).

Z. ~~Pankratz~~ Tympanuchus Prairie fen ~~(Svedarsky's fen)~~, 26; Polk County (T.149, R.45, S.17); proposed to be part 7050.0180, subpart 6b, item U, subitem (6).

AA. Ordway Prairie fen, 35; Pope County (T.123, R.36, S.30); proposed to be part 7050.0180, subpart 6b, item V, subitem (3).

BB. Cannon River Wilderness Area fen, 18; Rice County (T.111, R.20, S.34); proposed to be part 7050.0180, subpart 6b, item X, subitem (1).

CC. Savage fen, 66; Scott County (T.115, R.21, S.16); proposed to be part 7050.0180, subpart 6b, item Y, subitem (2).

It should be noted that the entry for this fen currently under part 7050.0470, subpart 3, item C, subitem (3) includes section 17 in the legal description. The MDNR has assigned separate occurrence numbers to the fens at this site: one in section 16 (occurrence number 66) and two in section 17 (occurrence numbers 22 and 67). Therefore, the Agency is proposing to make three separate entries under part 7050.0470 from the one existing entry. The second and third entries under part 7050.0180 are proposed as follows:

Savage fen, 22; Scott County (T.115, R.21, S.17); proposed to be part 7050.0180, subpart 6b, item Y, subitem (1).

Savage fen, 67; Scott County (T.115, R.21, S.17); proposed to be part 7050.0180, subpart 6b, item Y, subitem (3).

DD. ~~Kennedy~~ Wiscoy fen, 58; Winona County (T.105, R.7, S.15); proposed to be part 7050.0180, subpart 6b, item AA.

EE. Sioux Nation WMA NHR fen, 29; Yellow Medicine County (T.114, R.46, S.17); proposed to be part 7050.0180, subpart 6b, item BB, subitem (1).

New calcareous fens proposed to be added to Chapter 7050 are listed below as they will appear under part 7050.0180, subpart 6b. The noted exhibits refer to the site maps showing the locations of the calcareous fens proposed for ORVW designation during the current rulemaking revision.

B. Carver County: Seminary fen, 75 (T.116, R.23, S.35), Exhibit C5;
C. Clay County:
(1) Barnesville Moraine fen, 44 (T.137, R.44, S.18), Exhibit C6;
(3) Barnesville WMA fen, 43 (T.137, R.44, S.18), Exhibit C7;
(6) Felton Prairie fen, 48 (T.142, R.45, S.31), Exhibit C8;
(7) Felton Prairie fen, 53 (T.141, R.46, S.24), Exhibit C9;
(8) Haugtvedt WPA North Unit fen, 54 (T.137, R.44, S.28, 29), Exhibit C10;
F. Goodhue County:
(1) Holden 1 West fen, 3 (T.110, R.18, S.1), Exhibit C11;
(3) Red Wing fen, 72 (T.113, R.15, S.21), Exhibit C12;

G. Houston County: Houston fen, 62 (T.104, R.6, S.26), Exhibit C13;
I. Le Sueur County:
   (2) Ottawa Bluffs fen, 56 (T.110, R.26, S.3), Exhibit C14;
L. Marshall County:
   (1) Tamarac River fen, 71 (T.157, R.46, S.2), Exhibit C15;
   (2) Viking fen, 68 (T.155, R.45, S.18), Exhibit C16;
   (3) Viking fen, 70 (T.155, R.45, S.20), Exhibit C17;
   (4) Viking Strip fen, 69 (T.154, R.45, S.4), Exhibit C18;
N. Murray County: Lost Timber Prairie fen, 13 (T.105, R.43, S.2), Exhibit C19;
Q. Norman County:
   (1) Agassiz-Olson WMA fen, 17 (T.146, R.45, S.22), Exhibit C20;
   (2) Faith Prairie fen, 15 (T.144, R.43, S.26), Exhibit C21;
   (3) Faith Prairie fen, 16 (T.144, R.43, S.35), Exhibit C22;
   (5) Green Meadow fen, 14 (T.145, R.45, S.35, 36), Exhibit C23;
R. Olmsted County:
   (1) High Forest fen, 12 (T.105, R.14, S.14, 15), Exhibit C24;
S. Pennington County:
   (1) Sanders East fen, 65 (T.153, R.44, S.7), Exhibit C25;
   (2) Sanders East fen, 74 (T.153, R.44, S.7), Exhibit C26;
   (3) Sanders fen, 64 (T.153, R.44, S.18, 19), Exhibit C27;
U. Polk County:
   (1) Chicog Prairie fen, 39 (T.148, R.45, S.28), Exhibit C28;
   (5) Kittleson Creek Mire fen, 55 (T.147, R.44, S.6, 7), Exhibit C29;
V. Pope County:
   (1) Blue Mounds fen, 1 (T.124, R.39, S.15, 14), Exhibit C30;
   (2) Lake Johanna fen, 4 (T.123, R.36, S.29), Exhibit C31;
W. Redwood County:
   (1) Swedes Forest fen, 8 (T.114, R.37, S.19, 20), Exhibit C32;
   (2) Swedes Forest fen, 9 (T.114, R.37, S.22, 27), Exhibit C33;
X. Rice County:
   (2) Cannon River Wilderness Area Fen, 73 (T.111, R.20, S.22), Exhibit C34;
Z. Wilkin County:
   (1) Anna Gronseth Prairie fen, 47 (T.134, R.45, S.15), Exhibit C35;
   (2) Anna Gronseth Prairie fen, 49 (T134, R.45, S.10), Exhibit C36;
   (3) Anna Gronseth Prairie fen, 52 (T.134, R.45, S.4), Exhibit C37;
   (4) Rothsay Prairie fen, 46 (T.136, R.45, S.33), Exhibit C38;
   (5) Rothsay Prairie fen, 50 (T.135, R.45, S.15, 16), Exhibit C39;
   (6) Rothsay Prairie fen, 51 (T.135, R.45, S.9), Exhibit C40;
BB. Yellow Medicine County:
   (2) Yellow Medicine fen, 30 (T.115, R.46, S.18), Exhibit C41.

Calcareous fens in this state vary greatly in size and quality. Since fens are fed by ground water and not dependent on seasonally fluctuating amounts of precipitation, a constant microenvironment can be maintained, producing a climax vegetation type which has remained stable for thousands of years. For this reason, fens often harbor relict plant species that are uncharacteristic or absent from other vegetation types. Due to human activities, however, a number of these fens have been seriously degraded and have lost much of their original character. In general, impacts to calcareous fens are evidenced by a loss of calicoles which in turn are replaced by weedy opportunistic plant species that take advantage of the changed habitat conditions.

The major threats to calcareous fens come from ditching, drainage, permanently inundating, and filling operations relating to agricultural activities, commercial development, gravel mining activities and highway construction. Water pollution impacts from those activities and from point source discharges have the potential to significantly alter the quality and quantities of the water upon which fen development and maintenance are so dependent. For this reason, the Agency believes that it is reasonable to propose that the calcareous fens listed in part 7050.0470 be designated as Outstanding Resource Value Waters. By placing the calcareous fens under the restricted discharges category of the nondegradation section of the rule, activities which do or could potentially contribute to the degradation of the waters of these fens can be prohibited or more stringently controlled, depending on the outcome of the prudent and feasible test referenced in part 7050.0180, subpart 6. These prohibitions and controls can apply to both point source discharges as defined in Minnesota Statutes section 115.01, subdivision 11, and to nonpoint source impacts resulting from land management and land use activities.

Since calcareous fens are so dependent upon specific hydrological conditions, impacts to water quantities in these fens resulting from certain land use activities, and to lesser degree from point source discharges, become important considerations in their protection and preservation. Too much water or too little water can disrupt the unique habitat and can lead to a shift in the plant species composition to one where common plant species become more abundant.

Under item (b) of Minnesota Statutes section 115.01, subdivision 13, pollution of waters is defined as, "the alteration made or induced by human activity of the chemical, physical, biological or radiological integrity of waters of the state." A change in the physical integrity of waters of the state, in this instance a change in the quantity of water present in the calcareous fen needed to maintain a suitable habitat for this plant community, will be construed as pollution of waters.

Therefore, within the context of the Agency's regulatory authorities, a land use activity, or a point source discharge (notwithstanding its chemical quality), which could potentially bring about a detrimental change in the water quantity present in these fens will trigger the need for the prudent and feasible analysis.

In 1991 the State Legislature passed the Wetlands Conservation Act which contained a provision stating that calcareous fens, as identified by the MDNR commissioner, may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, unless the MDNR commissioner, under an approved management plan, decides some alteration is necessary. Minn. Stat. sec. 103G.223. Standards and criteria for identification, protection, and management of calcareous fens have also been proposed by the Board of Soil and Water Resources in Minn. Rules pts. 8420.1010 to 8420.1060, which relate to the Wetlands Conservation Act. Exhibit W10. While the prudent and feasible analysis referenced above is a process whereby the Agency Board has the ultimate decision making authority on the existence or lack of prudent and feasible alternatives, the Agency plans to cooperate with the MDNR on issues regarding calcareous fen protection.

The proper hydro-geological conditions which allow for the formation of calcareous fens are uncommon occurrences throughout the State. The rare and endangered plant species they support make these fens unique resources deserving of a high degree of protection. The Agency therefore believes that it is reasonable to designate these calcareous fens as ORVWs. Essentially, all of the calcareous fens identified by the MDNR to date are being proposed for this designation. In doing so, it is hoped that an element of protection will be added to aid in the effort to preserve these unique wetland plant communities.

A county-by-county inventory conducted by the MDNR of rare natural features is currently proceeding by way of the Minnesota County Biological Survey. As this survey progresses, additional fens will likely be identified and inventoried in the future. As new calcareous fens are identified, it is the Agency's intent, in cooperation with the MDNR, to include additional calcareous fens as ORVWs in subsequent rule revisions. In those instances where a MDNR newly identified calcareous fen is threatened by a potential discharger or certain land use activity, the Agency will consider the calcareous fen as an unlisted outstanding resource value water pursuant to the provisions of part 7050.0180, subpart 7.

F. Part 7050.0185 NONDEGRADATION FOR ALL WATERS.

1. Subpart 1. Policy.

The policy statement is proposed to be revised to add phrases that: 1) emphasize that the beneficial uses inherent in the State's water bodies, including wetlands, are valuable public resources and 2) emphasize that wetland alteration can cause a significant degradation on wetland designated uses and that one of these designated uses is habitat. These phrases are reasonable because they serve to clarify the rules and propose no changes to protection levels of the standards. Wetlands are waters of the state and protected by the existing standards. "Wetland" must now be identified in the rules because of the effort to develop water quality standards that more specifically apply to wetlands.

2. Subpart 2. Definitions.

The reference to Minn. Stat. sec. 115.01, subd. 14 is proposed to be changed to subd. 20 because the statute has been recodified.

3. Subpart 4. Additional requirements for significant discharges.

The word "and" is proposed to be deleted because it does not belong in the sentence and confuses the meaning of the rule. The sentence was intended to refer to the economic and social development impacts of a project not the economic, social development and impacts of a project. "And" was mistakenly included during the original drafting of this subpart.

4. Subpart 9. Physical alterations of wetlands.

The Agency is proposing a new subpart to establish nondegradation rules for projects that propose to physically alter wetlands. The subpart is proposed as follows:

> Physical alteration of a wetlands. The permit or certification applicant shall comply with part 7050.0186 if there is a proposed physical alteration that has the potential for a significant adverse impact to a designated use of a wetland and that is associated with a project that requires a National Pollutant Discharge Elimination System (NPDES) permit, a 401 certification under parts 7001.1400 to 7001.1470, or a state disposal system permit.

Nondegradation is proposed to be accomplished through the mitigation sequence. In general, nondegradation means that there can be no net increase in pollution discharges. Physical alteration results from a discharge. It is reasonable to use the mitigative process as the standard for nondegradation because the process is specifically written to replace wetlands that have been significantly altered such that one or more designated uses are lost. Exhibit W55 contains a matrix of wetland designated uses and the most common potential significant physical impacts.

G. Part 7050.0186 WETLAND MITIGATION.

This is a new part that specifies the steps and conditions for the mitigative process that is identified in part 7050.0185, subpart 9 as the nondegradation standard for the physical alteration of wetlands.

1. Subpart 1. Policy.

The policy statement emphasizes that wetlands must be protected from significant adverse impacts on their designated uses. It also identifies the wetland mitigative process as the means to achieve nondegradation of wetland designated uses.

2. Subpart 2. Wetland mitigation principles.

Subpart 2 describes the mitigative sequence of avoiding, minimizing, and mitigating. This is reasonable because the process is consistent with the Agency's present review process for Section 401 water quality certification applications. The sequence is also consistent, and complements, 40 CFR 230.10, 40 CFR 1508.20, and the Wetland Conservation Act. Exhibits W17, W18, W27, W28, W53, and W58. The process of using the mitigative sequence involves negotiations between the applicant and the Agency, with specific case-by-case considerations being the paramount factor.

The Clean Water Act Section 404(b)(1) guidelines were promulgated in 1982. Since then the Agency has conditioned waivers of Section 401 water quality certifications for fill activities with the requirement that sequencing be satisfied. Exhibit W59. As the water quality standards are currently written, a fill activity violates water quality standards because of suspended solids exceedances and impacts to the biota in the wetland. This necessitated the use of a conditional waiver. The current revision would allow the certification process to proceed without the necessity of a waiver because the mitigation sequence is being incorporated into the water quality standards, which satisfied the nondegradation requirements.

The most common types of activities requiring use of the mitigative process in Minnesota are fill activities associated with building developments and road construction. For example, during the last two years, only four agriculture-related projects (out of a total of 121 projects requiring Section 401 certification) were reviewed for water quality considerations and only one was required to have wetland replacement as a condition of the Section 401 Water Quality Certification waiver. Exhibit W59 contains several examples of projects the Agency reviews. In all cases, either the conditional waiver requires use of the mitigative sequencing or the proposed project is denied because nondegradation and mitigative sequencing requirements were not met.

3. Subpart 3. Determination of wetland dependency.

This subpart was added to ensure consistency with, and to complement, the Wetland Conservation Act. A project is wetland dependent if wetland features, functions, or values are essential to fulfill the basic purposes of the project. Projects that are wetland dependent are assumed to be unable to avoid having some impact on a wetland. Examples of wetland dependent activities are growing rice and constructing wetland interpretive trails. These projects are directed to the second step of the mitigative sequence, impact minimization.

4. Subpart 4. Impact avoidance.

This subpart emphasizes that the first step in the mitigative sequence is avoidance to the extent possible. According to 40 CFR 230.10, because wetlands are "special aquatic sites", there is a presumption that prudent and feasible alternatives that will not involve wetlands are available. Exhibits W28, W50, W52 and W58. It is the responsibility of the applicant to demonstrate otherwise. As noted in subpart 3, activities that meet the wetland dependency requirement may go directly to the second step in the mitigative sequence.

As an example, the Agency denied Section 401 certification for a proposed fill activity in 1987 (#NCSCO-RF 87-830-77 in Exhibit W59) because impacts to the wetland could be avoided, but were not.

The term "prudent and feasible" is one that is well known in environmental statutes. The phrase appears in the Minnesota Environmental Rights Act, Minn. Stat. sec. 116B.09, subd. 2, and in the Minnesota Environmental Policy Act, Minn. Stat. sec. 116D.04, subd. 6. To paraphrase, no Agency may allow an action that results in pollution if there is a reasonable alternative which avoids the impact.

5. Subpart 5. Impact minimization.

The second step in the sequence is impact minimization. All projects that can not avoid impacts to wetlands must actively pursue minimizing significant adverse impacts to wetland designated uses.

The seven factors to consider when evaluating attempts to minimize a project's impact on a wetland are consistent with, and complement, Minnesota Rules, part 8420.0520, subp. 4 (Exhibit W10) and 40 CFR 230, Subpart H. Spatial considerations involve reviewing the footprint of the proposed project. If rotating a project would avoid the wetland yet still meet the project purpose, that alternative should be selected. The location of existing features and the type of project would be reviewed for minimization potential also.

In addition to project-specific minimization considerations, landscape considerations must also be reviewed. These include topographic, hydrologic, and biotic information, wetland designated uses and distribution, and consideration of individual and cumulative impacts to wetlands. 40 CFR 230, Subpart H specifies actions to minimize adverse effects, including considerations to minimize impacts to plants and animals.

6. Subpart 6. Impact compensation.

The last step in the sequence is compensatory mitigation for those impacts that could not be avoided. Replacement wetlands are required to maintain nondegradation of wetland designated uses.

The mitigative process in subpart 6 specifically states a preference for restored wetlands over created wetlands. Although some types of wetlands have been created with short term success, most restored wetlands will have better long term success for most types of wetlands in providing the uses of natural undisturbed wetlands. Exhibits W24, W49 and W58.

Restored wetlands are re-established in an area that was historically wetlands but which provides no or minimal wetland uses because of past alterations, such as filling or draining.

Created wetlands are constructed in areas that were not wetlands in the past. These should have, at a minimum, undulating bottom contours, shallow side slopes, and irregular edges. These attributes will enable created wetlands to increase the likelihood of replacing the designated uses of natural wetlands that were impacted. Exhibits W10 and W49.

The mitigative process in subpart 6 also states preferences for in-kind and on-site wetlands. Exhibit W58. In-kind wetlands are the same type of wetland as the one being impacted. Exhibit W32. On-site wetlands are in the same immediate watershed as the impacted wetland. Exhibit W27. A replacement wetland that is in-kind and on-site will come closest to maintaining the uses of the impacted wetland. Also, the replacement wetland should be completed prior to the loss of the impacted wetland, if possible. This language is consistent with the Wetland Conservation Act. Exhibit W53.

Subpart 6, item C, uses the phrase "to the extent feasible". The Agency recognizes that, although it is preferable for a replacement wetland to be in-kind and on-site, it is not always possible. There may not be space available in the immediate area or there may not be a potential restoration wetland in the immediate sub-watershed. As noted in subpart 2 above, the process of achieving a reasonable replacement wetland involves negotiations between the applicant and the Agency, with specific case-by-case considerations being the paramount factor.

To provide further insight in the area of water quality designated uses for replacement wetlands, the Agency will be guided by a wetland assessment matrix when possible. Exhibits W54; W44. The matrix is designed to qualitatively assess the water quality designated uses of the wetland to be impacted to help determine the qualities that should be possessed by the replacement. Reference wetlands are not always available but, when they are, they provide further valuable information as to the attributes the existing wetland might have had if it is now degraded. The qualitative attributes listed along the side of the matrix were selected because, taken together, they provide a picture that can be used to assess the relative value of the wetland. Because wetlands provide benefits both within the wetland and downstream (nutrient retention and bank erosion control are two examples) the matrix also assesses cumulative impacts and downstream resource protection in a qualitative manner.

The Agency received several comments regarding the wetland mitigative process language. Several commenters questioned whether the Agency has legal authority beyond the Wetland Conservation Act. Exhibits W23; W24; W53. The Agency's authority is established under Minnesota Statutes sections 115.03, 115.44, and 115.01 (see section II, Statement of Agency's Statutory Authority, and section I, Introduction, part C, Wetland Water Quality Standards, respectively). Authority is also authorized under Section 303(c)(1) of the federal Clean Water Act (see III, Statement of Need).

Another letter recommended the mitigative process be moved from the Water Quality Standards to the Permit Rule (Ch. 7001). Exhibit W15. The mitigative process parallels effluent limits as forms of overall nondegradation of the water resources.

H. Part 7050.0200 WATER USE CLASSIFICATIONS FOR WATERS OF THE STATE.

The State Revisor of Statutes has added subparts under this part.

1. Subpart 1. Introduction

The word "following" is proposed to be removed and the phrase "in subpart 2 to 8" is proposed to be added in response to the structural change under this part.

2. Subpart 3. Class 2.

The term "aquatic life" is proposed to replace "fisheries" in Class 2. This change is also proposed under part 7050.0222, subparts 2 to 7. This change is needed to indicate that the protection of the standards is given to aquatic life in general under the rules. In addition, because wetlands are proposed to be recognized as a separate use class under this rule, fisheries is not necessarily an inclusive term for the aquatic communities found in these habitats.

This change is part of the effort to establish biological criteria in the chapter. The change is reasonable because it does not change the level of protection established under the standards, but, instead, describes the coverage of the protection more explicitly.

The level of protection established under the standards already protects more than just fish. According to the 1990 SONAR for revisions to part 7050.0218, subpart 1, the protection of aquatic life is the primary purpose of the proposed standards and protecting the aquatic community means protecting sensitive organisms in the community from the direct effects of toxic chemicals. The 1990 SONAR for part 7050.0218, subpart 2, states that toxic-based standards are established to protect 95 percent of the species in a given aquatic community. Since the toxic standards protect more than fish, this change will not change the level of protection provided by the standards, but will increase the visibility of aquatic species other than fish and establish them as an indicators of water quality and a unit of measure for evaluating degradation.

The phrase "be used for fishing, fish culture" is proposed to be changed to "support fish, other aquatic life" in accordance with the change from "fisheries" to "aquatic life."

The word "are" is proposed to be changed to "do" and the words "for which" are proposed to be changed to "where" to achieve correct word usage.

The word "boating" is proposed to be added to make the description of Class 2 consistent with the language under part 7050.0222, subpart 7, item B and C in the proposed rules.

3. Subpart 8. Class 7.

The Agency proposes to replace the term "agency water quality assessment procedure" with "use attainability analysis". The use of the proposed term is consistent with the requirements under 40 CFR 131.10(j) which indicates that the state must conduct a use attainability analysis when a state designates or has designated uses that do not include the uses specified in Section 101(a)(2) of the CWA, or when the a state wishes to remove a designated use that is specified in section 101(a)(2). The water assessment procedures that have been conducted in the past have been a type of use attainability analysis. However, in the future there will be greater emphasis placed on conducting more formal biological assessments as part of the use classification and use attainability procedures.

There are three conditions that are evaluated to determine whether a water should be Classified as a limited resource value water. The revised rule seeks to change language to examine the broader community of fauna and flora rather than limiting the analysis only to fisheries. This change is proposed to provide for a context in which habitats such as wetlands can be assessed for their value to aquatic life.

Additional changes have been proposed to clarify the meaning of the rule language and to achieve correct word usage. Also, the State Revisor has relisted the paragraphs under this subpart to lettered items.

I. Part 7050.0210 GENERAL STANDARDS FOR DISCHARGERS TO WATERS OF THE STATE.

1. Subpart 9. Water quality based effluent limitations.

The Agency proposes to add the phrase, "for specific pollutants or whole effluent toxicity" to the description of water quality based effluent limitations. This addition does not change the manner in which effluent limitations are determined, but merely clarifies the nature or type of limitation that may be affected. This is a reasonable change, as it provides accurate and specific information to the reader. For a discussion of the reasonableness of whole effluent toxicity (WET) tests, see the discussion under part 7050.0218.

2. Subpart 13a. Wetland pollution prohibited.

The Agency proposes to add this subpart and the following language:

> "Wetland pollution prohibited. Wetland conditions shall be protected from chemical, physical, biological, or radiological changes to prevent significant adverse impacts to the following designated uses: maintaining biological diversity, preserving wildlife habitat, and providing recreational opportunities as specified in part 7050.0222, subpart 6; erosion control, ground water recharge, low flow augmentation, storm water retention, and stream sedimentation as specified in part 7050.0224, subpart 4; and aesthetic enjoyment as specified in part 7050.0225, subpart 2."

Part 7050.0218, subpart 13, uses narrative language to protect waters of the state from water pollution. Wetland protection is implicit in the term "waters of the state". The proposed subpart 13a will make wetland protection explicit and provides guidance to applicants as to what uses are commonly found in wetlands and the kinds of changes that can impact them. Exhibit W55. It does not change levels of wetland protection that have been available since subpart 13 was promulgated. Previous to this revision, when an application was reviewed for potential impacts to water resources, including wetlands, subpart 13 was used as a narrative guide for determining whether an impact to a designated use would occur as a result of the activity described on the application. With this revision, the Agency will review both subparts as appropriate.

It is reasonable to protect wetlands as specified under the proposed language because chemical, physical, biological, or radiological changes to a wetland may result in changes in the designated uses of the wetland. For example, a physical change in wetland hydrology, such as permanently increasing the water level, could result in a complete die-back in wetland trees. The designated uses that would be impacted, in this case, include maintaining biological diversity and enhancing the natural beauty of the landscape. However the impact varies with each wetland. See SONAR language for part 7050.0130 for further discussion on the impact of varying water levels. Protecting the designated uses will ensure the attributes of a wetland will not be significantly degraded.

EPA's Water Quality Standards for Wetlands National Guidance, Exhibit W3, requires states to, at a minimum, "apply aesthetic narrative criteria and appropriate numeric criteria to wetlands and to adopt narrative biological criteria for wetlands by [September 30, 1993]." Narrative criteria are general statements designed to protect a specific designated use or set of uses for a waterbody. The Water Quality Standards Regulations (40 CFR 131.11 (b)) requires inclusion of narrative criteria in state water quality standards to supplement numeric criteria. Narrative criteria are particularly important in wetlands, since wetlands, depending on their particular type and background condition, may require different numeric standards to protect their designated uses. Therefore, it is reasonable to use the narrative criteria as stated.

J. Part 7050.0211 FACILITY STANDARDS.

1. Subpart 1. Minimum secondary treatment for municipal point source and other point source dischargers of sewage.

A formatting change is proposed under the standards table. The information under the "Limiting Concentration or Range" category for "Toxic or corrosive pollutants" is proposed to be formatted so that the text is contained within the column of the appropriate category. This is reasonable because it does not change the meaning of the text, but makes the rule easier for readers to understand.

The State Revisor of Statutes has also changed "5-day" to "five-day" here and throughout the standards.

The reference to part 7050.0218, subpart 3, item FF, is proposed to be changed to item HH to correspond to changes proposed under part 7050.0218.

Also, the sentence "The arithmetic mean shall not exceed the stated value in any calendar month." is proposed to be added to the double-asterisks note that corresponds to the standards table. This sentence is needed to address the environmental concern for phosphorus loading. This addition is reasonable because an arithmetic mean of 1 milligram per liter total phosphorus is generally sufficient protection and it clarifies the rule by identifying how the Agency will determine compliance.

2. Subpart 2. Exception for existing trickling filter facilities.

The Agency proposes to change the rule citation from "part 7050.0210, subpart 1" to "subpart 1" under this part. The reference to part 7050.0210, subpart 1 appears under items A and C and under subpart 3, items A and C and is an error. The proposed change is needed to correct this error and make the rules accurate.

The purpose of this subpart is to identify exemptions to the requirements for minimum secondary treatment standards for municipal point source and other point source dischargers. This purpose is clearly illustrated in the context of the first sentence under item A, which lists standards for five-day carbonaceous biochemical oxygen demand and total suspended solids. Subpart 1 under part 7050.0210 does not contain these standards, but contains a general narrative standard for untreated sewage instead.

3. Subpart 3. Exception for pond facilities.

The Agency proposes to change the rule citation from "part 7050.0210, subpart 1," to "subpart 1" under part 7050.0211. This change appears under item A and item C. See subpart 2 for an explanation of need for and reasonableness of this revision.

K. Part 7050.0212 REQUIREMENTS FOR POINT SOURCE DISCHARGERS OF INDUSTRIAL OR OTHER WASTES.

1. Subpart 2a. Dredge disposal exemption.

This subpart establishes the basis for exemptions from secondary effluent limitations for suspended solids and phosphorous for dredge disposal facilities. It states that waters discharged from a dredge disposal facility and returned to the water body from where it was removed are not subject to limitations for these parameters if best management practices (BMPs) and best practicable technology (BPT) are established in a state disposal system (SDS) permit and the designated uses of the receiving water are maintained.

The exemption is needed to address the inability of the dischargers of return water to meet the existing standards for total suspended solids (TSS) and phosphorus. Minnesota has approximately 20 dredge disposal facilities that discharge excess water from dredge holding ponds into the state's waters and are unable to consistently meet a 30 mg/l limitation for TSS. SDS permits are required for all dredge disposal facilities. National Pollutant Discharge Elimination System (NPDES) permits are not required for dredge disposal facilities. Establishing permit limitations that are not achievable by the permittee sets up permit noncompliance situations that cause many problems for both the Agency and the regulated community.

Individual variances to these limitations may be obtained by the permit applicant; however, this is a rigorous and time consuming activity. In addition, obtaining a variance requires demonstration that either meeting the standard is technically infeasible or that it will result in a financial hardship for the permittee.

In general, technology does exist that would treat dredged materials so that return waters meet secondary effluent limitations. The technology may include several retention ponds operated in a series, sophisticated filtration systems, mechanical treatment facilities or other highly technical options. However, discharges from dredge disposal facilities are generally temporary or intermittent. Investing in technically complex and expensive treatment systems would not usually be cost-effective for the incremental environmental benefit that might be achieved. In addition, these systems pose some operation problems due to the varied characteristics of dredged material.

In order to qualify for a variance on financial grounds, the applicant must demonstrate that meeting the standard would result in financial hardship. The test for financial hardship is dependent on the financial health of the applicant, rather than the cost-effectiveness of the treatment option.

The inability to achieve secondary effluent limitations for TSS is a problem with a class of facilities; variances are meant to address specific and unique cases. Therefore, it is reasonable to address this problem through the standards rules rather than through the variance process.

None of the current SDS permits for dredge disposal facilities include limitations for phosphorous, although according to current standards, this limitation should apply. Because of that fact, the Agency does not have data on the phosphorous content of dredge return water. One of the properties of phosphorous is that it binds with solids, so it is expected that a dredge return water with elevated suspended solids is likely to exceed the 1 mg/l phosphorous effluent limitation. However, removal of phosphorous-rich sediments from a water body is likely to reduce the overall reintroduction of phosphorous into the water column, thereby resulting in a net benefit from the dredging activity. Therefore, it is reasonable to include phosphorous in this exemption.

This exemption is limited to effluents that are returned to the water body from where the sediments were removed. This is reasonable because it ensures that physical, chemical and biological impairments are not transferred from one water body to another. This revision does not exempt permittees from meeting effluent limitations for toxics, metals or other parameters not expressly exempted in this part. Dredge disposal system permits will continue to include effluent limitations for parameters other than total suspended solids and phosphorus where appropriate. Those permittees not employing best management practices will continue to be subject to effluent limitations for total suspended solids and phosphorus.

a. Item A.

In order to qualify for this exemption, BPT and BMPs must be established in the SDS permit.

Best practicable control technology (BPT) refers to the design of the treatment system. In order to achieve BPT, an evaluation of alternatives for the specific project is necessary and will be reviewed as a part of the permit application. Typical alternatives to be evaluated would be:

- alternative dredging technology that may be less water-intensive.
- alternative sites for the disposal facility
- alternative design of the treatment facility, such as a confined or non-discharging facility
- use of polymers to aid in settling solids

Best management practices (BMPs) are practices to prevent or reduce the pollution of the waters of the state. These practices may include schedules of activities, prohibitions of land use practices, specific operating procedures and control practices for site runoff or dredge material storage.

It is reasonable to require BPT and BMPs in order to protect the receiving water to the greatest extent practicable because the permittee is relieved from having to meet stringent effluent standards. This does not exempt permittees from monitoring for these parameters. As a matter of fact, monitoring is very important to measure the effectiveness of the technology and management practices.

b. Item B.

It is required that the designated uses for the receiving water body as established under part 7050.0200 are maintained. It is reasonable to require that the goals of the federal Clean Water Act are maintained.

A comment was received from Cleveland-Cliffs Incorporated of Duluth, Minnesota in response to the August 31, 1992 Notice of Intent to Solicit Outside Information. They requested that, in its standards revisions, the Agency take into account the importance of maintaining safe shipping lanes, the nature of the material being dredged, and the practical limitations on the handling of the return water and dredged materials. These revisions do not place any additional restrictions that would impede the maintenance of safe shipping lanes. In addition, the purpose for these revisions was to address the practical limitations and varied characteristics of dredged material. Characteristics of dredged material vary widely depending upon the water body from which it was removed. The dredged material may include clay, silt and/or sand, all of which have different properties in solution. Some materials may remain suspended for longer periods of time than others, or resuspend more easily with the influence of wind mixing. This supports the use of BPT and BMPs, since they are applied to the specific situation.

Another comment was received from Northern States Power (NSP), agreeing with the proposal to regulate discharges from dredge disposal facilities through best management practices and best practical technology instead of through numeric limits on total suspended solids and phosphorus. NSP also suggested that when the Agency reviews proposed disposal options, it should recognize that the source of the accumulated sediment is not necessarily the dredger. Within the standards rule, the Agency's responsibility is to ensure environmentally safe disposal of dredged materials. Issues of liability must be addressed in another forum. And finally, NSP suggested that the Agency undertake activities with other regulators to streamline the regulatory process concerning dredge and fill activities. The Agency believes this revision moves toward that goal. The Agency is participating in discussions with other state and federal agencies in an effort to streamline the regulatory process, however, most of those activities are outside of the scope of this rule revision.

The Agency also received a comment from Project Environment Foundation indicating a concern that there is a lack of consistency in the definitions of the terms BPT and BMPs. They suggest that numerical standards should be used in conjunction with BPT and BMPs to ensure the best protection of water quality. The definition and application of BPT and BMPs are addressed in item A above. In addition, as stated earlier, characteristics of dredged material vary widely, depending upon the source of the materials. The Agency does not have sufficient data to establish a "ceiling" effluent limitation that would be achievable and appropriate. Therefore, the Agency has elected not to change the proposed rule language in response to this comment.

L. Part 7050.0213 ADVANCED WASTEWATER TREATMENT REQUIREMENTS.

The Agency proposes to break the first paragraph of the asterisks note into two paragraphs. This division will separate the information about compliance at treatment works designed and constructed to meet limitations into the second paragraph. This format change is reasonable because it does not change the meaning of the rules and it makes the language easier to read and understand.

The State Revisor of Statutes added subparts under part 7050.0220, which made changing "part 7050.0200, number 7" to "part 7050.0200, subpart 8" necessary under this part. This reference change is also proposed under part 7050.0214, subparts 1 and 4.

M. Part 7050.0214 REQUIREMENTS FOR POINT SOURCE DISCHARGERS TO LIMITED RESOURCE VALUE WATERS.

1. Subpart 1. Effluent limitations.

"Part 7050.0220, number 7" is proposed to be changed to "subpart 8." See part 7050.0213 for an explanation.

2. Subpart 2. Alternative secondary treatment effluent.

This subpart references part 7050.0211, subpart 1. The Agency proposes to delete "subpart 1" from this reference.

This subpart identifies the limitations that will be used to determine the construction or operation of a wastewater treatment facility that discharges into a limited resource value water. While the reference to part 7050.0211, subpart 1, is appropriate for most types of treatment facilities, it is not appropriate for existing trickling filters or pond facilities. The effluent limitations for these types of treatment facilities are identified under part 7050.0211, subparts 2 and 3 respectively. Therefore, the reference only to subpart 1 inadvertently excludes the application of this subpart to existing trickling filters and pond facilities. The change is reasonable because it corrects a reference error and does not establish new effluent limitations.

3. Subpart 4. Public waters designated unaffected.

The State Revisor of Statutes has deleted the phrase "applicable provisions and requirements of."

The reference to Minn. Stat. ch. 105 has been changed to 103G because the statutory chapter has been recodified.

"Part 7050.0220, number 7" is proposed to be changed to "subpart 8." See part 7050.0213 for an explanation.

N. Part 7050.0215 REQUIREMENTS FOR ANIMAL FEEDLOTS.

1. Subpart 1. Definitions.

a. Item D.

The reference to Minn. Stat. sec. 115.01, subd. 7 has been changed to subd. 21 because of a recodification.

2. Subpart 2. Effluent limitations for a discharge.

a. Item A.

The Agency proposes to substitute the term "requirements" for the term "effluent limitations," to delete the phrase "comply with the following limitations" and to substitute "a feedlot pollution rating of zero using a 25-year, 24-hour rainfall event" for the 25 milligrams per liter standard for five-day biochemical oxygen demand (BOD). These changes are reasonable because the zero model rating that is substituted is a widely recognized method of uniformly and objectively evaluating a feedlot facility's pollution potential without costly storm event monitoring. The model represents the Best Professional Judgment of the authors who are leading research specialists who deal with agricultural nonpoint source pollution and experienced Agency engineers.

A model rating of zero corresponds to an estimated discharge of 25 mg/L BOD, therefore the change does not constitute back sliding. The size of the storm event being modeled is one of the variables to be inputted during the rating calculation. The 25-year, 24-hour storm is specified to be consistent with the current language. Where phosphorus (P) is an issue, the model rating is not proposed to be used because the model does not accurately predict P discharges. Overland flow will effectively reduce BOD, but is not as effective in reducing P. Exhibit F1, page 9 and 11. The requirement for P currently follows the 25 mg/l BOD standard in item A. This requirement is proposed to be made item B and the existing item B is proposed to be made item C. This restructuring is to avoid potentially confusing redundancy, since the 25-year, 24-hour storm event is already specified in item A.

As noted in the model documentation, the model is the result of efforts by four Federal and State agencies - the Agricultural Stabilization and Conservation Service, the Soil Conservation Service, the Minnesota Soil and Water Conservation Board, (which has since become part of the Minnesota Board of Water and Soil Resources), and the Agency, to coordinate their animal waste control programs so that Federal and State cost-share funds, the Federal technical assistance program, and the State permit program could all work together to efficiently combat this source of pollution. The model is impartial, relatively simple to use, reasonably accurate and based on research data.

The model will more effectively use limited financial resources to abate and correct water pollution than the existing BOD standard. There are an estimated 40,000 facilities which are regulated by Minn. Rules ch. 7020, governing animal feedlots. Costs to monitor an individual feedlot would be a minimum of $6,000 to set up a monitoring station, and a minimum of $3,000 per year for sample collection and analysis. These costs would not contribute to solving any potential pollution hazards. In view of the limited resources available to both producers and in government cost share programs, it is reasonable to use the model to determine which sites need additional pollution control efforts, so that money that would otherwise be spent on monitoring can be spent on correcting pollution hazards. The model is and has been used in standard practice for the evaluation of potential pollution hazards from feedlots.

The publication "An Evaluation System to Rate Feedlot Pollution Potential," which contains the feedlot evaluation system model, is available through the MPCA library and the State Law Library for interlibrary loan.

O. Part 7050.0218 METHODS FOR PROTECTION OF SURFACE WATERS FROM TOXIC POLLUTANTS FOR WHICH NUMERICAL STANDARDS NOT PROMULGATED.

1. Subpart 3. Definitions.

"Whole effluent toxicity test" is defined under part 7050.0218, subpart 3, item FF, of the existing rules. Whole effluent toxicity (WET) testing has been established by the EPA and many states including Minnesota as an important means to assess the potential toxicity of effluents. WET tests are based on the well established narrative standard that pollutants should not be discharged in toxic amounts.

WET tests measure the composite effect of a largely unknown array of substances in an effluent on aquatic organisms. WET tests can quantify these effects and the results transformed into water quality-based effluent limitations similar to how pollutant specific standards are used to set effluent limitations. As a state with delegated NPDES permit authority, the Agency is entrusted to carry out the requirements of the Clean Water Act, and to implement major policy initiatives directed by the EPA. One of the EPA's major efforts is the implementation of toxicity testing requirements in the NPDES permit program.

The Agency has been requiring dischargers to do WET tests on their effluents for several years. In an acute WET test, test organisms such as fathead minnows or Daphnia (water fleas) are placed in samples of effluent, the same effluent that is discharged to the receiving stream, and the number of organisms that die in two days is recorded. If more than half of the organisms die, the effluent is considered acutely toxic. In general, if a repeat test also shows acute toxicity, the discharger is required to determine the cause of the toxicity and to eliminate it.

The rule is clear regarding the use of acute WET tests as an effluent limitation in permits. However, there is a need to clarify the rule language so that WET tests, as well as chemical-specific standards, can be used as the basis for permit limitations in water quality limited situations. In situations where the allowable dilution provided by the receiving stream is limited or absent, the end point of the WET test must be chronic toxicity rather than acute toxicity. Also, there is a need to add to the definitions in part 7050.0218 so the terminology associated with whole effluent testing will be in the rule. Together these proposed changes will help establish a clearly defined method for evaluation and compliance that parallels the process used with the numerical standards identified under parts 7050.0220 through 7050.0227.

Part of the 1990 amendments to ch. 7050 was the addition of a number of definitions related to toxicity. These definitions were designed to accompany the procedures for developing pollutant specific criteria added to the rule in 1990. Included was a definition of, and references to, WET tests. Many of the concepts embodied in the definitions are common to both pollutant specific and whole effluent approaches. The difference is in terminology that may be employed, primarily when quantifying the effects.

The Agency propose to add some language to three existing definitions and add two new definitions

a. Item B. Acute toxicity.

The Agency is proposing to add the phrase "represented as LC50s or EC50s, and expressed as concentrations of mass per unit volume, percent effluent, or toxic units" to the definition of Acute toxicity. This language is needed to clarify how the effects of acute toxicity will be evaluated and quantified.

The terminology used in the proposed phrase corresponds to whole effluent tests, defined under item FF of the existing rules. "LC50" is an abbreviation for "lethal concentration" and is currently defined under item R. "EC50" is an abbreviation for "effect concentration" and is currently defined under item N. "Percent effluent" is proposed to be defined under item Z and "toxic unit" is proposed to be defined under item EE.

Acute toxicity in pollutant specific toxicity tests and whole effluent tests can be represented as lethal concentrations or effect concentrations, the concentration of chemical or effluent which is lethal or debilitating to 50 percent of exposed organisms at acute durations (usually 2 to 4 days). Pollutant specific concentrations are expressed as mass per unit volume, whereas whole effluent concentrations express toxicity as percent effluent or its reciprocal, toxicity units.

The proposed terminology and units of measure are reasonable because they correspond to the standards for toxics identified under part 7050.0222 and to the methods the MPCA uses to determine compliance with those standards. Also, they are consistent with common usage by EPA and in EPA guidance. Exhibit T61.

b. Item H. Chronic criterion.

A situation analogous to to the one discussed under item B for acute toxicity exists for chronic toxicity. Chronic no observed adverse effect levels (NOAEL) for pollutant specific criteria are expressed as mass per unit volume, whereas chronic whole effluent tests express their NOAEL's as percent effluent or as toxicity units.

The Agency proposes to add the word "effluent" to the definition of chronic toxicity to establish that a chronic criterion can be designated for an effluent. Adding this word is reasonable because chronic toxicity is part of whole effluent toxicity testing. Effluents usually contain a mixture of toxicants which can have an unknown chronic as well as acute effect.

c. Item Z. Percent effluent.

This is a new item. Since this part contains terms that are in alphabetical order, the existing items lettered Z to CC will be changed to correspond to this addition.

The Agency is proposing to add a definition for "percent effluent." This definition is needed to further explain the language proposed to be added to the definition of "whole effluent toxicity test," under item FF of the existing rules.

The definition will identify how a WET test is quantified and expressed in a fashion that is parallel to chemical-specific terms. The definition is consistent with terminology used in EPA guidance. Exhibit T58.

d. Item EE. Toxic unit.

This is a new item and items lettered DD to FF will be changed to accommodate this addition.

The Agency is proposing to add a definition for "toxic unit." This definition is also needed to further explain the language proposed to be added to the definition of "whole effluent toxicity test," under item FF of the existing rules.

This definition is consistent with the terminology used in EPA guidance. Exhibit T58.

e. Item HH. Whole effluent toxicity test.

This item letter is proposed to be changed from "FF" to "HH" due to the addition of two definitions under this part.

The Agency is proposing to add the following sentence to the definition of whole effluent toxicity test: "Effects on tested organisms are measured and expressed as toxic units or percent effluent for both acute and chronic whole effluent toxicity tests." This sentence is needed to clarify how tests results will be reported. The proposed language is reasonable because the terminology is the common terminology used in EPA guidance, Exhibit T58, and the procedures are consistent with those used to establish the numerical toxicity standards identified under part 7050.0222.

2. Subpart 10. Applicable criteria.

a. Item C.

"Part 7050.0220, subpart 3, items E to H" is proposed to be changed to "7050.0222, subpart 7, items B to E" because of the proposed restructuring of part 7050.0220.

P. Part 7050.0220 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR DESIGNATED CLASSES OF WATERS OF THE STATE

Upon the advise of the Revisor's Office, the Agency proposes to split the current part 7050.0220, which contains all the numerical and narrative standards for the various use classes, into eight new parts. The proposed addition of the tables of standards, the eight new Class 2 standards, and the new Class 2D for wetlands makes the current part 7050.0220 very large and unwieldy. The Agency, in consultation with staff of the Revisor's Office, believes that the addition of several new parts will reduce confusion and make the rule easier to read and to amend in the future.

The current rule is proposed to be modified to create eight new parts as follows:

Part 7050.0220. The heading for this part is proposed to be changed from "Specific Standards of Quality and Purity for Designated Classes of Waters of the State" to "Specific Standards of Quality and Purity By Associated Use Classes." This part will include part 7050.0220, subpart 1, from the current rules and the proposed new tables of numerical standards arranged by the four associated use classes.

Part 7050.0221. This part will contain part 7050.0220, subpart 2, from the current rules and contain the standards for Class 1 waters.

Part 7050.0222. This part will contain part 7050.0220, subpart 3, from the current rules and contain the standards for Class 2 waters.

Part 7050.0223. This part will contain part 7050.0220, subpart 4, from the current rules and contain the standards for Class 3 waters.

Part 7050.0224. This part will contain part 7050.0220, subpart 5, from the current rules and contain the standards for Class 4 waters.

Part 7050.0225. This part will contain part 7050.0220, subpart 6, from the current rules and contain the standards for Class 5 waters.

Part 7050.0226. This part will contain part 7050.0220, subpart 7, from the current rules and contain the standards for Class 6 waters.

Part 7050.0227. This part will contain part 7050.0220, subpart 8, from the current rules and contain the standards for Class 7 waters.

Q. Part 7050.0220 SPECIFIC STANDARDS OF QUALITY AND PURITY BY ASSOCIATED USE CLASSES.

The Agency is proposing to add to the rule four tables listing numerical and narrative standards together for all the use classes applicable to a particular surface water of the state. For example, trout streams are protected for six separate beneficial uses; fisheries and recreation, drinking water, industrial consumption, irrigation and livestock watering, aesthetics, and other uses. Each of these beneficial uses, except "other", has numerical and narrative standards that protect these uses. Currently the rule lists the standards separately under each use class in part 7050.0220, subparts 2 through 8. The proposed tables will list, side-by-side, all the numerical and some narrative standards for the associated use classes applicable to surface waters. The longer narrative standards will be listed at the end of each table.

The Agency believes that the proposed tables will make the rule easier to use and reduce the chances of making errors in selecting the correct standards for a particular surface water.

The standards in the proposed tables are restricted to surface waters because surface waters have multiple beneficial uses and multiple sets of standards assigned to them, which has been the source of some confusion as mentioned above. Ground waters (Class 1) are protected for just one beneficial use, drinking water, and only the drinking water standards apply to ground waters. For this reason the proposed tables are restricted to the associated use classes and standards applicable to surface waters. However, it should be noted that some surface waters are protected for drinking water in addition to their other uses, and the same drinking water standards applicable to these surface waters are applicable to ground waters.

The addition of the tables will address three issues. Two aspects of the current arrangement of standards make it confusing to readers, often leading to errors in the application of standards. A third issue is the updating of the documents that incorporate the Class 1 primary and secondary drinking water standards in the current rule which were originally established in 1962.

First, many users of the rule are not fully aware that all surface waters are protected for more than one beneficial use, and therefore, they may be unaware that numerous standards for the multiple beneficial uses apply to their surface water of interest. The result is surface waters may go unprotected for these other uses. Second, several use classes, particularly class 1 and 2, have standards for the same pollutant that differ from class to class. PH provides an example; a total of six use classes have a standard for pH, and they are not all the same. Part 7050.0450 states that if use classes have different standards for the same pollutant, the lowest (most restrictive) standard applies. The current rule arrangement of the numerical standards (listed separately by use class) makes determining the correct standard more difficult and time consuming, and could lead to the application of an incorrect standard or no standard at all.

The third issue is the potential confusion and mistakes that users of the rule might make due the presence of the outdated Class 1 primary and secondary drinking water standards in the current rule. These standards are based on a 1962 document (Public Health Service Drinking Water Standards Revised 1962, U.S. Department of Health, Education, and Welfare, Public Health Service, Washington 25, D.C.). These outdated standards have never been updated because of the language in part 7050.0220, subpart 2 which cites the 1962 document and "any revisions, amendments, or supplements to it." This language has been in ch. 7050 since statewide standards were first adopted in 1967. The Agency has interpreted "revisions, amendments, or supplements to it" to mean that the latest drinking water standards issued by the EPA are applicable. The presence of the 1962 standards in the rule caused only limited confusion for many years because there were few changes to the drinking water standards from 1962 to about 1985. However, since 1985, as more and more new drinking water standards have been finalized by EPA and more of the old standards have changed, the outdated standards and the reference to the 1962 document in the rule has increasingly become a major source of confusion to outside parties.

It is proposed to include most of the current drinking water standards in the proposed tables of standards and replace the reference to the 1962 document with a reference to the current drinking water standards standards in the Code of Federal Regulations. These proposals are further discussed below.

1. Subpart 1. General.

In the current rule, this subpart provides an introductory statement leading into the numerical and narrative standards for all use classes. The words "and narrative" are proposed to be added at this time to address the existing narrative standards already in ch. 7050 and the proposed addition of narrative standards for designated classes of wetlands. This general language is proposed to be repeated under subpart 1 of parts 7050.0221 to 7050.0227.

The Agency received several comments regarding the use of narrative language as a tool to protect state water resources. All waters of the state, including wetlands, are covered by narrative language in the existing standards. Although wetlands are already protected through existing water quality standards, the additional language proposed under parts 7050.0222, subpart 6; 7050.0223, subpart 5; 7050.0224, subpart 4; and 7050.0225, subpart 2, will more appropriately address the unique characteristics of wetlands.

2. Subpart 2. Explanation of the tables of standards in subparts 3 to 6.

This proposed subpart will contain information needed for the reader to use the proposed tables of standards in the rest of this part. In order to accommodate the standards in a table format, a number of abbreviations, acronyms and explanatory notes must be included. All are defined or explained in this subpart to make the tables easier to use. Three of the terms used in the tables have been defined elsewhere in the rule and these definitions are repeated in subpart 2 so the reader does not need to hunt for the definitions when using the tables of standards.

The abbreviations and acronyms used in the tables are:

(C) This means the chemical is considered carcinogenic and the standard is human health-based. This symbol is used in the current rule in part 7050.0220, subpart 3, and it has the same meaning there. A cancer potency slope or a reference dose plus an extra safety factor of 10 (class C carcinogen) was used to calculate the human health-based standard.

CS This means "chronic standard". CS is defined in the current rule (part 7050.0218, subpart 3, item I.) as the highest water concentration of a toxicant to which organisms can be exposed indefinitely without causing chronic toxicity.

exp. () This means the natural antilogarithm (base e) of the expression in parenthesis. The expression refers to the standards that vary with total hardness or pH. These standards are in the form of a formula and are listed at the end of the tables as "Notes".

FAV This means "Final Acute Value". FAV is defined in the current rule (part 7050.0218, subpart 3, item O.) as an estimate of the concentration of a pollutant corresponding to the cumulative probability of 0.05 in the distribution of all the acute toxicity values for the genera or species from the acceptable acute toxicity tests conducted on a pollutant. The FAV can be applied as an effluent limitation or to prevent acutely toxic conditions in mixing zones.

MS This means "maximum standard". MS is defined in the current rule (part 7050.0218, subpart 3, item U.) as the highest concentration of a toxicant in water to which aquatic organisms can be exposed for a brief time with zero to slight mortality. The MS equals the FAV divided by two. The MSs are often used as remedial action cleanup goals to protect surface waters in some ground water contamination situations.

(S) This means the associated value is a secondary drinking water standard. Secondary drinking water standards are based on non-health related end points such as unpleasant tastes or odors and properties that stain laundry.

TH This means "total hardness" in mg/l; used in the calculation of the hardness related metal standards

TON This means "threshold odor number", which refers to the number of times a sample must be diluted to produce odor-free water from a sample having a perceptible odor.

Common synonyms or acronyms for some of the chemicals, pollutants and other materials listed under "Substance or Characteristic" are included in the proposed tables. For example, under "polychlorinated biphenyls", "(PCBs, total)" is listed. The synonyms and acronyms are either after or under the primary listing, and they are always in parentheses. In the case of "Trihalomethanes, total", the four chemicals in parentheses which follow are the four trihalomethanes included in the total. Additional identifying information such as ortho, para, cis and trans is included after some chemical names in parentheses.

3. Subparts 3. through 6.

The use classes for waters of the state are defined in part 7050.0200. The numerical and most narrative standards for surface waters have been arranged into four tables, based on the three subcategories of Class 2 waters (fisheries and recreation), plus limited resource value waters (Class 7) and their associated uses, as follows:

Proposed Subpart	Aquatic Life and Recreation Category	Associated Use Classes
3	Trout Waters, including drinking water	1B, 2A, 3A or 3B, 4A and 4B, and 5
4	Cool and warm water fisheries including drinking water	1B or 1C, 2Bd, 3A or 3B, 4A and 4B and 5
5	Cool and warm water fisheries (2B), or "rough fish" waters (2C), or wetlands (proposed 2D)	2B, 2C or 2D; 3A, 3B, 3C or 3D; 4A and 4B, or 4C; and 5
6	Limited Resource Value Waters	3C, 4A and 4B, 5 and 7

All surface waters are protected for Class 6, "other" uses, but there are no numerical standards associated with this use class and it is not included in the tables.

The proposed tables include all the numerical and some narrative standards currently listed in part 7050.0220, subparts 3 through 8, plus the proposed new eight standards. When a narrative standard is included in the table, such as the dissolved oxygen standard for trout waters (Class 2A) of "7 [mg/l] as a daily minimum", the standard given is the chronic standard. In these cases, there are no maximum or final acute value standards. In another case, such as the trout water standard for silver, there is single numerical chronic standard of 0.12 ug/l followed by "note # 8", which refers the reader to the hardness variable maximum and final acute value standards at the end of the table.

Other narrative standards, those too long to fit in the table itself, are either listed in full at the end of the tables in the "notes", or the "note" refers the reader to the portions of the rule containing the full standard. The latter include the narrative standards for radioactive materials, the site specific dissolved oxygen standards, and some of the standards pertaining to wetlands.

The tables include the following narrative standards as "notes".

Fecal coliform organisms
Radioactive materials (reference)
Temperature
Site specific Dissolved Oxygen (DO) standards for Class 2B and 2C waters (reference), and the DO standard for Class 7 waters
Class 3D, 4C and 5 standards for wetlands (reference)
Class 2D (wetlands) standard for pH
Toxic Pollutants standard for Class 7 waters

The only narrative standards not listed or referenced in the proposed tables are the Class 4B Toxic substances standard, and a statement following the Class 2 Dissolved oxygen standards. The Toxic substances standard reads: "Toxic materials - None at levels harmful either directly or indirectly". The statement following the dissolved oxygen standards provides guidance on implementing the standard and reads: "This dissolved oxygen standard requires compliance with the standard 50 percent of the days at which the flow of the receiving stream is equal to the lowest average 7-day flow with a once in ten year recurrence interval (7Q10). These were omitted because of space limitations in the tables.

The other "notes" at the end of the tables list the eight standards which vary with total hardness or pH. These standards are in the form of formulas. Seven of the eight are trace metal standards which vary with total hardness. Some trace metals are more toxic in soft waters than they are in hard waters. The standards reflect this toxicity-hardness relationship. Example standards are included for hardness values of 50, 100, 200, 300 and 400 mg/l as a convenience to the reader. The pentachlorophenol standard varies with pH; example standards are listed for pH values of 6.5, 7, 7.5, 8, 8.5 and 9.

The drinking water standards included in the proposed tables are the current primary and secondary drinking water standards issued by the EPA under the Safe Drinking Water Act. EPA primary and secondary drinking water standards are called Maximum Contaminant Levels (MCL). These standards are codified in the Code of Federal Regulations, Title 40, part 141 subparts B and G, and part 143. Exhibit T64. No MCLs which are not final and no Maximum Contaminant Level Goals (MCLG), which are the precursors to MCLs, are included in the tables.

Placing the latest drinking water standards and the other standards in the tables does not change the standards currently applicable to Minnesota's ground or surface waters. Tabulation of the standards does not cause any standard to go up or down, nor will it add or subtract any standard that is applicable now. This change is intended only to make the rule more usable and reduce commonly committed errors and misinterpretations made by users. Some drinking water standards are not included in the tables for the reasons discussed below.

A few drinking water standards are relevant to ground water but not to the raw surface water supplies. These standards, fecal coliform bacteria and two water treatment additives, are not included in the tables. The current rule addresses this situation for fecal coliform by including the term "bacteriological standard" in the standards normally restricted to ground waters (Class 1A), but excludes the bacteriological standard from the subclasses that include surface waters (Classes 1B through 1D). The total coliform bacteria standard is excluded by the purposeful omission of "bacteriological standards" in the last line in part 7050.0220, subpart 2, item B which reads: "The physical and chemical standards quoted above for Class 1A waters shall also apply to these [Class 1B] waters in the untreated state". No surface waters are classified 1A currently. Therefore, the total coliform standard does not currently apply to surface waters protected for drinking, and it is not included in the proposed tables under Class 1.

Two water treatment additives have EPA drinking water standards which are not in the tables. These chemicals, acrylamide and epichlorohydrin, may be added to the water as part of the treatment process before it is distributed to the consumer. These chemicals are not likely to be found in the raw surface water supplies.

The primary drinking water standards for copper and lead consist of required treatment techniques including corrosion control treatment, source water treatment, lead service line replacement, and public education rather than the usual numbers. These treatment standards for copper and lead are not included in the tables.

The EPA drinking water standards for radioactivity are excluded from the tables due to the space limitations.

Two pollutants, fluoride and hexachlorocyclopentadiene, have both primary and secondary drinking water standards. In both cases the secondary standard is the lower of the two standards and the lower secondary standard would be the applicable standard for compliance and enforcement purposes. The primary standards are listed to be complete and for the benefit of the reader.

Should any discrepancy occur between a standard listed in the proposed tables (part 7050.0220, subparts 3 through 6) and the standards listed under each use class separately (parts 7050.0221 through 7050.0227), the latter, class by class listings of standards, will be considered the correct standards for application and compliance determinations. This includes the drinking water standards in the Code of Federal Regulations.

R. Part 7050.0221 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR CLASS 1 WATERS OF THE STATE, DOMESTIC CONSUMPTION.

This part was created from part 7050.0220 as follows:

Proposed rules	Current rules
Subpart 2	7050.0220, subpart 2, item A
Subpart 3	7050.0220, subpart 2, item B
Subpart 4	7050.0220, subpart 2, item C

Subpart 5	7050.0220, subpart 2, item D
Subpart 6	7050.0220, subpart 2, item D

As already stated, the EPA primary and secondary drinking water standards are incorporated by reference as Class 1 standards to protect raw water supplies for domestic consumption. The primary drinking water standards, or MCLs, are established to protect human health, but they also take into account non-health related factors such as treatability and analytical detection limits. MCLs go through a lengthy promulgation and public notice process before being finalized and published in the Federal Register. Secondary drinking water standards are based on non-health related aesthetic end points.

Several changes are proposed for this subpart in conjunction with the addition of the proposed tables of standards.

First, the reference to the 1962 Public Health Service document will be deleted and replaced with the reference to the primary and secondary drinking water standards in the Code of Federal Regulations (CFR), Title 40, part 141 subparts B and G, and part 143. Exhibit T64. It is proposed to retain the "revisions, amendments, or supplements" language so the Agency can use the latest EPA drinking water standards in their risk assessment, compliance and enforcement activities.

Second, the outdated standards listed for Class 1A waters are proposed to be deleted to eliminate a source of confusion with the updated standards in the proposed tables. The Agency is not proposing, at this time, to list out all the updated standards in subpart 2. The Agency believes this would be an unnecessary duplication in the rule since all but a few standards (the bacteriological, radiological, treatment technique (Cu and Pb), and water treatment additive standards) will be listed in the proposed part 7050.0220, subparts 3 and 4, and the complete set of primary and secondary standards are incorporated by referencing the CFR.

Third, it is proposed to delete the references in subparts 3 and 4 (Class 1B-1C), back to the standards in item A (Class 1A). The incorporation by reference of the standards in the CFR will suffice as the source of the numerical standards. However, the exception to the current Class 1A total coliform standard, as discussed above, for Class 1B and 1C will be retained. Also, the more lenient turbidity standard for Class 1C of 25 NTU will be retained.

Finally, some of the standards for Class 1D waters in the current rule are less stringent than the Class 1A primary and secondary drinking water standards. This is a recognition that very poorly protected aquifers in karst topographies may not be able to meet the Class 1A standards. The Agency is proposing to retain the Class 1D standards and not change them at this time.

In conclusion, these changes are being proposed to help end the confusion over selection of appropriate standards, and to update the primary drinking water standards. These changes will not make the rule more or less stringent than it is now, nor will these changes affect treatment or cleanup costs.

1. Subpart 6. Additional Standards.

The proposed dividing of part 7050.0220 made it necessary to change the reference to "above listed" standards to standards "in subparts 2 to 5." This does not change the meaning of the current rules.

S. Part 7050.0222 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR CLASS 2 WATERS OF THE STATE; AQUATIC LIFE AND RECREATION.

This part was created from part 7050.0220 as follows:

Proposed rules	Current rules
Subpart 2	7050.0220, subpart 3, item A
Subpart 3	7050.0220, subpart 3, item B
Subpart 4	7050.0220, subpart 3, item C
Subpart 5	7050.0220, subpart 3, item D
Subpart 7	
item A	7050.0220, subpart 3, item D
item B	7050.0220, subpart 3, item E
item C	7050.0220, subpart 3, item F
item D	7050.0220, subpart 3, item G
item E	7050.0220, subpart 3, item H
Subpart 8	7050.0220, subpart 3a

Revision subjects.

Three of the major revision subjects identified in the SONAR introduction are discussed under this part of the SONAR. These subjects are: narrative biocriteria, the eight new aquatic life standards, and the nine updated aquatic life standards. This part of the SONAR includes a general discussion of each major subject as a preliminary introduction and background to the specific revisions that will be made in each item. Then, the changes that are unique to an item will be discussed separately under the heading for the corresponding item.

1. Narrative biocriteria.

The aquatic life use classes are currently described in terms of various fisheries group. The Agency is proposing changes in the language that will maintain fish as a descriptor of use class in Classes 2A, 2B, 2Bd, and 2C but also include the terms "healthy community" and "associated aquatic organisms". It is reasonable to make these changes because, as discussed in the SONAR for part 7050.0200, Class 2, the criteria that are set forth under this rule are established to protect the entire aquatic community. The wording change describes this protection more explicitly.

The emphasis of the proposed changes provides the narrative language for utilizing indicator community for use support determinations. Fish communities may be good indicators of biological condition and may be sensitive to various impacts. However, in certain waterbody types and for assessing some impacts macroinvertebrates, macrophytes, algae, or other indicative communities may be a better choice. In adding the 2D classification, "fish" were not highlighted because in many wetland types they may not be present.

The term healthy was added to all the aquatic life use class descriptions to indicate what the attainable goal is for each aquatic life use class. Healthy can be defined as a community that has a structure and function comparable to that of the most natural situations or reference condition for that region and waterbody type.

The Agency also proposes to delete the terms "commercial" and "rough fisheries" in the use class description. These terms are ambiguous in that the Agency has never identified what are considered to be rough or commercial fish species for this rule. Where they have been identified, the terms "rough" and "commercial" describe many of the same fish species. According to the game and fish regulations, Minnesota Statutes chapter 97A and 97C, "rough fish" include carp, buffalo, sucker, sheepshead, bowfin, burbot, cisco, gar, goldeye, and bullhead. Under the same statutes, many of these fish species are considered commercial fish when taken for sale in inland waters.

The intent of the designated use classification scheme is not to distinguish the types of fishing regulations that are being imposed in the waters. The Agency's intent is to illustrate differences in aquatic life, habitat type, and biological potential and establish criteria to protect these different aquatic life uses. Class 2A waters are those waters that are or have the potential to support coldwater sport fish species in the Salmonidae family including, for example, brook trout, rainbow trout, brown trout, and lake trout. Class 2B waters are those waters that because of their size and natural condition can support or have the potential to support populations of warm or cool water fish that are top carnivore species and are typically of interest to sport anglers. These fish species for example would include walleye, smallmouth bass, northern pike, channel catfish, and white bass. Class 2C waters are those waters that because of their size and natural condition do not support or have the potential to support populations of top carnivore species but do support a community of fish and associated organisms that naturally occur in an area; in other words, an indigenous community.

2. Eight new aquatic life standards.

   a. The development of the proposed water quality standards.

The Agency has developed 17 site-specific criteria since 1990. Eight of these are being proposed as state wide standards. The procedures used to develop state wide standards are the same procedures used to develop site-specific criteria. These procedures are contained in part 7050.0218, subparts 4 through 10. The difference between a criterion and a standard is that a standard has been promulgated through the rulemaking process and is listed in chapter 7050.

Each criterion or standard takes about two to three months of an Agency staff person's time to complete the extensive data search and evaluation needed to determine the number. Toxicity data are summarized in tables and the most pertinent data are recorded on "summary sheets". Page one of the summary sheets provides an overall summary of the process and includes the criterion or standard. Page two of the summary sheets is reserved for pollutants that have an EPA criterion. Since none of the eight proposed standards has a recent (since 1980) EPA aquatic life criterion, page two was not used. (Iron has an old aquatic life criterion of 1000 ug/l dating from 1976, and antimony has a draft aquatic life criterion dated 1988. Exhibits T50 and T36.) Page three is used to summarize the toxicity data when no EPA criterion is available. And finally, page four of the summary sheets records the information for the human health-based criterion. The data tables and summary sheets for all eight proposed standards are contained in Exhibit T1. Table 1 lists the eight proposed standards (also listed in Exhibit T48).

Same as Exhibit T48

Table 1. Proposed Water Quality Standards for Class 2 Waters.

Chemical	Class 2A			Class 2Bd	Class 2B/2C/2D			Basis
All units in ug/l	CS	MC	FAV	CS	CS	MC	FAV	
1. Alachlor (c)	3.8	800	1600	4.2	59	800	1600	PCA Hc, T1
2. Antimony	5.5	90	180	5.5	31	90	180	PCA Hs, T1
3. Atrazine (c)	3.4	323	645	3.4	10	323	645	PCA Hc, T1
4. Cobalt	2.8	436	872	2.8	5.0	436	872	PCA Hs, T1
5. Iron	221	243	485	1245	1245	1363	2726	PCA T1
6. Manganese	138	4643	9285	138	491	4643	9285	PCA Hs, T1
7. Naphthalene	81	409	818	81	81	409	818	PCA T1
8. Thallium	0.28	64	128	0.28	0.56	64	128	PCA Hs

Abbreviations

CS = Chronic standard
MS = Maximum standard
FAV = Final acute value
(c) = Carcinogen

Class 2A = Trout waters, protected for drinking and aquatic life
Class 2Bd = Warm and cool waters protected for drinking and aquatic life
Class 2B/2C = Warm and cool waters protected for aquatic life
Class 2D = Wetlands

Note: The MS and FAV standards applicable to Class 2Bd are shown under Class 2B/2C

Basis codes for standards

PCA = Criterion developed by MPCA staff
Hc = Human health carcinogenic effects
Hs = Human health systemic effects
T1 = Direct aquatic life Toxicity, EPA national procedures used

Aquatic life criteria (standard) development is broken down into three major portions: (1) Toxicity-based criteria development for protection of aquatic life from direct toxicity, (2) Human health-based criteria development for protection of humans who eat the fish and other edible aquatic organisms, and (3) wildlife-based criteria development for protection of wildlife that consume aquatic life. The three steps are briefly described below. Exhibit T40 provides a detailed description of the process.

1) Toxicity-based criteria development.

Development of a toxicity-based criteria begins with a data search using EPA's AQUatic toxicity Information REtrieval data base (AQUIRE). AQUIRE provides a systematic computerized data base including toxicity, physicochemical bioaccumulation, and bioconcentration data for thousands of chemicals. The Agency also utilizes the state's library system to do further literature search, access EPA and U.S. Fish and Wildlife Service publications, International Joint Commissions reports, and obtain other reports and publications from scientific journals and universities, to gather acute and chronic data for a particular chemical.

The literature is reviewed and acceptable acute and chronic data are tabulated. If acute data is available for at least eight species, a method developed by EPA is used to determine the toxicity-based criterion. Logarithmic means of the acute data, by genus, are ranked from highest to lowest. The four lowest "genus mean acute values" (GMAV) are used to calculate a statistical estimate of the fifth percentile GMAV from the low or sensitive end of the distribution of all GMAVs. This value is called the Final Acute Value (FAV). Thus, the goal of the FAV is to protect 95 percent of the species in an aquatic community from unacceptable acute toxicity.

If acute data for eight species are not available, the Agency uses an alternative method that utilizes the limited available toxicity data to calculate the FAV. This method is known as the EPA Advisory Method.

The next step in the toxicity-based criterion development is the calculation of an Acute to Chronic Ratio (ACR). Acute values (LC50s) and chronic values for the same test organism from the same experiment or laboratory are needed to calculate ACRs. The ACR is simply the acute value divided by the chronic value. All the acceptable ACRs available for the chemical are averaged together. The ACR is used to determine the chronic criterion by dividing the FAV by the ACR.

Toxicity data for algae and other aquatic plants are also reviewed. If plants are more sensitive to a pollutant than the animal species, the criterion is lowered to protect aquatic plants.

2) Human health-based criteria development.

Human health-based criteria protect human consumers of fish and shellfish that are taken in Minnesota waters. A bioaccumulative pollutant may be at a very low concentration in the water such that no acute or chronic toxicity is observed. The pollutant, however, may accumulate in fish or shellfish over a period of time which is passed on to consumers who eat these organisms. Bioaccumulative pollutants may cause health problems, especially to those who frequently eat contaminated organisms.

The primary task in the development of the human health-based criterion is the determination of a bioaccumulation factor (BAF). Most BAFs are based on bioconcentration tests and bioconcentration factors (BCF). Both BAFs and BCFs are the ratio of the concentration of the pollutant in fish tissue to the concentration in the surrounding water. The difference between a BAF and BCF is that a BAF reflects uptake of the chemical from both the food chain and the water, whereas a BCF reflects uptake of the chemical only from the water. BAFs are measured in the field and BCFs are based on lab tests. Minnesota's criteria development procedures include a method to predict a BAF from a BCF. Exhibit T40.

The greater the BAF, the more likely the pollutant will be a concern to human consumers of fish. BAF data are gathered through the same literature search as is done for toxicity data.

There are two different pathways that can be taken to calculate human health-based criteria. One pathway is taken if the pollutant is known or believed to cause cancer. While another pathway is taken for a noncarcinogenic pollutant. If the pollutant causes cancer, the Agency uses a cancer potency slope to calculate the criterion. If the pollutant is a noncarcinogen, a reference dose is used to calculate the criterion. Both the potency slopes and reference doses are obtained from the EPA Integrated Risk Information System (IRIS) through the Minnesota Department of Health (MDH). The Agency is careful to use the same potency slopes and reference doses used by the MDH to set drinking water criteria which are referred to as Recommended Allowable Limits (RAL). Exhibit T47.

For most surface water of the state (Class 2B, C and D) the human health-based criteria protect people who catch and eat fish from these waters. For this purpose it is assumed people eat 30 grams of fish per day. Some surface waters are also protected as a source of drinking water. All trout waters (Class 2A) and certain nontrout waters, such as a portions of the Mississippi and Red Rivers (Class 2Bd), are protected for drinking water plus fish consumption. Human health-based standards for these waters are calculated assuming people drink two liters of water and eat 30 grams from the same water. Exhibit T40.

3) Wildlife-based criteria development.

This process is designed to protect wildlife that feed on aquatic life. To date the Agency has not developed any wildlife-based criteria. The procedures for developing wildlife-based criteria are contained in part 7050.0218, subpart 9.

b. Selection of the criterion.

The lowest of the two criteria, toxicity-based or human health-based, becomes the Chronic Criterion (CC). Finally, the CC is checked against

EPA taste and odor criteria that protect humans from objectionable tastes or odors in edible fish tissue. The CC is lowered to the taste and odor criterion if the latter is lower.

c. The eight proposed standards.

The eight proposed standards fall into three categories: 1) herbicides, 2) metals, and 3) other organics. The proposed standards are listed in Table 1. Table 1 is the same as Exhibit T48. A discussion of the important aspects of the toxicity or bioaccumulation data, background concentrations, analytical detection limits, and other relevant information for each of the proposed standards follows.

1) Herbicides.

Standards are proposed for two herbicides: Alachlor and Atrazine.

a) <u>Alachlor</u>

Alachlor is a preplant or preemergence herbicide sold under several trade names including Lasso. The chemical name is: 2-chloro-2′, 6′-diethyl-N-(methoxymethyl) acetanilide. Alachlor is used to control annual grasses, certain broadleaf weeds, and yellow nutsedge. It is used in growing corn, soybeans, potatoes, peanuts, and cotton. It acts by preventing germination in the target plants. Exhibit T6.

The proposed alachlor standard is human health-based for surface waters protected for drinking and aquatic life (Class 2A and 2Bd), but toxicity-based for Class 2 waters not protected for drinking (Class 2B, 2C and 2D). Exhibit T1.

The toxicity-based criterion was developed using the EPA national method, however, one of the eight species requirements was not met. The MPCA advisory method produced a criterion that seemed overly protective and therefore, the national method was used. The chronic data available for alachlor indicate that using the national method (rather than the advisory method) is adequately protective. Table 2 of Exhibit T1. The usable plant toxicity data suggests that aquatic plants will be adequately protected by the proposed standard as well. Exhibits T2 through T6 contain the most pertinent toxicity data used to set the proposed alachlor standard.

Alachlor is classified by the EPA as a carcinogen, and the Agency used the latest cancer potency slope recommended by the MDH to calculate the human health-based criterion. Alachlor is not highly bioaccumulative. The final BAFs of 2.5 (Classes 2B, 2C, and 2D) and 10 (Class 2A) were obtained from an excellent bioconcentration study done at the University of Wisconsin, Superior. Exhibit T3.

In 1988 the Agency, with the cooperation of the Department of Agriculture, started analyzing river samples for herbicides. The samples were taken at selected stations in the Agency's routine water quality monitoring program. Most stations selected were located in the agricultural regions of Minnesota with a few in nonagricultural areas.

Samples were taken in June of 1988 and 1989, the two years for which data are available. The results show only a few values, most from the 1989 sampling, above detection limits. The detection limit is 0.02 ug/l, but some values were reported as less than 0.2 ug/l. A notable exception to this pattern was a 1989 value of 3.4 ug/l from the Blue Earth River near its mouth in Mankato. The next highest value, 1.4 ug/l, was measured in 1989 in the Cedar River, three miles south of Austin. The highest values measured are below the proposed standards.

b) Atrazine

As with alachlor, the proposed atrazine standard is human health-based for surface waters protected for drinking and aquatic life, but toxicity-based for Class 2 waters not protected for drinking. Exhibit T1.

The discussion of atrazine is more extensive than the discussion provided for the other chemicals because of its widespread use, its presence in surface and ground waters, and the emphasis being placed on nonpoint source pollution prevention in general by the Agency. More information is also available about the toxicity of atrazine and the toxicity of its breakdown products.

Atrazine is a heterocyclic nitrogen compound and one of several common triazine herbicides (chemical name: 2-chloro-4-ethylamino-6-isopropyl-amino-1, 3,5-triazine). Commercial names include AAtrex and Atranex. Atrazine kills weeds by interfering with the photosynthetic process. Exhibit T10.

Atrazine is used for weed control in a variety of crops such as corn, asparagus, potatoes, tomatoes, sorghum, rye and sugar cane. Exhibits T10 and T32. Atrazine is the most heavily used herbicide in the United States. Exhibit T10. Atrazine can enter the surface water through surface runoff, ground water upwelling, and atmospheric deposition. The amount of atrazine entering the surface water is dependent on the soil type, how soon a major rainfall occurs after application, the amount of humus in the soil, and other factors. The more sandy the soil and the less humic material present, the more likely atrazine will migrate to ground water. Exhibit T32.

Atrazine has been found to be persistent in soils (half lives of 20-101 days), but little is known about persistence in the aquatic environment. Its mobility is largely dependent on factors such as soil type, and amount of rainfall. Highest surface water concentrations are found in late spring and summer months, following application. Residual atrazine values, however, are found throughout the year. After application, atrazine breaks down into the major metabolite products of deethylatrazine, deisopropylatrazine, diaminoatrazine, hydroxyatrazine, deethylhydroxyatrazine, deisopropylhydroxatrazine, and diaminohydroxyatrazine. The metabolites appear to be fairly mobile in surface water. Exhibit T32.

Atrazine metabolite toxicity.

For the most part, the literature suggests that in the aquatic environment, the toxicity of the metabolites appears to be equal to, or less than, that of the parent chemical. Stratton (1984) reports deethylated atrazine to be less toxic than atrazine itself, but it was more toxic than the other metabolites tested. Exhibit T49. In the same study, Stratton investigated the toxicity of mixtures of metabolites and the parent compound to blue-green algae. In most tests, Stratton found toxicity to be less than additive. However, when atrazine was mixed with deisopropylated atrazine or deethylated atrazine, there was a greater than additive effect (synergism). Deisopropylated atrazine and deethylated atrazine mixtures were additive in their toxicity. In spite of Stratton's important study, the information on metabolite toxicity is fragmented and does not give sufficient information to establish separate criteria for each metabolite. Exhibit T34 illustrates that individual metabolite toxicity values for plants are above the proposed standard.

The Agency assessed the options of applying the atrazine standard as 1) the parent compound plus metabolites, or 2) the parent compound alone. A standard of "Atrazine plus metabolites" would assure protection of aquatic communities as the parent chemical is broken down into the various metabolites, and, conversely, a standard of "atrazine" alone may be under protective as atrazine is metabolized into other compounds. However, the Agency is proposing an atrazine alone standard at this time for the following reasons. First and most importantly, the breakdown products of all triazine herbicides (cyanazine, simazine and prometone for example, as well as atrazine) are chemically very similar, and triazine metabolites can not be traced back to an individual parent chemical. Thus, it would not be possible to attribute the metabolites measured in surface waters to atrazine or any other single triazine herbicide. Secondly, while there is ample toxicity data to develop an atrazine standard, there is insufficient data to develop standards for individual metabolites.

Determination of the proposed atrazine standard.

There is enough acute data to use the EPA national method to determine the toxicity-based criterion. Also, there is a great deal of information on chronic toxicity as listed in table 2a of Exhibit T1, as well as acute to chronic data for ACRs as shown in table 2b of Exhibit T1 for this pollutant. However, the calculated toxicity-based criterion is greater than some toxicity values for aquatic plants. Table 4b or Exhibit T1. Criteria development procedures allow for the lowering of the criterion to protect sensitive aquatic plants in this situation. Therefore, the Agency lowered the toxicity-based criterion of 30 ug/l to match the results of the lowest acceptable plant toxicity test which is 10 ug/l.

The EPA advisory value for atrazine of 1.0 ug/l is considerably lower than the proposed standard. Exhibit T10. However, EPA urges caution in the use of this advisory number because it is not based on their 96 hour algal exposure or acceptable chronic exposures to vascular plants. The advisory is based on the lowest effect level found to algae. However, the plant toxicity data listed in Table 4a and 4b in Exhibit T1 shows that by lowering the proposed standard to 10 ug/l, algae will be protected. Other toxicity information pertaining to the proposed atrazine standard can be found in Exhibits T11 and T12. Tables B-1 and C-1 in Exhibit T34 provide a concise summary of animal and plant toxicity data.

Atrazine is a class C carcinogen according to the EPA. A class C designation means this chemical is a suspected carcinogen but the evidence is not conclusive. The reference dose plus an additional safety factor of 10, rather than a potency slope, is used to determine human health criteria for class C carcinogens. The Agency has learned that the reference dose for atrazine may be changed soon. The information Agency staff has indicates the reference dose will be raised or made less stringent. If the change occurs before the hearing record closes, the Agency proposes to adjust the proposed atrazine standard accordingly.

Atrazine is not bioaccumulative in fish. The final BAF value of 2 came from a whitefish bioconcentration study. Bioconcentration data for some invertebrates are available, but vertebrate animals tend to metabolize atrazine more readily than do invertebrates. Fish BCFs and BAFs are given preference over invertebrate BCFs and BAFs when they are not in agreement because fresh water invertebrates caught in Minnesota are seldom eaten by people while fresh water fish are readily consumed by Minnesotants and visitors. The most pertinent BCF information on atrazine is in Exhibits T13 through T15.

Atrazine in surface and ground water.

Samples taken from the Mississippi River and its tributaries in a United States Geological Survey study found that 27 percent of the samples exceeded the federal drinking water standard of 3 ug/l. Exhibit T33. The Des Moines River in Iowa had an atrazine concentration ranging from 0.05 to 0.8 ug/L. The South Skunk River, which parallels most of the Des Moines River, had an atrazine concentration of 0.16 to 12.0 ug/L. Exhibit T34. Concentrations higher than 40 ug/l have been measured in some streams in Iowa, Ohio and in the tributaries to Chesapeake Bay.

Samples taken in Minnesota as part of the routine water quality monitoring in 1988 and 1989, as discussed for alachlor, showed concentrations ranging from 0.02 to 2.0 ug/l. The value of 2.0 ug/l was measured in 1989 in the Cedar River, three miles south of Austin. Values of 1.8 and 1.9 ug/l were measured in 1989 in the Rabbit River five miles northwest of Cambell (near western Minnesota boarder, southwest of Fergus Falls). A concentration of 2.3 ug/l was measured in Garvin Brook in 1982. All these samples were taken in June. The highest values measured are below the proposed standards. More typical concentrations were in the 0.1 to 0.4 range in agricultural watersheds, and below detection (0.02 ug/l) in watersheds with little agriculture. These results show generally lower concentration than have been reported elsewhere in the United States. The results of ongoing intensive surveys by the Department of Agriculture should help define the potential herbicide problem, including atrazine, in Minnesota in more detail.

2) Metals.

Standards are proposed for five metals: Antimony, Cobalt, Iron, Manganese, and Thallium. Table 1 and Exhibit T48 contain a list of the proposed standards for metals.

a) Antimony

Antimony is a silverly-white metallic alloy that is used in making matches, fireproofing materials, and hardening other metallic compounds. The proposed standard is human health-based for Class 2A and Class 2Bd waters, and toxicity-based for Class 2B, 2C and 2D waters. Exhibit T1.

The toxicity-based criterion was developed using the EPA national method. A great deal of the most useful information was developed by the University of Wisconsin at Superior, under contract by the EPA Environmental Research Laboratory-Duluth. Exhibit T7. Exhibits T8 through T9 contain other pertinent antimony toxicity information.

The human health-based criterion was developed using a BCF of 1 based on data in the EPA draft criterion. Exhibit T36. The Agency used 0.4 for the Relative Source Contribution Factor (RSC) in calculating the criterion. This RSC was used by the EPA to calculate the new antimony primary drinking water standard of 6 ug/l. Exhibit T35. The Agency proposes to use the recent RSC from EPA, together with the reference dose from the MDH to calculate the human health-based criterion.

No usable ambient stream or lake data for antimony were found in the STORET data base for Minnesota.

b) Cobalt

Cobalt is a steel-gray metallic element used in ink coloration, and as a metal alloy. The proposed standard is human health-based for Class 2A and Class 2Bd waters, and toxicity-based for Class 2B, 2C and 2D waters. Exhibit T1.

The toxicity-based criterion was developed using the EPA national method despite the lack of information for salmonids. There are a total of 14 Genus Mean Acute Values (GMAV) available to calculate the Final Acute Value (FAV). The toxicity-based criterion was lowered to match the chronic value of 5 ug/l for Daphnia magna as shown in table 2a of Exhibit T1. Daphnids have often been shown to be sensitive to metals. Other pertinent cobalt toxicity information can be found in Exhibits T8 and T16.

A single BCF of 0.3 is available for calculating the human health-based criterion. Exhibit T17. The procedures require using a BAF of 1.0 when the measured value is less than 1.0. The procedures also require the use of a RSC of 0.2 when no chemical specific data are available, which is the case for cobalt. Since the RAL list number 3 was issued in January 1991, the reference dose for cobalt has been withdrawn from the Health Assessment Summary Tables (HEAST). Because 0.0004 is the last reference dose available, the human health-based criterion is based on this reference dose. The human health-based criterion is not much lower (2.8 compared to 5.0 ug/l) than the toxicity-based criterion, but the Agency believes that the lower human health-based criterion should be used for the proposed Class 2A and Class 2Bd standards based on the last reference dose available.

The Agency has monitored for cobalt on a few occasions as part of the routine monitoring program. In general, concentrations range from about 1.0 to 2.2 ug/l in rivers across Minnesota, but some of these values may not reflect true concentrations because ambient levels are near or below the analytical detection limit of 0.5 ug/l. Cobalt data from the copper-nickel study in northeastern Minnesota reported most of concentration to be below detection limits of 0.2 to 0.5 ug/l. This study made special efforts to obtain the lowest detection levels possible.

c) Iron

Iron is a metallic element used in steel production. The proposed standard is toxicity-based for all Class 2 waters. Exhibit T1.

The EPA national method was used in developing the toxicity-based criterion despite the lack of a third fish species. The advisory method would have resulted in a criterion lower than background concentrations in most areas of the state. A single measured acute to chronic ratio of 2.19 for *Daphnia magna* is available. Exhibit T16. *Daphnia magna* is the third most sensitive organism to iron toxicity. The use of the *D. magna* ACR will be protective. Also, use of the generic acute to chronic ratio of 55, as called for in the procedures to "fill in" for the required second and third ACRs (resulting in an ACR of 18.8), would have driven the toxicity-based criterion well below background concentrations found in Minnesota.

The brook trout appears to be considerably more sensitive to iron toxicity than other aquatic organisms. Exhibit T1. The low brook trout LC50 of 917 ug/l is the reason for the lower proposed standard for trout waters. Other pertinent iron toxicity information can be found in Exhibits T18 through T21.

There was no BCF or BAF data found for iron, so a human health-based criterion could not be developed. Iron is not known to bioaccumulate in fish tissue and the toxicity-based criterion should protect human health. The secondary drinking water standard of 300 ug/l is based on iron's ability to stain laundry and impart unpleasant tastes to drinking water. Iron has no primary drinking water standard.

Background concentrations of iron in Minnesota's waters become an important issue relative to the proposed standard. Background concentrations may exceed the proposed standard in all areas of the state. Background data from the Agency's routine water quality monitoring network are summarized in Table 2, and in Exhibit T51. As shown in Table 2, the percent of measured iron concentrations above the proposed Class 2B, 2C and 2D standard range from a low of six percent in the Upper Mississippi River basin to a high of 35 percent in the Red River basin. The percent of values above the proposed standard of 221 ug/l for trout waters (Class 2A) is substantially higher. Ninety, 81 and 67 percent of the measured values exceeded the Class 2A standard in the Lower Mississippi, Lake Superior and Rainy River watersheds, respectively. Very few routine monitoring stations are located on trout streams.

Table 2. Summary of Background Data for Total Iron For Rivers and Streams in Minnesota

Showing % of Values Above Proposed Class 2B, 2C and 2D Chronic Standard of 1245 ug/l

Watershed	% Above Std.	Median Value ug/l	No. of Values
Big Sioux, Cedar, Des Moines	28	743	541
Minnesota	30	660	1303
Red	35	680	665
Rainy	13	350	346
Lake Superior	15	520	890
St. Croix	15	660	370
Upper Mississippi	6	340	1228
Lower Mississippi	23	640	888

The Agency is aware that proposing a standard that will be below some background concentrations poses potential problems in the application of the standard. Application of the iron standard in risk assessment or in determining the need for remedial action or treatment will have to be within the context of the local background concentrations of iron. Several issues are involved when background concentrations often exceed a standard. These issues include: 1) the quality of the toxicity data upon which the standard is based and how those data are interpreted, 2) the form of the metal in the toxicity test and the form as measured in ambient waters, and 3) the guidance in part 7050.0170 on how to treat background levels that are greater than the standard.

The iron toxicity data base, while small compared to the data base for the trace metals, consistently shows iron to be fairly toxic. As noted above, in evaluating the toxicity data for iron, the Agency used the national method rather than the advisory method and selected a lower acute to chronic ratio (ACR). These choices resulted in the proposed standards being less stringent in recognition of naturally high concentrations of iron in Minnesota waters.

The proposed standard is consistent with the laboratory toxicity tests. However, it is quite possible that unaccounted for, or unknown, factors are mitigating iron toxicity in nature. The proposed standard is for total iron, as are the background concentrations shown in Table 2. The chemistry of iron in natural water is very complex, Exhibit T53, and it is reasonable to assume that some forms of iron are not toxic to aquatic life, at least in concentrations likely to occur in natural waters. Iron toxicity is usually attributed to the soluble ferrous (Fe++) ion and the insoluble ferric (Fe+++) ion. However, particulate ferric hydroxide can accumulate on and clog the gills of small fish and invertebrates causing reduced survival or growth. A "total" iron analysis includes the complexed and particulate iron in suspension as well as dissolved iron, and, therefore, will be protective or potentially over protective of aquatic life. A filtered or "dissolved" iron analysis would exclude the particulate forms of iron and may be under protective. Exhibit T52. Until more definitive information is available on the toxicity of common forms of iron in natural waters, the Agency believe the standard should be in terms of total metal as recommended by Exhibit T52.

The third issue mentioned above is the guidance provided by part 7050.0170 on dealing with background levels that exceed standards. The most pertinent provision states that, if the background levels exceed the standard, the background levels can be used as the standard in place of the numerical standard to control loadings from point or nonpoint sources. This provision means that those waters that have natural levels higher than the proposed standard will not be considered in noncompliance with the standard, and that the background levels become the standards used to control additional loadings. In implementing this provision, the Agency assesses the variability of the background levels and allow loadings or effluent concentrations within the range of this variability.

d) <u>Manganese</u>

Manganese is a grayish-white metallic element used in an alloy with the manufacturing of iron, aluminum, and copper. The proposed standard is toxicity-based for Classes 2B, 2C and 2D waters and human health-based for Class 2A and 2Bd waters. Exhibit T1.

The manganese toxicity-based criterion was developed using the EPA national method. The national method was used despite the lack of a third fish species and the lack of a species from a phylum other than Arthropoda or Chordata. The EPA advisory method results in a criterion that is believed to be unreasonably low. Pertinent manganese toxicity data can be found in Exhibits T8, T16, T22, and T23.

A new Reference dose (RfD) for manganese of 0.005 mg/kg/day has recently been added to IRIS. The RfD is based on effects to the central nervous system. The MDH proposes to use this RfD to determine a Health Risk Limit (HRL) to add to their draft HRL rule. The new HRL for manganese is not in the draft rule dated January 11, 1993. Exhibit T62. MDH is using a relative source contribution factor of 0.8 for manganese. The Agency proposes to use the new RfD and the relative source contribution factor of 0.8 to calculate the human health-based criterion. Acceptable BAF or BCF data for manganese for fresh water fish is scarce. Based on the limited data, the Agency believes that manganese is not bioaccumulative in fish and propose to use a BAF of one. This results in a proposed human health-based standard of 138 ug/l for Classes 2A and 2Bd waters.

The proposed Class 2A and Class 2Bd manganese standard will be exceeded frequently by background concentrations, as shown in Table 3. Not all waters in these watersheds are Class 2A and Class 2Bd. Exceedances of the Class 2B standard of 491 mg/l will be infrequent. The percent exceedance of the Class 2B standard ranged from zero to six percent for the same watersheds listed in Table 3. The Big Sioux, Cedar and Des Moines watersheds had six percent exceedances. When natural levels exceed the standard the provisions of part 7050.0170 apply as in the case of iron.

Table 3. Summary of Background Data for Total Manganese For Rivers and Streams in Minnesota

Showing % of Values Above Proposed Class 2A and 2Bd Chronic Standard of 138 ug/l

Watershed	% Above Std.	Median Value ug/l	No. of Values
Big Sioux, Cedar, Des Moines	54	150	539
Minnesota	62	160	1182
Red	37	110	666
Rainy	21	59	347
Lake Superior	11	21	898
St. Croix	37	100	371
Upper Mississippi	37	110	1225
Lower Mississippi	45	130	875

e) Thallium

Thallium is a bluish-white metallic element used to make photo electric cells and rat poison. The proposed standard is human health-based for all Class 2 waters. Exhibit T1.

The thallium toxicity-based criterion was developed using the EPA advisory method. There was one low plant toxicity value of 8 ug/l; however, the difference between 11 and 8 ug/l is not significant and the Agency believes the toxicity-based criterion of 11 ug/l will protect aquatic plants. The human health-based criterion of less than 1 ug/l should protect all biota. Pertinent thallium toxicity information can be found in Exhibits T8, T38 through 39, and T41 through T44.

The human health-based criterion was developed using BCF of 66.5 based on data from Atlantic salmon and bluegill studies. BCFs for saltwater clams are available, but these data were not used because the BCF values were lower than the fish BCFs, and clams are eaten less frequently than fish. Pertinent thallium BCF data is shown in Exhibits T41, T45, and T46. The Agency used a reference dose obtained from the MDH for thallium, and the default RSC of 0.2. The MDH used an RSC of 0.1 for antimony and other metals in the RAL list number 3 RAL (January 1991). Exhibit T47.

No usable ambient stream or lake data for thallium were found in the STORET data base for Minnesota.

3) Other Organics

Standards are proposed for one chemical under this category: Naphthalene.

a) Naphthalene

Naphthalene is a polynuclear aromatic hydrocarbon used as a wood preservative, the production of certain dyes, and as a moth repellent. The proposed standard is toxicity-based for all Class 2 waters.

The toxicity-based criterion was developed using the EPA national method. The lowest GMAVs were selected so that no more than two saltwater GMAVs were among the lowest four GMAVs (See part 7050.0218, subpart 5, item C.). Table 3b of Exhibit T1. The Agency found one chronic value that was lower than the toxicity-based criterion. Table 2a of Exhibit T1. However, this value is for a saltwater species and the proposed standard should protect freshwater organisms, based on the chronic data for them. Exhibit T1. Exhibits T24 through T29 and Exhibit T37 contain pertinent naphthalene toxicity data.

The human health-based criterion was developed using a new reference dose of 0.04 milligram per kilogram per day (mg/kg/day) as recommended by the MDH. The MDH used 0.004 mg/kg/day to calculate the RAL, which was the reference dose available at the time the RAL was released (January 1991). Exhibit T47. The bioaccumulation factor is from a whole body bluegill BCF and a rainbow trout edible portion BCF. Exhibits T30 and T31.

No usable ambient stream or lake data for naphthalene were found in the STORET data base for Minnesota.

Analytical Detection Limits.

The analytical detection limits obtained by the MDH analytical laboratory are shown in Table 4. The proposed Class 2A and Class 2Bd standard of 0.28 ug/l for thallium will be below the detection limit of 0.5 ug/l, otherwise, the proposed standards are above detection levels. The Agency believes that standards have to be set at levels required to protect aquatic life and human health independent of detection limits. A standard below detection does make ascertaining compliance with the standard more difficult. Techniques employed by the Agency to deal with this situation include monitoring the effluent before dilution, predicting water concentrations based on loading data, monitoring the pollutant in sediments where concentrations are likely to be higher, and monitoring bioaccumulative pollutants in fish tissue.

Table 4. Analytical Detection Limits
Compared to the Lowest Proposed Chronic Standard

Chemical	Detection Limit ug/l	Chronic Standard ug/l
Alachlor	0.02	3.8
Antimony	2	5.5
Atrazine	0.02	3.4
Cobalt	0.5	2.8
Iron	20	221
Manganese	3	138
Naphthalene	0.5	81
Thallium	0.5	0.28

d. Nine updated aquatic life standards for toxics.

The Agency is proposing to update nine of the 53 Class 2 aquatic life standards for toxics in parts 7050.0220 and 7050.0222. All nine are proposed for change because the reference doses (RfD) or potency slopes (q1*) used to calculate the standards have changed since the standards were first promulgated in 1990. (See part 7050.0218, subpart 6 and Exhibit T40 for details on how standards are determined.)

The RfDs or q1*s for 26 of the chemicals for which the Agency has Class 2 standards have undergone some change since 1990. The new RfDs and q1*s were obtained from the Health Risk Assessment Section of the Minnesota Department of Health (MDH). They are the latest values as of September 1992. Exhibit T54.

MDH obtains the Rfds and q1*s from the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST). IRIS and HEAST sources are maintained by the EPA, and the RfDs and q1*s represent a consensus of opinion within EPA on the toxicity and carcinogenicity of chemicals. As stated previously, Agency uses the same RfDs and q1*s the MDH uses to set their Recommended Allowable limits (RAL) and their proposed Health Risk Limits (HRL). Use of IRIS as the source for the RfDs and q1*s is specified in part 7050.0218, subpart 6.

The review of the 26 standards with new RfDs or q1*s resulted in nine chemicals needing to be updated. The reason many of the remaining standards are not changing is that the toxicity-based criteria remain lower than the human health-based criteria, and, therefore, the former control the standards. Some standards are being left unchanged for the reasons listed in Table 5, and as explained further below. The updated information for all human health-based criteria is contained in Exhibit T56.

Table 5. Review of Chemicals with Class 2 Standards
With new or Revised RfDs or q1*s

Chemical	Change	Status of Standard
Acenaphthene	new RfD	Remains toxicity-based
Anthracene	new RfD	Remains toxicity-based
Arsenic	revised RfD	**Updated standard
Benzene	revised q1*	Updated standard
Bromoform	revised RfD	Updated standard
Chlorpyrifos	new RfD,BAF	Remains toxicity-based
Chromium VI	revised RfD	Remains toxicity-based
1,2-Dichloroethane	revised q1*	**Remains unchanged
Di-n-octyl phthalate	new RfD	**Remains toxicity-based
Endosulfan	revised RfD	Updated standard
Ethyl benzene	revised RfD	Remains toxicity-based
Fluoranthene	revised RfD	Updated standard
Hexachlorobenzene	revised q1*	Updated standard
Lindane	new RfD	Remains based on 1990 q1*
Mercury	revised RfD	**Remains unchanged
Nickel	revised RfD	Updated standard
Parathion	new RfD	Remains toxicity-based
Pentachlorophenol	new q1*	**Updated standard
Selenium	revised RfD	Remains toxicity-based
Silver	new RfD	Remains toxicity-based
Tetrachloroethylene	revised q1*	**Remains unchanged
Toluene	revised RfD	Remains toxicity-based
Toxaphene	revised q1*	**Remains unchanged
2,4,6-Trichlorophenol	revised q1*	Remains organoleptic-based
Vinyl chloride	revised q1*	Updated standard
Zinc	new RfD	**Remains toxicity-based

** See further discussion in text

Of the nine updated standards, five are greater or less stringent, and four are lower or more stringent, than the current standards. The former category includes benzene, fluoranthene, hexachlorobenzene, nickel, and vinyl chloride. The latter category includes arsenic, bromoform, endosulfan, and pentachlorophenol; of these, arsenic and pentachlorophenol are significantly lower. Since these nine standards are being updated based only on new or revised RfDs or q1*s, according to established procedure, not all of them will be discussed individually. A comparison of the current and proposed chronic standards is shown in Table 6. None of the toxicity-based maximum standards or final acute values for the nine chemicals are proposed for change.

Table 6. Comparison of Current and Proposed Class 2 Chronic Standards
All units in ug/l Unless Noted

Chemical	Current Standards 2A	2Bd	2B,C,D	Proposed Standards 2A	2Bd	2B,C,D	Basis
Arsenic	50	50	70	2.0	2.0	53	Hs
Benzene	5.9	6.9	114T	9.7	11	114T	Hc,T
Bromoform	103	128	558	33	41	466	Hc
Endosulfan	0.044	0.15	0.15	0.0076	0.029	0.031	Hs
Fluoranthene	1.1	4.1	4.6	7.1	20T	20T	Hs,T
Hexachlorobenzene ng/l	0.056	0.22	0.22	0.061	0.24	0.24	Hc
Nickel*	88	88	158	297	297	NA	Hs&T
Pentachorophenol	5.7T	5.7T	5.7T	0.93	1.9	5.5	Hc
Vinyl chloride	0.14	0.15	7.6	0.17	0.18	9.2	Hc

NA = not applicable
Hc = standard is human health-based and chemical is considered a carcinogen
Hs = standard is human health-based and chemical is a systemic toxicant
T = standard is toxicity-based
* *Values shown are human health-based; hardness related toxicity-based standard will be lower than the proposed standards for hardness values less than 212 mg/l.*

The bioaccumulation factor (BAF) is the other major variable, besides the RfDs and q1*s, which can change with new information and can affect the human health-based criteria. BAFs are needed so that it can be determined whether the revised human health-based criteria will be lower than the current toxicity-based criteria. Most BAFs used in 1989 remain unchanged, but a few were changed based on new information, as shown below.

Chemical	1990 BAF	1992 BAF	Comments
Arsenic	4.4	4.4	no change justified after review
Chlorpyrifos	none	238	for Class 2B
		950	for Class 2A
Di-n-octyl phthalate	none	none	inadequate data
Nickel	47	1	new BAF based on fish
Parathion	none	71	
Pentachloro-	467	35	for Class 2B
phenol	467	142	for Class 2A
Silver	none	1	Great Lakes Initiative
Zinc	none	4.4	Great Lakes Initiative

1) Arsenic

The proposed new arsenic standard for Classes 2A and 2Bd waters of 2.0 ug/l is considerably lower than the current standard of 50 ug/l. The current Classes 2B and 2C standard of 70 ug/l is proposed to be lowered to 53 ug/l. This change is based on a lower (more stringent) RfD. The RfD is based on arsenic's noncarcinogenic human health effects. Arsenic is a well known human carcinogen based on inhalation studies. However, the evidence suggesting it is a carcinogen when ingested, either in water or with fish tissue, is less conclusive. The information the Agency has at this time is that EPA is reviewing the current primary drinking water standard for arsenic of 50 ug/l, and may propose a standard based on its carcinogenicity in the future.

The Recommended Allowable Limit (RAL) for arsenic, released by the MDH in 1990, is 0.2 ug/l, and is based on arsenic's carcinogenicity. RALs are used as drinking water or ground water criteria; i.e., they protect humans from the harmful effects of ingesting drinking water contaminants. However, because of the uncertainties about arsenic's carcinogenicity, and concern about having a HRL below most natural background concentrations, the MDH is not proposing to include a HRL for arsenic in their pending HRL rule. Exhibit T62.

The bioaccumulation factor used to calculate the 1990 arsenic standard was 4.4. The Agency reviewed the bioaccumulation and bioconcentration data again and concluded that there was no need to change the BAF. The Great Lakes Initiative draft BAF for arsenic in fish is 1.0.

The Agency believes that, in spite of the uncertainties and pending review within EPA, the proposed arsenic standards will be protective of both human health and aquatic life. Use of the q1*, as used by the MDH for the 1991 RAL, to calculate the standard would lower the proposed standards by a factor of 10 (0.2 for Classes 2A and 2Bd waters and 3.3 ug/l for Class 2B waters). Standards in the 0.2 to 3.3 ug/l range would be below background concentrations in much of the state. Based on data from the routine surface water monitoring program, the proposed 2A and 2Bd standard of 2.0 ug/l will be below most background concentrations in some watersheds in the state, as shown in Table 7. The proposed 2B and 2C standard of 53 ug/l will not be exceeded by natural background levels. Where natural background concentrations exceed the standard, the natural background levels can be used as the standard (part 7050.0170).

Table 7. Summary of Background Data for Arsenic For Rivers and Streams in Minnesota

Showing % of Values Above Proposed Class 2A and 2Bd Chronic Standard of 2.0 ug/l

Watershed	% Above Std.	Median Value ug/l	No. of Values
Big Sioux, Cedar, Des Moines	59	2.76	56
Minnesota	88	3.2	128
Red	76	3.3	78
Rainy	5	1.0	41
Lake Superior	2	1.0	123
St. Croix	--	--	--
Upper Mississippi	19	1.2	120
Lower Mississippi	19	1.3	137

In conclusion, the Agency is proposing a revised arsenic standard considerably more stringent than the current standard. The proposed 2A and 2Bd standard of 2.0 ug/l will be exceeded by background concentrations in the surface waters in some parts of the state. The uncertainties over arsenic's carcinogenicity may not be resolved soon. The promulgation of a new EPA primary drinking water standard often takes several years. Also, final MCLs for carcinogens are based on nonhuman health end points such as analytical detection limits, background concentrations, or treatability, which often makes the final MCLs less stringent.

2) 1,2-Dichloroethane

The change in potency slope was very slight (9.2 to 9.1), so the standard was left unchanged.

3) Di-n-Octyl Phthalate

Neither bioaccumulation or bioconcentration data are available for this chemical, and, therefore, a human health-based criterion can not be determined. If the BAF for di-2-ethylhexyl phthalate, a related chemical, is used to calculate a standard for di-n-octyl phthalate, the resulting criterion is within a factor of three of the current toxicity-based standard for this chemical (11 compared to 30 ug/l). In the absence of bioaccumulation data, the Agency believes the standard should be left unchanged.

4) Mercury

The latest RfD for mercury is roughly twice as large as the RfD used in 1990 (0.0003 to 0.00016). Consequently, use of the new RfD would result in a mercury standard about double the current standard of 0.0069 ug/l. The Agency believes a mercury standard of 0.013 ug/l would be under protective, and proposes to leave the current standard unchanged. For example, it is known from the very low detection level mercury monitoring done in northern Minnesota lakes that even the current standard is not protective of the fish in these sensitive lakes. The mercury concentrations in these lakes is in the 0.001 to 0.002 ug/l range, but mercury concentrations in fish are high enough to require consumption advisories. Exhibit T63. Also, wildlife can be sensitive to mercury toxicity and it is believed a higher standard would not protect sensitive wildlife.

5) Pentachlorophenol

The proposed Class 2A and 2Bd pentachlorophenol (PCP) chronic standards of 0.93 and 1.9 ug/l, respectively, are lower than the current Class 2 standards. The proposed Class 2B chronic standard of 5.5 ug/l will be lower than the current standard for most Class 2B waters of the state. Only for those waters with average pH values less than 6.97 will the current standard be lower (more stringent). The current chronic standard varies with the pH of the ambient waters, and ranges from 3.5 to 26 ug/l over a pH range of 6.5 to 8.5. The reason the proposed standard is lower is that EPA now considers PCP a potential human carcinogen. PCP has been classified as a 2B carcinogen and has been given a potency slope of 0.12. Exhibit T54. EPA defines a class 2B carcinogen as a "probable human carcinogen based on a combination of sufficient evidence in animals and inadequate data in humans". Exhibit T35. The new q1* replaces a RfD which was used to calculate the human health-based criterion in 1990. However, the pH dependent toxicity-based criterion was lower than the RfD based human health criterion in 1990.

The bioaccumulation factor for PCP was reviewed for the proposed standard. Exhibit T56. BCF and BAF data are summarized and discussed in the 1986 EPA water quality criterion for PCP, in the draft Great Lakes Initiative documents, and in a paper by Niimi and Cho (1983). All three sources report BCFs or BAFs in the range of 23 to 40. These BAFs and BCFs are adjusted to account for the lipid (fat) content of the various test fish used. Niimi and Cho (1983) provide evidence that PCP does not biomagnify up the food chain. Biomagnification refers to an increase in the tissue concentrations of a bioaccumulative chemical with each step in the food chain, such that top predator fish have higher concentrations than small fish, small fish higher concentrations than zooplankton, and so on. The Agency proposes to use the BAF data in Niimi and Cho (1983) as the basis for the BAF used to calculate the proposed standard. Exhibit T57. Field measured BAF data is preferred over laboratory measured BCF data because BAFs take into account potential biomagnification, metabolism and other factors that affect bioaccumulation in nature. Also, since field measured BAF data are available, the BCF to BAF adjustment factor in part 7050.0218, subpart 7, item B. is not used.

The geometric mean of the four lipid normalized BAFs in Exhibit T57 is 23.6. The resulting BAFs are as follows:

Revised BAFs for PCP:

23.6 X 1.5 % lipid (for Class 2B, 2C and 2D waters) = 35
23.6 X 6 % lipid (for Class 2A waters) = 142

PCP was analyzed in river samples taken during the routine monitoring program in 1978 and 1979. In total, 78 samples from around the state were analyzed for PCP. Of these, one value was above the most stringent (Class 2A) proposed standard of 0.93 ug/l. This was 0.97 ug/l measured in the Red River four miles south of Georgetown. This value would be below the proposed standard for the Red River of 1.9 ug/l. The lowest analytical detection level achieved for these data was 0.1 ug/l.

6) Tetrachloroethylene

The change in potency slope was very slight (from 5.3 to 5.1 mg/kg/day) and, in addition, the new q1* has be withdrawn for HEAST since September, 1992. The Agency proposes to leave the standard unchanged.

7) Toxaphene

The change in the potency slope was very slight, apparently due to rounding off the value the Agency proposes to leave the standard unchanged.

8) Zinc

The new RfD for zinc results in a human health based criterion of 328 ug/l for zinc. This is calculated using a BAF of 4.4, which is the draft BAF from the Great Lakes Initiative. This human health-based criterion is only slightly lower than the hardness dependent toxicity-based standard of 343 ug/l calculated for the maximum hardness of 400 mg/l. The Agency believes this is not enough difference to warrant a human health-based "cap" in the standard.

Revisions unique to each item

A discussion of the proposed changes that are unique to each item follows.

3. Subparts 2, 3 and 4.

The following changes to the standards are proposed to correct several minor errors left over from the amendments to ch. 7050 completed in 1990.

The Agency proposes to round off three of the current Class 2 standards to two significant digits. This change is being made to make these standards consistent with the practice, started when the 53 standards for toxics were adopted in 1990, to round values off to two significant figures. The three standards are:

Class 2 maximum standards for Dieldrin, from 1.25 to 1.3 ug/l;
Class 2Bd chronic standard for 1,1,2,2 Tetrachloroethane, from 1.54 to 1.5 ug/l; and

Class 2A Final Acute Value for Cadmium at a hardness of 200 mg/l, from 17.1 to 17 ug/l.

These changes do not involve any reassessment of the basis for the three standards.

The Agency proposes to add to the Class 2Bd standards in part 7050.0222, subpart 3, the following:

Color value Pt.-Co units	none	none	none

This will correct an error that says that Class 2Bd waters have a color standard because all Class 2A standards, which includes a color standard, apply to Class 2B waters, except those standards listed in the current part 7050.0220, subpart 3, item B. The Class 2A color standard is a carry over from the rule prior to the amendments in 1990. Class 2B waters have never had a color standard. When the new class "2Bd" was created in 1990 to include nontrout waters protected for drinking, a use they have in common with Class 2A (trout) waters, the error was made in not excluding the color standard from Class 2Bd waters.

The chemical "Acenaphthene" is misspelled in the current rule as "Acenapthene". It is proposed to correct this error.

In the lists of Class 2 standards, the "(C)" designation is associated with substances that are carcinogenic, and for which the human health-based criterion is the basis for the standard. The Class 2A and 2Bd standards for some substances are human health-based due to the inclusion of drinking water in the determination of the standards. However, the Class 2B standard for the same substance may be toxicity-based because the human health-based criterion is based on fish consumption only. The "(C)" designation is erroneously associated with three Class 2B standards that are in this category. It is proposed to delete the "(C)" from the following toxicity-based Class 2B standards. The Class 2Bd and 2B standards are shown to illustrate the change from human health to toxicity-based standards.

Substance	Human Health-based Class 2Bd standard ug/L	Toxicity-based Class 2B standard ug/L
Benzene	11	114
Chloroform	55	224
Methylene chloride	46	1561

A third change to these subparts is proposed to make the rule easier to use. It is proposed to add to the top of each page that includes the Class 2A, 2Bd, and 2B standards the following headings:

Class 2A standards continued
CS MS FAV

A similar heading will appear at the top of the pages listing the Class 2Bd and 2B standards. This will help the reader identify the use class that the standards on each page pertain to, and it will help identify which standards are the CS, MS and FAV.

4. Subpart 2. Class 2A waters; aquatic life and recreation.

The Agency proposes to change the word "fisheries" to "aquatic life" in the name of designated use Class 2. This change is also proposed under subparts 3 to 4. See part 7050.0200, subpart 3 (Class 2) for a discussion of the need for and reasonableness of this change.

The Agency proposes to delete reference to warm water sport fish by deleting "warm or." The term warm is being removed from the description of Class 2A waters because, even though warm water fish may be present, it is the presence or potential presence of the cold water fish species that is used to classify a waterbody under Class 2A. For a more detailed explanation of the intent the use classification scheme and Class 2A, see the discussion of narrative biocriteria in the part 7050.0222 revision subject text.

The restructuring of part 7050.0220 has made it necessary to change the "part 7050.0220, subpart 3, item H" to "part 7050.0222, subpart 7, item E." This change is also proposed under subparts 3 and 4.

The Agency proposes to delete the phrase "this dissolved oxygen standard requires compliance with the." This phrase appears twice in the rule due to a word processing error made during the 1990 rule revision. This change will correct this error without causing a change in the standard. This correction also occurs under subparts 4 and 5.

5. Subpart 5. Class 2C waters.

The phrase "species commonly inhabiting waters of the vicinity under natural conditions" is proposed to be condensed to the word "indigenous." This change will eliminate a wordy statement without changing the meaning of the standard.

The restructuring of part 7050.0220 has made it necessary to change "item C" to "subpart 4."

6. Subpart 6. Class 2D waters.

The Agency proposes to establish a designated use Class 2D to protect indigenous species in wetlands. Narrative standards are proposed for dissolved oxygen, pH, and temperature. Wetland background ranges are proposed as benchmarks.

This addition is reasonable for the reasons summarized below. Currently, most wetlands are classified as Class 2B waters, because they are not listed in part 7050.0470. The existing Class 2 parameters do not take into account the wide range of variability of dissolved oxygen, pH, and temperature wetlands can have. Wetland soils are anaerobic (without oxygen) at least a portion of the year and this can result in an accumulation of organic matter in the sediments. The presence of organic soils and active photosynthesis can result in large dissolved oxygen swings in the water column during a 24 hour period.

Therefore, the Agency is proposing "maintain background" standards for dissolved oxygen, when the background level is a daily minimum below 5 mg/l. Class 2B standards for other substances or characteristics will continue to apply. The narrative standard of maintaining 'background ' allows a natural assemblage of plants and animals.

In the same manner, some wetlands are characterized by low pH (bogs) or high pH (calcareous fens). Requiring a circumneutral pH could significantly impact the designated uses of those wetlands. Exhibits W56 and W58. The Agency is not aware of impacts to wetlands from temperature restraints. Using a narrative standard does not decrease protection but does allow flexibility in permitting as new information becomes available.

One respondent, Exhibit W24, was concerned with the difficulty of determining "background conditions" in a wetland. Background condition is an evaluation of a wetland in its present condition. The Agency uses water chemistry data gathered through monitoring programs or reference data from a similar wetland when data are unavailable for a specific wetland, and inventory plant and animal species and their diversity to determine background conditions. These evaluation techniques are similar to those used to determine natural water quality. See the discussion for part 7050.0170 for more discussion on natural water quality. The level of physical, biological, and chemical monitoring that will be required to determine background condition will be a case by case determination. The type of wetland, condition of the wetland, and the type of discharge being proposed vary greatly with each project and justify this case by case approach.

The EPA has suggested that the Agency plan to add numeric standards for wetlands in subsequent triennial revisions as data become available. Exhibit W3. This progression of narrative standards followed by numeric standards is the same as the progression for protection of rivers and lakes in previous water quality standard revisions.

a. Normal farm practices.

The following paragraph concerning normal farm practices is also proposed:

> "Activities in wetlands which involve the normal farm practices of planting with annually seeded crops or the utilization of a crop rotation seeding of pasture grasses or legumes, including the recommended applications of fertilizer and pesticides, are excluded from these standards and the standards in parts 7050.0224, 7050.0225, and 7050.0227. All other activities in these wetlands must meet water quality standards."

Normal farming activities are exempt from Clean Water Act Section 404 permitting requirement by 40 CFR 232.3(c)(1)(i). Exhibits W46 and W47. The normal farm practices of seeding, cultivating, and applying fertilizers and pesticides will not significantly or permanently alter seasonal wetland uses. Exhibit W51. These practices are likely to occur only in seasonal wetlands that have dried sufficiently as to allow farm equipment on them. These activities are allowable, but the water quality standards do not explicitly state this. The Agency was requested to add this paragraph. Exhibit W51. Since it is allowable and reasonable, the paragraph was added.

b. Reclassification of waters.

Waters that are presently listed as Class 2B waters but are fens or other wetlands contained within an ORVW geographic area are being proposed to be changed to 2D waters. It is reasonable to make this change because the 2B aquatic use description regarding sport fish and several of the accompanying standards (i.e. pH, temperature and dissolved oxygen) are not appropriate for these wetlands. As noted previously, the 2D designated use classification was developed to address the unique characteristics of wetlands. These changes in classification will appear under part 7050.0470.

7. Subpart 7. Additional standards.

The Agency is proposing to establish a separate subpart to address standards that are required for all Class 2 waters. This subpart will be comprised of existing text. Item A contains text that currently follows part 7050.0220, subpart 3, item D. Even though the first part of the text states "for all classes," the existing format made the text appear to be part of item D and apply only to Class 2C. Therefore, the language has been proposed to be moved to part 7050.0222, subpart 7, item A instead of subpart 5 with the rest of the text from item D.

The restructure made it necessary to change "above listed" classes to classes "in subparts 2 to 6."

8. Subpart 8. Site-specific modifications of standards.

The restructuring of part 7050.0220 made it necessary to change standards "listed in subpart 3" to standards in "subparts 2 to 6."

T. Part 7050.0223 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR CLASS 3 WATERS OF THE STATE; INDUSTRIAL CONSUMPTION.

This part was created from part 7050.0220 as follows:

Proposed rules	Current rules
Subpart 2	7050.0220, subpart 4, item A
Subpart 3	7050.0220, subpart 4, item B
Subpart 4	7050.0220, subpart 4, item C
Subpart 6	7050.0220, subpart 4, item C

1. Subpart 5. Class 3D waters.

The Agency proposes to establish a new designated use Classification called "Class 3D." Class 3D will protect those wetlands that have pH values that deviate significantly from neutral. It also protects wetlands with naturally high concentrations of chloride or hardness.

This class has been added for reasons similar to Class 2D, proposed under part 7050.0222, subpart 6. The proposed class is reasonable because the narrative language does not decrease protection, but does allow flexibility for permitting discharges to a wide variety of wetlands. Without this flexibility, variances are required to avoid violating the water quality standards. The data are not available yet to list numeric standards for chlorides and hardness for all wetlands.

Wetlands with an industrial consumption designated use are currently classified as Class 3B waters. Specific water quality standards for Class 3B water include the following: chlorides, 100 mg/l; hardness, 250 mg/l; and pH, a range of 6 to 9. Some wetlands naturally have concentrations of chlorides and hardness that exceed these standards and "maintain background" standards are proposed under Class 3D to protect these wetlands. Levels of pH naturally vary widely in the different types of wetlands and a "maintain background" standard is proposed under Class 3D for all pH levels to provide protection to these diverse waters.

This approach is based on the general standard for discharges proposed under part 7050.0210, subpart 13a, wetland pollution prohibited, which states, in part, that wetlands will be protected from significant adverse chemical changes to wetland designated uses. See the part 7050.0210, subpart 13a, for a discussion of the reasonableness of this standard.

2. Subpart 6. Additional standards.

The Agency is proposing to establish a separate subpart to address standards that are required for all Class 3 waters. This subpart will be comprised of text that is currently follows part 7050.0220, subpart 4, item C. Even though the first part of the text states that these standards are in addition to the specialized Class standards, the existing format made the text appear to be part of item C and apply only to Class 3C. Therefore, the language has been proposed to be moved to part 7050.0223, subpart 6, instead of subpart 4 with the rest of the text from item C.

The restructuring of part 7050.0220 made it necessary to change "above listed" standards to standards "in subparts 2 to 5."

U. Part 7050.0224 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR CLASS 4 WATERS OF THE STATE; AGRICULTURE AND WILDLIFE.

This part was created from part 7050.0220 as follows:

Proposed rules	Current rules
Subpart 2	7050.0220, subpart 5, item A
Subpart 3	7050.0220, subpart 5, item B

1. Subpart 4. Class 4C waters.

The Agency proposes to establish a new classification "Class 4C". Class 4C is proposed to protect wetland designated uses that enhance agriculture and wildlife. The specific designated uses proposed are erosion control, ground water recharge, low flow augmentation, storm water retention, and stream sedimentation. These uses are potentially important in the wetland and in downstream water resources. Not all wetlands have all these uses, but, where they do occur, they are valuable.

Erosion control by wetlands occurs because stream velocities decrease as the stream channel widens at the site of the wetland. The plants in the wetland provide increased friction to flows also. The decrease in erosion results in improved water quality downstream through reductions in bank erosion.

Ground water recharge in wetlands can be an important resource, both to people and as discharge points, such as springs and seeps. Water that is detained in wetlands is naturally cleansed of sediments and toxics and, because of the slowed velocities, given time to percolate into the aquifer, if there is appropriate geology below the wetland.

Low flow augmentation by wetlands can be important for maintaining flow in streams during droughty periods. Wetlands perform this function not only because of its larger basin, but also because its organic sediments have greater water-holding capacity than inorganic sediments. The augmented flows from wetlands help sustain aquatic organisms downstream and could lengthen the amount of time water is available for livestock and wildlife watering needs and for irrigation purposes.

The storm water retention potential provided by wetlands is important to moderate the peak flows after a storm event. The retention also enhances the other designated uses listed in subpart 4.

Stream sedimentation is a natural result of the reduced velocities that occur in wetlands. Nutrients and toxics, when present, are often associated with the particles in the water column. The filtering that wetlands perform by allowing these particles to settle can greatly improve water quality downstream, especially in lakes. However, excessive sedimentation can smother the natural organic wetland sediments, which can potentially result in an impact to other designated uses. Excessive sedimentation usually occurs only if the upstream river channel is significantly disturbed.

V. Part 7050.0225 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR CLASS 5 WATERS OF THE STATE; AESTHETIC ENJOYMENT AND NAVIGATION.

This part was created from part 7050.0220 as follows:

Proposed rules	Current rules
Subpart 2	7050.0220, subpart 6

The substances proposed to be listed under subpart 2 for wetlands are pH and hydrogen sulfide, measured as sulfur. Changing pH to a narrative standard is discussed under part 7050.0222, subpart 6. In a parallel sense, the data are not yet available for numeric criteria in wetlands for hydrogen sulfide.

W. Part 7050.0226 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR CLASS 6 WATERS OF THE STATE; OTHER USES.

This part was created from part 7050.0220 as follows:

Proposed rules	Current rules
Subpart 2	7050.0220, subpart 7

The proposed restructuring of part 7050.0220 made it necessary to change "the foregoing categories" to "parts 7050.0221 to 7050.0225."

X. Part 7050.0227 SPECIFIC STANDARDS OF QUALITY AND PURITY FOR CLASS 7 WATERS OF THE STATE; LIMITED RESOURCE VALUE WATERS.

This part was created from part 7050.0220 as follows:

Proposed rules	Current rules
Subpart 2	7050.0220, subpart 8

A format change is proposed for the list of Class 7 numerical standards. The text for the fecal coliform organisms, pH value, and dissolved oxygen standards is proposed to be formatted into a column under the heading "standard." This change is reasonable because it does not change the text or meaning of the rules, but will help readers differentiate "substance or characteristics" from "standards."

Y. Part 7050.0410 LISTED WATERS.

Part 7050.0410 functions as a key for part 7050.0470, which lists waters of the state by major surface water drainage basins, and allows the list of designated use classes for a listed water to be abbreviated. Existing text establishes the classifications that are designated to all waters listed under part 7050.0470, and a change is proposed to exclude wetlands from this list of classifications. Language is also proposed to establish that wetlands listed under part 7050.0470 are classified as Classes 3D, 4C, 5, and 6 in addition to the classifications specified in a part 7050.0470 entry for a wetland. These changes reflect the use classifications and standards being proposed for wetlands under parts 7050.0222, subpart 6; 7050.0223, subpart 5; 7050.0224, subpart 4, and part 7050.0225.

Z. Part 7050.0420 TROUT WATERS.

The Agency proposes to change part 7050.0420 to update reference to the MDNR list of designated trout waters and to designate MDNR-specified tributaries to trout waters as Class 2A waters.

The MDNR updated the list of designated trout waters by publishing the Commissioner's Order No. 2450 in the June 22, 1992, State Register (16 S.R. 2785, 2902-28). Exhibit C55. This list is referenced as Minn. Rules part 6262.0400, which is proposed to be added under this part. It is reasonable for the MPCA to update the list of waters identified under part 7050.0420 to match the list identified by the MDNR because the Agency and MDNR should be in coordination in their management and protection efforts and all MDNR designated trout waters should be identified as Class 2A waters under Chapter 7050 to receive the appropriate level of protection.

Minn. Rules part 6262.0400, subpart 5, also designates tributaries to trout waters as trout waters. The Agency is proposing to add these tributaries as trout waters under Minn. Rules ch. 7050 and designate them as 2A waters to be consistent with the MDNR Commissioner order.

Under the current rule, the MDNR designated trout streams and trout lakes were incorporated by reference into Ch. 7050. Under the proposed rule, these trout waters listed under the Commissioner's Order No. 2450, with the exception of Shakopee Mill Pond, are incorporated under the appropriate water basin within part 7050.0470. According to MDNR, Shakopee Mill Pond is not managed as a trout water and the entry for the pond in the Commissioner's Order as it appeared in the State Register was an error. Therefore, staff propose not to list Shakopee Mill Pond under part 7050.0470 as a trout water.

AA. Part 7050.0425 UNLISTED WETLANDS.

This subpart is proposed to be added to parallel the existing language in 7050.0430:

> "Those waters of the state that are wetlands as defined by part 7050.0130, item F, and that are not listed in part 7050.0470 are classified as Class 2D, 3D, 4C, 5, and 6 waters."

This part is needed to address the many wetlands that have not been listed under part 7050.0470. Adding this language is reasonable because it clarifies how these unlisted waters will be classified. Classes 2D, 3D, 4C and language under Classes 5 and 6 are being proposed during this rule revision to establish water quality standards that directly relate to wetlands and their unique characteristics and designated uses.

One respondent, Exhibit W48, disagreed with the concept of classifying wetlands according to their potential uses. In the Agency's current rules, all waters of the state, including wetlands, are assigned uses so this action does not change the use attainability process, which was defined in the NEED section of this SONAR.

BB. Part 7050.0430 UNLISTED WATERS.

Part 7050.0430 was modified to reflect that wetlands have been given the new Classes of 2D, 3D, and 4C. These changes are reasonable because, without this modification, wetlands would be placed in both wetland and non-wetland criteria, creating confusion.

CC. Part 7050.0465 MAP: MAJOR SURFACE WATER DRAINAGE BASINS.

The map label for Olmsted County is currently misspelled as "Olmstead." This spelling error is proposed to be corrected.

The map contained in part 7050.0465 identifies the nine (9) major surface water drainage basins under which the waters in part 7050.0470 are organized. The watershed boundaries separating these drainage basins was based on a hydrologic unit map developed by the United States Geological Survey (USGS) in 1974. The hydrologic units established on this map are divided into Regions, Subregions, Accounting, and Cataloging units. The bold drainage basin lines identified on the map correspond to the Subregional unit codes established for the state.

The use of the Subregional unit code boundaries in the southeastern corner of the state has led to some confusion when attempting to determine the water use classifications for waters in that area. Waters within Houston, Fillmore, and some waters in Mower Counties flow either directly into the Mississippi River or into either the Wapsipinicon River or the Upper Iowa River watershed, which are direct tributaries to the Mississippi River. They do not flow into the Cedar River basin as is inferred from the map. Therefore, the Agency is proposing to modify the map in part 7050.0465 to more accurately reflect the actual watershed drainage patterns for these three counties. In doing so, six watercourses that were specifically listed under the Cedar-Des Moines Rivers Basin in part 7050.0470, subpart 8, are proposed to be listed under Lower Mississippi River Basin in part 7050.0470, subpart 7. The water use classifications for these waters remain unchanged.

DD. Part 7050.0470 CLASSIFICATION FOR WATERS IN MAJOR SURFACE WATER DRAINAGE BASINS.

There are a number of proposed rule amendments that are reflected in changes to part 7050.0470. These amendments include: 1) the assignment of the Class 1C Domestic Consumption water use classification to certain waters that have been identified as drinking water sources; 2) the proposed reclassification of six watercourses as Class 7 Limited Resource Value waters; 3) the addition of entries for stream trout lakes and trout streams designated by the Commissioner of the Minnesota Department of Natural Resources; 4) removal of lake trout lake ORVW status at request of MDNR; 5) changes to entries for ORVW calcareous fens and addition of newly designated ORVWs; 6) changing the use class for fens; and 7) other minor organizational changes to the listing of waters. Each set of proposed amendments are explained in greater detail as follows.

1. Class 1C Domestic Consumption Classifications

The domestic consumption water use classification is assigned to waters of the state that serve as a source supply for drinking, culinary or food processing or other domestic purposes. Agency staff, with the assistance of staff from the Minnesota Department of Health, Environmental Health Division, have identified surface waters that are used as source waters for public water systems but that are not currently assigned the domestic consumption use classification.

A public water supply system is a system supplying piped water for human consumption, and has a minimum of 15 service connections or 15 living units, or serves at least 25 persons daily for 60 days of the year. Minn. Rules pt. 4720.0100, subp. 16. Public water supplies are divided into three categories: community water supplies, noncommunity water supplies, and nontransient, noncommunity water supplies. Examples of public water supply systems within these three categories are listed below.

A community water supply system is a public water system that serves at least 15 service connections or living units used by year-round residents, or that regularly serves at least 25 year-round residents. Examples of these type of systems are: municipalities, mobile home parks, and apartments.

A noncommunity water system is a public water system that serves the traveling or transient population. Examples of such systems include: hotels, motels, resorts, restaurants, campgrounds, recreation areas, churches, and gas stations.

A noncommunity, nontransient water system is a public water supply system that regularly serves at least 25 of the same persons over six months per year. Examples include: schools, day-care facilities, factories, and businesses.

The Agency is proposing to classify 18 additional surface waters which have been identified by the Minnesota Department of Health as public water supply system sources as Class 1C waters. The quality of this class of waters of the state shall be such that with treatment consisting of coagulation, sedimentation, filtration, storage, and chlorination or other equivalent treatment processes, the treated water will meet the primary and secondary drinking water standards. Exhibit C42 is a listing of the surface waters proposed for the Class 1C use classification, the municipalities or facilities using these waters as supply sources, and the counties in which these cities or facilities are located.

It should be noted that one of the public water supply sources utilized by the Hibbing Taconite Company, the Scranton Mine Pit Lake, is not a discrete body of water at this time. Under current water level elevations, the Scranton is inundated by other surface waters within the Hull-Rust-Mahoning-Scranton-Susquehanna complex. Exhibit C43 contains an aerial photograph of this inundated mining complex. Hibbing Taconite has a floating barge within this waterbody which is reportedly used to dewater the pit at a current rate of approximately 12,000 gallons per minute (gpm). Once the water level is established at an elevation of

1290 feet, pumping rates will be re-evaluated. For the near future, the Scranton will continue to remain inundated. Based on this information, the Agency is proposing to classify the surface waters within this complex as Class 1C waters. The entry in Minn. Rules pt. 7050.0470, subp. 1 will read as follows:

Scranton Mine Pit Lake (Hull-Rust-Mahoning-Scranton-Susquehanna), (T.57, R.20, S.6,7; T.57, R.21, S.1,2,11,12): 1C, 2Bd, 3B;

Comments letters and oral statement submissions were received regarding the proposed classification of these public water supply sources as Class 1C waters. Many of the comments were specifically directed toward the mine pit lakes on the Iron Range, their uses, and concerns for their continued protection because of their important role as drinking water supplies. Several commenters proposed that all mine pit waters situated within the Biwabik Iron Formation Aquifer be classified as Class 1C waters. Exhibit C44. The Agency has considered this proposal and has concluded that assignment of the Class 1C use classification should be restricted to those mine pit lakes that are currently being used for drinking water purposes. The Agency therefore believes it is reasonable to designate those waters that have been identified by the Minnesota Department of Health as public water supply sources to be classified as Class 1C waters in Minn. Rules pt. 7050.0470.

2. Class 7 Limited Resource Value Water Use Reclassifications

The waters included in the Class 7 use classification include surface waters of the State which are of limited value as a fisheries and recreational resource and are generally either intermittent or have a flow at the once in ten year, seven day low flow (7Q10) of less than one cubic foot per second. Class 7 waters are protected so as to allow secondary body contact use, preserve the ground water for use as a potable water supply and to protect aesthetic qualities of the water. Discharges to Class 7 waters are regulated so that downstream waters are protected for their designated uses.

Stream assessment surveys are conducted on waters proposed for Class 7 reclassification and the information obtained during this assessment process is used to determine the extent to which these waters demonstrate the Class 7 criteria conditions which are set forth below:

a. The existing fishery and potential fishery are severely limited by natural conditions as exhibited by poor water quality characteristics, lack of habitat or lack of water;

b. The quality of the resource has been significantly altered by human activity and the effect is essentially irreversible; and

c. There are limited recreational opportunities (such as fishing, swimming, wading, or boating) in and on the water resource.

> Conditions "a" and "c" or "b" and "c" must be established by the MPCA stream assessment procedure before a water can be classified as a Class 7 Limited Resource Value water. (Refer to Minn. Rules pt. 7050.0200, subp. 7)

Since the last revision of Minn. Rules ch. 7050, the Agency assessed nine watercourses for potential Class 7 reclassification. These nine watercourses, and the six watercourses proposed for reclassification are shown in the table below.

Existing or Potential Discharger	Assessed Watercourse	Present Use Classification	MPCA Recommended Use Classification
Rogers	Unnamed Ditch	Class 2B	Class 7
	Unnamed Creek	Class 2B	Class 7
Gaylord/M.G.Waldbaum	Lateral Ditch C	Class 2B	Class 7
	County Ditch # 55	Class 2B	Class 7
McGregor	County Ditch # 42	Class 2B	Class 7
New Auburn	Unnamed Ditch	Class 2B	Class 7
Wyoming	Unnamed Creek	Class 2B	No Change(Class 2B)
Boise Cascade (Int'l Falls)	Moon Light Rock Creek	Class 2B	No Change(Class 2B)
Fairmont	Center Creek	Class 2B	No Change(Class 2B)

Based on information gathered during the field assessments, comments provided by local residents living near the assessed watercourses, and comments from the MDNR Area Fisheries staff, six of the nine assessed waters are being proposed for Class 7 reclassification. Moonlight Rock Creek at International Falls, Center Creek at Fairmont, and an unnamed creek near Wyoming, Minnesota are not being proposed for reclassification as Class 7 waters based on information that indicates existing or potential fisheries and recreational uses of these waters.

The water assessment surveys performed on the waters proposed for reclassification serve to document whether the Class 7 criteria have been met on the assessed waters. These criteria are not a separate test for a limited fishery or limited recreational opportunities but instead are the factors that lead to the conclusion that these uses are limited. The following summaries discuss the reasons in support the recommended classifications of the assessed watercourses. Survey information, photographs of the assessed waters and site maps are part of the assessment surveys. Exhibits C45 to C51.

a. Unnamed creek and unnamed ditch at Rogers

The city of Rogers presently has a continuous discharging wastewater treatment facility (WWTF) which discharges to a ditch that connects to an unnamed creek which flows through a wetland and then to the Crow River. The city had explored an alteration of this discharge route which included a low flow diversion structure and diversion ditch around the wetland. There were some concerns as to the impacts to the wetland resulting from such a diversion, so this proposed discharge option was not pursued.

Both the unnamed ditch and the unnamed creek are proposed for Class 7 reclassification because their existing fisheries and recreational uses are limited due to the lack of water within these watercourses. The stream assessment survey was conducted in August of 1990 during a relatively wet period of time. The rainfall record from Rogers indicate that the area had received 2.3 inches of rain two weeks prior to the assessment survey. Prior to that, monthly rainfall totals for June and July 1990 were 8.4 inches and 8.3 inches respectively. Despite this, the unnamed creek was dry at an observation point three quarters of a mile south of the Interstate 94 culvert undercrossing. (Reference the site map in Exhibit C45).

While the Agency is proposing to designate the unnamed ditch and the unnamed creek as Class 7 waters, the wetland, through which the unnamed creek flows, will retain its Class 2B fisheries and recreational use classification.

b. Lateral Ditch C of County Ditch Number 55 and County Ditch Number 55 at Gaylord

The City of Gaylord operates a stabilization pond WWTF with a controlled discharge to Lateral Ditch C of County Ditch No. 55. Until recently, a major egg processing industrial facility located in Gaylord, the M.G. Waldbaum Co., was a major discharge to the city's WWTF. Discharges from the industrial facility contributed to an overloading condition of the city's treatment pond facility which resulted in exceedances in permit effluent limitations and odor problems from the WWTF. To correct these problems, the city proposed the construction of a separate wastewater treatment facility to service the treatment needs of the city's proposed industrial park, with M.G. Waldbaum Co. being a major contributor to this new WWTF. In order to assign appropriate effluent limits for this proposed facility, the two proposed receiving waters were assessed for potential Class 7 reclassification.

Lateral Ditch C of County Ditch Number 55 and County Ditch Number 55, also known as North Branch Rush River, have both been extensively channelized. The channelization of these watercourses has: 1) created a uniform depth and bottom substrate; 2) decreased the length of the stream and the stream's sinuosity; and 3) lead to abnormally low stream discharge during low flow periods. These impacts can decrease the habitat diversity of the watercourse and reduce the stream's fisheries and recreational use potential. Due to the channelized nature of these two watercourses, the Agency is recommending a Class 7 use classification for Lateral Ditch C and County Ditch Number 55 to a point approximately eight river miles below the new WWTF discharge. Downstream of this point, the watercourse would retain its present Class 2B water use classification.

Effluent limitations assigned to the treatment facility servicing the Gaylord Industrial Park have presently been assigned in accordance with a variance that has been granted to the city and its co-permittee the M.G. Waldbaum Co. These limitations are based on maintenance of the Class 7 instream standards as well as being protective of the downstream

Class 2B use classification. Additional instream ambient monitoring requirements have been included in the discharge permit for this facility in order to assure maintenance of the downstream Class 2B water quality standards. Exhibit C46 is a copy of the stream assessment worksheet for these two waters and it includes as an attachment a copy of the September 13, 1991, Agency Board item dealing with the discharge permit and variance request.

c. County Ditch Number 42 at McGregor

The city of McGregor operates a stabilization pond WWTF which now discharges directly to County Ditch Number 42 on a controlled basis. Prior to the construction of this new pond treatment facility, the city discharged their treated wastewater to an unnamed ditch which is tributary to County Ditch Number 42. Both of these watercourses were assessed in 1978 and subsequently designated as Class 7 waters in 1980. The new pond treatment facility is located southwest of the old system, further upstream on County Ditch Number 42. This portion of County Ditch Number 42 was not previously considered for reclassification since at the time of the 1978 survey it was upstream of the old treatment facility.

Conditions along the upper reaches of County Ditch Number 42 are similar to the conditions which were observed during the 1978 stream assessment survey in sections of the ditch that have been classified as Class 7 waters. The county ditch has been extensively channelized and the fisheries habitat within this ditch segment appears to be limited. Huntting was identified as a potential use along this watercourse. Due to the degree of channelization, the upper reach of County Ditch Number 42 is also recommended for Class 7 reclassification. Reference Exhibit C47.

d. Unnamed Ditch at New Auburn

The city of New Auburn operates a stabilization pond treatment facility followed by land application of the treated wastewater. Due to excessive inflow and infiltration, the city's pond system is hydraulically overloaded. This coupled with the fact that the land application site is not operating according to design has forced the city to explore different treatment and discharge options.

One option calls for an expansion of the treatment pond system with a controlled discharge to a county tile which outlets to an unnamed ditch that flows into High Island Lake. This ditch is roughly one half mile long and is located on the eastern side of the town. The flows in this ditch consist of water from the county tile system as well as storm water runoff from town and the surrounding area.

The unnamed ditch is 100 percent channelized. According to the city clerk, maintenance clean-out of the ditch occurred within the last couple of years. Due to the low topography of the area and the close proximity of the ditch to the lake, the depth of water in the ditch would appear to fluctuate with the level of the lake. High Island Lake experiences periodic fish winterkills. Based on this information and the channelized nature of the ditch, the Agency is proposing to classify the unnamed ditch as Class 7. Reference Exhibit C48.

e. Unnamed Creek near Wyoming

The city of Wyoming presently has a wastewater stabilization pond facility followed by land application of the treated wastewater. In conjunction with a planned expansion of the WWTF, the city is considering piping the treated wastewater 6.7 miles to an unnamed creek that is tributary to the Sunrise River. The treatment facility presently servicing Chisago City/Lindstrom discharges to this unnamed creek and the upper segment of the unnamed creek from the outlet from Wallmark Lake to a point approximately one (1) mile above its confluence with the Sunrise River is classified as a Class 7 water. (See the site map contained in Exhibit C49.) This reclassification occurred in 1980 based on an assessment survey conducted in 1978. Information from this survey indicated that the remaining one mile of creek should retain its Class 2B fisheries and recreational use classification.

The unnamed creek was assessed again in 1984, and at that time, Agency field staff recommended that the lower reach of the unnamed creek should be classified as a Class 7 water due to low dissolved oxygen concentrations, minimal flows, and the presence of a plant community more typical of a wetland than a free flowing stream. The issue of reclassifying this lower segment of the unnamed creek was not considered during the 1987 or 1990 revisions to chapter 7050.

In response to a request to reevaluate the use classification of the lower reaches of the unnamed creek, Agency staff assessed the unnamed creek in September 1992. At the time of this survey, the creek bed upstream of the Chisago City/Lindstrom WWTF was dry. At survey stations below this WWTF, which discharges to the unnamed creek approximately 2.7 miles upstream from its confluence with the Sunrise River, there was water present in the creek but the flow velocities were not perceptible. This was also the case at the point on the unnamed creek where the city of Wyoming is proposing to discharge treated wastewater from their proposed upgraded facility. These reductions in creek flow velocities appear in part to be due to beaver activity backing-up the creek, thereby creating more of a wetland condition along the creek. Between the area of the proposed point of discharge and the mouth of the unnamed creek, there is a shift to more of a riverine condition.

If the city of Wyoming obtains a discharge permit to pipe the wastewater effluent to the unnamed creek, a recommended condition of the discharge permit will be to insure that the unnamed creek be maintained as a free flowing watercourse from the point of discharge to the Sunrise River. At a minimum this would mean that periodic inspections of the area and removal of any beaver dams which may impede the flow of the unnamed creek. Under these circumstances, the lower reach of the unnamed creek is expected to revert back to a more riverine condition, similar to the conditions observed during the 1978 assessment survey. This fact plus local fisheries use of the unnamed creek at the road the culvert crossing closest to the mouth of the creek supports maintenance of the present Class 2B fisheries and recreational use classification of this lower reach of the creek. Exhibit C49 is the stream assessment worksheet for this creek.

f. Moon Light Rock Creek at Boise Cascade Industrial Landfill at International Falls.

Moon Light Rock Creek was originally assessed in 1983 for the purpose of potential reclassification as a Class 7 Limited Resource Value water. At that time, Agency staff concluded that it should not be reclassified as a Class 7 water and it was not proposed for reclassification during the 1984 revisions of Chapter 7050. Boise Cascade requested reconsideration of the designated use classification and this prompted a reassessment of the creek in October 1992.

The natural stream bed of the creek did, historically, flow through the area where the landfill is now situated. To divert the flow around the landfill, the creek flows were directed to a channelized watercourse adjacent to a set of railroad tracks on the south side of the landfill. The creek flow runs westerly along this channelized segment for approximately one-half mile before it is directed to the north to reconnect with the natural creek bed.

While there has been some physical changes that have taken place along this channelized reach since the 1983 survey, such as bank stabilization and the presence of more overhanging shrub and grass vegetation, fisheries habitat within this reach is still limited as a result of this channelization. Agency staff, however, do not believe it is reasonable to reclassify Moon Light Rock Creek as a Class 7 water when one considers that upstream of the channelized segment that the creek retains its natural character and that just downstream of the landfill site, the creek flows through a residential area where it does afford a fisheries and recreational use by local residents.

Based on the survey information obtained in 1983 and the observations and information obtained during the 1992 reassessment of the creek, no change in the assigned use classification of Moon Light Rock Creek is being proposed. Exhibit C50 contains the stream assessments from both the 1983 and 1992 surveys.

g. Center Creek at Fairmont

Center Creek originates at the outlet of Lake George, which is one in a series of a chain of lakes located south of the city of Fairmont. Like many other river systems in the southern and southwestern part of the state, stream flows along Center Creek can get very low and at times may dry-up completely or essentially freeze solid in the winter. Both these conditions have been documented on Center Creek.

The city of Fairmont operates a continuously discharging WWTF which discharges to Center Creek at a point approximately 28 river miles above the creek's confluence with the Blue Earth River. Average annual wet weather design flow for this WWTF is 3.9 million gallons per day (MGD) or approximately 6.0 cubic feet per second (cfs). The average annual design flow for this facility is 2.86 MGD or approximately 4.4 cfs.

According to Minn. Rules pt. 7050.0210, subp. 7, "Discharges of sewage, industrial waste, or other wastes shall be controlled so that the water quality standards will be maintained at all stream flows which are equal to or exceeded by 90 percent of the seven consecutive daily average flows of record (the lowest weekly flow with a once in ten-year recurrence interval) for the critical month(s)." This flow statistic is commonly referred to as the 7Q10 flow. The 7Q10 flow upstream of the Fairmont WWTF discharge has been estimated to be 0.0 cfs. Since there is no upstream dilution in Center Creek under 7Q10 conditions, the quality of the wastewater effluent being discharged from the Fairmont WWTF must meet the water quality standards applicable to the creek. Center Creek is classified as a Class 2B fisheries and recreational use water.

In March 1992, the city submitted a formal reclassification request to reclassify Center Creek as a Class 7 Limited Resource Value water from the outlet of Lake George to the creek's confluence with the Blue Earth River. The city contends that fisheries and recreational uses of Center Creek are limited due to lack of water, lack of habitat, and lack of public access to the creek. Exhibit C52. The Agency responded to the request by stating that based on available information, it was the staff's opinion that Center Creek was not a Class 7 water and that the Agency would be conducting a stream assessment survey of Center Creek to justify this position. Exhibit C53.

This stream assessment survey was conducted on September 21-22, 1992. Agency staff, with assistance from the Minnesota Department of Natural Resources (MDNR), assessed three stations along the creek at points above and below the WWTF discharge at Fairmont and at a site approximately 21 river miles below the WWTF outfall. The stream flows in the creek at the time of the survey ranged from 32 cfs above the treatment facility to 51 cfs at the most downstream station. Exhibit C51 contains the 1992 stream assessment survey and the fish electroshocking results, results from the August 1986 MDNR survey and a copy of a September 22, 1992 office memorandum from the MDNR Windom Area Fisheries Office.

To summarize this information, Agency staff believe that the survey data support the continued classification of this creek as a Class 2B fisheries and recreational use water. Game fish, as well as rough fish and minnow species, were electroshocked at stations throughout the various survey reaches of the creek. There is a minimal amount of channelization that has occurred along this creek and there is a diversity in the physical characteristics of the stream channel and bottom substrate composition which provide suitable fisheries habitat.

Habitat availability is most limited upstream of the WWTF discharge during periods of low stream flow. Downstream of the treatment facility, low flow impacts are less pronounced since the wastewater discharge provides a sustaining flow in the creek. One treatment option that the city is exploring calls for the removal of all or part of the wastewater effluent from Center Creek during low flow conditions. This proposed option indicates that the treated wastewater would be piped to another watercourse in the area with an existing Class 7 classification during periods when there is insufficient upstream dilution in Center Creek. This option is being considered by the city in lieu of upgrading their nitrification capabilities at the WWTF. If this wastewater diversion option is instituted, downstream pool areas in Center Creek that presently serve as fish refuges during periods of low flow would decrease in numbers and size and may even be lost during extended periods of drought. This treatment option is not favored by the Agency because of the potential downstream physical impacts.

3. The addition of entries for Stream Trout Lakes and trout streams designated by the Commissioner of the Minnesota Department of Natural Resources.

   Under the part 7050.0420, the Agency incorporates by reference the most current MDNR Commissioner's Orders with respect to stream trout lakes and trout streams which are in effect at the time the proposed amendments to Minn. Rules ch. 7050 go to rulemaking hearings. While this does have the net affect of shortening the list of waters specifically listed in part 7050.0470, it has complicated the process by which one determines the applicable use classifications for a given water.

   The process as it currently stands requires a person to first determine what basin the waterbody is located in, check the listing of waters in the use classification section of part 7050.0470, and if it is not listed there, then one has to refer to the Commissioner's Orders to see it the water is list as a designated trout water. If it is not listed in either part 7050.0470 or the Commissioner's Orders, then the water is considered an unlisted water, and is classified under part 7050.0430. This generally is not a problem, so long as one has a copy of the appropriate Commissioner's Orders. If a copy is not available, at a minimum this can lead to time delays in determining the appropriate use classification.

   To make the process of determining the use classification less complicated, the Agency is proposing to specifically list the trout streams and lakes identified by the MDNR Commissioner in Minn. Rules pt. 7050.0470. There will still be a need to carefully reference the legal descriptions for the designated trout streams. Not only are the named stream segments of a trout stream classified by the Agency as trout waters, but the tributaries to these identified trout stream segments within the sections specified in the legal descriptions are classified as trout waters as well. This designation is consistent with MDNR's classification of these tributaries as trout streams in Minn. Rules pt. 6262.0400. To address this fact, rule language has been added to part 7050.0420 to classify these tributary segments to the identified trout streams as Class 2A waters as well. Entries for parts of these waters that are not designated as trout waters will also have to be altered to include the phrase "excluding trout waters."

4. Removal of lake trout lake ORVW status at request of MDNR.

   In 1987 the Agency proposed to designate lake trout lakes as ORVWs under the restricted discharges category of part 7050.0180. Included in the list of candidate lakes at that time were 48 lakes that were either existing lake trout lakes or they were thought to have the potential for lake trout management. There were a considerable number of comments received during the public hearings on this proposal. As a result, 35 existing and potential lake trout lakes were designated as ORVWs in March 1988.

Additional information obtained from lake surveys conducted since 1988 and recommended alternate fisheries management goals for some of these lakes has prompted the MDNR to request that the following lakes be removed from the ORVW designation since they do not support self-sustaining lake trout populations (reference Exhibit C54).

Cook County	
Devilfish Lake	(16-29)
Esther Lake	(16-23)
Hungry Jack Lake	(16-227)
Jim (Jerry) Lake	(16-135)
Musquash Lake	(16-104)
Itasca County	
Trout Lake	(31-216)

Esther and Musquash Lakes are presently being managed as stream trout lakes. Survey information for Devilfish and Jim Lakes indicate marginal lake trout conditions and Devilfish Lake has a walleye management classification assigned to it. Trout Lake, near Coleraine, has been judged to no longer be suitable for trout management and is being managed as a walleye fishery. The 1992 Lake Management Plan for Hungry Jack Lake indicated that while temperature-oxygen conditions are suitable for lake trout in Hungry Jack Lake, the management goals for increased walleye and northern pike populations would preclude an attempt to manage for lake trout. It should be noted as a clarification, that while Big Watab Lake and Lower Hay Lake were proposed as ORVWs in 1987, these two lakes were not assigned the ORVW designation in 1988.

5. Revise the names of the ORVW calcareous fens to correspond to the names established by MDNR.

   See the SONAR discussion under part 7050.0180, subpart 6b.

6. Change the class designation for listed fens to Class 2D.

   See the SONAR discussion under part 7050.0222, subpart 6.

7. Minor Organizational Changes to Minn. Rules pt. 7050.0470.

   A new item is proposed to be added throughout this part. Waters in a major drainage basin are currently categorized under streams, item A; lakes, item B; or fens, item C, within this part. The Agency proposes to add a fourth category, as item D, called scientific and natural areas (SNAs). This category is needed to make scientific and natural areas easier to identify under part 7050.0470.

Currently SNAs appear at the end of existing categories and are overlooked because they are not alphabetized with the other entries. Scientific and natural areas are stringently protected as outstanding resource value waters under part 7050.0180. The proposed category is reasonable because it does not change how the waters are addressed in the rules but makes it easier for readers to identify them and their restricted use status.

Also, subitem numbers identified in the proposed rules under part 7050.0470 may change to incorporate the trout waters identified in MDNR Commissioner's Orders No. 2450 and to place other waters proposed to be listed in proper alphabetical order.

Changes are being made under specific items to address issues other than those listed above as follows:

8. Subpart 1. Lake Superior Basin.

a. Item A. Streams.

Subitem (15).

The Agency proposes to delete subitem (15) "Unnamed Ditch, Eveleth, (T.57, R.17, S.6). This deletion is reasonable because it is a duplicate entry. This ditch is also listed as "Elbow Creek, Eveleth" under subitem (7). The following subitems will be renumbered to correspond with this change.

9. Subpart 2. Lake of the Woods Basin.

a. Item B. Lakes.

Subitem (115) and (129).

The Agency proposes to change the entry for Lake of the Woods. The information proposed under subitem (129) for the new entry is currently listed under subitem (115) as "Woods, lake of the" with the exception of an added geographic range coordinate of "36." The additional range coordinate is needed to more completely identify the water body. It is reasonable to provide the best identification possible in the rule. Changing the format of the lake name is reasonable because it utilizes the most common form of the name, will make it easier for readers to find the water resource under this part and does not change the status of the lake under the rules. The proposed "Lake of the Woods" entry is proposed under subitem (129), but will be placed in proper alphabetical order and given a corresponding subitem number after the rule has been adopted.

10. Subpart 3. Red River of the North Basin.

a. Item A. Streams.

Subitem (34).

The Agency proposes to change "Tamarack" to "Tamarac." This change is reasonable because it corrects the spelling of river name.

Subitem (15).

The Agency proposes to delete the phrase "(excluding trout waters)" for the Hoover Creek listing. This phrase is no longer needed under this entry because portions of Hoover Creek are no longer designated trout waters. This change is part of the Agency's effort to list all the trout waters designated by the MDNR under Commissioner's Order No. 2450.

11. Subpart 4. Upper Mississippi River Basin.

a. Item A. Streams.

Subitem (97).

The Agency proposes to change the word "Brook" to "Branch." This change is reasonable because it corrects the name of the water body, which is Stanchfield Branch.

12. Subpart 5. Minnesota River Basin.

a. Item A. Streams.

Subitem (74).

The Agency proposes to add a new subitem (74) to add another entry for Judicial Ditch Number 10 that cross references Wood Lake Creek currently listed under subitem (158). Wood Lake Creek has been discovered to be the same water resource as a portion of Judicial Ditch Number 10. It is reasonable to add a cross reference to clarify the identification of a water body and to ensure readers looking for Judicial Ditch Number 10 find all of the information that concerns that resource. Subitems (74) through (161) are proposed to be renumbered to correspond with this change.

Subitem 153.

The Agency proposes to delete the name "Dawson Mills Soy Isolate" since there is no longer a discharge from this company to the unnamed stream which is a tributary to Lac qui Parle River.

Subitem 158.

The Agency proposes to add reference to Judicial Ditch Number 10 as part of the existing entry for Wood Lake Creek. This is reasonable because both Judicial Ditch Number 10 and Wood Lake Creek identify the same water body. A cross reference to Wood Lake Creek has also been proposed under the entry for Judicial Ditch Number 10 (see subitem 74).

13. Subpart 6. Saint Croix River Basin.

a. Item A. Streams.

Subitem 7

The Agency proposes to delete the entry for King Creek. The entire segment of King Creek in Township 47, Range 19, is identified as trout waters in the MDNR Commissioner Order No. 2540. The Agency is proposing to add entries under part 7050.0470 for all the waters listed in the Commissioner Order. Since the entire creek is trout water, it is reasonable to delete the existing entry for King Creek to avoid having duplicate entries.

b. Item C. Fens.

The Agency is proposing to add this item as a place holder. Throughout this part, item A lists streams; item B lists lakes; item C lists fens and the Agency is proposing that item D be created to list scientific and natural areas. Even though there are no fens currently listed under this subpart, this category may be used in the future. It is reasonable to add item C because it establishes a consistent format under this part and makes the organization easier to follow for the readers.

14. Subpart 7. Lower Mississippi River Basin.

a. Item A. Streams.

Subitem (7).

The Agency proposes to add "(Cold Spring Brook)" to the entry for Cold Creek because this creek is commonly referred to by this name too. The Agency also proposes to add "(excluding trout waters)" into this entry. See subitem (10) under this item for a discussion of the need and reasonableness for this addition.

Subitem (10).

The Agency proposes to add "(excluding trout waters)" after "Dakota Creek." The State of Minnesota Department of Natural Resources Commissioner's Order Number 2450 identifies Dakota Creek and its tributaries within township 105, range 4, section 7 and township 105, range 5, sections 1, 2, 3, 11, and 12, as "trout waters" in Winona County. Since this subitem currently does not reference this designation, a reader may not know to look for trout water restrictions. Trout waters are designated as Class 1B, 2A, 3B, 3C, 4A, 4B, 5, and 6 under part 7050.0420. The proposed language highlights an existing designation for the creek and alerts readers to the fact that portions of the creek have additional protection under the rules.

Subitem (13).

The Agency proposes to delete the existing entry for Gilmore Creek. See subpart 6, item A, subitem (7), for the discussion of need and reasonableness for this change.

Subitems (16), (19), (24), and (33).

The Agency proposes to add "(excluding trout waters)" in the existing entries for Indian Spring Creek, Long Creek, Pine Creek, and Snake Creek. See subitem (35) for the discussion of need and reasonableness for these changes.

Subitem (35).

The Agency proposes to add "(excluding trout waters)" after "Sullivan Creek." This addition is needed to alter readers to the fact that portions of the creek have additional classifications and protection under the rules. The Minnesota Department of Natural Resources Commissioner's Order Number 2450 identifies Sullivan Creek and its tributaries within township 103, range 5, sections 12, 13, 14, 23, 24, 25, and 26, as trout waters in Houston County. Without this exclusion, a reader may not know to look for trout water restrictions. Trout waters are designated as having user classifications 1B, 2A, 3B, 3C, 4A, 4B, 5, and 6 under part 7050.0420. The proposed language is reasonable because it highlights an existing designation and clarifies that portions of the creek are not classified as 2C as indicated in this subitem.

Subitem (38).

The Agency proposes to delete the township designation of "104" under the existing entry for Trout Run Creek (Trout Creek). This is reasonable because a new entry is proposed for Trout Run Creek (Trout Creek) (T.104, R. 10) because this portion of the creek is designated trout water. This is part of the Agency's effort to incorporate all trout waters listed in MDNR Commissioner's Order No. 2540

V. ECONOMIC CONSIDERATIONS

A. Economic Impact of the Proposed Amendments

1. In the exercise of its powers, the Agency is obligated by Minn. Stat. sec. 116.07, subd. 6 (1992) to give due consideration to economic factors. The statute provides:

> In exercising all its powers the pollution control agency shall give due consideration to the establishment, maintenance, operation and expansion of business, commerce, trade, industry, traffic, and other economic factors and other material matters affecting the feasibility and practicability of any proposed action, including, but not

> limited to, the burden on a municipality of any tax which may result therefrom, and shall take or provide for such action as may be reasonable, feasible and practical under the circumstances.

Minn. Stat. sec. 115.43, subd. 1 (1992) imposes a similar consideration of economic factors.

In proposing these amendments, the Agency has considered their impact on industry, municipalities, small business, and other regulated parties. But the Agency is not able to determine an overall cost, if any, that may be incurred because establishing numerical and narrative standards is only half of the regulatory process that ultimately determines the cost of meeting the standards. The other half of the regulatory process is the application of the standards to control pollution through the establishment of effluent limitations. While it is impossible to determine the exact costs, it is the opinion of the Agency that these amendments will not substantially change the overall economic burden to the regulated community. Some additional costs may be incurred as a result of the amendments, which will be described in detail in the following paragraphs. In most situations, treatment costs are unlikely to change. The remainder of this section will discuss in more detail the economic impacts that were considered.

2. Determination of Costs

These amendments deal with the establishment of numerical and narrative standards to provide protection of designated beneficial uses. Setting the standard is the first step of a two step regulatory process that ultimately determines treatment needs and costs. The second step is the determination of the effluent limitations or measures to minimize degradation of the states waters through water quality permits or certifications or, in the case of superfund remedial actions, cleanup requirements that will be required to meet the water quality standards. Water quality standards, rather than minimum technology-based treatment requirements, usually determine the need for treatment when receiving waters provide little or no dilution for discharges.

In practice, the "second step" of the process is always site-specific or discharge-specific, and it is carried out as part of the permit or certification process or cleanup evaluation. For this reason costs are best determined by looking at specific permits or remedial action sites and comparing the current limitations or cleanup requirements to what they would be based on the proposed standards or classification changes.

In summary, an overall cost can not be determined because it is the actual application of the standards on a case by case basis that determines the costs, and the number of situations where these amendments would alter the treatment or cleanup needs cannot be determined at this time. However, the economic effects are likely to be minimal even where the proposed amendments would have an impact. The following section addresses the major changes to the rule, and discusses the possible economic impact of those changes.

3. Economic Impact of Specific Amendments

a. Revising water quality standards to address wetlands specifically. The revisions to the 7050 Water Quality Standards regarding wetlands are intended to be clarifications of the Agency's existing standards.

1) Definition of wetlands: The proposed definition is consistent with the federal definition (40 CFR 230.41(a)(1)) and the Wetland Conservation Act definition. Exhibit 53. No additional costs will be incurred as a result of adding this definition to the standards.

2) Use classification changes: The proposed revisions to Parts 7050.0222 through Part 7050.0225 modify use classifications 2, 3, 4, and 5 to more appropriately identify specific designated uses for wetlands. Since the designated uses for all waters of the state are protected implicitly by part 7050.0185, subpart 1., explicitly listing wetland uses provides additional guidance but does not exceed the protection to uses already stated in part 7050.0185.

The parameters that are proposed as narrative standards are pH, dissolved oxygen, temperature, chlorides, hardness, settleable solids, and hydrogen sulfide. For point source dischargers, the pH and dissolved oxygen standards are most important.

Wetlands naturally have large dissolved oxygen variations on a daily basis because of their organic sediments. If a point source discharge is planned for a wetland determined to have naturally low oxygen concentrations, the effluent limitation would be set at a level such that the natural background level would not be lowered further, and at the level needed to maintain the dissolved oxygen concentration of the water resources downstream from the wetland that may require a minimum of 5.0 mg/l (Part 7050.0210 Subp. 13.). This assessment will be performed on a case-by-case basis as it has been in the past.

The same case-by-case analysis would be performed when considering pH. Just as an acidic discharge must be treated sufficiently so that the designated uses of the receiving water resource are not impacted, a neutral pH discharge to a low or high pH wetland may require treatment if a use is threatened.

There are currently approximately 600 municipal NPDES permits. Of these dischargers, it is estimated that about 40 discharge directly to a wetland. None of these dischargers incurred greater costs to meet the dissolved oxygen or pH standards. Although it is possible that a future discharger may incur added costs, most likely to treat a circumneutral pH being discharged to a bog, this situation would be very rare, based on the Agency's past 20 years history of issuing NPDES permits. It is possible to estimate what this hypothetical cost would be though. For example if a community of 500 people was required to modify its effluent pH concentration from 7 to 5, the added capital cost would be approximately $5000 and the added annual operation and maintenance cost would range from $4000 to $40,000, depending on the buffering capacity of the wastewater.

It is also possible that a discharger could permanently inundate a natural wetland to enhance treatment, especially for phosphorus. Depending on the wetland, the result could be an impact to wetland designated uses which would require wetland replacement. Wetland replacement costs vary widely, from a few hundred dollars to restore a degraded wetland by sealing off a tile line (plus land acquisition costs, if necessary) to thousands of dollars per acre to create a wetland at a non-wetland site. Since the Agency prefers restoration to creation, wetland replacement costs by point source dischargers are anticipated to be very low, and to occur very rarely.

The procedures noted above are required by Parts 7050.0185, 7050.0200, and 7050.0210 currently. For example, the Agency requires an effluent limit of 1.0 mg/l total phosphorus if the discharge is directly to a lake (part 7050.0211). The existing language, on a case-by-case basis, allows a stricter limit if it is determined that the 1.0 mg/l TP would still cause significant impacts to the lake's designated uses. Review of dissolved oxygen and pH impacts, and the result that additional treatment may be needed, is consistent with the processes followed for phosphorus under both the current rule and the proposed revisions in the existing rule and the proposed revisions.

Excess sediments in concentrations that threaten wetland designated uses are mainly the result of excess bank erosion or human disturbances upstream. Mitigation would be through the voluntary adoption of Best Management Practices in the affected watershed. Voluntary BMPs are being implemented through education, cost sharing, and other programs to reduce a broad range of pollutants.

3) Physical alterations of wetlands and the mitigative process: The use of the mitigative sequencing as a result of a proposed physical alteration to a wetland is limited to the following processes the Agency already has in place: Section 401 water quality certifications for Section 404 permits, NPDES permits, and state disposal system permits. The proposed mitigative sequencing procedures merely formalizes the environmental review process that has been used by the Agency since the 1982 promulgation of 40 CFR 230.

Incorporating mitigative sequencing into the 7050 water quality standards is important however. The Agency cannot presently positively certify that a fill activity covered by a CWA Section 404 permit will not cause violations of the water quality standards, because, without the mitigative process, non-degradation would be violated. Instead the Agency must require the mitigative process covered by 40 CFR 230.10(a) as a portion of the waiver to certification. Exhibits 27; 28. This revision makes it possible to provide a positive certification since non-degradation requirements will be met. Since the requirements are unchanged, this revision will not cause an increase in cost. For information purposes, during 1991 and 1992 the Agency reviewed 121 projects requiring Section 401 water quality certifications. The general breakdown of projects by type is as follows: transportation - 56; development - 17; agriculture - 4; and others - 44. Of the four agricultural permits, only one required replacement wetlands.

There is interest in comparing the 7050 mitigative sequencing with the Wetland Conservation Act (WCA) mitigative sequencing. Exhibits 10; 53. It is a very high priority for the Agency and the Board of Water and Soil Resources (BWSR) to have consistent guidelines to the extent possible.

Comparisons of the two mitigative processes reveal many similarities: both use the same sequencing of avoid, minimize, and replace and both have the same general reporting documentation. The main divergence is in the area of wetland replacement determinations. The WCA rule uses site-specific criteria while the Agency is required by the federal Clean Water Act and its associated rules to protect designated uses and to prevent cumulative impacts to the extent possible (40 CFR 230; 40 CFR 1508.7). As examples, the Agency might require the wetland mitigation replacement plan to be modified in the following cases:

(1) If, in the Agency's determination, there are cumulative impacts that will result in a significant adverse impact to a downstream water resource or to the wetland complex itself. The WCA rules only address site-specific impacts.

(2) If, in the Agency's determination, a wetland that removes sediment before it reaches a very sensitive downstream waterbody is being replaced with a wetland that would not protect the downstream resource such that downstream designated uses were threatened. The WCA rules replaces on an acreage basis without specifically focusing on designated uses.

The Agency has been using the mitigative process since 1982 without requiring a project modification because of cumulative impacts, so that situation would apparently occur only on a very rare basis. There is only a very short history regarding WCA mitigative requirements, but since BWSR and the Agency are coordinating very closely, it is anticipated that additional requirements to maintain unusual designated uses would occur very rarely also.

b. Amending the biological narrative standards. This part of the rule identifies the standard and procedure to identify whether a waterbody is meeting its designated use for aquatic life.

The incorporation of narrative biological criteria in this rule means that the biological condition of surface waterbodies will be determined by comparison to a reference condition. The assessments that will be conducted to establish the reference condition and biological surveys that are undertaken to measure biological condition of waters will be accomplished by the Agency staff or in cooperation with other governmental entities. These biological surveys will not result in any additional costs to the regulated community.

Biological surveys are part of an integrated diagnostic assessment that can be used to gain information about the condition of surface waters. In the process of conducting such assessments, waterbodies or waterbody segments may be found that are in nonattainment with their designated aquatic life uses because their biological condition deviates significantly from the reference condition. When these situations arise, other information from the assessment including habitat conditions, surface water chemistry information, and proximity to pollution sources can assist in diagnosing the cause and source of the impairment.

Where the cause of the impairment is perceived to be due to a permitted discharge, then the Agency would need to determine if the permittee was in compliance with their permit. If the permittee is in compliance with their permit effluent limitations, they would not be considered out of compliance due to the biological impairment or measured exceedances of any chemical criteria in the receiving stream. The Agency may, however, request the permittee to conduct additional monitoring to further evaluate the nature of the discharger's effluent and its impact on the receiving water.

The Agency at the present, requests some dischargers to monitor up and downstream of their discharge points, conduct bioassays, and conduct toxicity reduction evaluations when questions arise regarding the toxicity of an effluent or the impact of the effluent on the receiving waterbody. The requirements for additional monitoring would be done on a case-by-case basis. The types of monitoring requested could vary considerably and would be dependent on what stream water chemistry information was already available, and what was already known about the nature of the effluent.

New monitoring requests or requirements will not arise solely from information from biological surveys but information from the total diagnosis of the situation. In this sense, it is very unlikely that the result of a biosurvey by itself would result in any additional monitoring costs. Likewise it is most likely that information from a biological survey would be the starting point of a more detailed evaluation to determine the potential need to modify a permit and establish different effluent limitations. The actual setting of the effluent limits and changes in treatment that would occur, however, are ultimately based on effluent toxicity evaluations and the numerical chemical criteria that is established. They are not a direct result of the biological survey.

When the cause of an impairment is attributable to a nonpoint source pollution that is not affected by a permit, the Agency could choose to mitigate through the implementation of projects involving voluntary measures. These projects involve promoting Best Management Practices through education, cost sharing and other voluntary mechanisms. In this case, costs would be voluntarily incurred.

c. Conditional exemptions from secondary treatment standards for TSS and phosphorus for some dredge disposal facility discharges. This provision relaxes the TSS and P standards for temporary or intermittent discharges from dredge disposal facilities when BMPs and BPT are employed. There will be no additional cost to permittees as a result of this change.

d. Adding eight new aquatic life standards for the following toxics: Alachlor, Antimony, Atrazine, Cobalt, Iron, Manganese, Naphthalene, and Thallium.

A part of the proposed amendments deals with the promulgation of eight new water quality standards for toxic pollutants. Water quality standards may be used as the basis for setting National Pollutant Disposal System Elimination System (NPDES) or State Disposal System (SDS) permit effluent limitations or, in the case of superfund and hazardous waste sites impacting surface waters, cleanup requirements or goals. In this regulatory context standards can have a direct economic impact on dischargers if the water quality standards, rather than minimum technology-based treatment requirements, determine the need for treatment. Standards often determine effluent limitations when receiving streams provide little or no dilution for the discharge.

In practice, the setting of effluent limitations and cleanup goals is a site-specific process as part of the permit or remedial evaluation process. Therefore, the examination of potential costs is best done using actual permits or sites as examples.

All eight of the proposed standards started as site-specific criteria, developed under part 7050.0218, specifically to set a permit limitation or to assess the need for remedial action for a particular facility or site. Most site-specific criteria have been used subsequently at other locations. In fact, the number of times the criteria have been used at new locations is one of the parameters used to select which criteria should be promulgated as standards. When the Agency requests the use of a criterion at a new location, the criterion is reviewed for applicability at the new site. The review looks at such questions as local water quality characteristics that might mitigate or enhance toxicity, local endangered or very sensitive species, and other factors that could justify raising or lowering the original criterion. However, rarely does the site-specific review result in a change to the original criterion. Thus, the original criteria are likely to be applied in the future at new locations without change. Under this scenario there will be no additional costs to the regulated community caused by the promulgation of the new standards because the site-specific criteria that would be used at a new location will very likely be the same as the statewide standards once the latter are promulgated. The treatment or cleanup costs would be the same because the goal is the same. Examples include the Kluver sanitary landfill and the Dakhue landfill sites where the same criteria, originally developed for another site, were used to assess the need for remedial action.

The situation described above will be true in many instances and no additional costs will be incurred. However, permittees that have limitations based on treatment technology for any pollutants for which standards are being proposed, additional costs are a possibility, if the proposed standards would result in lower effluent limitations. To assess possible costs, example permits or remedial actions containing limitations or cleanup goals for the proposed eight new standards are discussed below.

1) Herbicides

The Huntting Elevator near Lansing was the site of bulk storage and transfer of agricultural pesticides. Over the years the soil and ground water at this site became contaminated with herbicides including alachlor and atrazine. The contaminated ground water was moving toward an unnamed tributary of the Cedar River. The alachlor and atrazine criteria were developed for this site, and this is the only location where these criteria have been applied. Huntting Elevator is the first site involving ground water contaminated with agricultural pesticides that the Agency has dealt with. A complete Superfund investigation was done, in part, due to the lack of knowledge of the fate of pesticides in ground water at the time of the investigation.

Possibly due to better storage and handling of the pesticides on site, the ground water herbicide concentration levels have dropped to acceptable concentrations. As such, no further remediation or treatment is required and only monitoring is being done at the Huntting Elevator site.

The Minnesota Department of Agriculture (MDA) normally handles agricultural cleanup activities in Minnesota and they have dealt with several chemical spill sites. To date, the MDA has not had to pump out contaminated ground water for treatment and discharge into a surface water. Land application of contaminated soil and water, a treatment technology which enhances the natural degradation of the chemicals, has been the method used by MDA to remediate these sites.

Due to their wide spread use in agriculture, herbicides are a concern as a component of nonpoint source pollution (runoff) from agricultural lands. Atrazine has been found in Minnesota's surface waters in many locations (see page 65 of this document) but not in concentrations above the proposed standard of 3.4 (Class 2A and 2Bd) or 10 ug/l (Class 2B). If the concentrations of alachlor or atrazine were to exceed the proposed standards in a surface water due to nonpoint source runoff, mitigation would be through the voluntary adoption of Best Management Practices (BMPs) in the affected watershed. Voluntary BMPs are being implemented through education, cost sharing and other programs to reduce a broad range of pollutants in runoff including pesticides of all kinds. BMPs specifically to minimize atrazine in runoff have been developed by the MDA. Implementation of BMPs will be a cooperative effort between the MDA, the Agency, the Soil Conservation Service, and local land owners.

The Agency does not foresee any additional costs incurred by the promulgation of the alachlor and atrazine standards.

2) Metals

Effluent limitations for iron, manganese, cobalt are found in some NPDES permits, particularly those associated with the mining industry. Also, the criteria for these metals have been used in to evaluate several ground water contamination sites.

a) Iron

A technology-based effluent limitation of 1000 ug/l as a monthly average and 2000 ug/l as a daily maximum, for dissolved iron, are commonly put into NPDES permits for mine pit dewatering discharges. Three such permits will be examined as examples of the impact of the proposed standards on potential costs to these permittees.

The iron effluent limitations are specified as dissolved iron, whereas the proposed iron standards are stated as total iron. Total iron is all the iron dissolved or suspended in an unfiltered sample. Dissolved iron is the truly dissolved iron plus the suspended iron that will pass through a very fine filter. The Agency recognizes the inconsistency of having "total" standards and "dissolved" effluent limitations. Conceptually, a permittee could be in compliance with their permit limitation of 1000 ug/l dissolved iron and still exceed a background-based standard of 1000 ug/l total iron in the receiving stream (see discussion of the forms of iron in water on page 67 of this document). In this situation, if the permittee is in compliance with the permit effluent limitation, they would not be considered out of compliance due to a calculated or even measured exceedance of the standard in the receiving stream. The Agency would need to evaluate whether or not a permit modification is needed (see part 7050.0210, subpart 17). Allowance for the difference between total and dissolved would be part of the follow up analysis.

The Agency is not aware of any data that quantifies the ratio of total versus dissolved iron in effluents or natural waters. The Agency believes that the discrepancy between the water quality standard and effluent limitation is not an insurmountable problem, but do agree that total and dissolved analyses on the same sample are needed. The issue of whether to define metal standards as total, dissolved, or some other form, is very complex and needs a through review. This issue has recently become an important issue within the EPA, as well.

US Steel Corporation, Minntac (Permit No. MN 0052493)

The active Minntac taconite open pit mine near Mountain Iron has several permitted dewatering discharges. This example will focus on two outfalls, 030 and 060, both discharging to Kinney Creek. Kinney Creek is a designated trout stream (Section 11, T 58 N, R 19 W). The proposed iron chronic standard for Class 2A waters is 221 ug/l. As mentioned above, the iron limitation in the current permit is 1000 ug/l as monthly average.

Assuming Kinney Creek has a design low flow (7Q10) of zero, the discharger would normally be required to meet the chronic standard at the end of the pipe. If US Steel Corp. was given an effluent limitation of 221 ug/l, presumably additional treatment costs would be incurred. However, the Agency would not propose an effluent limitation of 221 ug/l because background concentrations of iron exceed this value. The Agency does not have iron data specifically for Kinney Creek, but it does have data for several watersheds in the iron range and north shore areas. These data are summarized in Table 10.

Table 10. Iron Concentrations in ug/l from Representative Watersheds

Station	mean	St.dev.	CV*	Max value	N	mean +2 St.dev.
East Swan R. near Hibbing	995	1014	1.02	4100	31	3023
St. Louis R. near Zim	831	564	0.68	3000	32	1959
Beaver R. near Beaver Bay	824	475	0.58	2600	35	1774
Miss. R. near Blackberry	276	134	0.49	580	32	544

*CV means coefficient of variation which is the standard deviation (St.dev.) divided by the mean. The larger the CV, the more variability in the data.

Limited data for other streams closer to Mountain Iron such as East Swan Creek southeast of Hibbing, Penobscott Creek near Hibbing, and West Two River near Iron Junction show iron values similar to those for the first three stations listed above. Iron concentrations appear to be lower in the Mississippi River watershed.

Part 7050.0170 allows the Agency to use the natural background as the standard when the natural concentrations exceed the standard. In applying the natural background as the standard, the Agency has accounted for natural variability in surface water concentrations, when there was adequate data to characterize the variability. The Agency uses a concentration near the high end of the range of values since high values occur naturally. This approach recognizes that occasional high values are a normal part of the natural system, whereas use of an average value, for example, sets up an unreasonable situation in which the standard would be exceeded about half the time. In the past the Agency has used the mean plus two standard deviations as a standard based on natural background. The mean plus two standard deviations approximates the 95 percentile value in the range of all values.

In a different context, the Agency has used a 95th percentile value of natural concentrations (e.g., roughly equal to the fifth highest value out of 100 values) to characterize background conditions. The 95th percentile is used to define natural background concentrations for assessing nondegradation to surface waters. Also, the use of a value which approximates a 95th percentile value as an effluent limitation is consistent with the common compliance strategy that a facility may be out of compliance about five percent of the time due to factors outside the control of operators.

Mean values plus two standard deviations for two rivers in the iron range area (the first two in Table 10.) are well above the current technology-based effluent limitation of 1000 ug/l.

While use of a 95 percentile value has precedence, it may not be appropriate in all cases. As stated above, the mean plus two standard deviations is comparable to the 95th percentile value; but this is true for data that are normally distributed. It appears that iron concentrations may not be normally distributed (mean values are consistently higher than median values). Exhibit T51. If the data are skewed toward the higher values, as appears to be the case for iron, using the mean plus two standard deviations in some situations may not be protective. However, the means plus one standard deviation (about equal to the 67th percentile) for the first three rivers in Table 10 are above 1000 ug/l as well.

In the situation of the Minntac discharge to Kinney Creek, while the Agency has no data for Kinney Creek, it is reasonable to assume that the iron concentrations in Kinney Creek will be similar to that of the surrounding watersheds. Effluent limitations based on the available background data, taking into account known variability, would not be lower than the current technology based limitations. Therefore, it is the conclusion of the Agency that there will be no additional cost to US Steel Corp. at Minntac as a result of the proposed iron standard. The Agency does not anticipate any cost savings as a result of the proposed standard either because the technology-based limitation will still be used.

Cyprus Northshore Mining Corporation (Permit No. MN 0055301)

Cyprus Mining Corp. (formally Reserve Mining) discharges from the large tailings basin at Milepost 7 to the Beaver River. The Beaver River is a tributary to Lake Superior, and, like Kinney Creek, is a designated trout stream. But unlike Kinney Creek, iron data are available for the Beaver River. Table 10. Also, the Beaver River may have a 7Q10 greater than zero, although in a situation where the background concentration potentially controls the quality of the discharge, knowing the 7Q10 is not critical.

The mean iron concentrations in the Beaver River plus one and two standard deviations are 1299 and 1774 ug/l, respectively. The discussion for Minntac regarding the use of the background levels as the standard (limitation) applies equally well to Cyprus Northshore, and no costs to Cyprus will result from the adoption of the iron standard.

The fact that the downstream lake is an Outstanding Resource Value Water may warrant being more protective in assessing the natural variability, but the outcome would be the same (i.e. no additional costs) because of the high natural levels of iron in the Beaver River.

LTV Steel/Erie Corporation. (Permit No. MN 0042579)

The LTV Steel Dunka pit near Babbitt discharges mine pit water to several non-trout waters (Class 2B). The most active of these discharges is to the Dunka River. These discharges have the technology-based limitation of 1000 ug/l as dissolved iron that was discussed above. No additional costs will be incurred by LTV because the proposed Class 2B standard of 1245 ug/l is less stringent than the technology-based limitation.

In addition to the mining permits, iron limitations are found in some permits for peat mining operations, coal fired steam electric generating plants (boiler blowdown or boiler cleaning water), and some contaminated ground water pump and treat operations. For example Michigan Peat (Permit # MN0055662) and Minnesota Sphagnum, Inc. (Permit # MN0057428) have monthly average total iron limitations of 300 ug/l or the natural background, whichever is lower. NSP Prairie Island (Permit # MN0004006) and Austin Utilities (Permit # MN0025810), for example, have daily maximum limitations of 1000 ug/l total iron for some types of discharges. The St. Louis Park (Reilly Tar Site) permit (# MN0045489) for the pumping, treatment and discharge of contaminated ground water to Minnehaha Creek has an iron limitation of 1000 ug/l as a quarterly average. All of the receiving waters in these examples are Class 2B waters and the proposed standard of 1245 ug/l will not increase costs for these dischargers.

b) Manganese

The St. Louis Park (Reilly Tar) permit mentioned above has a manganese limitation of 1000 ug/l as a quarterly mean. The proposed Class 2B standard is 491 ug/l. Since Minnehaha Creek provides no dilution at low flow (7Q10) conditions, reducing the manganese limitation to 491 or to background levels may be required. A review of the 1991 and 1992 discharge monitoring reports (DMR) for this facility indicates manganese effluent values in the range of 600 to 1300 ug/l. No monitoring data for manganese is available for Minnehaha Creek. Data from a nearby watershed, Elm Creek at Champlin, has a mean manganese concentration of 236 ug/l. Assuming a coefficient of variation of 0.8, the mean plus two standard deviations would be 614 ug/l. This is below the quarterly mean effluent limitation of 1000 ug/ in the current permit. Agency staff has reviewed the current St. Louis Park treatment system to determine if it can meet the proposed manganese standard, or if additional treatment may be needed.

The current treatment system is designed to remove iron and the organic contaminants in the ground water. The system was built in 1990 and consists of a potassium permanganate (KMn04) feed system to oxidize the manganese and iron, a static in-line mixer to mix the KMn04 with the ground water, a single sand filter to remove the manganese and iron precipitates, and, finally, two activated carbon filters units in series for removal of organic contaminants. The purpose of manganese and iron removal in the current system is to prevent precipitates of these metals from fouling the carbon filters.

The review of this system and the DMRs indicates that it is not functioning well, and the current manganese effluent limitation of 1000 ug/l is occasionally exceeded. Agency staff believe that some modifications to the system would produce an effluent in compliance with the current limitations and the proposed new manganese standard. Ironically, influent monitoring indicates that the raw ground water has an average manganese concentration of about 370 ug/l, which is below the proposed standard. The KMn04 addition and the operational problems are adding manganese to the current effluent in excess of the proposed standard. However, the need to remove iron remains, in order to keep the carbon filters from becoming plugged. Agency staff suggests the following three options, with associated costs, to correct the current problems and to meet the proposed manganese standard.

(1) Replacement of the Existing Sand Filter Media with Greensand.

It may be possible to meet the standards by simply replacing the sand filter medium with a commercial greensand. Greensand is a naturally occurring sodium-aluminum silicate available commercially. Iron and manganese is oxidized and the precipitate is filtered out. Usually $KMnO_4$ is fed continuously to the influent to recharge the greensand. An additional sand filter may be needed to assure compliance with standards. The costs outlined below include a second sand filter.

Capital Costs - $50,000 for one additional dual media - gravity filter, sized at 4 gpm/ft2, including pump and backwash equipment.

Operation and Maintenance (O&M) Costs - estimated to be about $1,500 per year

(2) Use of an Alternative Oxidant.

The use of an alternative oxidant, such as chlorine dioxide (ClO_2), to oxidize the manganese and iron would solve the manganese carry over problem. An additional filter may be needed.

Capital Costs - $50,000 for the ClO_2 generator plus feed equipment - automated - flow proportioned. This amount does not include a second filter.

O&M Costs - $4,000 per year total, chemical costs about $1,500 per year; O&M for ClO_2 system should be about the same as the current O&M for the $KMnO_4$ system.

(3) Aeration for Iron Removal

Oxygen will oxidize manganese and iron. A one horse power compressor would be adequate, but reaction time with oxygen is slower and 1,100 cubic foot holding tank would be needed.

Capital Costs - estimated to be $20,000 or less.

O&M Costs - Estimated to be about $1,000 per year, which would be a savings over the existing O&M costs.

Because the existing system is not consistently meeting the manganese effluent limitations in the current permit, and some improvements may be needed to correct these problems, it is difficult to isolate the costs attributable only to meeting the proposed manganese standard. As indicated, most of what is needed, in terms of buildings, piping, pumps, filters, etc., to meet the current and proposed standards is already in place. The total projected costs to correct the current problems and to meet the proposed manganese standard are not prohibitive. In fact, the less expensive alternatives could represent a cost savings to St. Louis Park over the long term.

Other permits such as those for the peat mining operations and mine pit dewatering permits have no manganese limitation, but they may require monitoring for manganese.

c) Cobalt

Cobalt is not a commonly encountered pollutant and the only permit containing a cobalt limitation is the LTV Steel/Erie Corporation permit for the Dunka pit discharges. The cobalt criterion was developed for this permit. The chronic criterion is 5 ug/l which is the same as the proposed chronic standard for Class 2B waters.

The source of cobalt and other trace metals in the Dunka pit is the lean copper-nickel ore which overlies the taconite. The lean ore has been removed and stock piled. Leachate from the stock piles contains concentrations of metals, including cobalt, that exceed applicable standards before treatment. The LTV Dunka permit contains limitations for these leachate seeps as well as limitations for mine pit dewatering.

Most pit water is discharged to the Dunka River, a Class 2B water. The cobalt limitation for this discharge is the same as the criterion and the proposed chronic standard, 5 ug/l. Because they are the same, no increased costs will result from the promulgation of this standard.

The cobalt limitation for the stock pile leachate discharges in the LTV permit is 50 ug/l. This limitation is based on a site-specific determination of the chronic criterion for the Dunka seeps, based on the very high total hardness concentrations in the seep water. Toxicity data for cobalt indicate that total hardness can mitigate cobalt toxicity, as is true for other trace metals (although the data are not complete enough to support a hardness dependent standard). Under part 7050.0222, subpart 8 of the rule, the same site-specific considerations can be applied to a site-specific modification of the proposed standard as were used to determine the site-specific criterion of 50 ug/l. Therefore, no additional costs are anticipated due the the promulgation of the cobalt standard.

d) Antimony and Thallium

The Agency found only monitoring requirements and no effluent limitations for antimony and thallium in permits. Promulgation of the proposed standards will not result in increased costs.

A few municipalities have monitoring requirements for some of the metals for which standards are being proposed, but none has a limitation for these metals. Municipalities will not incur any costs due to the proposed new metal standards.

3) Other Organics

a) Naphthalene

The proposed naphthalene standard was developed as a site-specific criterion for the Harvest States site. Harvest States is a grain elevator complex along the Mississippi River in St. Paul. Soil and ground water on the site are contaminated with naphthalene. This site is unusual in that naphthalene is the only contaminant found in the ground water. Naphthalene is normally associated with other Polynuclear Aromatic Hydrocarbons (PAHs). Monitoring at the site shows that naphthalene concentrations are low enough that no pump out and treatment of the ground water is needed to protect the Mississippi River. The City of St. Paul removed the contaminated soil, mixed wood chips and fertilizer with it, and then thinly spread it on vacant land to allow natural degradation of the naphthalene. This remediation was carried out for reasons other than the removal of naphthalene.

Naphthalene is normally associated with other PAHs found at such sites as petroleum refineries, coal gasification facilities, wood treatment processes, and coking operations. Naphthalene is one of the easiest of the PAHs to remove when cleaning contaminated soils and ground water, and is removed along with the other PAHs normally present. No additional costs are anticipated as a result of the promulgation of the statewide naphthalene standard.

The Water Quality Division has a naphthalene effluent limitation of 50 ug/l (daily maximum) in a general NPDES permit used for a variety of dischargers likely to contain petroleum products. An example is the permit for the Simson Station-West in St. Cloud. They are pumping and treating ground water contaminated by a leaky under ground tank. Discharge is to the Sauk River. The proposed chronic standard for naphthalene is 81 ug/l. Since this is a higher value than the current effluent limitation of 50 ug/l, no additional costs are expected for dischargers that have this generalized permit.

4) Monitoring Costs

The addition of eight new standards may result in a very small increase in monitoring costs to permittees in the future. Presence of a standard in the rule might enter into the decision as to whether or not to have the permittee monitor for that pollutant. Relatively few dischargers monitor for any of these eight chemicals now, and most of the limited monitoring done is for iron. The analytical costs, as charged by the Minnesota Department of Health analytical laboratory, are shown below as an example of the cost to analyze these chemicals.

Chemical	Cost per Analysis in $
Alachlor and Atrazine	173
Antimony	43
Cobalt	63
Iron	26
Manganese	25
Naphthalene	369
Thallium	43

The monitoring frequency will not be increased for those dischargers that currently monitor for iron, or the other chemicals listed above, as a result of adopting the new standards. Thus, there should be no cost impact on these dischargers due to monitoring.

As the Agency staff review new discharge requests or remedial actions there is a small possibility that monitoring will be required that would not have been required prior to the promulgation of the standards. There is no way of knowing how many new situations will be reviewed by the Agency and how many of these will involve the need to monitor for these eight chemicals. But, assuming 100 analyses are required for each of the eight chemicals over the next year and five percent of the 100 analyses is a result of adding the standards to the rule, the total analytical cost would be $ 74,200 and $3,710 would be attributable to the proposed new standards. This "worst case" analysis illustrates that any increase in monitoring costs due to these proposed standards will be small.

e. Updating nine current aquatic life standards for the following toxics: Arsenic, Benzene, Bromoform, Endosulfan, Fluoranthene, Hexachlorobenzene, Nickel, Pentachlorophenol, and Vinyl chloride.

The Agency is proposing to update nine of the standards currently in part 7050.0220, subpart 3. Five of the nine proposed updated standards are less stringent than the current standards. No additional treatment costs will be incurred as a result of these changes. On the contrary, it is conceivable that some cost savings might result from raising these standards, but the Agency has not attempted to quantify possible savings.

The proposed updated standards for arsenic, bromoform, endosulfan and pentachlorophenol are more stringent than the current standards. Of these, arsenic and pentachlorophenol (PCP) are the most likely to result in increased treatment costs. No permits have limitations for bromoform or endosulfan.

1) Arsenic

The Hanna Mining Research Center permit (Permit # MN0020249) has an arsenic limitation of 40 ug/l (monthly average). The wastewater treatment for this research facility is a pond that discharges to Pickerel Creek, a designated trout stream. The proposed Class 2A arsenic chronic standard is 2.0 ug/l, which, assuming no dilution at 7Q10 flow, would be this facility's new effluent limitation when the permit is reissued. This pond has not discharged in five years, and the single arsenic monitoring value from the pond is less than 2 ug/l. It is unlikely this facility would incur any additional costs due to the proposed arsenic standard, if it continues to operate as it has over the last five years.

The Agency is not aware of other permits with arsenic limitations. Several permittees are required to monitor for arsenic. For example, the pumpout and treatment of contaminated ground water at the Ironwood landfill (Advance Transformer, permit # MN0053589), the quarry dewatering permit for Kraemer and Sons, Inc. (permit # MN0002224), and Minnesota Power at Cohasset (permit # MN0001007) monitor for arsenic but have no arsenic limitations. The Agency does not anticipate any increased costs due to the proposed change in the arsenic standard.

2) Pentachlorophenol

The Agency has reviewed the permits that have a pentachlorophenol (PCP) effluent limitation and believes there will be no additional treatment costs, but there is a possibility of modest additional operation and maintenance costs to some dischargers. The Champion International Corporation and Western Lake Superior Sanitary District discharges are used as examples to illustrate the potential costs.

Champion International Corporation (Permit # MN0056537) in Cass Lake operates a pumpout system to remove PCP from contaminated ground water due to former wood preservation activities on this site. Treatment is with granulated activated carbon at a maximum discharge rate of 200 gallons per minute (0.45 cubic feet per second). The limitation in the permit is 8 ug/l as a daily maximum. The discharge is to a channel connecting Pike Bay to Cass Lake which is a Class 2B water. The proposed updated Class 2B standard is 5.5 ug/l (assuming the mean pH of Pike Bay is 6.96 or greater, which is likely). Because no dilution is granted, the new effluent limitation would be 5.5 ug/l.

A review of the discharge monitoring reports for 1988 through 1992 (the record contains some gaps) shows two monthly values above their detection limit of 5 ug/l. A value of 9 and 7 ug/l were reported for January, 1990 and March, 1991, respectively. All other values reported were less than 5 ug/l (one sample per month). Since an effluent limitation of 5.5 ug/l is nearly the same as the detection limit of 5 ug/l in this case, compliance would be based on concentrations remaining below detection.

The granulated activated carbon filtration (GAC) system in place now at Cass Lake represents the best available treatment technology, and additional treatment should not be needed. However, the possibility of a lower effluent limitation in the future (from 8 to 5.5 ug/l) may mean some increase in operational and maintenance (O&M) costs to Champion in order for them to be assured of compliance with the potential lower limitation. With the exception of the single exceedance of the current limitation noted above and the measured value of 7 ug/l, PCP effluent concentrations have been below the 5 ug/l detection limit over the last five years. Thus, any increase in O&M costs should not be great.

The Agency believes additional costs could result from one or both of the two following situations:

Shorter "life span" of the carbon filters. Briefly, the three GAC units in series are monitored for rotation or replacement by measuring the PCP concentrations between units two and three. When the PCP concentration reaches 100 ug/l or above, replacement or rotation of the filters is needed some time in the following two or three months to prevent PCP break through in the final effluent. With a lower effluent limitation the threshold for filter change may be lower; and, over time, filters will be replaced more frequently, resulting in greater cost.

Lower detection level monitoring. The second possible additional cost is the use of an analytical procedure that provides a lower detection limit. The advantage of a lower detection limit to the company and the Agency would be, 1) to not have to use the detection limit as the compliance limit, 2) to have better data on exactly what the concentration of PCP is in the effluent, and 3) that compliance with a lower effluent limitation might be achieved without additional O&M costs. By providing more precise analytical results in the operational range of interest in this case (1 to 8 ug/l), a lower detection level method might show the current system is capable of consistently meeting a lower limitation when a less precise method, such as the one in use now, might not. This is because monitoring experience has shown that chemical concentrations at or just below the detection level for a given analytical method are often reported as higher than the true concentrations.

Gas chromatography with mass spectrometric detection (GC/MS) can achieve a detection limit of about 1 ug/l. This method costs $286.00 at the MDH analytical laboratory.

The advantages of a lower detection level method would be weighed against the added analytical cost, and the potential greater O&M costs if the latter is selected as the means to meet a potential lower limitation.

A more detailed examination of the treatment system and its operation, together with discussions with Company representatives and their consultants, will be carried out to determine the relative costs and the most cost effective option, or combination of options, given the proposed lower PCP standard.

Western Lake Superior Sanitary District (WLSSD) operates a large waste water treatment plant in Duluth. This 43.6 million gallon per day plant treats the sanitary waste from Duluth and surrounding communities and waste from Potlatch Corporation in Cloquet. WLSSD has a PCP effluent limitation of 11.6 ug/l as a daily maximum. This limitation is based on the acute toxicity of PCP at the low pH of the WLSSD discharge. The acute value used is an older PCP criterion and is slightly lower than the Final Acute Value (FAV) in the current rule (11.6 vs. 13.4 ug/l). The toxicity-based FAV and maximum standards are not proposed for change. Therefore, there will be no change to the PCP limitation for WLSSD and no costs incurred.

The Agency believes that the current permittees with PCP limitations will not have to provide additional treatment and will not incur additional treatment costs. Some costs may result if a discharger's limitation is reduced and they exceed the new limitation more frequently. Costs to possible future dischargers can not be determined, but any future discharger should have to provide BAT, independent of the standard.

f. Reclassifications.

For the purposes of the discussions relating to economic impacts, the proposed major amendments to the rule which deal with use reclassifications and ORVW designations can be divided into the following four groupings:

1) Class 1 Domestic Consumption classification
2) Outstanding Resource Value Waters
3) Class 2B waters reclassified as Class 2A waters
4) Class 7 reclassifications

Each grouping change will be discussed in greater detail as follows:

1) Class 1C Reclassification

In order to update the listing of surface waters in Minn. Rules pt. 7050.0470 used for domestic consumption purposes, the Agency is proposing to classify 18 surface water bodies as Class 1C waters. The waters proposed for this designation have been identified by the MDH as surface water source supplies for either community, noncommunity, or noncommunity, nontransient public water supply systems.

The present use classifications assigned to these waters are Class 2B, 3B, 4A, 4B, 5 and 6 class waters. By designating these waters for domestic consumption purposes, they will be classified as Class 1C, 2Bd, 3B, 4A, 4B, 5 and 6 class waters. With the addition of the class 1C designation, and the accompanying 2Bd classification, applicable water quality standards for these waters will be based on both the primary and secondary drinking water standards, as well as the aquatic life standards as specified in Minn. Rules pt. 7050.0222, subp. 3. Except for the total coliform bacteria and the turbidity standards, the primary and secondary drinking water standards will apply to these waters in their untreated state should they be designated as Class 1C waters.

The proposed Class 1C use classification of these waters does not impact the MDNR water appropriation permitting process nor does it affect the requirements of Minn. Rules ch. 4720, the Minnesota Department of Health rule dealing with public water supplies. By designating these waters as Class 1C waters, the Agency will evaluate and assign appropriate effluent limits for discharges to these waters so as to provide protection of their identified drinking water use.

Community Public Water Systems

The following four (4) mine pit lakes serve as community public water supply sources for the respective municipalities:

Canton Mine Pit Lake at Biwabik
Corsica Mine Pit Lake at McKinley
Fraser Mine Pit Lake at Chisholm
Missabe Mountain Mine Pit Lake at Virginia

These mine pit lakes have served and are projected to continue to serve as drinking water supply sources for these communities.

The proposed Class 1C use classification of these waters is a recognition of this fact and since there are no permitted discharges to these mine pit lakes, there are no identifiable economic impacts that result from the assignment of this use classification to these waters. Runoff from areas surrounding these mine pit lakes will continue to be managed through the implementation of best management practices to minimize the impacts associated with land erosion and other nonpoint source pollutant contributions.

Special monitoring requirements are contained in a permit issued to Minnesota Aquafarms, Inc. and Iron Range Aquafarms, Inc. which requires monitoring on a monthly basis of two sampling stations within Fraser Lake and twice monthly sampling of the untreated Chisholm public water supply intake from Fraser Lake (NPDES/SDS Permit No. MN0058190, Exhibit C 56). Minnesota Aquafarms, Inc. and Iron Range Aquafarms, Inc. operate an aquaculture fish production facility in the Sherman mine pit lake adjacent to the Fraser. This permit also contains a special requirement specifying that "The Permittee shall not construct, add fish, or conduct other activities in Fraser Lake, with the exception of maintenance feeding operations and fish removal operations for the trout present in the lake on June 28, 1988. " Exhibit C 56, Part I.C.5. This restriction remains applicable so long as the Fraser Lake is used as a drinking water source. At least in the near term, the city of Chisholm plans to use the Fraser Lake as its sole source of drinking water. Exhibit C 57.

Noncommunity Public Drinking Water Supplies

There are two wastewater treatment facilities (WWTF) that impact Lake Vermilion, a public water supply source for eight (8) noncommunity public water systems. The first WWTF discharge is from the Tower-Breitung Water and Sewage Commission facility and the second discharge is from the Boise Forte Reservation WWTF.

The city of Tower and the Breitung Water and Sewage Commission operate a wastewater stabilization pond facility which discharges on a controlled basis to a tributary to the East Two Rivers, NPDES permit number MN0056618. East Two Rivers flows to Lake Vermilion. The nearest noncommunity water supply system is located approximately 17 miles "down-lake" from this wastewater effluent discharge. While it is the policy of the MPCA to require year-round disinfection of sewage wastewater that is discharged within 25 miles upstream of a drinking water supply withdrawal, stabilization pond facilities can generally meet the fecal coliform effluent limitation of 200 org./100 ml without having to be chlorinated or disinfected through some other process. A review of the discharge monitoring reports for this facility have shown that the fecal coliform levels in the effluent have consistently been well below the 200 org./100 ml limit. Therefore, no additional treatment costs are anticipated as a result of the proposed Class 1C classification.

The Boise Fort Reservation WWTF currently discharges at an average effluent flow rate of approximately 0.015 MGD. Two facility upgrade options are being considered, a pond treatment facility with a controlled discharge, and a mechanical treatment facility with a continuous discharge of approximately 0.108 MGD.

If the pond treatment option is chosen, no additional costs are anticipated as a result of the Class 1C designation for the same reasons discussed previously for the Tower-Breitung discharge.

If the mechanical treatment facility operation is selected, year-round disinfection would be required. This would extend the period of required disinfection from eight (8) months to twelve (12) months. Assuming chlorination of the wastewater is the chosen method for disinfection at the upgraded facility, chemical costs for extending the disinfection requirement by four (4) months would be approximately $600 per year. This cost estimate includes the chemical costs for the chlorine and for the sulfur dioxide used to de-chlorinate the wastewater in order to meet the total residual chlorine effluent limitation.

Noncommunity, Nontransient Public Water Supplies

Four (4) mine pit lakes that have been identified as noncommunity, nontransient public water supplies are being proposed for Class 1C use classification. These mine pit lakes serve the following respective mining operations:

Enterprise Mine Pit Lake, Inland Steel Mining Company
Morton and Scranton Mine Pit Lakes, Hibbing Taconite Company
Mountain Iron Mine Pit Lake, USX

These waters are designated by the Minnesota Department of Health as public water supplies since they serve as sources of drinking waters for at least 25 of the same persons over six months per year. As noted in earlier discussions, the Scranton Mine Pit Lake, under existing water elevations, is part of a much larger surface water body encompassing the Hull-Rust-Mahoning-Scranton-Susquehana mining complex.

In addition to surface runoff from surrounding lands and ground water seepage to these mine pit lakes, these waters also receive mine pit dewatering discharges from active and/or non-active mining operations. As with the mine pit lakes utilized by the four communities discussed earlier under the section on community public water supplies, the Agency encourages the use of Best Management Practices (BMPs) in mining areas to minimize and control erosion. The Agency also recommends that special care is taken in the use of chemical dust suppressants, lubricants, fuels, drilling fluids, oils, fertilizers, explosives and blasting agents in the mining areas so to minimize their impact on surface and ground waters. Utilization of applicable BMPs has been and will continue to be the Agency's focus for storm water runoff and erosion control measures for flows from mining areas. While the designation of the four mine pit lakes as Class 1C waters will not result in a change in this management approach additional costs may be incurred due to increased implementation of BMPs if additional management controls are needed to protect the drinking water source.

The assignment of this use classification does have the potential to result in additional monitoring costs relative to discharges of process wastewater and dewatering flows from active mining areas that impact these drinking water supply sources. Historically, the Agency has viewed some of these mine pit lakes within the boundaries of the permitted facility which receive process wastes and dewatering discharges from active mining areas as being part of the mining operation. Dewatering discharges from these particular mine pit lakes which discharge to waters of the state were permitted through the NPDES/SDS permitting process. Recognizing that drinking water supply is an existing use of these waters, the Agency will establish monitoring requirements, and if appropriate, set effluent limits on discharges to these waters so as to protect for the drinking water use.

The cost estimates for this additional monitoring are separated into two categories. The first category includes monitoring of the process and active mine dewatering discharges discharging into the proposed Class 1C mine pit lakes at the time of permit renewal. Parameters and parameter groupings to be analyzed include the following.

INORGANICS: aluminum, arsenic, antimony, barium, beryllium, boron, cadmium, chromium, cobalt, copper, fluoride, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, tin, titanium, zinc, nitrate + nitrite, nitrite, ammonia, total organic nitrogen, total phosphorus, sulfate and chloride

ASBESTOS

VOCs: benzene, vinyl chloride, carbon tetrachloride, 1,2-dichloroethane, trichloroethylene, 1,1-dichloroethylene, 1,1,1-trichloroethane, and para-dichlorobenzene

SYNTHETIC ORGANICS: glyphosate, herbicides (CH), base-neutrals, and carbamates

GENERAL CHEMISTRY/BACTERIOLOGICAL: total suspended solids, biochemical oxygen demand, chemical oxygen demand, total organic carbon, surfactants, fecal coliform, color

OIL AND GREASE

Based on analytical cost estimates from the Minnesota Department of Health, total costs per sample for the above noted parameters and parameter groupings is $2,975 per sample.

The second category of discharge parameters monitored on a semi-monthly basis include: ammonia, nitrate + nitrite, nitrite, chloride, total suspended solids, turbidity, pH, color, oil and grease, dissolved iron

The analytical costs for these parameters is estimated to be $194 per sample. Additional parameters may also be added to this list of parameters to be measured on a semi-monthly basis depending on the results of the monitoring for the parameters in category one as described above.

As an example, USX (NPDES/SDS permit #MN0052493) may be required to monitor two additional monitoring stations as a result of the Class 1C designation of the Mountain Iron mine pit lake. The monitoring stations would be established to monitor the mine pit dewatering discharges from the eastern portion of the West Minntac mine and the western portions of the East Minntac mine. Additional parameter analyses would be required at a monitoring station already being sampled by USX. This station, identified in the permit as monitoring station 950, has been established to monitor surface flow of non-sewage wastewater from the Minntac and Pilotac Plant Areas on the south side of the Laurentian Divide. Over the life of the five-year permit, estimated added monitoring costs resulting from the Class 1C classification would be approximately $78,800.

Inland Steel Mining Company has indicated that it is currently pursuing an in-pit tailings disposal option where they intend to pump tailings into their depleted Minorca Pit rather than their current tailings basin Exhibit C 58. As the Minorca Pit fills with tailings, process water would have to be pumped out of the pit. This excess water would be pumped to the Sauntry and Enterprise Mine Pit Lakes. Once the dewatering of the Minorca Mine Pit begins, the company indicates that it would no longer use water from the Enterprise Mine Pit Lake for domestic consumption purposes and is therefore requesting that the Enterprise Mine Pit Lake not be classified as a Class 1C water pending approval of the proposed in pit tailings disposal proposal.

Agency staff has discussed this request with a company representative and have indicated that it will continue to include the Enterprise Mine Pit Lake as a Class 1C water based on its existing use as a drinking water source supply. As the plans and environmental reviews of the proposed in-pit tailings disposal option progress, and the company provides a schedule for the cessation of use of the Enterprise for drinking water purposes, the Agency will re-evaluate the need for continuing to propose this mine pit lake as a Class 1C water. The Agency anticipates that these discussions and submissions of information could occur prior to or during the public hearings on the proposed rule amendments.

In conclusion, the proposed Class 1C classification of these mine pit lakes will not necessarily result in additional treatment costs, but will result in some additional monitoring costs related to process waste discharges and dewatering discharges from mining operations that are discharged to these drinking water public supply sources.

2) Outstanding Resource Value Waters

The Agency is proposing to assign the ORVW designation to waters within the Falls Creek SNA and to 37 calcareous fens. Since the lands contained within the boundaries of the Falls Creek SNA are owned by the state, there are no identified economic impacts resulting from the proposed ORVW designation. There is a designated trout stream which flows through the SNA, portions of which lie outside the SNA boundaries. This trout stream is identified as Unnamed Stream (Falls Creek) in T.32, R. 19, 5.6,7; T.32, R.20, S.1, 12. Proposed discharges to the designated trout stream or its tributaries outside the boundaries of the SNA would be assessed and controlled in part through the provisions of Minn. Rules pt. 7050.0180, subp. 9. There are no permitted discharges to these upstream segments at this time, nor is the Agency aware of any proposed discharges to these waters, so no economic impacts are anticipated because of this designation.

Due to their dependency on sustaining ground water flows of certain chemical and physical characteristics, calcareous fens have the potential for being impacted not only from discharges of wastewaters, but from other land use activities occurring on surrounding lands as well. The Agency is not aware of any existing or proposed discharges to the calcareous fens proposed for ORVW designation, therefore there are no identified costs to permittees as a result of this designation.

Economic impacts, however, may be realized by persons proposing certain land use activities that have the potential to impact calcareous fens. As noted in earlier discussions, the major threats to calcareous fens come from ditching, drainage and filling operations related to agricultural activities, commercial development, gravel mining activities and highway construction. Economic impact analysis relating to any of these activities and their potential impact to calcareous fens, can only be accomplished on a site specific basis. Attempts to quantify a general dollar amount associated with mitigative actions or avoidances in connection with any of these activities is almost impossible to do.

Some or all of these costs may be incurred by persons proposing an action which could degrade or impact a calcareous fen whether or not these calcareous fens are designated as ORVWs. These economic impacts may be realized as a result the Agency's Section 401 Water Quality Certification process that is already in existence, or the MDNR calcareous fen management plan in Minn. Stat. sec. 103G.223. Also, these economic impacts may be realized as a result of the added level of protections afforded calcareous fens through certain provisions of the Wetland Conservation Act, Minn. Stat. sec. 103G.223.

3) Class 2B Waters reclassified as Class 2A Waters

The Agency is proposing to list and incorporate by reference the trout waters identified by the MDNR that are listed pursuant to MDNR Commissioner's Order No. 2450. Streams and lakes identified under this order are proposed by the Agency to be classified as Class 2A cold water fisheries. Since the last time the commissioner's orders were incorporated into chapter 7050, changes made to the trout stream order have resulted in some added waters, some deletion of certain waters, and changes in the designated reaches of existing trout streams. The extension of the trout stream designations for Union Creek, Wadena County and Hay Creek, Goodhue County has the potential to impact two dischargers to these stream segments. The economic impacts resulting from this designation are discussed as follows.

Union Creek, Wadena

The city of Wadena operates a mechanical wastewater treatment facility (WWTF) designed to treat an influent flow of 0.750 MGD. The discharge from this facility is to Union Creek, which is tributary to the Leaf

River. In the existing Minn. Rules ch. 7050, Union Creek is designated as a trout stream upstream of the WWTF outfall. The MDNR trout stream designation has been extended down to Union Creek's confluence with the Leaf River. The city is currently discharging into a Class 2B segment of Union Creek. This same segment is being proposed for Class 2A reclassification by the Agency based on the latest commissioner's order for trout streams.

Instream standards for un-ionized ammonia and dissolved oxygen in Class 2A waters are more restrictive than they are for Class 2B waters. In general, this change in use classification would result in the assignment of more restrictive effluent limitations for WWTFs discharging to these waters. The assignment of these effluent limits would occur either at the time of permit reissuance or through the modification of the existing permit in effect at the time the water use classification change becomes effective.

The Wadena WWTF recently underwent a $3.2 million upgrade based on effluent limitations set to insure maintenance of the Class 2B instream water quality standards. As a result of this recent upgrade, the 1992 discharge monitoring reports indicate that this facility is currently meeting the limits applicable for a discharge to Union Creek based on maintenance of Class 2A instream standards. Options open to the city would include agreeing to the assignment of the more restrictive effluent limitations included in a modified NPDES/SDS permit, or request a variance to the Class 2A standards for ammonia and dissolved oxygen. If such a variance were submitted by the city and granted by the Agency, a likely condition of the variance would be instream monitoring both above and below the WWTF outfall. The parameters to be analyzed include ammonia nitrogen, dissolved oxygen, pH, and temperature. Estimated analytical costs to the city to meet the proposed instream monitoring requirements would be $2,500 over a five-year permit period.

Hay Creek, S.B. Foot Tanning Company and the city of Red Wing

S.B. Foot Tanning Company and the city of Red Wing operate a wastewater treatment facility that discharges into Hay Creek, a tributary to the Mississippi River. The principle activity of this facility is the processing of leather by re-tanning and leather finishing operations into shoe upper leather at a permit rate of approximately 130,000 pounds of raw product per day. Noncontact cooling water is also discharged from this facility to Hay Creek.

The trout stream designation of Hay Creek has been extended down to its confluence with the Mississippi River. S.B. Foot Tanning Company presently discharges to a Class 2B segment of the creek, but with the adoption of the latest MDNR Commissioner's Order for trout streams, this particular segment of the creek is proposed for Class 2A classification. The instream water quality standards for un-ionized ammonia will go from the present Class 2B standard of 0.04 mg/l to a Class 2A standard of 0.016 mg/l if this proposed reclassification becomes effective.

In order to meet this more restrictive un-ionized ammonia standard, facility upgrades and/or operational modifications may be necessary. The information needed to evaluate what additional treatment needs, if any, would be required is not available at this time. Agency staff and S.B. Foot Tanning Company staff are cooperatively working on collecting this needed information. It is the intent of the Agency to submit an exhibit into the hearing record which provides an economic analysis of the projected costs which may be incurred by the company as a result of this proposed classification change.

4) Class 7 Reclassifications

Six waters are being proposed for Class 7 reclassification. In general, the assignment of this use classification will result in a net cost savings to the communities that discharge to these waters. The Class 7 use classification change applicable to the unnamed ditch at New Auburn and County Ditch No. 42 at McGregor will not result in any substantial cost savings for these cities with their present mode of wastewater treatment. It will, however, afford these cities greater operational flexibility in the timing of their controlled discharges.

Although not quantified, significant cost savings are projected for the city of Rogers and the Gaylord/M.G. Waldbaum facilities should their respective receiving waters be reclassified as Class 7 limited resource value waters. Some of these costs savings, however, are off-set by the instream monitoring requirements specified in the Gaylord/M.G. Waldbaum NPDES/SDS permit. These instream monitoring requirements are imposed in order to assure that the downstream Class 2B standards applicable for the North Branch Rush River are maintained.

g. Miscellaneous rule modifications. There are several minor amendments to Minn. Rules 7050 which serve to clarify current requirements, define undefined terms, update references to other rules and orders, provide consistent language and correct spelling and grammar. These changes are noted in the introduction of this document, Part I, section B, scope of proposed revisions, Minor Subjects, items 1, 4-16, 18-20, and 22-23. These changes will have no increased impact on economic factors for regulated communities.

B. Public Bodies.

Minn. Stat. sec. 14.11, subd. 1 (1992) requires the Agency to provide an estimate of the total cost associated with implementing the proposed amendments, if it is estimated that the total cost to all local public bodies exceeds $100,000 in either of the first two years following adoption of the rules. The Agency has reviewed all the proposed changes and determined that the changes which could potentially, directly or indirectly, increase costs to public bodies are, 1) the establishment of specific use classifications and standards for wetlands, 2) the eight proposed new aquatic life standards for toxics, and 3) the nine updated aquatic life standards for toxics.

1. Wetlands.

As discussed under the review of economic impacts expected from the proposed wetland amendments, only about 40 of the 600 permitted municipalities currently discharge to wetlands. There will be no increased costs to the existing discharges over the next two years because their effluent limitations should already reflect the level of treatment needed to protect the wetland. Also, it is extremely unlikely that any municipality proposing a new or expanded discharge will incur any increased costs over the next two years given, 1) the unlikely event that the Agency will receive very many requests for new or expanded discharges to wetlands over the next two years, and 2) the fact that, if there are such requests, the unlikely event that treatment costs would be different as a result of these amendments as compared to what is required now. Thus, it seems very unlikely that municipalities will incur costs in excess of $100,000 in each of the next two years. It is determined that there will be minimal, if any, increased costs to discharges as a result of the proposed wetland amendments.

2. Proposed new Standards for Eight Toxics.

The review of the few municipal permits that contain limitations for any of the eight pollutants for which new standards are proposed shows no economic impact to municipalities; the $100,000 cap will not be exceeded.

3. Proposed Updated Nine Standards.

Of the nine updated standards, the new standards for arsenic and pentachlorophenol (PCP) have the potential to increase treatment costs. However, only the Western Lake Superior Sanitary District (WLSSD) permit has a limitation for PCP (none has a limitation for arsenic). WLSSD will not incur any additional costs due to the proposed PCP standard as discussed earlier; therefore, the $100,000 cap will not be exceeded.

The Agency has reviewed the potential costs to municipalities from the other parts of the rule being revised, such as the designation of new calcareous fens as Outstanding Resource Value Waters, the addition of narrative biocriteria, and the designation of certain mine pit lakes as Class 1C waters, and believes that municipalities will not incur $100,000 in costs in either of the next two years due to these proposed changes.

C. Small Business

Minn. Stat. sec. 14.11 subd. 2 (1992) requires the Agency to consider several factors that may reduce the potential impacts on small business when promulgating new or amending existing rules. The factors are:

1. The establishment of less stringent compliance or reporting requirements for small businesses;
2. the establishment of less stringent schedules or deadlines for compliance or reporting requirements for small businesses;
3. the consolidation of simplification of compliance or reporting requirements for small businesses;
4. the establishment of performance standards for small business to replace design or operational standards required in the rule; and
5. the exemption of small businesses from any or all requirements of the rule.

The standards and conditions in ch. 7050 are applicable to all dischargers regardless of size. Also, the EPA requires compliance with permit limitations for all dischargers. Likewise, the amendments being proposed by the Agency at this time, the wetland classifications and standards, the new and updated Class 2 standards, the other classification changes, biocriteria, etc., are statewide in their scope. The regulatory implications of these statewide standards are best defined when they are applied in a site-specific situation. For this reason, it is difficult to address the particular needs of one segment of the regulated community when promulgating such generally applicable standards. However, the Agency has the flexibility, and will use this flexibility, to address points one through four listed above on a case-by-case basis through the NPDES or SDS permit, the certification process, and through the enforcement process.

The permit and certification process provides the flexibility to tailor requirements to the size and resources of the permittee. For example, monitoring requirements in a permit for a small business can be scaled back to minimize the cost burden to the small business.

In taking enforcement action against a small business not in compliance with their permit, the Agency has considerable flexibility and discretion to, for example, reduce reporting requirements and adjust compliance schedules to minimize the cost burden to the small business while still achieving the Agency's primary function of protecting the environment.

Item number 5 above is best addressed through the variance process as outlined in part 7050.0190 and Minn. Rules part 7000.0700. In assessing the merits of a request for a variance from a water quality standard or effluent limitation, the Agency staff will consider the particular economic condition and vulnerability of the small business when making its recommendation to the Agency Board to grant or deny the variance.

D. Agricultural lands

Minn. Stat. sec. 17.83 (1992) requires the Agency to notice and describe in the SONAR any "direct or substantial impact" the proposed rule might have on agricultural land in the state. This requirement in also identified in Minn. Stat. sec. 14.11, subd. 2 (1992). The two areas being revised that might impact agricultural lands are the proposed narrative standards for wetlands, and the numerical water quality standards for atrazine and alachlor.

1. Classifications and standards for wetlands.

The proposed narrative standards, which essentially clarify existing Agency authority, will protect wetlands from point and nonpoint sources of pollution and physical alterations. Marginal or seasonal wetlands in agricultural lands (Type 1) can still be cultivated when conditions permit, as is the case now. This will not change as a result of these amendments. The process of mitigation or replacement if a wetland is physically altered will follow the same process currently in place.

These regulatory procedures do not have the effect of substantially restricting the agricultural use of the land.

2. Class 2 numerical standards for atrazine and alachlor.

Two of the eight proposed new standards are for the herbicides, atrazine and alachlor, which are commonly used to control weeds on agricultural lands. It is conceivable that the standards may encourage reductions in the use of these herbicides through alternative weed control practices, or reductions in runoff through the voluntary adoption of BMPs consistent with nonpoint source programs. However, the proposed standards will not substantially restrict the agricultural use of the land, nor will they take agricultural land out of production.

In conclusion, the proposed rules do not involve the acquisition, permitting, leasing, or funding for agricultural land.

VI. TECHNICAL ADVISORY COMMITTEE

As required by Minn. Stat. sec. 115.54 (1992), the Agency must consider the advice of the Technical Advisory Committee (TAC) when adopting or revising its rules concerning wastewater treatment. The TAC has had difficulty in the past two years in achieving a quorum for its meetings. Therefore, with the advice of the Chair and some members of the committee, the Agency has provided the TAC with rule language and information by mail. The TAC chair will call a meeting as necessary, or poll the committee for comments on the rule. No special concerns have been identified by the TAC as of the date of this SONAR, and the Agency anticipates receipt of their comments and advice prior to adopting the revisions to this rule.

VII. LIST OF WITNESSES, EXHIBITS AND ACRONYMS

A. Witnesses

In support of the need and reasonableness of the proposed amendments to the rule, the following Agency staff helped prepare this statement of need and reasonableness and will be available to explain the proposed amendments and answer questions at the rulemaking hearing.

1. David Maschwitz: aquatic life standards for toxics, drinking water standards and certain minor amendments.

2. Dann White: aquatic life standards for toxics.

3. Howard Markus: water quality standards for wetlands.

4. Gerald Blaha: outstanding resource value water designation for calcareous fens and scientific and natural areas; limited resource value water reclassifications; and certain minor amendments.

5. Patricia Bailey: biological criteria and use classifications.

6. Mary Knudsen: discharges from dredge disposal facilities.

7. Greg Gross: amendments in general.

8. Dave Belluck: Atrazine.

B. Exhibits

In support of the need for and reasonableness of the proposed rules, the following exhibits will be entered into the hearing record by the Agency.

Exhibit Number	Document
	B = Exhibits concerning biocriteria
B1	Rankin, E.T. and C.O, Yoder. 1990. A comparison of aquatic life use impairment detection and its causes between an integrated, biosurvey-based environmental assessment and its water column chemistry subcomponent. Appendix I-Ohio 1990 305(b).
B2	U.S. Environmental Protection Agency. 1990. Biological criteria national program guidance for surface waters. EPA/440-5-90-004. Office of Water, U.S. Environ. Prot. Agency, Washington, D.C.
B3	U.S. Environmental Protection Agency. 1992. Procedures for initiating narrative biological criteria. EPA/822-B-92-002. Office of Water, U.S. Environ. Prot. Agency, Washington, D.C.
B4	Plafkin, J.L. et al. 1989. Rapid bioassessment protocols for use in streams and rivers : benthic macroinvertebrates and fish. Chapter 8.3. EPA/444/4-89-001. Office of Water, U.S. Environ. Prot. Agency, Washington, D.C.
B5	Plafkin, J.L. et al. 1989. Rapid bioassessment protocols for use in streams and rivers : benthic macroinvertebrates and fish. Chapter 7.2 EPA/444/4-89-001. Office of Water, U.S. Environ. Prot. Agency, Washington, D.C.
	C = Exhibits concerning classifications of waters
C1	Falls Creek Scientific and Natural Area Project Evaluation report, Minnesota Department of Natural Resources.
C2	Element Abstract for Calcareous Fen Plant Communities. Natural Heritage Program, Minnesota Department of Natural Resources.
C3	Calcareous Fen Locations and Ownership in Minnesota Index. Minnesota Department of Natural Resources. February 17, 1993.
C4	Calcareous Fens in Minnesota Element Occurrence Record. Minnesota Department of Natural Resources.

C5	Seminary fen, 75 (T.116, R.23, S.35) site map.
C6	Barnesville Moraine fen, 44 (T.137, R.44, S.18) site map.
C7	Barnesville WMA fen, 43 (T.137, R.44, S.18) site map.
C8	Felton Prairie fen, 48 (T.142, R.45, S.31) site map.
C9	Felton Prairie fen, 53 (T.141, R.46, S.24) site map.
C10	Haugtvedt WPA North Unit fen, 54 (T.137, R.44, S.28, 29) site map.
C11	Holden 1 West fen, 3 (T.110, R.18, S.1) site map.
C12	Red Wing fen, 72 (T.113, R.15, S.21) site map.
C13	Houston fen, 62 (T.104, R.6, S.26) site map.
C14	Ottawa Bluffs fen, 56 (T.110, R.26, S.3) site map.
C15	Tamarac River fen, 71 (T.157, R.46, S.2) site map.
C16	Viking fen, 68 (T.155, R.45, S.18) site map.
C17	Viking fen, 70 (T.155, R.45, S.20) site map.
C18	Viking Strip fen, 69 (T.154, R.45, S.4) site map.
C19	Lost Timber Prairie fen, 13 (T.105, R.43, S.2) site map.
C20	Agassiz-Olson WMA fen, 17 (T.146, R.45, S.22) site map.
C21	Faith Prairie fen, 15 (T.144, R.43, S.26) site map.
C22	Faith Prairie fen, 16 (T.144, R.43, S.35) site map.
C23	Green Meadow fen, 14 (T.145, R.45, S.35, 36) site map.
C24	High Forest fen, 12 (T.105, R.14, S.14, 15) site map.
C25	Sanders East fen, 65 (T.153, R.44, S.7) site map.
C26	Sanders East fen, 74 (T.153, R.44, S.7) site map.
C27	Sanders fen, 64 (T.153, R.44, S.18, 19) site map.
C28	Chicog Prairie fen, 39 (T.148, R.45, S.28) site map.
C29	Kittleson Creek Mire fen, 55 (T.147, R.44, S.6, 7) site map.
C30	Blue Mounds fen, 1 (T.124, R.39, S.15, 14) site map.
C31	Lake Johanna fen, 4 (T.123, R.36, S.29) site map.

C32	Swedes Forest fen, 8 (T.114, R.37, S.19, 20) site map.
C33	Swedes Forest fen, 9 (T.114, R.37, S.22, 27) site map.
C34	Cannon River Wilderness Area Fen, 73 (T.111, R.20, S.22) site map.
C35	Anna Gronseth Prairie fen, 47 (T.134, R.45, S.15) site map.
C36	Anna Gronseth Prairie fen, 49 (T134, R.45, S.10) site map.
C37	Anna Gronseth Prairie fen, 52 (T.134, R.45, S.4) site map.
C38	Rothsay Prairie fen, 46 (T.136, R.45, S.33) site map.
C39	Rothsay Prairie fen, 50 (T.135, R.45, S.15, 16) site map.
C40	Rothsay Prairie fen, 51 (T.135, R.45, S.9) site map.
C41	Yellow Medicine fen, 30 (T.115, R.46, S.18) site map.
C42	Waterbodies Proposed for Class 1C, Domestic Consumption, Designation; Minnesota Department of Health summary sheets and accompanying maps.
C43	Aerial photo of Scranton Mine Pit Lake showing portions of the Hull-Rust-Mahoning-Scranton-Susquehanna Complex. 1989 Hibbing Public Utilities Annual Report cover page.
C44	Comment letters and records of oral comments regarding the proposal to classify mine pit lakes, being used as public water supply sources, as Class 1C waters.
C45	Rogers Stream Assessment Survey.
C46	Gaylord/M.G. Waldbaum Stream Assessment Survey.
C47	McGregor Stream Assessment Survey.
C48	New Auburn Stream Assessment Survey.
C49	Wyoming Stream Assessment Survey.
C50	Boise Cascade at International Falls Stream Assessment Survey.
C51	Fairmont Stream Assessment Survey.
C52	March 1992 Stream Reclassification Request from the City of Fairmont.
C53	Agency response to Fairmont's March 1992 Stream Reclassification Request.
C54	Minnesota Department of Natural Resources comment letter dated September 30, 1992, with a request to remove Outstanding Resource Value Waters designation from six lake trout lakes.

C55 Minnesota Department of Natural Resources Commissioner's Order No. 2450, Minnesota Rules part 6262.0400, subparts 3 to 5. State Register, Monday 22 June 1992, pages 2902 through 2928.

C56 NPDES/SDS Permit No. MN0058190, Iron Range Aquafarms, Inc.; Minnesota Aquafarms, Inc., dated July 26, 1988.

C57 Letter from the Mayor, City of Chisholm, dated September 24, 1992, regarding Fraser Mine Pit Lake.

C58 Letter from Inland Steel Mining Company, dated April 1, 1993, regarding Enterprise Mine Pit Lake proposed Class 1C classification.

F = Exhibits concerning feedlot issues

F1 U.S. Department of Agriculture. 1982. An evaluation system to rate feedlot pollution potential. ISSN 0193-3787. Agricultural Research Service, U.S. Department of Agriculture, Peoria, Illinois.

F2 Martel, C.J. et al. 1982. Development of a rational design procedure for overland flow systems. A-2076/342. Cold Regions Research & Engineering Laboratory, U.S. Army Corps of Engineers.

G = Exhibits concerning general rulemaking issues

G1 Notice to Solicit Outside Opinion, State Register, Monday 24 February 1992, Volume 16, Number 35, page 1958.

G2 Comments received during February 25, 1992 Period of Solicitation of Outside Opinions.

G3 Notice to Solicit Outside Opinion, State Register, Monday 31 August 1992, Volume 17, Number 9, page 449.

G4a Letter introducing the Chapter 7050 revision issues, dated September 10, 1992.

G4b Mailing list for September 10, 1992 letter introducing revision issues.

G5a Letter concerning effort to adopt eight new statewide toxic standards, date September 10, 1992.

G5b Mailing list for September 10, 1992 letter concerning eight new toxic standards.

G6a Letter concerning reclassification to Class 1C for public drinking water sources, dated September 11, 1992.

G6b Mailing list for September 11, 1992 letter concerning reclassification of public drinking water sources.

G7 Revision subject fact sheets.

G8 Comments received during September 1, 1992 Period of Solicitation of Outside Opinions.

G9 Order of Hearing.

G10 Certificate of Agency Board's Authorizing Resolution.

G11a Notice of Hearing mailed to persons registered with the Agency in accordance with Minn. Stat. sec. 14.14, subd. 1a (1992).

G11b Certification of Agency Mailing List.

G11c Affidavit of Mailing.

G12 Notice of Hearing as published in the State Register.

G13a Notice of Hearing published in newspapers in accordance with Minn. Stat. sec. 115.44, subd. 7, item (a) (1992).

G13b Newspaper publication list for Notice of Hearing.

G14a Notice of Hearing sent to municipalities in accordance with Minn. Stat. sec. 115.44, subd. 7, item (b) (1992).

G14b Mailing list for Notice of Hearing sent to municipalities.

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W2. Leach, J. and J. Magner. 1992. Wetland drainage impacts within the Minnesota River Basin. Currents 2(2): 3-10.

W3. U.S. E.P.A. 1990. Water quality standards for wetlands: National guidance. EPA 440/S-90-011.

W4. MPCA Wetland Standards Advisory Group roster - 1991.

W5. Exhibit W5 does not exist.

W6. Wetland Water Quality Standards Coordination meeting roster - November 1991.

W7. May 1992 meeting handout package.

W8. Exhibit W8 does not exist.

W9. Exhibit W9 does not exist.

W10. Minnesota Rules Chapter 8420 - Rules related to the Wetland Conservation Act Chapter 354.

W11. The Statement of Need and Reasonableness for Chap. 354 - 1992.

W12. Izaak Walton League letter to MPCA dated September 29, 1992 re draft water quality standards.

W13. Minnesota Power letter to MPCA dated September 29, 1992 re draft water quality standards.

W14. National Audubon Society letter to MPCA dated September 30, 1992 re draft water quality standards.

W15. Project Environment Foundation letter to MPCA dated September 30, 1992 re draft water quality standards.

W16. U.S. Dept. of the Interior Fish & Wildlife Service letter to MPCA dated September 30, 1992 re draft water quality standards.

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W23. MN DOT letter to MPCA dated September 29, 1992 re draft water quality standards.

W24. Peterson Environmental Consulting, Inc. letter to MPCA dated October 14, 1992 re draft water quality standards.

W25. MN Association of Wheat Growers letter to MPCA dated September 30, 1992 re draft water quality standards.

W26. State of Minnesota Executive Order 91-3 directing state departments and agencies to follow a "no-net loss" policy in regard to wetlands.

W27. Memorandum of Agreement between the EPA and the Dept. of the Army concerning the determination of mitigation under the Clean Water Act Sect 404(b)(1) guidelines, dated February 6, 1990.

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W37. Marble, A. and M. Gross. 1984. A method for assessing wetland characteristics and values. Landscape Planning 11:1-17.

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W47. Memorandum for the field - US EPA & US Dept. of the Army re Clean Water Act Sect 404 regulatory program and agricultural activities. 1990.

W48. NSP letter to MPCA dated September 30, 1992 re draft water quality standards.

W49. Restoration and creation information re wetlands.

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W54. MN PCA Guidance matrix for wetland assessment.

W55. Wetland designated uses and significant physical impacts.

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W57. Wilcox, D. and J. Meeker. 1992. Implications for faunal habitat related to altered macrophyte structure in regulated lakes in northern Minnesota. Wetlands 12(3): 192-203.

W58. U.S. EPA Office of Water (A-104F). Wetlands and 401 Certification. April, 1989.

W59. MPCA Section 401 Water Quality Certification conditional waiver and denial examples.

C. ACRONYMS

The following acronyms appear within the text of the SONAR.

ACR	Acute to Chronic Ratio
Agency	Minnesota Pollution Control Agency
BAF	BioAccumulation Factor
BCF	BioConcentration Factor
BMP	Best Management Practice
BPT	Best Practicable Technology
(C)	the chemical is considered Carcinogenic
CC	Chronic Criterion
CFR	Code of Federal Regulations
CS	Chronic Standard
CWA	Clean Water Act (federal)
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
EC50	Effect Concentration
EPA	U.S. Environmental Protection Agency
exp ()	the base e antilogarithm of the expression in the parenthesis

FAV	Final Acute Value
GAC	Granulated Activated Carbon
GC/MS	Gas Chromatograph/Mass Spectrometer
GMAV	Genus Mean Acute Value
HEAST	Health Effects Assessment Summary Table
HRL	Health Risk Limit
IBI	Index of Biotic Integrity
IRIS	Integrated Risk Information System
LC50	Lethal Concentration
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
MS	Maximum Standard
NOAEL	No Observed Adverse Effect Level
NPDES	National Pollutant Discharge Elimination System
NSP	Northern States Power
O&M	Operation and Maintenance
ORVW	Outstanding Resource Value Waters
PAH	Polynuclear Aromatic Hydrocarbon
q1*	potency slope
RAL	Recommended Allowable Limit
RfD	Reference Dose
RSC	Relative Source Contribution factor
(S)	secondary drinking water standard
SDS	State Disposal System
SNA	Scientific and Natural Area
SONAR	Statement Of Need And Reasonableness
TAC	Technical Advisory Committee
TCAAP	Twin City Army Ammunition Plant
TH	Total Hardness
TON	Threshold Odor Number
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
USGS	U.S. Geological Survey
WCA	Wetland Conservation Act
WET	Whole Effluent Toxicity
WWTF	WasteWater Treatment Facility
7Q10	the lowest seven-day mean flow with a once in ten year recurrence interval

VIII. CONCLUSION

Based on the foregoing, the proposed revisions to Minn. Rules ch. 7050 are both needed and reasonable.

Dated: April 27 1993

Charles W. Williams
Commissioner

STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS

FOR THE MINNESOTA POLLUTION CONTROL AGENCY

In the Matter of the Proposed Revisions of the Rules Governing the Classification and Standards for Waters of the State, Minnesota Rules Chapter 7050

REPORT OF THE ADMINISTRATIVE LAW JUDGE

The above-entitled matter came on for hearing before Administrative Law Judge Allan W. Klein according to the following schedule:

Wednesday, August 25, 1993	St. Paul
Monday, August 30	Marshall
Tuesday, August 31	Detroit Lakes
Wednesday, September 1	Brainerd
Thursday, September 2	Duluth
Tuesday, September 7	Fairmont
Wednesday, September 8	Rochester
Thursday, September 9	St. Paul

This Report is part of a rulemaking proceeding held pursuant to Minn. Stat. §§ 14.131 through 14.20 to determine whether the Agency has fulfilled all relevant substantive and procedural requirements, whether the proposed rules are needed and reasonable, and whether or not the rules, as modified, are substantially changed from those originally proposed.

A number of Agency personnel appeared at various times during the proceeding. The "core group" representing the staff included Assistant Attorney General Richard Cool, Duane Anderson, Gerald Blaha, Greg Gross, David Maschwitz, and Debbie Olson.

The Agency must wait at least five working days before taking any final action on the rules; during that period, this Report must be made available to all interested persons upon request.

Pursuant to the provisions of Minn. Stat. § 14.15, subd. 3 and 4, this Report has been submitted to the Chief Administrative Law Judge for his approval. If the Chief Administrative Law Judge approves the adverse findings of this Report, he will advise the Agency of actions which will correct the defects and the Agency may not adopt the rule until the Chief Administrative Law Judge determines that the defects have been corrected. However, in those instances where the Chief Administrative Law Judge identifies defects which relate to the issues of need or reasonableness, the Agency may either adopt the Chief Administrative Law Judge's suggested actions to cure the defects or, in the alternative, if the Agency does not elect to adopt the suggested actions, it must submit the proposed rule to the Legislative Commission to Review Administrative Rules for the Commission's advice and comment.

If the Agency elects to adopt the suggested actions of the Chief Administrative Law Judge and makes no other changes and the Chief Administrative Law Judge determines that the defects have been corrected, then the Agency may proceed to adopt the rule and submit it to the Revisor of Statutes for a review of the form. If the Agency makes changes in the rule other than those suggested by the Administrative Law Judge and the Chief Administrative Law Judge, then it shall submit the rule, with the complete record, to the Chief Administrative Law Judge for a review of the changes before adopting it and submitting it to the Revisor of Statutes.

When the Agency files the rule with the Secretary of State, it shall give notice on the day of filing to all persons who requested that they be informed of the filing.

Based upon all the testimony, exhibits and written comments, the Administrative Law Judge makes the following:

FINDINGS OF FACT

Procedural Requirements

1. On July 16, 1993, the Agency filed the following documents with the Chief Administrative Law Judge:

(a) A copy of the proposed rules certified by the Revisor of Statutes.
(b) The Order for Hearing.
(c) The Notice of Hearing proposed to be issued.
(d) A Statement of the number of persons expected to attend the hearing and estimated length of the Agency's presentation.
(e) The Statement of Need and Reasonableness.
(f) A Statement of Additional Notice.

2. On July 19, 1993, a Notice of Hearing and a copy of the proposed rules were published at 18 State Register page 143.

3. On July 22, 1993, the Agency mailed the Notice of Hearing to all persons and associations who had registered their names with the Agency for the purpose of receiving such notice.

4. On July 30, 1993, the Agency filed the following documents with the Administrative Law Judge:

(a) The Notice of Hearing as mailed.
(b) The Agency's certification that its mailing list was accurate and complete.
(c) The Affidavit of Mailing the Notice to all persons on the Agency's list.
(d) An Affidavit of Additional Notice. In addition to the Agency's list, the Agency mailed copies of the Notice to approximately 866 city mayors, 1800 township chairpersons, 525 county commissioners, and over 100 other water-related boards and districts.

(e) The names of Agency personnel who would represent the Agency at the hearing together with the names of any other witnesses solicited by the Agency to appear on its behalf.

(f) A copy of the State Register containing the proposed rules.

(g) All materials received following two Notices of Intent to Solicit Outside Opinion published at 16 State Register 1958, dated February 24, 1992 and 17 State Register 449, dated August 31, 1992.

The documents were available for inspection at the Office of Administrative Hearings from the date of filing to the date of the hearing.

5. The period for submission of written comment and statements remained open until September 29, 1993. Then, a response period continued to October 6. On October 6, the record closed for all purposes.

Background and Nature of the Proposed Amendments

6. Water quality standards were first adopted by the State of Minnesota in 1967, and have been revised periodically since then. The most recent revisions occurred in 1990.

7. Minnesota Rules Chapter 7050 essentially consists of two parts. One part classifies all waters of the State into different classifications depending on their uses. The other major part sets forth water quality criteria and standards for each class.

8. The Federal Clean Water Act, as amended, 33 U.S.C. § 1251, *et seq.*, contains numerous provisions which affect the State's rules. Primary among these is the provision contained in section 303(c)(1) which requires each state to hold public hearings and review and revise their water quality standards at least once every three years. Section 303(c)(1) of the Act gives the Federal Environmental Protection Agency final approval of the proposed rules and, ultimately, the power to promulgate rules for the State if the EPA finds that the State has failed to follow the requirements of the Clean Water Act.

9. In this proceeding, the Agency is proposing a number of changes to its existing rules. It is proposing both changes in the classification of certain waters and changes to the standards that affect the various classes of waters. The major issues which arose during this proceeding included the following:

(a) wetland regulation and the role of the Agency in light of other government regulators;

(b) a change in the method of monitoring run-off from agricultural feedlots;

(c) the appropriate classification for Center Creek, downstream of Fairmont, Minnesota;

(d) the appropriate classification of the Fraser Mine Pit near Chisholm, Minnesota;

(e) the appropriate classification of Hay Creek, at Red Wing, Minnesota;

(f) effluent standards for iron and manganese, particularly where background levels exceed the proposed standard.

Statutory Authority

10. Minn. Stat. § 115.03, subd. 1(b) directs the Agency to investigate water pollution and "make such classification of the waters of the State as it may deem advisable." Subdivision 1(c) then directs the Agency to "establish and alter such reasonable pollution standards for any waters of the State in relation to the public use to which they are or may be put as it shall deem necessary . . . ."

11. In addition to the authority found in section 115.03, there is also authority found in section 115.44. That statute, in subdivision 2, directs the Agency to group waters of the State into classes, and adopt classifications and standards of purity and quality. Subdivision 3 sets forth a number of factors which the Agency must consider in adopting the classifications and standards. Subdivision 4, which was amended in 1993, specifies that the Agency must adopt standards of quality and purity for each classification as "necessary for the public use or benefit contemplated by the classification."

12. Minnesota Aquafarms, Inc. raised a number of objections to the rules because one of the reclassifications would affect the Fraser Mine Pit Lake. Minnesota Aquafarms, Inc. purchased portions of the Fraser Pit (and four other pits) with the intent to use them for fish farming. The City is now using the pit as its primary source of drinking water, and desires to have the water reclassified as a source of domestic consumption water. Minnesota Aquafarms opposes that reclassification out of fear that it will preclude fish farming operations.[1]

13. Minnesota Aquafarms claims that the proposed reclassification must be preceded by a contested case hearing, not a rulemaking proceeding. Its primary argument is that the effect of the reclassification would substantially harm its property rights and that to do so without a contested case hearing deprives it of due process of law. Aquafarms reasons that rulemaking is designed for agency statements of general applicability, while contested cases are designed to determine the legal rights, duties, or privileges of specific parties. Reasoning that classifying Fraser Mine Pit

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[1] The dispute between Aquafarms and the City involves a number of legal issues which have nothing to do with this rulemaking proceeding. The Administrative Law Judge has avoided describing them in the foregoing paragraph except to give only the barest essentials, for fear that his characterization may suggest some legal conclusions that the Administrative Law Judge did not intend to make. The Administrative Law Judge does not intend to make any assertions about the property rights, equitable rights, or other disputes which do exist between Aquafarms and the City except as needed. Those must be resolved in other forums.

waters for drinking water use results in defining the legal rights between the City of Chisholm and Aquafarms, Aquafarms argues that the classification must be preceded by a contested case proceeding, and not a rulemaking proceeding.

14. The procedure to be followed in classifying waters is prescribed in Minn. Stat. § 115.44 (1992, as amended by Laws of Minn. 1993, Chapter 180). To the extent that Aquafarms is suggesting that the Administrative Law Judge find the statute to be facially unconstitutional, that is beyond his authority. However, to the extent that Aquafarms is asking the Administrative Law Judge to declare that the Agency has misread the statute, and wrongly used a rulemaking procedure when the statute intended a contested case procedure, then the Administrative Law Judge does have jurisdiction to deal with that question under the rubric of determining whether the Agency is acting within its statutory authority to adopt the proposed rule. It is concluded that the Agency is not misreading the statute. Both the statute as it existed in 1992, and the statute as it exists following the 1993 amendment, contemplate that rulemaking will be used to classify waters. This is apparent from the wording of the statute. For example, subdivision 2 reads as follows:

> In order to attain the objectives of Laws 1963, ch. 874, the agency after proper study, and after conducting public hearing upon due notice, shall, as soon as practical, group the designated waters of the State into classes, and adopt classifications and standards of purity and quality therefor.

Subdivision 7, prior to the 1993 Session, provided in pertinent part, as follows:

> Notices of public hearing for the consideration, adoption, modification, alteration or amendment of the classification of waters and standards . . . shall specify the time, date and place of hearing, and the waters concerning which classification is sought to be made or for which standards are sought to be adopted or modified.
>
> Copies of the notice shall:
>
> (a) be published at least twice in a newspaper regularly published or circulated in the county or counties bordering or through which the waters sought to be classified, or for which standards are sought to be adopted flow . . . .

The 1993 amendment changed subdivision 7 by deleting the lead paragraph and subparagraph (a), leaving only a requirement that:

> For rules authorized under this section, the notice is required to be mailed under sections 14.14, subdivision 1a, and 14.22 must also be mailed to the governing body of each municipality bordering or through which the waters, for which standards are sought to be adopted, flow.

15. Although the Administrative Law Judge does not find section 115.44, read as a whole, to be ambiguous with regard to whether or not classifications are to be made by rule or by contested case, in the event that it was deemed to be ambiguous, it would then be appropriate to resort to other aids in construing it. One of those aids is past legislative and administrative interpretations of the statute. See, Minn. Stat. § 645.16. In this case, the Agency has a longstanding interpretation that the statute intended rulemaking, not contested cases. For example, in 1980, the Agency initially proposed the classification of limited resource value waters and recommended 187 specific waters for inclusion in that class. Various outside commentators proposed that others be included, while other commentators proposed that some of the 187 be excluded. All of those proposals for individual waters were dealt with during a rulemaking proceeding. In addition, portions of the Minnesota and Mississippi Rivers were proposed to be upgraded from Class 2C to Class 2B. Although that proposal was fiercely contested, the issue was dealt with at length in the rulemaking proceeding. See, generally, 4 State Register 2006, et seq.

In 1984, both the Agency and interested persons proposed a variety of reclassifications for specific bodies of water. These were dealt with in a rulemaking proceeding. See, 8 State Register 2066, et seq.

In 1987, the Agency proposed to add 48 lakes, 28 fens and four scientific and natural areas to the list of outstanding resource value waters. Following the hearing, the staff withdrew its proposal with regard to 13 of the lakes. The question of which lakes were included, and which were withdrawn, was the focal point of that rulemaking proceeding. See, 12 State Register 11, et seq.

Finally, in 1990, a number of fens and streams were reclassified, and a number of trout lakes were added to a class, all in a rulemaking proceeding. See, 14 State Register, pp. 1662-1717.

The record does not include any references to the Agency ever using a contested case process to classify or reclassify a waterbody.

In summary, there has been a longstanding Agency interpretation favoring classification by rulemaking. This has not been modified by the Legislature, which further supports the statutory interpretation reached above. Therefore, it is concluded that the Agency does have statutory authority to use the rulemaking provisions of Chapter 14 to group waters of the State into classifications, and add, delete, or modify the classifications attached to specific waters.

Fiscal Note

16. Minn. Stat. § 14.11, subd. 1 (1992) requires a fiscal note in the notice of hearing if the adoption of the rule will require local public bodies to spend more than $100,000 in either of two years immediately following adoption of the rule. The Agency reviewed the cost of compliance with the various rule provisions and determined that municipalities would not incur more than $100,000 in costs in either of the next two years. The Agency did insert a paragraph in its notice of hearing indicating that it believed that "no municipality will incur costs that exceed $100,000". It should be noted that the statutory test is whether or not the "total cost to all local public

bodies in the state" will exceed $100,000. This is an important distinction, which could cause problems in other cases. In this case, however, the Agency has concluded that the $100,000 cap will not be exceed under either test. See, SONAR, pp. 126-27.

17. The only serious challenge to the Agency's conclusion came from the city of Fairmont, which pointed out that the SONAR contained no cost estimates for the continued classification of Center Creek as a Class 2B water. The city has estimated a cost of between $10 to $12 million to upgrade the city's existing waste water treatment plant to meet certain ammonia discharge limitations applicable to 2B waters. The City has asked the Agency to reclassify Center Creek to a Class 7 water, in order to avoid the cost. The Agency does not agree with the City. See, Post-Hearing Brief and Comments of City of Fairmont Regarding Classification of Center Creek, at p. 7.

18. The Agency responds that it is not proposing any change to the classification of Center Creek, and the statute does not require an agency to estimate costs of possible rule changes that are proposed by others.

19. The Administrative Law Judge agrees with the Agency that it need not comply with the fiscal note provision when the costs are not the result of the Agency's proposals. It has long been held (and is now codified in Minn. Rule pt. 1400.0500) that a rule, or portion of a rule, which is not proposed for change by an agency need not be demonstrated to be needed or reasonable. Similar logic would dictate that where the agency is not proposing a change, it need not calculate the fiscal impact of changes proposed by others in determining whether the $100,000 limit has been exceeded.

20. The Administrative Law Judge concludes that the Agency has complied with the fiscal note provisions of Minn. Stat. § 14.11, subd. 1 (1992).

Impacts on Agricultural Land

21. On June 24, 1993, the Agency formally submitted a statement to the Commissioner of Agriculture regarding the proposed rule changes and the effect of the rule changes on farming operations. This statement was submitted in connection with Minn. Stat. § 116.07, subd. 4 (1992), which requires that the Agency provide a copy of proposed rule changes and a statement of the effect of the rule change on farming operations to the Commissioner of Agriculture before it adopts or repeals rules that "affect farming operations". In this statement (Agency Ex. 7), the Agency identified changes to rules relating to wetlands, alachlor and atrazine, and feedlots. The Department did not register any objection to any of the proposed rules, although the record does contain correspondence back and forth between the Agency and the Department prior to the June 24 submission. See, for example, SONAR, Exhibits G2i and G2j.

22. In addition to the requirement noted above, Minn. Stat. § 14.11, subd. 2 provides as follows:

> If the agency proposing the adoption of the rule determines that the rule may have a direct and substantial adverse impact on agricultural land in the state, the agency shall comply with the requirements of sections 17.80 to 17.84.

Minn. Stat. § 17.83 provides as follows:

> An agency proposing to adopt a rule which it determines may have a direct and substantial effect on agricultural land shall include notice of the effect in the notice of rule hearing . . . and shall inform the commissioner [of agriculture] in writing. In its statement of need and reasonableness . . . , the agency shall describe the possible adverse effect on agricultural land, state what alternatives the agency considered in order to avoid or reduce the effect, and indicate why the agency elected to proceed with the proposed adoption of the rule. The administrative law judge, in the report . . . shall include recommendations regarding actions available to the agency, including necessary amendments to the proposed rule, in order to avoid adverse effects on agricultural land as a result of implementation or enforcement of the rule.

23. Minn. Stat. § 17.81, subd. 2 limits the operation of the above-quoted statute by defining "action which adversely affects" as follows:

> . . . any of the following actions taken in respect to agricultural land which have or would have the effect of substantially restricting the agricultural use of the land: (1) acquisition for a nonagricultural use . . . ; (2) granting of a permit, license, franchise or other official authorization for nonagricultural use; (3) lease of state-owned land for nonagricultural use . . . ; or (4) granting or loaning of state funds for purposes which are not consistent with agricultural use.

24. In its Notice of Hearing, the Agency indicated that its proposed amendments would not involve any adverse actions affecting agricultural lands and will not have an adverse impact upon them. In its SONAR, the Agency indicated that it considered the impact of the proposed narrative standards for wetlands, and numerical water quality standards for atrazine and alachlor, but determined that neither of them would substantially restrict the agricultural use of land, nor would they take agricultural land out of production, and thus none of the Agency's proposed rules would have an adverse impact on agricultural lands.

25. The Agency's position was challenged by Aquafarms, which argued that the lands surrounding the Fraser Mine Pit were zoned as agricultural to accommodate Aquafarms' operation, that the proposed rule may prohibit aquaculture in the pit, and therefore, the proposed rule does have a substantial adverse effect on the agricultural use of the land and water. Tr. 9, pp. 105 and 115, as clarified by Aquafarms' Final Comments at p. 13.

26. The Agency responds that it did not overlook Aquafarms' interest in this matter when considering the agricultural impact, but that the Agency determined that its proposed reclassification does not automatically prohibit Aquafarms' use of Fraser Lake for aquaculture and that a reclassification does not trigger any provisions of section 17.83 because it is not "action which

adversely affects" agricultural land. The Agency reasons that because the reclassification does not constitute one of the four listed types of impacts (acquisition, permitting, leasing, or funding), the statute is not triggered. Finally, the Agency points out that Aquafarms is currently prohibited from using the Fraser pit for aquaculture activities (Exhibit C56, part I.C.5. at p. 8 and Post-Hearing Response, Attachment 43 at p. 26.) The Agency argues that whether MAI will ever be able to use Fraser Mine Pit Lake for aquaculture purposes is uncertain, and subject to a variety of regulatory proceedings (principally MPCA permitting) which are not even scheduled to begin until 1996.

27. The Administrative Law Judge concludes that the proposed reclassification does not trigger the requirements of Minn. Stat. § 17.83 because the Agency has correctly determined that the reclassification does not have a direct and substantial adverse effect on agricultural land. The definition of "action which adversely affects" in Minn. Stat. § 17.81, subd. 2 contains four types of actions. The only one which is even close to the reclassification is the one relating to "granting of a permit, license, franchise or other official authorization for nonagricultural use." Reclassification does not constitute such an action. It does not "grant" anything, nor give "permission" to any person to do anything. Moreover, whether the reclassification will prohibit aquaculture is unknown at this point, and cannot be known until the MPCA permit is finalized some years from now.

<u>Small Business Considerations</u>

28. Minn. Stat. § 14.115 imposes two general requirements on an agency. The first is that it consider and adopt certain methods for reducing the impact of proposed rules on small businesses, while the other requires an agency to make additional outreach efforts to notify small businesses of the proposed rules.

29. With regard to outreach, the Agency has satisfied the statutory requirements by including a discussion of small business considerations in the Notice of Hearing and the SONAR. In addition, the Agency published a brief notice of the hearings, with a reference to the full text State Register publication, in "Minneapolis/St. Paul City Business", Agency Ex. 11. The Agency published a similar notice in "Small Business Notes", Agency Ex. 12. The Agency also contacted a variety of state and federal governmental agencies associated with small businesses. <u>See</u>, Agency Staff Post-Hearing Response to Public Comments, at p. 85 and Attachment 62 thereto.

30. With regard to considering and adopting particular methods for reducing the impact of the rule on small businesses, the Agency discussed, in the SONAR, its consideration of the statutory standard.

31. Aquafarms challenged the Agency's compliance with the requirement for considering and including methods to alleviate the impact on small businesses. Aquafarms meets the statutory definition of a small business in Minn. Stat. § 14.115, subd. 1. It alleged that the Agency's discussion in the SONAR was too general and failed to discuss Aquafarms' particular situation. Minnesota Aquafarms Comments in Opposition to Fraser Mine Pit Water Classification, at pp. 30-33.

32. The Agency responds that the law does not require it to do more than it did, given the speculative nature of Aquafarms' possible future use of the Fraser Mine Pit Lake. The Agency went into great historical detail concerning Aquafarms' past use and the current prohibition against Aquafarms' use of the lake for aquaculture. The Agency concluded that there were no identifiable economic impacts from the proposed reclassification which could be dealt with at this time. The Administrative Law Judge agrees with the Agency that it is impossible to predict the outcome of the disputes between the City of Chisholm and Aquafarms. It is impossible to predict the outcome of the 1996 permitting process, should Aquafarms seek to reintroduce fish to the Fraser site. It would be unreasonable to require the Agency to speculate about the impacts of its proposed reclassification on some future activity that Aquafarms might desire to engage in. It is concluded that the Agency has adequately complied with the small business considerations by its generalized discussion in the SONAR.

Scope of this Report

33. The State Register publication of these rules occupied 100 pages. There are a substantial number of rules proposed for revision. This Report is generally limited to a discussion of those rules which received critical comment or otherwise need to be examined. Because many sections of the proposed rules drew no criticism, and were adequately supported by the SONAR, a detailed discussion of each section of the proposed rules is unnecessary. The Administrative Law Judge specifically finds that the Agency has demonstrated the need for and reasonableness of each of the proposed rules not discussed in this Report by an affirmative presentation of facts, that the provisions are specifically authorized by statute, and that there are no other problems that prevent their adoption.

34. Before the hearings began, the Agency identified a number of changes which it desired to make to the rules as initially published in the State Register. These changes were introduced into the record at the August 25, 1993 St. Paul hearing, and summarized in Agency Ex. 13. Copies of this exhibit were made available at the registration table at subsequent hearings, and sent to persons who had attended the August 25 hearing, those who had purchased a SONAR, as well as to those who were on the interested parties' mailing list for this rulemaking proceeding. A total of 359 people were sent a copy of the exhibit. Subsequent to the hearings, the Agency proposed a second set of changes to the rules as published. These were attached to the Agency's Post-Hearing Responses as Attachment 2. Then, in its Final Comments, the Agency proposed a few additional changes to the proposed rules. Final Comments, at pp. 122-27.

35. Where changes are made to the rule after publication in the State Register, the Administrative Law Judge must determine if the new language is substantially different from that which was originally proposed. Minn. Stat. § 14.15, subd. 4. The standards to determine if the new language is substantially different are found in Minn. Rules pt. 1400.1100. The Administrative Law Judge has concluded that none of the changes proposed by the Agency throughout the proceeding constitute substantial changes.

36. The Administrative Law Judge must determine, inter alia, whether the need for and reasonableness of the proposed rules has been established by the

Agency by an affirmative presentation of fact. The question of whether a rule is reasonable focuses on whether it has a rational basis. A rule is reasonable if it is rationally related to the end sought to be achieved by the statute. Broen Memorial Home v. Minnesota Department of Human Services, 364 N.W.2d 436, 440 (Minn. App. 1985); Blocher Outdoor Advertising Co. v. Minnesota Department of Transportation, 347 N.W.2d 88, 91 (Minn. App. 1984). The Agency's burden has been described as a requirement that it "explain on what evidence it is relying and how the evidence connects rationally with the Agency's choice of action to be taken." Manufactured Housing Institute v. Pettersen, 347 N.W.2d 238, 244 (Minn. 1984). An agency is entitled to make choices between possible standards, so long as the choice it makes is rational. When commentators suggest approaches other than that suggested by the Agency, it is not the proper role of the Administrative Law Judge to determine which alternative presents the "best" approach. Instead, his role is to determine whether or not the Agency has demonstrated its approach to be a reasonable one.

Section-By-Section Analysis

Wetlands

37. The Pollution Control Agency has been involved in wetland regulation since 1978, exercising the authority granted to it by section 401 of the Clean Water Act. Exhibit W59 contains 33 examples of Agency actions on specific proposals relating to wetland activities. However, very few people have been aware of the Agency's authority and past activities because these activities are normally conducted between the Pollution Control Agency and the U.S. Army Corps of Engineers. In the relatively few cases where a Corps permit is needed, a project applicant submits an application to the Corps of Engineers. The Corps then contacts the Agency, and asks it to review the proposed project. The Agency then responds to the Corps, setting forth its action with regard to the application. Traditionally, copies of the Agency's decision letters are sent to the Corps, the DNR, the U.S. Fish & Wildlife Service, and the U.S. EPA in Chicago. Copies of the Agency's letters are not routinely sent to the project proposer. Several members of the public and representatives of businesses objected to the Agency's involving itself in wetland activities which, they felt, were already being adequately taken care of by others. They were not aware that the Agency has been involved for many years.

38. The Agency's role in wetland regulation has historically been limited to a relatively small number of projects. These are projects that require any one of the following actions:

1. issuance of a NPDES permit;
2. issuance of a SDS permit; or
3. issuance of section 404 Corps of Engineers permit.

Tr. 2, p. 15.

39. Many commentators objected to duplicative regulation by many agencies. As one commentator put it:

> We see this as similar to a deer being run over by a semi. Three semis track over the top of it and now PCA is proposing to pull up and step out of their vehicle and shoot it for good measure.
>
> There is so much regulation in this area right now, it just seems to be an unnecessary and costly expenditure of public funds to add this section of regulation to PCA as well.

Tr. 1, p. 50. A number of commentators pointed to the recent adoption, by the Board of Water and Soil Resources, of an extensive set of rules under the State's Wetland Conservation Act. The general theme sounded by these commentators was that there is plenty of regulation already, and it is not necessary that there be any more.

40. Actually, the relationship between the BOWSR rules and the proposed MPCA rules is more like a deer standing in the middle of a busy highway with two trucks coming toward it from opposite directions. If the deer runs to the left, it gets hit by one semi. But if it runs to the right, it gets hit by the other. It won't get hit by both, at least not on the same issue. Sequencing (avoid-minimize-mitigate) is the prime example. If a section 404 permit, an NPDES permit, or an SDS permit is required for a project, then the project must comply with the PCA rules, including sequencing. But it is exempt from the BOWSR rules on sequencing. On the other hand, if a project doesn't require one of those three permits, it does not have to meet the MPCA rules on sequencing, but it does have to meet the BOWSR rules. While the two sequencing rules are not verbatim duplicates, the concepts underlying them are the same. Both are consistent with Executive Order 91-3, issued by Governor Carlson on January 17, 1991, which directs all state agencies to operate under a "no net loss" policy, to the fullest extent of their authority, and to be guided by the concepts of avoidance, minimization, and mitigation. Thus, there should be no conflict where an individual or business is caught between the two agencies.[2]

41. In addition to trying to minimize conflict and duplication, the Agency responds that it has no choice with regard to whether or not it regulates wetlands, and that in many instances, even the particular words which it uses in its proposed rules are not of its own choosing -- they are imposed on it by the Federal Environmental Protection Agency. A review of the record indicates that the Agency is correct.

42. The United States Environmental Protection Agency has issued the following "guidance":

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[2]The Agency should be alert for any instances where the day-to-day application of the rules places applicants or others in a "Catch 22" situation where they are caught in conflicts between the BOWSR rules and the PCA rules. The Agency has a history of regular project coordination meetings with the Corps, the BOWSR staff, and the DNR staff to avoid conflicting recommendations on wetland issues. It is hoped that these will continue, so that the fears of the public commentators will not be realized.

By September 30, 1993, states and qualified Indian tribes must adopt narrative water quality standards that apply directly to wetlands. Those standards shall be established in accordance with either the National Guidance, Water Quality Standards for Wetlands . . . or some other scientifically valid method. In adopting water quality standards for wetlands, states and qualified Indian tribes, at a minimum shall:

(1) define wetlands as "state waters";

(2) designate uses that protect the structure and function of wetlands;

(3) adopt aesthetic narrative criteria . . . and appropriate numeric criteria in the standards to protect the designated uses;

(4) adopt narrative biological criteria in the standards; and,

(5) extend the antidegradation policy and implementation methods to wetlands.

United States Environmental Protection Agency. Agency Operating Guidance, FY 1991: Office of Water. Office of the Administrator, Washington, D.C., as cited in Exhibit W3.

43. In August of 1992, the Agency solicited public comment on a draft set of rules. That draft used the Minnesota Wetland Conservation Act as the basis for several important definitions and concepts. For example, it defined "wetlands" by simply referring to the definition in the Wetland Conservation Act. It defined "agricultural lands" with reference to the rules to be adopted under that Act. The Agency proposed rules which contained specific exemptions for certain agricultural activities. Exhibit G7.

44. The Agency received a comment from the U.S. Fish & Wildlife Service indicating that the proposed definition and exemptions were inconsistent with EPA's National Guidance, and the service "strongly supports" EPA's recommendation that states remove or modify regulatory language that limits the authority of water quality standards over wetlands. A copy of the service's letter was sent to the EPA. Exhibit W16.

45. On November 12, 1992, the regional office of the United States Environmental Protection Agency commented on the July 28, 1992 draft of the rules. With regard to the definition of "wetlands", which adopted the same language as the Wetland Conservation Act, the EPA indicated that "the only acceptable definition" is the one set forth in EPA rules. The EPA stated: "The State standards must use this definition." Exhibit W17. In addition, the EPA objected to some of the exemptions proposed by the Agency, and required that a whole subpart be removed from the proposed standards. The subpart attempted to exempt certain projects if they were exempted from the Wetlands Conservation Act.

46. On November 24, 1992, the Agency responded to the EPA's comments, indicating that it would use the required phraseology for the definition of "wetlands". The Agency disagreed, however, with some of the other comments from the EPA, and urged the EPA to withdraw its concerns. The Agency went on to indicate that it was aware of the conflict between the Federal Clean Water Act and the State's Wetland Conservation Act regarding exemptions, and was "actively searching for some common ground to accommodate both perspectives." Exhibit W18.

47. There is very little difference between the definition of "wetland" in the Agency's proposed rules and the definition in the Wetland Conservation Act. Moreover, the Agency intends to rely upon employees of the Board of Water and Soil Resources or the Department of Natural Resources if there is a question regarding a wetland delineation. Final Comments, p. 8. Therefore, as a practical matter, it is highly likely that the definition, at least, will be administered in a manner consistent with the Wetland Conservation Act. The main difference between the two will be in the absence of all of the exemptions which are contained in the Wetland Conservation Act and its rules. However, since the Agency does not get involved in wetland projects which do not require one of the three kinds of permits enumerated above, the vast majority of the projects which are exempted from the Wetland Conservation Act will be beyond the reach of these rules as well. As noted above, the Agency attempted to include some of the more important of the Wetland Conservation Act's exemptions in the rule, but the EPA would not allow it.

48. The Administrative Law Judge concludes that the Agency has demonstrated the need for and reasonableness of its adopting rules on wetlands despite the perceived overlap with other agencies.

49. The Agency has proposed to establish specific water quality standards for wetlands, labeled as Class 2D Waters. As part of those standards, the Agency has stated that "normal farm practices" of planting or pasturing, "including the recommended applications of fertilizer and pesticides", are excluded from the standards. This is partially consistent with a similar exemption from the Clean Water Act section 404 permitting requirements for "normal farming" activities. See, generally, Exhibit W47. The Minnesota Farm Bureau Federation requested that this paragraph be added to the State rules after the EPA rejected the Wetland Conservation Act exemptions. Exhibit W51. The Agency did add it in response to the comment, but then received comments from power companies, Mn/DOT, the Minnesota Forest Industry, Timber Producers Association, and similar entities who routinely apply herbicides and pesticides but who cannot qualify for the "normal farming" exemption. They asked that they be treated in a similar manner. The Agency responded that it could not expand the scope of the proposed language to include them (presumably because it would then be substantially broader than the Clean Water Act exemption, and thus be vetoed by the EPA), but indicated that the Agency would exercise its prosecutorial discretion to refrain from taking enforcement activities in connection with applications of herbicides and pesticides so long as label requirements are followed and so long as there are no CWA 402, 401 or SDS permits or certifications required. Post-Hearing Comments at p. 8 and Final Comments at p. 9. The Agency recognizes that the applications of herbicides and pesticides are already regulated by the EPA, with oversight by the Minnesota Department of Agriculture and the Minnesota Department of Natural Resources, which regulation includes "recommended applications" standards.

50. The exemption for "normal farm practices" was opposed by the U.S. Fish & Wildlife Service as diluting wetland protection by excluding an activity that has been shown to affect a high percentage of Minnesota's wetlands. The Service presented data from nine rural counties which showed that the proposed exemption would allow "unrestrained agricultural chemical inputs" to between 86% and 47% of the wetlands in those counties. The Service noted that "typical agriculture use" of herbicide in the west central agricultural area of the State could potentially impact the water quality of prairie potholes. Concentrations already detected have in as high as 30 ug/l (Dual), 54 ug/l (Basagdan), 6.56 ug/l (Alachlor), and 28 ug/l (Atrazine). The Service noted that such concentrations had been determined to impact algae, floating plants, and some shallow-rooted broadleaved submergents. The Service believed that inclusion of the proposed exemption would allow agricultural chemicals to potentially cause a significant risk to aquatic life and wildlife. Other commentators (National Audubon Society, Sierra Club, and Isaac Walton League) all argued that the agricultural exemption was either unnecessary or unreasonable.

The Fish & Wildlife Service's assertion that the exemption would allow "unrestrained agricultural chemical inputs" seems to ignore the limitation contained within the exemption which allows only "recommended applications". As noted earlier in the discussion of those who wish to broaden this exemption, the Agency has placed faith in the limitations contained in the labeling requirements. The appropriate question which the Service should address, and which the Agency might well wish to address in the next triennual review, is whether or not the labeling requirements are adequate limitations. If they are not, then the Agency may wish to add its own limitations (as it has proposed to do for Alachlor and Atrazine in this proceeding) and then make the farming exemption subject to those limitations, rather than the labeling limitations. In other words, the labeling limitations would be a "default" standard for the many substances which the Agency has not adopted specific standards, but where the Agency has adopted specific standards, then those specific standards would apply. But for purposes of this proceeding, the Agency is entitled to rely on the labeling limitations. The exemption does not exempt agriculture from all of Chapter 7050. It only exempts it from the 2D standards (which also include the 2B standards). For example, it does not exempt agriculture from existing rule 7050.0210(2), which prohibits the discharge of wastes so as to cause a nuisance condition, "such as . . . aquatic habitat degradation . . . or other offensive or harmful effects". Therefore, the Agency and the public (including the Fish & Wildlife Service and the environmental groups) are not without recourse in the event that an application, even within the labeling restrictions, causes serious harm. But except for such an unusual circumstance, the Agency is essentially telling farmers that if they follow the label restrictions, they are exempt from the class 2B and class 2D standards for normal farming practices.

51. The Administrative Law Judge concludes that the resolution of this issue (the reasonableness of the "normal farm practices" exemption) depends upon determining what are harmful levels of various herbicides and pesticides. For example, in this proceeding, the Agency has identified specific levels of alachlor and atrazine and developed water quality standards for them. One of the stated justifications for doing so was because of the greater emphasis being placed on the control of nonpoint source pollution, including agricultural runoff. SONAR, pp. 14 and 63. However, it would

appear that for most fertilizers and pesticides, the Agency is deferring to the protections resulting from the "recommended applications", which are established by other agencies, including the EPA and the Department of Agriculture. This represents a legitimate policy decision which the Agency may make.

Aquatic Life Standards: Iron and Manganese

52. The Agency proposed to add eight new water quality standards to the rules. These included iron and manganese. The Agency was aware that there were areas of the State where the natural background concentration of both of these exceeded the proposed standards. Nevertheless, the Agency believed it would be more efficient to have a single statewide standard, and then grant variances or otherwise deal with the situations where the background exceeded that standard, rather than to do case-by-case, site-specific criteria. As a part of the hearing process, the Agency changed its mind about the efficiency it hoped to achieve. A number of commentators noted that the ground water aquifers underlying the Twin Cities area, including the Jordan aquifer, had natural concentrations exceeding the proposed standards. Therefore, anybody proposing to discharge this ground water to a surface water, as in situations of ground water remediation activities, would either have to install removal equipment, apply for a variance, or negotiate with the staff about the appropriate limit. In addition, questions were raised regarding the fact that the iron standard was expressed in terms of total iron, while there are situations where a dissolved iron measurement would be more appropriate because some permits do have effluent limitations which are expressed in terms of dissolved iron.

53. The Agency came to believe that it would be easier to address both iron and manganese on a case-by-case basis. The Agency also noted that the addition of biocriteria to the rules would give the Agency another tool to deal with problems with background concentrations exceed criteria or standards. For all these reasons, the Agency determined to withdraw the proposed water quality standards for both iron and manganese. Post-Hearing Response to Public Comments, at pp. 10-12 and Final Comments at pp. 17-19. Minn. Stat. § 14.05, subd. 3 permits an agency to withdraw a proposed rule at any time prior to filing it with the Secretary of State, but it must publish notice that the proposed rule has been withdrawn in the State Register. So long as the Agency published its withdrawal of the two proposed standards, the Administrative Law Judge accepts it as valid.

Cobalt

54. The Agency is proposing to add a cobalt standard for Class 2 waters. The Class 2A and 2Bd standard would be 2.8 ug/l chronic, 436 ug/l maximum, and 872 ug/l final. For Class 2B waters, the chronic number would go from 2.8 ug/l to 5 ug/l. That same number (5 ug/l) is then carried through to other classes which incorporate the 2B standard by reference.

55. The Agency reported that a cobalt standard has been used to set permit limitations for leachate from mining operations, as well as to assess conditions at two landfill leachate sites and two contaminated ground water sites. The proposed standards are human health-based for Class 2A and 2Bd waters and toxicity-based for Class 2B, 2C and 2D waters.

56. The proposed standard drew comments from a number of sources. The Department of Natural Resources and Cleveland Cliffs, Inc. both referred to bioassay data which indicated that an appropriate toxicity-based limit would be closer to 50 ug/l rather than the 5 ug/l which the Agency had proposed. Both appeared to be referring to the SONAR's discussion of a site-specific determination which was made for LTV Steel/Erie Corporation permit for the Dunka pit discharges. See, SONAR at p. 114. The Agency explains there, and in their Final Comments, that the water from the Dunka stockpile seeps has a very high total hardness, and that the bioassay data for cobalt indicates that high hardness can mitigate cobalt toxicity. However, the Agency does not feel it has enough data to support a hardness-based standard for cobalt. The Agency indicated it is willing to consider higher levels than the 5 ug/l pursuant to part 7050.0222, subpart 8, which allows for site-specific modification of standards if local conditions and data support it. Unstated, however, is the fact that a bioassay is very expensive, and the cost would be upon the person seeking a higher limit.

57. Northern States Power Company, as well as the Department, both commented they have background samples which show cobalt at greater than 5 ug/l. DNR referred to background samples collected in northern Minnesota, while NSP referred to its water chemistry monitoring data at various sites on the Minnesota and Mississippi Rivers. The Agency staff could not agree with DNR's statement, because out of 521 water samples tested in northern Minnesota, only one sample is above the standard. Final Comments, p. 21. In the SONAR, the Agency reported that data from a copper-nickel study in northeastern Minnesota reported most concentrations to be below detection limits of 0.2 to 0.5 ug/l, even though the study made special efforts to obtain the lowest detection limits possible. In response to the NSP data, the Agency responded that its data showed only occasional exceedences in the Minnesota and Mississippi Rivers, and that in general, concentrations range from about 1.0 to 2.2 ug/l in rivers across the state. The staff also noted that where natural background conditions exceed the proposed standard, the natural background levels may be used as the standard, in place of the proposed rule, or, as was done in the case of the Dunka seeps, the bioassay may be performed.

58. The Administrative Law Judge concludes that the Agency has followed an appropriate method for setting the cobalt standards. The Agency has demonstrated the need for and reasonableness of its proposed cobalt standards.

59. The Administrative Law Judge has reviewed the other comments relating to the various standards, and finds that the Agency has justified them. In particular, the Administrative Law Judge would note that where the Agency has not proposed a change to a standard, that standard is not "fair game" for action in this rulemaking proceeding.

60. A number of other commentators suggested changes to portions of the rules which were not proposed for change by the Agency. For example, 3M Corporation pointed out that the state's chronic standard for mercury was substantially different from the national chronic criterion, and that the Minnesota standard was established using a reference dose which has now been changed in the most recent EPA IRIS database. The Agency responded that it was aware of these matters, but had decided to leave the current standard unchanged because it lacked the time and resources to thoroughly research the new mercury data for this round of amendments. The Agency indicated that it

was willing to work with 3M and other interested persons to address establishing a new mercury standard in the future. SONAR at 76 and Final Comments at pp. 23-25. The Administrative Law Judge agrees that the Agency does not have to justify the need for and reasonableness of retaining an existing rule which is not proposed for amendment by the Agency. Therefore, no action is needed in connection with this, and other similar comments relating to other standards. Persons concerned about portions of rules which were not proposed for change in this proceeding should contact the Agency and urge that their concerns be addressed in the next rulemaking proceeding.

Animal Feedlot Standards

61. The Agency's existing rules contain an effluent limitation, for non-federally regulated feedlots, of 25 milligrams per liter of five-day BOD. Part 7050.0215, subp. 2 A. The Agency proposed to replace that limitation with achieving a score of zero using a feedlot evaluation system model which had been developed by the ASCS, SCS, the Minnesota Soil & Water Conservation Board (now part of BOWSR), and the MPCA. The Agency estimated that the model rating of zero corresponds to an estimated discharge of 25 mg/l BOD, and therefore the proposed change would not affect the environment or the feedlot operator -- it was merely a change in how rule compliance would be measured. Despite the fact that the Agency had worked with a feedlot advisory group including representatives from the State Cattlemen's Association, the Farm Bureau, the Farmers' Union, the Dairy Herd Improvement Association, the Pork Producers, National Farm Organization, the Turkey Growers' Association, as well as staff from the SCS, Extension Service, Soil and Water Conservation Districts, BOWSR, DNR, the Department of Agriculture, University of Minnesota, and others, all of whom were informed of the proposed change and none of whom objected to it, the Agency ran into a "beehive" of opposition at the Rochester hearing. This opposition appears to have be generated by one or two individuals who attempted to obtain the model, were unable to do so (as a practical matter), and thus were forced to make certain assumptions about the impact of the rule. In a short period of time, they were able to generate substantial opposition to the rule and a sizable turnout of individuals at the Rochester hearing.

62. After evaluating the events at the Rochester hearing, and the obvious lack of information among individual producers, along with some technical problems presented by the availability (or unavailability) of the model, the Agency determined to withdraw the proposed change to its existing rule, and allow the existing rule to remain in its current form. As noted earlier, Minn. Stat. § 14.05 authorizes an agency to withdraw a proposed rule at any time during the rulemaking process, so long as it gives notice of the withdrawal in the State Register.

Classification of Particular Water Bodies: Introduction

63. The most contentious issues in this rulemaking proceeding involved the propriety of a handful of reclassifications of water bodies. While each of them will be discussed in detail below, it is appropriate to outline the legal framework of the classification system.

64. The Federal Clean Water Act, 33 U.S.C. § 1251, et seq., is designed to "restore and maintain the chemical, physical, and biological integrity" of the Nation's waters through prevention, reduction, and the eventual

elimination of pollution. It contains a two-step process to achieve that national goal. The first step is to improve water quality sufficiently, wherever attainable, to meet an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water. The second step is the total elimination of discharge pollutants. As noted earlier, the Act provides for a partnership between the federal government and the states. The major responsibility of the federal government (the Environmental Protection Agency) is the adoption of uniform, national technology-based standards, known as effluent limitations guidelines, for certain categories and classes of discharges. The Act also requires states, with federal oversight and approval, to institute certain requirements to assure protection of the quality of all state waters. These water quality standards are not technology-based standards but are, instead, based upon the desired uses of those waters and the conditions required to support those uses. Water quality standards are used as a supplementary basis for effluent limitations to prevent water quality from falling below acceptable levels.

65. Under the federal Act, water quality standards generally consist of three elements: (1) a designated "use" of the water body (such as domestic water supply, recreation, propagation of fish, agricultural, industrial, etc.) consistent with the goals of the Act; (2) criteria specifying the amount of various pollutants that may be present in those water bodies and still protect the designated uses; and (3) an antidegradation provision. A water quality standard defines the water quality goals of a water body by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses.

66. Each state must include use designations in its standards that are consistent with and serve the purposes of the Act. This means that the standards should, wherever attainable, provide water quality for the "protection and propagation of fish, shellfish and wildlife and for recreation in and on the water." This is the basis for the so-called "fishable/swimmable" goal.

67. Minnesota has seven classes of waters based upon uses. These classes are explained in part 7050.0220 of the proposed rule. Each class has certain standards applied to it so that the quality level of the class may be maintained.

68. Of particular interest in this proceeding are the descriptions given to Class 1 waters, Class 2 waters and Class 7 waters. Class 1 waters are for drinking, with four separate subclasses depending upon the amount of treatment needed to meet drinking water standards. Class 2 waters are for fishing and aquatic recreation. There are four separate subclasses, depending on what kind of fish and what level of body contact are involved. Class 7 waters, finally, are waters where the Class 2 uses do not exist and the national "fishable/swimmable" goal is not believed to be attainable.

69. The rules contain listings of particular classifications for several hundred waters around the state. However, not every lake, river, stream or other water body is specifically identified. For those "unlisted waters", existing rule 7050.0430 provides that they shall be classified as a Class 2B, 3B, 4A, 4B, 5 and 6 water. The only exception to this is for designated trout streams or trout lakes.

Viking Fen

70. There are three small calcarious fen areas located in the northwestern corner of the state, in Marshall County, all referred to as portions of the Viking fen. The three areas are labeled "Viking fen, 68", "Viking fen, 70", and Viking strip fen, 69". Each has been identified by the Department of Natural Resources as a calcarious fen. As with virtually all other calcarious fens in the state, the Pollution Control Agency is proposing to identify them as outstanding resource value waters (ORVWs). In general, calcarious fens are fed by ground water and maintain a constant microenvironment which remains stable for many years. For this reason, fens often harbor relict plant species that are uncharacteristic or absent from other areas. The Wetlands Conservation Act contains a specific provision for calcarious fens, prohibiting their filling, drainage, or degradation without approval from the Commissioner of Natural Resources. Minn. Stat. § 103G.223. The Board of Water and Soil Resources has provided special rules for them. The Pollution Control Agency, in these rules, is proposing to classify the three Viking fen areas as outstanding resource value waters, which will result in a prohibition against any new or expanded discharges of wastes to them unless there is no prudent and feasible alternative to the discharge.

71. A letter was received from a landowner affected by the addition of the Viking fen, 70. He asked that the fen not be added to the list of ORVWs. He thought that protecting the plant species ("weeds, to most people") was a waste of money, and that the money could be better spent on flood victims, the hungry, or the homeless. He was particularly concerned that he received no compensation for leaving this land idle, yet he had to pay taxes on it.

72. The Administrative Law Judge concludes that the commentator's primary concern should be directed to the Legislature, not the Agency, because it is the prohibitions of the Wetland Conservation Act that most seriously impact his use of the land. However, to the extent he is challenging the reasonableness of the inclusion of the fen in the list of outstanding value resource waters, the Administrative Law Judge finds that the Agency has demonstrated the need for and reasonableness of classifying all such fens as ORVWs in order to protect the plants.

Active Mining Pits

73. The Agency initially proposed to classify 18 surface waters as Class 1C waters which had not previously been in that class. These were waters which had been identified by the Minnesota Department of Health as public water supply system sources. A public water supply system is a system supplying piped water for human consumption which has a minimum of 15 service connections of 15 living units, or serves at least 25 persons daily for 60 days of the year. Minn. Rules pt. 4720.0100, subp. 16. Public water supplies are divided into three categories: community water supplies, noncommunity water supplies, and nontransient, noncommunity water supplies. Examples of these three categories are listed below:

1. A community water supply system serves at least 15 service connections or living units used by year-round residents, or regularly serves at least 25 year-round residents. Examples of these types of

systems are: municipalities, mobile home parks, and apartments.

2. A noncommunity water system is a public water system that serves the traveling or transient population. Examples of such systems include: hotels, motels, resorts, restaurants, campgrounds, recreation areas, churches, and gas stations.

3. A noncommunity, nontransient water system is a public water supply system that regularly serves at least 25 of the same persons over six months per year. Examples include: schools, day-care facilities, factories, and businesses.

74. Among the waters proposed to receive the 1C classification were the Enterprise Mine Pit Lake, the Fraser Mine Pit Lake, the Morton Mine Pit Lake, the Mountain Iron Mine Pit Lake, and the Scranton Mine Pit Lake (Hull-Rust-Mahoning-Scranton-Susquehanna).

75. Each of the above-listed mine pit lakes were identified by the Minnesota Department of Health as surface water source supplies for either community or noncommunity/nontransient public water supply systems. Exhibit C42.

76. The Enterprise Mine Pit Lake was initially identified by the Department of Health as a noncommunity/nontransient public water supply. Exhibit C42. On April 1, 1993, Inland Steel Mining Company sent a letter to the Agency (Exhibit C58) indicating that although at the current time water from the Enterprise Pit was pumped to the plant and used for drinking water purposes, the company was proposing to discontinue this use in favor of obtaining its drinking water from wells. On April 27, 1993, the Agency issued its Statement of Need and Reasonableness. It included a proposal to classify the Enterprise Mine Pit Lake as a Class 1C use. When the rules were published in the State Register of July 19, 1993, the proposed reclassification was included among them. On May 3, 1993, Inland again wrote the Agency, indicating that it now set a date of June 1, 1993 as the date that it would no longer be drawing drinking water from the Enterprise Mine Pit Lake. Inland requested that the Agency withdraw its proposed reclassification for the Enterprise Pit. Agency Exhibit 5. At the start of the public hearing process, the Agency announced that it was withdrawing its proposed reclassification of the Enterprise Pit in light of the cessation of obtaining drinking water from the pit. Tr. 1, p. 29. The Agency confirmed this change in its Exhibit 13 and Attachment 19 to its final comments. There was no opposition to the Agency's withdrawal of the proposed reclassification.

77. The Mountain Iron Mine Pit Lake was initially identified by the Department of Health as a noncommunity/nontransient public water supply in Exhibit C42. The Agency proposed to classify it as a 1C water in the proposed rules. However, on September 23, 1993, the Agency sent letters to a number of individuals and the Hibbing Public Utilities Commission, indicating that it had determined to withdraw its proposed reclassification for the Mountain Iron Mine Pit. The Agency gave two reasons for this withdrawal: that active mining operations were still continuing in the Mountain Iron Pit, and the pit was considered to be part of the Minntac mining facility pursuant to the

current Agency water quality permit and, therefore, the pit is not considered a "water of the state". The Agency asserted that the existing permits which cover the mining operation do emphasize the importance of protecting ground water for potable water uses and thus the proposed reclassification to Class 1C would not change the level of protection for that use. Post-Hearing Response at pp. 76-77 and Attachments 57-60. There was no opposition to the proposed withdrawal.

78. The Scranton Mine Pit Lake (Hull-Rust-Mahoning-Scranton-Susquehanna) was initially identified by the Department of Health as a noncommunity/nontransient public water supply, providing water to Hibbing Taconite Company. The Agency initially proposed to classify this as a 1C water. However, in exactly the same way as it treated the Mountain Iron Mine Pit Lake noted above, the Agency decided after the comment period to withdraw its proposed reclassification. No opposition was voiced to the proposed withdrawal.

79. The Morton Mine Pit Lake was identified by the Department of Health as a noncommunity/nontransient public water supply, serving the Hibbing Taconite Company. Exhibit C42. The Agency proposed to reclassify it to a Class 1C water. However, unlike the Mountain Iron and Scranton cases, the Agency has not proposed to withdraw that classification. By letter dated September 28, the Iron Mining Association of Minnesota submitted a comment (on stationery of Cleveland-Cliffs, Inc.) indicating that it saw no reason why the Morton Mine Pit Lake should not be withdrawn on the same basis as the Mountain Iron and Scranton Lakes were withdrawn. In their Final Comments, the Agency indicated that it did not withdraw the proposed reclassification because the Morton Mine Pit Lake is not identified in the NPDES/SDS permit for Hibbing Taconite Company as being part of the active mining operations within the permitted facility and thus the water quality provisions of that permit did not include the Morton pit. The Agency considers the lake to be "waters of the state". Since it was used for public water supply purposes, the Agency believed the 1C classification was still appropriate. The Administrative Law Judge finds the Agency has justified its proposal to classify the Morton Mine Pit Lake as 1C.

<u>Proposed Reclassification: North Branch Rush River (County Ditch No. 55) at Gaylord</u>

80. Lateral Ditch C of County Ditch 55, and County Ditch 55 itself (which is also known as the North Branch of the Rush River) carry water from the outlet of Titlow Lake in a generally southeasterly direction toward the Minnesota River, a distance of approximately 30 miles. The Agency has proposed to reclassify the uppermost portion of this waterway (approximately eight river miles) from the present Class 2B classification to Class 7. The remainder of the waters, down to the mouth of the Minnesota River, would retain their Class 2B status.

81. The proposed stretch is not used for swimming or other recreation. Its potential for such use is limited at best.

82. The proposed reclassification was opposed by the Department of Natural Resources. The Department, like the Agency, did not believe that the stretch in question contained valuable habitat for game fish. However, the Department was concerned about the effect of the reclassification of this

upper stretch on downstream reaches. A 1991 memo indicated the Department would be supportive of granting a temporary variance to allow discharges to reach Class 7 levels in the uppermost reaches, if it was coupled with downstream monitoring to determine if there are significant impacts on the downstream resource. In fact, a variance was granted in 1991, and presumably discharges have been made closer to Class 7 standards than Class 2B standards. Unfortunately, there is no evidence in the record to demonstrate whether or not there has been an adverse impact on the downstream water quality. The record does demonstrate, however, that the upper portions of the ditch system and the north branch of the river, down to approximately County Road 9 crossing south of New Rome, have been extensively channelized with uniform cross-sectional width and depth. This channelization has destroyed any suitable habitat. In contrast, the lower portion of the Rush River (below the County Road 9 crossing) has not been ditched or otherwise extensively altered. It offers escape cover for game fish and suitable spawning habitat for many fish species. This lower portion may provide important production areas for fish species common in the Minnesota River. Exhibit C46.

83. The current NPDES/SDS permit for the Gaylord/Waldbaum waste water treatment facility does require instream monitoring to assure that Class 2 water quality standards are maintained at the point where the proposed Class 7 segment ends, and the Class 2B segment would begin. The data from that monitoring, however, is not in the record.

84. The Administrative Law Judge concludes that the Agency has demonstrated the need for and reasonableness of its proposed reclassification. While it would have been desirable to have monitoring data in the record showing the effect of the 1991 variance on the downstream stretch, it could be argued that the unusual rainfall and moisture conditions of 1992 and 1993 would render such data inconclusive. The record contains ample evidence of such severe channelization of the segment at issue such that it, along with the absence of actual or potential recreational use, supports the Class 7 designation, even without the monitoring data.

Proposed Reclassification: Center Creek Below Fairmont

85. Center Creek is approximately 31 river miles in length. It runs from the outlet of Lake George, in the City of Fairmont, to the Blue Earth River, south of Winnebago. It runs through the City of Granada and through the cities of Huntley and Winnebago. Center Creek is a marginal water body from the standpoint of fishing and recreation. At its uppermost reaches, in and near the city of Fairmont, it has little recreational or fisheries value. At its lowermost reaches, however, it does have both fisheries and recreational value. Reasonable people have differed over the appropriate classification of Center Creek, because of the noticeable difference between the upstream part and the downstream part.

86. The present controversy over the classification of Center Creek began in 1988, when the Agency issued a waste load allocation study of the various pollutants in Center Creek. The study proposed that the City's waste water treatment plant (whose permit was scheduled to expire on June 30, 1992) be required to meet a variety of effluent limitations, including ammonia limitations which would range from 1 mg/l in the summertime to 10 mg/l in the winter. The City's plant was built in 1973, but was not designed to remove

ammonia. It has been well maintained, and the City hopes to continue to use it for 20 or 30 more years.

87. The waste load allocation study was part of an ongoing series of negotiations regarding the City's ammonia discharges. Tr. 7, p. 88. The City was also concerned about its ability to meet a proposed copper limitation. The City requested a variance from the ammonia and copper effluent limits in the proposed permit. By mutual agreement, the variance request was put "on hold" until the reclassification decision could be made. Tr. 7, pp. 14-15.

88. In March of 1992, the City formally requested that Center Creek be reclassified from a Class 2B water to a Class 7 water. Exhibit C52. The Agency responded that a triennual rule revision was scheduled for 1993, and that the requested reclassification of Center Creek would be considered during that process. Exhibit C53.

89. Center Creek has been classified as a Class 2B water since 1973, and that classification has applied continuously to the current date. Over the years, additional classifications relating to agriculture, industry, and other uses have been added, but the Class 2B designation has remained throughout.

90. Class 2B waters are described as:

> . . . all waters of the state which are or may be used for fishing, fish culture, bathing, or any other recreational purposes, and for which quality control is or may be necessary to protect aquatic or terrestrial life or their habitats, or the public health, safety or welfare.

Minn. Rule Part 7050.0200.

In the rule that sets forth the detail standards for Class 2B waters, the following text appears:

> The quality of this class of surface waters shall be such as to permit the propagation and maintenance of cool or warm water sport or commercial fishes and their habitats and be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. This class of surface water is not protected as a source of drinking water.

91. Class 7 waters are described as follows:

> . . . surface waters of the state which are of limited value as a water resource and where water quantities are intermittent or less than one cubic foot per second at the once in ten year, seven-day low flow . . . . These waters shall be protected so as to allow secondary body contact use, to preserve the ground water for use as a potable water supply, and to protect the aesthetic qualities of the water. It is the intent of the agency that very few waters be classified as limited resource value waters. In conjunction with those factors listed

in Minn. Stat. § 115.44, subds. 2 and 3, the Agency, in cooperation and agreement with the Department of Natural Resources with respect to determination of fisheries values and potential, shall determine the extent to which the waters of the state demonstrate the conditions set forth below.

> a. The existing fishery and potential fishery are severely limited by natural conditions as exhibited by poor water quality characteristics, lack of habitat, or lack of water; or
>
> b. The quality of the resource has been significantly altered by human activity and the effect is essentially irreversible; and
>
> c. There are limited recreational activities (such as fishing, swimming, wading or boating) in and on the water resource.
>
> Conditions "a" and "c" or "b" and "c" must be established by the agency water assessment procedure before the waters can be classified as limited resource value waters.

Minn. Rule Part 7050.0200.

In the section setting forth the limitations for Class 7 waters, the following text appears:

> The quality of this class of waters of the state shall be such as to protect aesthetic qualities, secondary body contact use, and ground water for use as a potable water supply.

92. Translating the differences between the two classes into ordinary language, Class 2B waters will support cool or warm water sport or commercial fish, and will also allow primary body contact (swimming, tubing, and wading where there is a likelihood of incidental water ingestion and/or immersion). Class 7 waters will not support any long-term fish population, nor will they allow swimming, tubing, or other activities which could involve water ingestion and/or immersion. Fecal coliform organisms, for example, in a Class 2B water, are essentially limited to not more than 200 organisms per 100 milliters of water. In Class 7 waters, the limitation is essentially not more than 1,000 organisms per 100 milliliters of water. The limitations on Class 2B waters include specific limitations on such substances as arsenic, benezene, cyanide, DDT, lead, mercury, and similar elements. Class 7 waters, on the other hand, do not contain any such specific limitations, but only a general restriction on toxic pollutants, which are "not to be allowed in such quantities or concentrations that will impair the specified uses."

93. It is clear from the testimony at the public hearing in Fairmont and the written submissions from both upstream and downstream reaches, that there is a dramatic difference between the actual and potential uses of Center Creek near Fairmont, at one end, as compared with the actual and potential uses of

Center Creek at Granada and downstream to the confluence with Blue Earth River. In and near Fairmont, Center Creek is not viewed as a fishing resource. It is not viewed as a recreational resource. People do not report either fishing themselves, or seeing others fish (except for the area immediately below the Lake George Dam). People do not report tubing, wading, or other recreational uses of the river, nor do they report having seen others using it for recreation. Testimony and comments from residents of Fairmont is almost universally to that effect. Fairmont residents contrasted this bleak picture with a very positive report on the fishing and recreational opportunities in the Fairmont chain of lakes which are extensively used by citizens (both local and tourist) as the primary fishing and recreational resource in the area. One witness estimated that 98% of the fishing in the community is done in the city's lakes. Tr. 7, p. 37. Of the 27 public witnesses who spoke at the evening hearing in Fairmont, only one reported any meaningful fishing and recreational use of Center Creek, and that individual was from Granada, and was reporting on uses in Granada, not in Fairmont. Id. at pp. 65-66.

94. In stark contrast to the public testimony at Fairmont, the record contains a number of written submissions from persons in Granada, Huntley, and Winnebago regarding fishing, wading, tubing, and similar activities at the downstream end of the river. Some examples are set forth below (references are to Attachments to the Agency's Final Comments):

> A woman who now lives in New Mexico, but visits her parents who live on Center Creek in Faribault County, indicated her children play in the water. "They fish, wade, build dams, dig for clams, find turtles, etc." They have taken tubes down the creek. They have observed wild life along the creek.
>
> A Faribault County family reports that they live about one city block from the creek and both their children and grandchildren swim, wade, innertube, boat and fish in the creek. Attachment 3.
>
> A person who lives south of Winnebago indicated that he and his grandchildren fish in Center Creek, catching northerns, walleyes, catfish, bullheads and carp. Attachment 4. Similar statements were made in Attachment 5.
>
> The Senior Patrol leader of Boy Scout Troop 148 who lives about halfway between Huntley and Winnebago indicated that he has played and fished in the creek, as well as camping and swimming there as part of his Boy Scout activities. Attachment 6.
>
> A farmer at River Mile 5.5 reported his grandchildren fishing in the creek, and also tubing. His primary concern, however, was the health of his cattle who drink the water. Attachment 7.

A farmer at River Mile 7.3 reported finding a fishing line caught in his fence every now and then, and the creek being used by wildlife. Attachment 8.

A farmer south of Huntley reported people fishing off the bridge "all the time". Attachment 9.

The City of Granada reported children fishing off the bridge and rafting and wading in the creek. Attachment 10. Another Granada resident reported regularly having neighborhood boys riding their bikes down the creek path to take a swim. Attachment 11.

A Granada resident whose six children all swam, fished, and rafted on the creek indicated that Center Creek was "Granada's lake". Attachment 12.

The Verona Township Board of Supervisors indicated that residents of Verona Township (in the Huntley-Winnebago area) do use the creek for fishing and recreation. Attachment 18.

95. Another sharp contrast between the testimony of the residents at Fairmont and the written submissions from the Granada and downstream persons relates to the flow in the stream. In Fairmont, there is little or no flow in the stream most of the time, particularly above the waste water treatment plant. The stream goes dry, and totally freezes in the winter. This is far different from the testimony of the downstream residents, a number of whom say that they have never seen the stream dry up. Attachments 2, 3, 4, 5 and 11.

96. There is no regular gauging station on Center Creek. The creek begins at the Lake George Dam, and the city has records of the flow over the Lake George Dam. Those records (Public Ex. 8, as supplemented by seasonal records submitted by the City on September 29) demonstrate that between 1982 and 1991, each year had periods of time during which there was no flow over the dam. The common scenario was for flows to begin in the spring and early summer, but then to taper off in the late summer and through the winter. Only 1992 and 1993 (through the end of August) had water flowing over the dam every day. However, Lake George is not the sole source of water into the stream above the treatment plant. The cumulative total drainage area of Center Creek at its mouth is 136 square miles. The area above the outlet of Lake George is 43 square miles, Lily Creek (which enters Center Creek between the Lake George Dam and the treatment plant) and other lesser areas result in a total drainage area above the waste water treatment plant (exclusive of the Lake George drainage area) of 48 square miles. So one-third of the total drainage area goes over the Lake George Dam, one-third of the drainage area enters between the dam and the treatment plant, and the remaining one-third is between the treatment plant and the mouth.

97. The 7Q10 flow for the creek above the plant is zero cfs. The average annual design flow for the plant itself is 4.4 cfs. Therefore, during times of low flow conditions, the discharge of treated waste water from the plant provides nearly all of the stream flow in the vicinity of the city.

98. On August 3, 1988, MPCA staff gauged the creek at River Mile 23.7, which is about five river miles below the plant discharge. They determined the stream flow to be between 3.6 and 3.8 CFS. Upstream of that location, at the Interstate 90 crossing which is River Mile 25.8, the flow on that date was 2.14 CFS. Yet on that date, the city's records show there was no flow over the Lake George Dam, and there had not been any flow over the dam since mid-June. Therefore, the flow over the Lake George Dam is not determinative of water levels in the stream below the plant. But most of the flow in the creek at dry times does come from the plant.

99. By combing through the surveys and other data in the record, the Agency found a total of eight instances where water levels were actually measured at River Mile 28.9, which is just upstream of the treatment plant outfall. The waters passing that point would include waters which had come over the dam, plus waters from the Lily Creek Watershed and other smaller sources above the treatment plant. While the data is bunched and is so limited that it is impossible to draw any concrete conclusions from it, it does call into question the assertion that the Lake George data is an accurate representation of the total flow immediately above the treatment plant. See, Attachment 6 to Post-Hearing Response.

100. The Blue Earth River Basin Initiative is a five-county joint powers cooperative agency dedicated to improving the water quality of the Blue Earth River Basin. It is opposed to the reclassification of Center Creek because it believes that the human alterations are reversible and recreational opportunities, along with some fishing, are available. Letter of August 23, 1993.

101. The Department of Natural Resources opposes reclassification of Center Creek. The Department points out that the Governor has directed state agencies to make the Minnesota River "swimmable and fishable" within ten years, and this will require significant reductions of discharges from both urban and rural resources. The Department believes it would be unfair to rural landowners, who are being forced to bring their operations into compliance, if the city were allowed to meet more liberal effluent standards. However, the Department recognizes the economic burden which an immediate nitrification upgrade would pose upon the city, and suggests that a temporary variance from the Class 2B ammonia standard be granted to the city to allow additional time to search for less expensive alternatives.

102. The Department's position is also based upon stream surveys conducted in 1986 and 1992. The DNR survey data from 1986 demonstrates that the predominant fish throughout the creek are rough fish, such as bullheads, carp and suckers. However, at each of four locations surveyed, there was at least one game fish, such as a northern pike, sunfish, or perch. Exhibit C51.

103. The 1992 assessment included a DNR fish survey which was conducted on September 21 and 22, 1992. Water was flowing over the Lake George Dam throughout the entire winter, spring and summer of 1992. It was a very wet year. The number and type of fish found in the 1992 survey were roughly the same as those found in the 1986 survey, except that walleyes replaced northern pike. Exhibit C51.

104. The fish survey data is consistent with the reports of downstream landowners and creek users to the effect that the creek does support a fishery, but primarily rough fish.

105. The habitat along Center Creek is, for the most part, adequate for fish. The stream exhibits little channelization, and there are log jams, boulders, some tree cover and a diverse bottom substream, all of which are conducive to good fish habitat. Exhibit C51.

106. The stream also contains pools, which trap fish when flows diminish. During the September 1992 stream survey, pools with depths in excess of four feet were located. These pools would have 2.5 to 3.0 feet of water in them even under low flow conditions. Tr. 9, pp. 79 to 86.

107. Center Creek has a history of being used for discharge of pollutants. The record contains newspaper articles from 1945 (headline: "Tons of Fish Dying, Rot in Center Creek") and reports of fish kills, damage to livestock, and citizen complaints in 1950, 1957, and 1966. Center Creek contains numerous pastures adjacent to the waterway which contribute animal wastes, decaying plant life, and runoff from adjacent farm land. The city's operating personnel located a point source discharge from an agricultural operation which is discharging water (intermittently) which is much more polluted than that coming from the treatment plant. See, September 29 City Submissions "Other Sources of Nitrogen on Center Creek". It is widely recognized that nonpoint sources are a substantial contribution to pollution of the Minnesota River. However, steps are being taken to enforce pollution from feedlot and other agricultural sources as part of activities to improve the Minnesota and Blue Earth Rivers. Tr. 6, pp. 72-75. As the DNR's regional administrator indicated, farmers will be even less willing to spend money on cleanup if they perceive (rightly or wrongly) that cities are being allowed to increase their pollution. Id., p. 78.

108. It is not practical to divide Center Creek into two reaches, one of which would be classified as Class 2B, the other of which would be classified as Class 7. There is inadequate dilution from the watershed below the treatment plant to permit such a resolution, and neither the city nor the agency have proposed it.

109. The city has offered to voluntarily limit its effluent if the proposed reclassification is granted. The city would retain all of the conditions in its present permit, plus it would accept additional restrictions relating to dechlorination and minimum dissolved oxygen content in the effluent. Tr. 6, pp. 88-89. In response to those who claim that the proposed reclassification would allow the city to put more pollutants into the creek, the city responds that this offer would result in the same effluent conditions as currently exist, and, in the case of chlorination and dissolved oxygen, even better effluent. However, such an agreement would not restrict others from taking advantage of the Class 7 designation.

110. The city's primary concern over the retention of the Class 2B designation is the cost of upgrading its plant to meet the proposed ammonia limitation. The plant was never designed to limit ammonia, and cannot be operated to limit ammonia without substantial revision. If the city were to build a new treatment facility, the construction cost would be $11.973 million if the city had to meet an ammonia limitation, while it would be $10.2 million

if there were no ammonia limitation. The incremental difference is $1.77 million. In contrast, it would cost $8.768 million to rehabilitate the existing facility to enable it to meet the proposed ammonia limitation. If the city were to finance the facility at a six percent interest rate for 20 years, the total average domestic user charge would go from the current amount of roughly $22.00 to $44.00 for a new facility that met the ammonia limitation, $40.00 for a new facility that did not meet the ammonia limitation, and $40.00 to rehabilitate the existing plant to meet the ammonia limitation. Those figures would be slightly less if the interest rate were less than six percent. However, the ratios remain the same. Agency Ex. 23.

111. The city lost 850 jobs due to the closing of the PictSweet/United Foods plant in 1992. Fairmont Foods which used to be the second largest employer, is now the largest employer, at 425 persons. Fairmont Foods is currently considering expanding in Iowa, rather than Fairmont, citing Fairmont's current high sewer, water and electric rates, as well as workers' compensation costs. Fairmont Foods has provided 18 to 25% of the operating revenues of the waste water treatment facility over the last three years. The City is concerned that if it did build a new plant, or rehabilitate its existing plant, and then Fairmont Foods were to relocate to another community, rates for the remaining residents and businesses would "skyrocket". Tr. 6, at 132.

112. Fairmont residents are concerned about their jobs and the economic health of the city. Tr. 7, p. 78. They assert that common sense and reasonableness dictate that $9 to 12 million dollars is too much to spend for the limited uses offered by the creek. Tr. 7, at p. 28. They would far prefer to spend cleanup money on their chain of lakes, which offer more and better fishing and recreation than does Center Creek.

113. Minn. Stat. § 115.43, subd. 1 (1992) provides, in part:

> In exercising all such powers, the agency shall give due consideration to the establishment, maintenance, operation and expansion of business, commerce, trade, industry, traffic, and other economic factors and other material matters affecting the feasibility and practicality of any proposed action, including, but not limited to, the burden on a municipality of any tax which may result therefrom and shall take or provide for such action as may be reasonable, feasible, and practical under the circumstances.

The Agency has suggested that since other statutes and rules provide a process for variances from effluent limitations in the case of "exceptional circumstances . . . caus[ing] undue hardship", that the Agency need not consider the economic impact of the classification until a variance proceeding. That is incorrect. The clear language of the statute quoted above requires that due consideration to economics be given at all times, and the tax burden resulting from an agency proposed action must explicitly be considered. The Agency may not disregard economics when considering a stream classification.

Despite the foregoing legal error, the Administrative Law Judge concludes that the Agency has indicated a sensitivity to, and has adequately considered, the cost issues involved. The Agency has noted that there would be lower incremental costs in applying the ammonia limitation when a new plant is built, rather than trying to retrofit the old plant. The Agency indicated it would give "serious consideration" to an alternative that would delay the implementation of ammonia removal until a new facility could be constructed. The Agency stated that, in essence, the effective date of the ammonia effluent limitation could be delayed by variance until a new facility was in the facility-planning stage. Tr. 9, at pp. 93-95 and Final Comments, at pp. 57-58. In support of this, the Agency pointed out it had already preliminarily determined to support a copper variance for Fairmont. Id.

114. Based on all of the evidence in the record, the Administrative Law Judge concludes that the appropriate classification for Center Creek is Class 2B, rather than Class 7. From Granada downstream, the creek is regularly being used for fishing and swimming. Class 2B limits protect swimmers, while Class 7 ones do not. While swimmers would be protected by the City's offer to maintain and improve its effluent, other current and potential dischargers would not be bound by Fairmont's assurances. Under the facts and circumstances recited above, the stream must be classified as Class 2B, rather than Class 7. It would be appropriate, however, for the Agency to begin the process of considering the variance request reasonably promptly.

Proposed Reclassification: Fraser Mine Pit Lake at Chisholm

115. The record contains numerous documents setting forth the history of the City of Chisholm's use of the Fraser Mine Pit Lake for its drinking water supply, and Aquafarms' past and proposed future use of the same water body for aquaculture. The record also contains a substantial amount of legal argument regarding numerous legal claims by both city and Aquafarms. As was noted in an earlier footnote, the Administrative Law Judge has no authority nor desire to attempt to adjudicate most of the disputes which are presented in the record. Instead, focus is limited to the Agency's proposed reclassification of the Fraser Mine Pit Lake from Class 2B (and other classes) to Class 1C (and other classes). While some of Aquafarms' issues have been addressed above, many of them must be addressed in other forums.

116. The City of Chisholm began using water from the Fraser Mine Pit Lake for its drinking supply in 1977, and executed a license agreement dated August 9, 1978 between United States Steel Corporation and the City. In 1978, the City laid a permanent water line from the Fraser Mine Pit. In 1987, Iron Range Aqua Farm, Inc. purchased certain parcels of real estate from USX Corporation, subject to existing licenses. The original license agreement with U.S. Steel was subsequently assigned to Aquafarms. The City has, since at least 1978, withdrawn water from the pit lake and used it for drinking supply purposes. Unless the license is terminated earlier, it runs until December 31, 1997. However, due to disputes between the City and Aquafarms, the City did, in 1992, purchase other lands adjacent to the Fraser pit. The City believes this now grants it access to the mine pit and the right to withdraw waters separate from the license agreement. The City has let bids to construct a new pumping facility on this newly acquired property, and intends to continue to use the Fraser as its source of drinking water for the indefinite future.

117. The population of the City of Chisholm, according to the 1990 Census, was in excess of 5,000 persons. No one disputed that the City provides piped water for human consumption to at least 25 persons daily for 60 days of the year. Nor did any person suggest that the city's water system did not regularly serve at least 25 year-round residents. Those two numbers are the threshold test for classification as a "public water supply" and a "community water supply", respectively, as contained in Minn. Rule pt. 4720.0100.

118. The Minnesota Department of Health has listed the Fraser Mine Pit Lake at Chisholm as a community water supply source. Exhibit C42 and SONAR, pp. 87-88.

119. Minn. Rule pt. 7050.0200 describes Class 1 waters as follows:

> Domestic consumption includes all waters of the state which are or may be used as a source of supply for drinking, culinary or food processing use or other domestic purposes, and for which quality control is or may be necessary to protect the public health, safety, or welfare.

120. In light of the foregoing facts, the Administrative Law Judge concludes that the Agency has demonstrated the need for and reasonableness of its proposal to reclassify the Fraser Mine Pit Lake as a Class 1C water. None of the legal arguments raised by Aquafarms prohibit the Agency from proceeding with its proposed reclassification.

<u>Proposed Reclassification: Hay Creek at Red Wing</u>

121. Hay Creek is approximately 15 miles long. Its origins are in the upland south of the city of Red Wing. It flows in a northerly direction, reaching the western edge of the city, where it crosses Highway 61 and then enters into a marshy delta area before emptying into the Mississippi River. The upland areas of Hay Creek have been managed for some time by the Department of Natural Resources as a trout stream. The trout population is comprised mostly of wild brown trout. The record contains evidence of trout population surveys from 1975, 1983, 1989 and 1993.

122. The Department of Natural Resources designated the upper reaches of Hay Creek, all but the bottom 3.6 miles, as a trout stream some years ago. The Pollution Control Agency, by adopting prior departmental orders, classified the upper portions of the stream as Class 2A waters. After the 1989 survey, the Department determined to add the remaining 3.6 miles of the creek to the list of trout waters. The Commissioner's Order designating this lower reach of Hay Creek as trout waters was published in the State Register on June 22, 1992. Exhibit C55 at 2914.

123. The Agency has now proposed to amend its rules to add the lower part of the creek to the list of listed trout waters, so that the Agency's rules would conform to the Department's designation. This would add the 2A classification to the lower 3.6 miles of the creek.

124. The S.B. Foot Tanning Company and the City of Red Wing are co-permittees of an NPDES permit for the discharge from a waste water

treatment facility into lower Hay Creek. The point of discharge is approximately 1.7 miles from the junction of the creek and the Mississippi. Tr. 9, at pp. 41 and 49. Therefore, roughly one-half of the proposed reclassified section is upstream of the outfall, while roughly one-half is below it.

125. The treatment facility serves a number of industries, but the predominant contributor is S.B. Foot Tanning Company. Foot is a leather manufacturer which retans and finishes hides at the Red Wing facility. Tr. 9, at p. 21 and Public Ex. 12. Its wastes are discharged to the treatment plant, which processes them by screening, clarification, aeration, another clarification, and disinfection before discharging them to Hay Creek.

126. The proposed reclassification from Class 2B to 2A has raised two concerns for the City and the Foot tannery. The first concern is ammonia removal, and the second concern is a temperature limitation. Both the City and Foot have raised concerns about the Agency's compliance with a variety of statutory requirements, as well as questioning whether the Agency has demonstrated the reasonableness of the proposed reclassification in light of the cost.

127. Both the Agency and Foot have prepared cost estimates to bring the treatment plant into compliance with the ammonia standard for the 2A classification. However, neither has prepared a cost estimate for compliance with the temperature standard.

128. With regard to the ammonia standard, the Agency estimates a total capital cost of approximately $142,000. Final Comments, at p. 72. This assumes, however, that the ammonia standard can be met by optimizing the existing facility. Foot, on the other hand, estimates that in order to assure compliance, mere optimization of the existing facility will not be enough. Foot calculates that a second stage nitrification facility will have to be added. The cost of this would be in the range of $500,000. Public Ex. 12.

129. The existing standard for temperature for Class 2A waters is "no material increase". That standard is not proposed for amendment in this proceeding. Foot's expert indicated that he did not calculate the cost of compliance for that standard because he did not know what it meant. If taken literally, he did not think it could be achieved, as it is virtually impossible to control the temperature of a waste treatment effluent other than to allow it to approximate that of the ambient air, other than by literally heating it or refrigerating it after it is released from the treatment process. The expert (who was highly qualified to testify on the treatment of tannery wastes) was not aware of any facility which did that. He indicated that if the Agency truly meant that the effluent be warmed or cooled to match the temperature characteristics of the receiving stream, the economics of such a proposal for the Red Wing facility would be "inconceivable". Public Ex. 12.

130. In response, the Agency indicated that the "no material increase" thermal limit has been in the rules since 1967. The staff agreed with Foot's expert that if taken literally, it is unlikely that the Foot effluent (or any effluent) could comply with the rule. Staff indicated that historically, however, it had not read the limitation literally. Staff stated that it would not assign effluent limits to the plant's discharge to literally comply with the rule. Instead, it would allow a mixing zone to be used. It would

evaluate instream temperature monitoring in order to determine what, if any, changes would be necessary to comply with the more restrictive standard. Post-Hearing Response, at p. 70 and Attachment 55. In other words, the staff does not now know what the standard actually will be, what will be required to meet whatever it is, and therefore, has no idea what the cost will be.

131. The Agency did acknowledge the need to reevaluate this narrative standard, and either define the term "material", or establish actual numeric temperature criteria for 2A waters. Post-Hearing Response at p. 70, Final Comments at p. 64. The Isaac Walton League submitted a letter indicating support for setting a thermal standard for cold water streams. The League did not, however, indicate any particular numbers, and the implication is that this would be done in the next revision of the rule. The League's comment is apparently independent of the Red Wing situation, as it made no reference to Red Wing.

132. The 1989 stream survey which triggered the Department of Natural Resources's designation of the lower reach of Hay Creek as a trout stream was based upon electroshocking at three locations in the creek. The first location was 1.7 miles from the mouth. It yielded four brown trout, and occasional suckers. The four trout were located just downstream of the treatment plant discharge. The second electroshocking location was 10.9 miles from the mouth. It yielded 89 brown trout. The third electroshocking location was 11.7 miles from the mouth. It yielded 207 brown trout. Therefore, the vast majority of the trout were located substantially upstream of the plant, in the upland reaches which are already classified by the Department (and the Agency) for trout.

133. On August 26, 1993, after the hearings in this matter had commenced, the Department conducted another electroshocking survey at "station one", which begins at the Featherstone Road Bridge and extends 780 feet upstream of that point. It is just a few hundred feet below the plant's discharge. This 1993 survey yielded substantially greater numbers of fish, with 21 trout being found, at lengths ranging from 8.8 to 16.5 inches, and weights ranging up to 1.67 pounds. These were all brown trout. In addition, there was one yearling fingerling brown trout. Based upon sampling efficiencies of .65 for adult trout, and .25 for fingerling trout, the Department estimates that that station contains 219 adult trout per mile, and 27 fingerling trout per mile. Attachment 51. Unfortunately, the record does not contain any electroshocking survey results from August of 1993 at upland reaches, so that it is impossible to know whether the same ratios of lowland population to upland population occurred in 1993 as occurred in 1989. The '89 data, however, comports with testimony in the record which suggests that the trout population is much greater in the upland area than in the lowland area.

134. The creek below the plant's outfall, which is about 1.7 miles long, is marked by the marshy area between Highway 61 and the Mississippi River, and a developing commercial/industrial area upland of Highway 61. Aerial photographs show the stream to be bordered by the Clay City Industrial Park, Wilson Oil Company, a coal storage yard, the Goodhue County Shop Building, and the tannery. (1989 aerial photographs submitted by Red Wing/Foot, and Tr. 9, at p. 44). The only evidence of fishing or recreational use of the 1.7 mile stretch is one mention, in the DNR reclassification documentation, that "Anglers have reported catching trout near Highway 61 and near the mouth of the Mississippi."

135. The Administrative Law Judge concludes that the Agency has failed to adequately consider the cost (and, therefore, the feasibility and practicability) of the proposed reclassification of the lower reach of Hay Creek at Red Wing. The reasonableness of the proposed reclassification is marginal at best in light of the short distance and the character of the adjoining lands when compared to the cost to upgrade the facility. But the uncertainty of the nitrification costs, coupled with the inability of either a well-qualified expert or the Agency to put any cost on the temperature requirement, leads to the conclusion that the proposed reclassification cannot be deemed to be "reasonable, feasible, and practical" within the meaning of Minn. Stat. § 116.07, subd. 6 (1992).

136. The above Finding prohibits the Agency from reclassifying the 1.7 mile reach below the outfall of the treatment plant at this time. The determination does not affect the proposed reclassification of the 1.9 mile reach above the outfall. Therefore, the Agency would be free to reclassify the portion above the outfall if it desired to. The 1989 and 1993 electroshocking data would provide a rational basis to support such a reclassification.

<u>Fond du Lac Nation and Grand Portage Band</u>

137. Both orally (Tr. 5, pp. 41-56) and in writing, the Agency was urged to make a number of changes to the rules to reflect the role of wild rice in the cultural and economic lives of Indian peoples, as well as wild rice's value to waterfowl. The Agency was urged to develop water quality standards to enhance and maintain wild rice waters and habitat.

138. The Agency responded that all known wild rice waters were currently classified as Class 4A waters (a classification designed to permit waters to be used for agriculture). The Agency noted that there was a particular limitation (10 milligrams per liter of sulphates) applicable to water used for the production of wild rice during periods when the rice may be susceptible to damage by high sulphate levels. The Agency indicated that it would be amenable to any additional limitations which would enhance the production of wild rice but that the chemical and environmental factors which protect and promote the growth of wild rice are not well understood at the current time.

139. The Administrative Law Judge finds that the Agency has demonstrated the need for and reasonableness of its proposed classification system for wild rice waters, including Class 4A waters with the special sulphate limitation.

140. It was also proposed that the few remaining quality wild rice waters of the State be designated as ORVWs. The Agency responded that it was unsure of what criteria to use to identify a "quality wild rice water", and that it would be necessary to identify criteria and then follow the rulemaking process in another proceeding before it could make such a change. The Administrative Law Judge finds that the Agency has justified this position, but as has been done in the case of calcarious fens and other unique waters, he would suggest that the commentator work with the Department of Natural Resources and the Agency to determine whether or not criteria could be developed, and the waters properly identified, so that they could be listed in a future rulemaking proceeding.

141. It was also suggested that the Agency develop new standards which would prohibit the removal of riparian vegetation around cold water streams, protect fisheries and shore birds in the St. Louis River from impacts of a hydropower dam, and protect cold water streams from pollution by livestock which are allowed to tramp through and enrich streams. In each case, the Agency responded that it could not react to the proposals during this rulemaking proceeding. The Administrative Law Judge agrees with that assertion, and finds the rules to be needed and reasonable without the proposed additions.

142. The Grand Portage Band also noted that the Agency was proposing to specifically list and classify four water bodies which were located within the Grand Portage Reservation. The four bodies were Grand Portage Creek, Hollow Rock Creek, Red Rock Creek, and Reservation River. The Band also asked that any other waters of the Reservation which were listed in the rules be removed from the rules. The Grand Portage Reservation Tribal Council asserted that it, rather than the State, had authority to regulate those waters because it had inherent authority to regulate activities and natural resources within the boundaries of the reservation. The Tribal Council did not, however, supply any legal authority for its position.

143. The Agency responded, in its Final Comments at pp. 77-82, with a legal argument that basically asserts that listing and classifying the four bodies of water are properly within the scope of the rule, but that questions of who has jurisdiction to regulate persons whose activities may affect these bodies of water need not and cannot be determined in this rulemaking proceeding. The Agency asserted that the issue of who has authority to regulate activities on reservations depends on many variables, and must be determined on a case-by-case basis.

144. The Administrative Law Judge concludes that the Agency has demonstrated its statutory authority to list and classify the four water bodies (and by implication, any other water bodies already listed and classified in the existing rules), even though they are located either partially or wholly within the boundaries of an Indian reservation.[3]

145. Both the Grand Portage Band and the Fond du Lac Nation urged the Agency to support regulations proposed by the EPA entitled, "Water Quality Guidance for the Great Lakes System", as published in the Federal Register on April 16, 1993. This guidance, commonly known as the Great Lakes Initiative, deals with issues such as mercury, PCBs and dioxin. The Agency responded that it has been involved in the development of the proposal, and has submitted substantial comments on the proposal following its publication. The Agency indicated it intended to continue to work with the EPA on the proposal. The Administrative Law Judge finds that no change to the rules is required as the result of this suggestion.

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[3]This conclusion is limited to the narrowest of issues -- whether the Agency has statutory authority to list and classify waters which are located either partially, or wholly, within the boundaries of a reservation. It should not be misinterpreted as expressing any opinion on enforcement powers, priority of rights, or any other matters which might arise in some other setting.

Miscellaneous Issue: Biological Criteria

146. Identical letters submitted by Minnesota Timber Producers Association and Minnesota Forest Industries, Inc. raised a question about language in proposed Rule 7050.0150. The particular language at issue reads as follows:

> The intent of the State is to protect and maintain surface waters in a condition which allows for the maintenance of all existing beneficial uses. The condition of a surface water body is determined by its physical, chemical, and biological qualities.
>
> The biological quality of any given surface water body shall be assessed by comparison to the biological integrity of a reference condition or conditions which best represents the most natural condition for that surface water body type within a geographic region. The biological quality shall be determined by reliable measures of indicative communities of fauna and flora.

With regard to the last sentence in the proposed rule, the commentators asked whether the "reliable measures" would be taken at one point in time, or throughout time. They indicated that biological quality and conditions do change over time due to succession, the life cycle of the community and other factors. They urged that the Agency recognize the need to take such measurements over time.

147. The Agency responded (Post-Hearing Response, at p. 80) that it recognized the need to update biological reference conditions over time to reflect natural successional changes that occur over several years, as well as seasonal changes which might require adjustment of data from one season to another.

148. Northern States Power Company raised a related issue, asking whether or not human activities, such as agriculture, industrial consumption, navigation and fishery use would be considered when establishing reference conditions for biological quality. The Agency responded (Final Comments, at p. 104-05) that it recognized that water bodies were subject to a number of different kinds of human activities. The Agency distinguished, however, between direct impacts from human activities (such as point source discharges at a specific location) and more ubiquitous human impacts, such as atmospheric deposition which affects most waters throughout the state. The Agency did not think it was appropriate to include the first kind of impact, but recognized it would be difficult to avoid including the second. The Agency explained that "reference conditions which best represent the most natural condition" was intended to refer to minimally impacted or least impacted sites, rather than pristine ones.

149. Ashland Petroleum Company went beyond those inquiries to attack the lack of specificity in the proposed rule. Ashland indicated that the proposed rule does not adequately address how biological quality will be measured, for what purposes the measurement will be used, what will constitute acceptable biological quality, and what actions will be taken to address degraded biological quality. Ashland also expressed concern about the costs associated

with conducting biological assessments, suggesting that the Agency will be unable to conduct them itself, and will shift the cost of performing assessments unto the regulated community. Finally, Ashland questioned the need for the rule at all.

150. The Agency responded to these questions and issues at some length in its Final Comments (pp. 104-114). The Administrative Law Judge concludes that the Agency has demonstrated the need for and reasonableness of its proposed rule. The long and short of the matter is that the Agency does not have a choice about adoption. The EPA is requiring the adoption of narrative biological criteria at this time. As in the case of wetlands discussed at the start of this Report, the EPA can and does dictate the agenda which the states must follow.

Miscellaneous Issues: Reclassification of Minnesota and Mississippi Rivers

151. A number of commentators suggested that the Agency upgrade various portions of the Mississippi River or the Minnesota River. The Department of Natural Resources (both rivers), the Isaac Walton League (Mississippi), the Sierra Club (both rivers). The Agency responded that such reclassifications, without prior notice, would be a substantial change to the rule as initially proposed, but that the staff would discuss these issues with interested parties before the next triennual review begins. Final Comments, p. 118. The Administrative Law Judge believes this to be a reasonable position, and the Agency's proposed rule may be adopted without such changes. A similar comment was made by the United States Fish & Wildlife Service with regard to refuges and certain other classes of sites. The Administrative Law Judge agrees with the Agency that it would be inappropriate to attempt to make such reclassifications at this point in this rulemaking proceeding.

Based upon the foregoing Findings of Fact, the Administrative Law Judge makes the following:

CONCLUSIONS

1. That the Agency gave proper notice of the hearing in this matter.

2. That the Agency has fulfilled the procedural requirements of Minn. Stat. §§ 14.14, subds. 1, 1a and 14.14, subd. 2, and all other procedural requirements of law or rule.

3. That the Agency has demonstrated its statutory authority to adopt the proposed rules and has fulfilled all other substantive requirements of law or rule within the meaning of Minn. Stat. §§ 14.05, subd. 1, 14.15, subd. 3 and 14.50 (i)(ii), except as noted at Finding 135.

4. That the Agency has documented the need for and reasonableness of its proposed rules with an affirmative presentation of facts in the record within the meaning of Minn. Stat. §§ 14.14, subd. 2 and 14.50 (iii).

5. That the amendments and additions to the proposed rules which were suggested by the Agency after publication of the proposed rules in the State Register do not result in rules which are substantially different from the

proposed rules as published in the State Register within the meaning of Minn. Stat. § 14.15, subd. 3, and Minn. Rule 1400.1000, subp. 1 and 1400.1100.

6. That the Administrative Law Judge has suggested action to correct the defects cited in Conclusion 3 as noted at Finding 135.

7. That due to Conclusion 3, this Report has been submitted to the Chief Administrative Law Judge for his approval pursuant to Minn. Stat. § 14.15, subd. 3.

8. That any Findings which might properly be termed Conclusions and any Conclusions which might properly be termed Findings are hereby adopted as such.

9. That a finding or conclusion of need and reasonableness in regard to any particular rule subsection does not preclude and should not discourage the Agency from further modification of the proposed rules based upon an examination of the public comments, provided that no substantial change is made from the proposed rules as originally published, and provided that the rule finally adopted is based upon facts appearing in this rule hearing record.

Based upon the foregoing Conclusions, the Administrative Law Judge makes the following:

RECOMMENDATION

It is hereby recommended that the proposed rules be adopted except where specifically otherwise noted above.

Dated this 5th day of November, 1993.

Allan W. Klein

ALLAN W. KLEIN
Administrative Law Judge

pcA

STATE OF MINNESOTA)
) ss.
COUNTY OF HENNEPIN)

AFFIDAVIT OF PERSONAL SERVICE

LaVon Regan, being first duly sworn, hereby deposes and says that on the 8th day of November, 1992, at the City of Minneapolis, county and state aforementioned, she served the attached REPORT OF THE CHIEF ADMINISTRATIVE LAW JUDGE AND REPORT OF THE ADMINISTRATIVE LAW JUDGE; OAH Docket No. 6-2200-8062-1, upon Charles W. Williams, Commissioner, Pollution Control Agency, by personally handing to x Deborah A. Olson said REPORTS and Official Record.

LaVon Regan

Subscribed and sworn to before me
this 8th day of November, 1993.

Louise C. Cooper
Notary Public

LOUISE C. COOPER
NOTARY PUBLIC—MINNESOTA
DAKOTA COUNTY
MY COMMISSION EXPIRES 4-6-99

80/100 Mike Sim Ousky
Marv

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

RECEIVED
JUN 19 2003

17 JUN 2003

REPLY TO THE ATTENTION OF:
WQ-16J

Mr. Rod Massey, Director
Policy and Planning Division
Minnesota Pollution Control Agency
520 Lafayette Road N.
St Paul, Minnesota 55155-4194

Dear Mr. Massey:

On January 29, 2003, the Minnesota Pollution Control Agency (MPCA) submitted revisions of Minnesota's water quality standards rules to the United States Environmental Protection Agency (USEPA) for review. The submittal included revisions to Minn.R.pt.7050.0150, Determination of Compliance With Water Quality Standards and Water Quality Condition; Minn.R.pt.7050.0210, General Standards for Dischargers to Waters of the State; Minn.R. pt. 7050.0222, Specific Standards of Quality and Purity for Class 2 Waters of the State; and Minn.R. pt. 7050.0470, Classifications for Waters in Major Surface Water Drainage Basins. These revisions were adopted by Minnesota on January 27, 2003, and became effective on February 1, 2003. On May 19, 2003, MPCA submitted to USEPA a certification by the Minnesota Attorney General that the rule revisions submitted on January 29, 2003, were duly adopted by Minnesota.

The rule revisions submitted by Minnesota add "assessment factors", which are interpretive language describing the types of data and information used to apply three existing narrative standards in water quality assessments. In addition, Minnesota has made three "housekeeping" changes to Minn.R. ch 7050, correcting two typographical errors, and relocating the narrative standards within Minn. R. ch 7050. The purpose of these rule revisions is to provide a consistent framework for Minnesota to apply state narrative water quality standards to site-specific conditions when making determinations of whether or not the narrative standards are attained in a given water body.

As specified in the Federal regulations at 40 CFR 131.21, USEPA is required to review and approve new and revised State water quality standards. USEPA has reviewed the information submitted in support of the revised rules and determined that the revised rules comply with the requirements of Section 303(c) of the Clean Water Act (CWA) and 40 CFR 131. USEPA also reviewed the information provided by MPCA and determined that Minnesota's revisions complied with the procedural requirements of Federal regulations at 40 CFR 131.20. Finally, as stated previously, the revised rules were certified as to legality by the Minnesota Attorney General in a letter dated May 19, 2003. Therefore, USEPA hereby approves the revised rules pursuant to Section 303 of the CWA and Federal regulations at 40 CFR 131.21.

Consistent with Section 7 of the Endangered Species Act, USEPA is required to consult with the United States Fish and Wildlife Service (USFWS) on any action it takes that might affect federally-listed threatened and endangered species. Approval of new and revised State water quality standards under Section 303 of the CWA is an action requiring consultation. USEPA prepared a biological evaluation of Minnesota's revised water quality standards. Based on this evaluation, Minnesota's rules appear unlikely to adversely affect federally-listed threatened, endangered or candidate species in Minnesota. A copy of the biological evaluation prepared by USEPA and revised based on consultation with and comments from the USFWS is enclosed. The USFWS concurred with the findings of the biological evaluation but requested the inclusion of two candidate species, the Dakota skipper butterfly and the Eastern massasauga snake. It is the USFWS's and USEPA's determination that these two species would not be adversely affected by the Minnesota rule revisions. Based on our review and the consultation with the USFWS, the USEPA is approving the new and revised water quality standards referenced above.

If you have any questions regarding this action, please contact me or either David Pfeifer Francine Norling, or Thomas Poleck of my staff. Mr. Pfeifer may be reached at (312) 353-9024, Ms. Norling can be reached at (312) 886-0271, and Mr. Poleck can be reached at (312) 886-0217.

Sincerely yours,

Linda Holst

for Jo Lynn Traub
Director, Water Division

Enclosure

cc: Dan Stinnett, USFWS, Twin Cities Field Office
David Maschwitz, MPCA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 W. JACKSON BOULEVARD
CHICAGO, IL 60604-3590

BIOLOGICAL EVALUATION FOR MINNESOTA POLLUTION CONTROL AGENCY (MPCA) REVISED WATER QUALITY STANDARDS RULES

(submitted January 29, 2003)

Prepared by:
U.S. EPA, Region 5
Water Quality Branch

April 8, 2003

Contents

Executive Summary

On January 29, 2003, the Minnesota Pollution Control Agency (MPCA) submitted revisions of Minnesota's water quality standards rules to the United States Environmental Protection Agency (USEPA) for review. The MPCA is proposing to amend Minn.R.ch.7050, which contains statewide provisions that protect the quality of Minnesota's surface and ground waters from pollution. The proposed amendments add "assessment factors", which are interpretive language describing the types of data and information used to apply three existing narrative criteria in evaluating water quality data to determine whether or not the narrative criteria are attained. Narrative water quality criteria are descriptive statements that prohibits unacceptable conditions in or upon the water that would impair designated uses. The proposed assessment factors do not change the narrative criteria themselves. The three narrative standards to which these factors apply protect surface water from:

- impairments due to excess plant nutrients;
- impairments of the biological community and aquatic habitat; and
- from the presence of contaminants in fish tissue at levels that make fish unsafe for human consumption.

In addition, MPCA has proposed three "housekeeping" changes to Minn.R.ch 7050, correcting two typographical errors, and relocating one regulatory provision within Minn. R. ch 7050.

The purpose of these revisions is to provide a consistent framework for MPCA's staff to apply MPCA's narrative water quality criteria to site-specific conditions when making determinations of whether or not the narrative standards are attained in a given water body. The revisions also give the public a better understanding of the assessment of their specific water bodies of interest.

Water Quality Branch staff in the Water Division of USEPA Region 5 reviewed the proposed rule revisions for consistency with the requirements of the Clean Water Act and its regulations and the Endangered Species Act and its regulations. Based on this review, the details of which are provided below, it is our conclusion that this rule is not likely to adversely affect listed endangered, threatened or candidate species. Nine of the specific rule changes will have no effect on listed species. Two of the rule changes, namely Minn. R. ch. 7050-0150, Subpart 5 (impairment of waters due to excess algae or plant growth) and Subpart 6 (impairment of biological community and aquatic habitat) may have a beneficial effect on aquatic and aquatic-dependent species, due to the state of Minnesota's improved ability to detect and therefore correct water body impairments. The aquatic and aquatic-dependent species that may be beneficially affected by this rule include Higgins Eye Pearly Mussel, Mapleleaf Winged Mussel, Topkea Shiner, Bald Eagle, Piping Plover, and Eastern Massasauga.

I. Description of Federal Action

On January 29, 2003, the Minnesota Pollution Control Agency (MPCA) submitted revisions of Minnesota's water quality standards rules to the United States Environmental Protection Agency (USEPA) for review. Under Section 303 of the Clean Water Act (CWA), States are required to submit new and revised water quality standards to USEPA for review and approval. USEPA reviewed the revised rules and found that they are consistent with the applicable requirements of the CWA and Federal regulations implementing the CWA at 40 CFR 131. Based on this review, USEPA intends to approve Minnesota's revised rules.

Description of MPCA Submission

MPCA revisions amend Minn.R. ch.7050, which contains statewide provisions that protect the quality of Minnesota's surface from pollution. The proposed amendments add "assessment factors", which are interpretive language describing the types of data and information used to apply three existing narrative criteria in water quality assessments. A narrative water quality criterion is a descriptive statement that prohibits conditions in or upon the water that will impair existing uses. The proposed assessment factors do not change the narrative criteria themselves. The three narrative criteria to which these factors apply protect surface water from:

- impairments due to excess plant nutrients;
- impairments of the biological community and aquatic habitat; and
- from the presence of contaminants in fish tissue at levels that make fish unsafe for human consumption.

These narrative criteria are located in Minn.R. pt.7050.0150, and Minn.R.pt.7050.0222. The pertinent subparts (namely 5, 6, and 7) are reproduced in full in Appendix A.

In addition, MPCA has proposed three "housekeeping" changes to Minn.R.ch 7050, correcting two typographical errors, and relocating one regulatory provision within Minn. R. ch 7050.

The Purpose of the Revisions to MPCA's Rules

MPCA initiated these rule revisions in response to a petition from four stakeholders. The purpose of these revisions is to provide a consistent framework for MPCA's staff to apply MPCA's narrative water quality standards to site-specific conditions when making determinations of whether or not the narrative criteria are attained in a given water body. The revisions also give the public a better understanding of the assessment methods that are used to determine the attainment status of their specific water bodies of interest.

II. Action Area

These revisions apply to all waters within the entire State of Minnesota.

III. Endangered and Threatened Species Present in the Action Area

All listed species in Minnesota

Federally listed species (including endangered, threatened, and candidate species) in Minnesota, as catalogued on the U.S. Fish and Wildlife Service website on February 11, 2003, include the following 15 species (11 animals and 4 plants):

Animals: Karner Blue Butterfly, Bald Eagle, Higgins Eye Pearly Mussel, Canada Lynx, Mapleleaf Winged Mussel, Piping Plover (Great Lakes watershed), Piping Plover (other than Great Lakes watershed), Topeka shiner; Gray Wolf, Eastern Massasauga, Dakota Skipper.

Plants: Minnesota Dwarf Trout Lily, Prairie Bush-clover, Western Prairie Fringed Orchid, Leedy's Roseroot.

Species Accounts

Karner Blue Butterfly (*Lycaeides melissa samuelis*)

This butterfly lives in dry and sandy areas, including oak savanna and jack pine areas, and dune/sand plain communities, which support wild lupine and nectar plants (USFWS Draft Recovery Plan - October, 2001) These habitats are not aquatic or aquatic-dependent. Therefore, this species will not be considered further in this biological evaluation.

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was placed on the federal endangered species list in 1972, and are listed as threatened in Minnesota. Bald eagles feed opportunistically on fishes, injured waterfowl and seabirds, various mammals, and carrion (Terres 1980). Breeding habitat most commonly includes areas close to (within 4km) coastal areas, bays, rivers, lakes, or other bodies of water that reflect the general availability of primary food sources (Andrew and Mosher 1982, Green 1985, Campbell et al. 1990). Eagles usually nest in tall trees or on cliffs near water. They preferentially roost in conifers or other sheltered sites in winter in some areas, and typically selects the larger, more accessible trees (Buehler et al. 1991, 1992). Wintering areas are commonly associated with open water though in some areas eagles use habitats with little or no open water if other food resources (e.g., rabbit or deer carrion) are readily available. Winter home ranges can be very large, especially for non-breeding birds. Eagles usually avoid areas with nearby human activity (boat traffic, pedestrians) and development (buildings) (Buehler et al.1991; all references in previous paragraph as listed by http://www.natureserve.org).

Eagles have expanded their range from northern Minnesota and now nest in southeastern Minnesota. In 1988, eagles were found nesting along the Minnesota River Valley in western Minnesota for the first time in over 100 years. In 1989, there were 390 occupied breeding areas in Minnesota; today there are over 700. Nests are constructed in large white or red pine trees, aspen or cottonwood, near lakes and rivers in remote areas. In recent years however eagles are choosing sites near lakes with moderate recreational use, near dwellings and even in metropolitan areas. (www.dnr.state.mn.us/birds/eagles/). Although recovering in many areas, the bald eagle is still susceptible to a number of threats, particularly environmental contaminants and excessive disturbance by humans. Major threats include habitat loss, disturbance by humans, biocide contamination, decreasing food supply, and illegal shooting (Evans 1982, Green 1985, Herkert 1992, from www.natureserve.org). In 1992, many died in northern Utah after eating poisoned bait set out by ranchers. Breeding success still is being affected by environmental contaminants in the diet along Lake Superior in Wisconsin (Kozie and Anderson 1991, from www.natureserve.org).

Freshwater Mussels

Freshwater unionid mussels, as a whole, are known to feed on organic particles, algae, and microscopic plants and animals which they filter from the water column (http://endangered.fws.gov). These species reproduce sexually by broadcast release of sperm which the female obtains through filtration. The fertilized egg develops within the female until it is released into the water column as a glochidial larvae that attaches to the gills or fins of host fishes. The glochidia are encysted during their development and then drop to the streambed as juvenile mussels (http://endangered.fws.gov). Freshwater mussels are filter-feeding, essentially immobile animals. They acquire oxygen and food across their extensive gill surface, and release metabolic waste into the surrounding water. Because North American species lack true siphons, or tubes for water intake and release, most species are confined to burrowing only as deep as the posterior edge of the shell, rendering them susceptible to predators, desiccation, and temperature extremes. Nevertheless, many species live 20-30 years, some up to 140 years (Bauer, 1987c). The decline in freshwater mussel populations is likely due to construction of impoundments and navigation facilities, dredging for channel maintenance, sand and gravel mining, and water pollution (including both point and nonpoint sources of pollution). Furthermore, any of these threats could have also affected host fishes, which would lead to indirect adverse effects on mussel populations. Very little information is known about the specific habitat associations, food sources, and reproductive biology of endangered unionid mussels, so more general information is listed in the following species accounts.

- **Higgins Eye Pearly Mussel (*Lampsifis higginsii*)**: The Higgins' Eye pearly mussels were listed as an endangered species in 1976. The Higgins' Eye pearly mussels are now found in parts of the following rivers: the upper Mississippi River north of Canton, Missouri, and in 3 tributaries of the Mississippi River - the St. Croix River between Minnesota and Wisconsin, the Wisconsin River in Wisconsin, and the lower Rock River between Illinois and Iowa. The species' current range is about 50% of its historic distribution. Even within its current range it formerly was more widespread and abundant, occurring as far south as St. Louis, Missouri, and in several additional tributaries of the Mississippi River. (USFWS (http://endangered.fws.gov) and www.natureserve.org).

  While apparently never abundant, the species has declined due to a number of factors including: commercial use for buttons in the early 20th century, channel dredging, industrial and agricultural effluents, increased bedload, overharvesting, siltation, dam and levee construction, microorganism (bacteria and protozoa) induced diseases, and competition with other species including most recently the zebra mussel. Researchers estimate that the range of the Higgins' Eye is only half of what it used to be. The Higgins' Eye and other kinds of mussels are the foundation of a healthy river. (USFWS Recovery Plan, 1982 and www.natureserve.org)

Higgins' Eye pearly mussels depend on deep, free-flowing rivers with clean water. The animals bury themselves in the sand and gravel river bottoms with just the edge of their partially-opened shells exposed. Much of their historic habitat was changed from free-flowing river systems to impounded river systems. This resulted in different water flow patterns, substrate characteristics, and host fish habitat and movement which affect how the Higgins' Eye feed, live, and reproduce. Municipal, industrial, and farm run-off degrade water quality. As a filter-feeder, this species concentrates chemicals and toxic metals in body tissues and can be poisoned by such chemicals in the water. Dredging and waterway traffic produce siltation which cover the substrate and mussel beds. The role of Higgins' Eye pearly mussels in the natural river ecosystems is as a food source for wildlife like muskrats, otters, and raccoons and as a filter which improves water quality. (www.natureserve.org)

- **Mapleleaf Winged Mussel (*Quadrula fragosa*)**: The winged mapleleaf freshwater mussel was listed as federally endangered in 1991. A federal recovery plan was completed in 1997 (U. S. Fish and Wildlife Service, 1997) which called for a refinement of the geographic range of this species in the St. Croix River bordering Minnesota and Wisconsin.

  The historical distribution includes records from 34 rivers in 12 states, all from tributaries of the upper Mississippi River or from the Mississippi River itself. The Winged Mapleleaf Mussel is probably extirpated from its entire historic range except for one remnant population in the St. Croix River between Minnesota and Wisconsin. (U. S. Fish and Wildlife Service Recovery Plan, 1997). It may also be located in a single site in the Ohio River adjacent to Kentucky and the Ouachita River in Arkansas (www.natureserve.org)

  The winged mapleleaf freshwater mussel appears to have inhabited medium-sized and large rivers. Locality records indicate that it also inhabited riffle areas and substrates ranging from sand and gravel to mixture including some cobble and boulder sized particles. Some threats to habitat include chemical and organic pollution, alteration and inundation of river channels and siltation have, and continue to have, a severe negative impact on this species. Commercial harvest of shells may also be a threat. The species is sensitive to pollution, siltation, habitat perturbation, and loss of glochidial host. A single catastrophic event could possibly cause the extinction of this species. (www.natureserve.org)

Canada Lynx (*Lynx canadensis*)

The Canada Lynx, the only lynx in North America, is a rare forest-dwelling cat of northern latitudes. It feeds primarily on snowshoe hares but also will prey on small mammals and birds. Within the contiguous United States, the lynx's range extends into different regions, including the Great Lakes (Minnesota, Wisconsin, and Michigan), that are separated from each other by ecological barriers consisting of unsuitable lynx habitat.

The Canada Lynx was determined by the USFWS in March, 2000 to be threatened in the contiguous U.S. The USFWS concluded that the threat to the lynx is the lack of guidance to conserve the species in current Federal land management plans. One of the primary reasons for listing the lynx is the low numbers in the contiguous U.S. and southern Canada, and the residual effects of overtrapping that was believed to have occurred in the 1970's and 1980's, in response to unprecedented high pelt prices. (USFWS, Lynx Biological Assessment, December 1999)

Primary habitat in the Great Lakes and Northeast geographic areas is large areas of continuous boreal forests (with interspersed hardwoods and bogs). Lynx prefer to move through continuous forest, and particularly use ridges, saddles, and riparian areas (Koehler, 1990; USFWS, Lynx Biological Assessment, December 1999). The Interim Lynx Conservation Assessment and Strategy (LCAS) identifies the following risk factors to lynx in the Great Lakes: timber management, fire exclusion, roads and winter recreation trails, incidental trapping and shooting, predation, being hit by vehicles, obstructions to movement, and habitat conversion through agricultural and urban development. Water quality issues have not been listed as a significant threat to the Canada Lynx.

Piping Plover (*Charedruis melodus*)

The sandy shores of the Great Lakes are one of the breeding grounds of this endangered pale-colored shorebird. The Minnesota breeding and winter areas include Duluth Port Terminal in St. Louis County and Pine and Curry Island, Morris Point, Rocky Point, Zippel Bay in Lake of the Woods County although the plovers is now considered extirpated from Minnesota. (Boyne, 2000 from www.natureserve.org). The 1991 international census estimated the number of breeding pairs in the Northern Great Plains at 1486, with 897 pairs in the U.S. and 589 pairs in Canada (USFWS 1994). Estimates for the Atlantic coast were 702 pairs in the U.S. and 236 pairs in Canada. The Great Lakes population included only 17 pairs, all in Michigan. (www.natureserve.org)

Around the Great Lakes, the Piping Plover breeds on sand and gravel shorelines, and behind foredune among cobble and sparse vegetation on islands (Powell and Cuthbert 1992). Niemi and Davis (1979) found that less than 8 percent of the available beach habitat was suitable for piping plover nesting. (From www.natureserve.org)

Food consists of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates (Bent 1928). The chicks learn to feed themselves and eat smaller versions of adult food items (Hull 1981). Open shoreline areas are preferred, and vegetated beaches are avoided (Cuthbert and Wiens 1982). (From www.natureserve.org)

Reasons for decline include: early 20th century shore bird hunting, loss of sandy beaches and other littoral habitats due to recreational/commercial developments and dune stabilization on the Great Lakes. Also, traditional nesting areas have been destroyed by high water levels, flooding, or eroding beaches. Threats to the survival of the species include loss of beach habitat, vehicular and human traffic on beach nesting areas, and channelization and modification of river flows that have led to the elimination of sandbar nesting habitat. Nesting territories often include small creeks or wetlands. Future threats are similar to current threats and include - increased recreational and commercial activity on beaches, wetland drainage, increased predation, and high lake water levels. (USFWS Recovery Plan, 1988)

Topeka Shiner (*Notropis topeka*)

The Topeka shiner is listed as Federally endangered (63 FR 69021, December 15, 1998). The Topeka shiner is a small minnow, less than three inches in total length that occurs primarily in small prairie (or former prairie) streams and in pools containing clear, clean water. Most Topeka shiner streams are perennial (flow year-round), but some are small enough to stop flowing during dry summer months. In these circumstances, water levels must be maintained by groundwater seepage for the fish to survive. Topeka shiner streams generally have clean gravel, rock, or sand bottoms. (USFWS Fact Sheet, http://mountain-prairie.fws.gov/endspp/shiner/facts.htm). The Topeka shiner eats midge larvae and other aquatic invertebrates (abundant silt, sand, and detritus in gut contents indicates substantial benthic feeding) (Kerns, unpubl.; Cross and Collins 1995) (http://www.natureserve.org/)

In August, 2002, the USFWS proposed designating critical habitat for the Topeka shiner a total of 186 stream segments, representing 3,765.9 kilometers (2,340 miles) of stream in the States of Iowa, Kansas, Minnesota, Nebraska, and South Dakota, including the Rock and Big Sioux River watersheds in Minnesota. In Minnesota, 14 streams in the range of the Topeka shiner were surveyed between 1985 and 1995. The species was collected from 5 of 9 (56 percent) streams with historic occurrences, and was not found in the 5 streams with no historic occurrences. These locales were in the Rock River drainage. In 1997, additional surveys were completed with the species being captured at 15 sites in 8 streams, including a stream in the Big Sioux River basin (Baker, in litt. 1997) (from Federal Register Notice: August 21, 2002 (Volume 67, Number 162)] [Proposed Rules] [Page 54261-54306])

The Topeka shiner is susceptible to water quality changes within its habitat, and has disappeared from several sites because of increased sedimentation resulting from accelerated soil runoff. Any activity which removes the natural protective vegetation covering within a stream's watershed may contribute to this factor, including agricultural cropping, urban development, and highway construction. Additionally, construction of stock watering ponds and watershed impoundments on streams containing Topeka shiners has been shown to eliminate this species from those stream reaches. (USFWS Fact Sheet, http://mountain-prairie.fws.gov/endspp/shiner/facts.htm). The major threats are land and water practices that alter the physical and biological characteristics of streams. Sensitive to permanent changes in habitat such as reduced water quality and increased water temperture. Detrimental land practices, such as cultivation, clearcut logging, building projects, and intensive, continuous grazing, increase the amount of silt and sediment in streams. (http://www.natureserve.org/)

Gray Wolf (*Canis lupus*)

The gray wolf once inhabited a variety of biomes within North America including boreal forests, temperate deciduous forests and temperate grassland. Killing by humans, loss of habitat, and loss of prey (bison, elk, deer, moose, caribou, and beaver) caused wolf declines early on. The gray wolf was essentially eliminated from all of Wisconsin, Michigan (except Isle Royale), and most of Minnesota by 1960. During the mid- to late 1970's, Minnesota estimated the wolf population at about 1,000 to 1,200 animals. The Minnesota DNR 1988-89 winter survey estimated from1,500 to 1,750 wolves. Currently, the DNR estimates that 2,445 wolves live in Minnesota. (http://midwest.fws.gov/wolf/wgl/r3wolfct.htm)

Over the 25 years since receiving Endangered Species Act protection as a threatened species, the gray wolf increased its range in the north-central and central parts of Minnesota. This successful range expansion was due to protections from uncontrolled killing, high deer numbers, and dispersal of individuals from existing packs. Wolves eat a variety of large and small animals, but white-tailed deer make up about 80 percent of their diet. Beaver are often taken in the spring and summer, while deer, and a few moose, are taken more frequently in winter. In areas of mixed farms and forest, domestic livestock are sometimes preyed upon. However, wolves prefer the large, extensive forest areas of northern Minnesota. The Minnesota Department of Natural Resources developed a Wolf Management Plan in February, 2001 to ensure the long-term survival of wolves in Minnesota while addressing wolf-human conflicts that inevitably result when wolves and people live in the same vicinity. (MNDNR, Wolf Management Plan, February 2001)

Eastern massasauga (*Sistrurus catenatus catenatus*)

The eastern massasauga rattlesnake is a Federal candidate species and are listed by Minnesota as endangered (Minnesota DNR 1996). A small rattlesnake found in wetland and associated native upland habitats, the Eastern massasauga was once found throughout much of the Midwestern United States. A broad array of vegetation communities are utilized by the eastern massasauga, including bogs, marshes, prairies, meadows, and coniferous forests. Recent studies suggest that massasaugas utilize both upland and wetland habitats. The eastern massasauga preys upon rodents and other snakes (Szymanski, 1998).

In Minnesota, two of the five historical populations are extirpated and the other three are likely extirpated. The last reported sighting was in 1986 by the Minnesota County Biological Survey (MCBS, 1994). A 1994 survey failed to document massasauga occurrence. If populations persist in Minnesota, they are threatened by small population size and habitat fragmentation.(Szymanski, 1998).

The listed threats to these populations are habitat modification, indiscriminate killing, and highway mortality, as well as collection, gene pool contamination, incompatible management practices, and habitat loss (Szymanski, 1998). Although the Eastern massasauga can be considered aquatic-dependent, water quality issues have not been identified as potential threats to the eastern massasauga.

Dakota skipper (*Hesperia dacotae*)

The Dakota skipper is a small butterfly that is currently listed as a candidate species under the Endangered Species Act. Dakota skippers occupy two types of habitat, low wet prairie dominated by bluestem grasses and upland dry prairie dominated by bluestem grasses and needle grasses. Dakota skippers are found exclusively on remnant native prairie habitats in both the tall-grass and mixed grass prairie eco-regions, although it likely occurred throughout a relatively unbroken area of grassland in the north-central U.S. and south-central Canada. These habitat are not aquatic or aquatic-dependent. The most significant remaining populations of the Dakota skippers occur in western Minnesota, northeastern South Dakota and north-central and southeastern North Dakota. (USFWS Fact Sheet, 2002)

The Dakota skipper are primarily threatened due to the widespread conversion of native prairie for agriculture and other uses. In addition, the isolation of the remaining populations have added to their decline. Areas in the original range of the Dakota skipper have lost 85%-99% of their historical tall-grass prairie and 72%-99% of their historical mixed-grass prairie. (USFWS Fact Sheet, 2002). Ongoing threats include, over-grazing, inappropriate fire management and herbicide use, woody plant invasion, invasive plant species, road contraction, and gravel mining. Water quality issues have not been identified as potential threats to the Dakota skipper.

Minnesota Dwarf Trout Lily (*Erythronium propullans*)

This endangered species is Minnesota's only endemic plant species, found in Rice and Goodhue Counties. (USFWS Recovery Plan, 1987.) It is a "spring ephemeral", adapted to flower and grow before the deciduous trees develop their leaves. This species occurs on fewer than 600 acres of woodland habitat, rich slopes dominated by maple and basswood, and adjoining floodplains dominated by elm and cottonwood. (USFWS Fact Sheet.) Nineteen specific sites have been identified where this species occurs. (USFWS Recovery Plan, 1987). About half of these sites are included in State Scientific and Natural Areas, State or County parks, or private preserves such as those of the Nature Conservancy. (USFWS Fact Sheet.)

The Minnesota Dwarf Trout Lily is endangered because of a combination of its natural rarity, and the additional pressures of human activities. The natural rarity of this species is probably best explained by its unusual mode of reproduction. Unlike many flowering plants, the dwarf trout lily almost never produces seed. Instead, it grows from an underground bulb that renews itself annually. Population size is only increased when the underground stem of a flowering plant produces a single offshoot runner bearing a new bulb. Because only a small proportion of all plants flower in any given year, only about one-tenth of all plants actually produce new offspring in a given year. (USFWS Fact Sheet)

Today's housing developments, logging, and expanded agricultural operations increase the chances that the few remaining populations could be destroyed. In addition, increased conversion of floodplains to cropland reduces the chances that plants dislodged by upstream floodwaters will find suitable habitat downstream. Disturbance of uphill areas can cause erosion and siltation in areas where lilies occur. (USFWS Fact Sheet)

Prairie Bush Clover (*Lespedeza leptostachya*)

This species is a prairie legume found only in the tallgrass prairie of four Midwestern States (Iowa, Illinois, Minnesota and Wisconsin). This species is considered a midwestern endemic. Prairie bush clover is federally listed at threatened, but has additional protection as an endangered species under the State of Minnesota law. Minnesota laws prohibit taking, transporting, and sale of State endangered plants from all lands except ditches, roadways, and certain types of agricultural and forest lands (USFWS Recovery Plan, 1988.)

This species is most abundant in a core area, which in Minnesota occurs in the southern portion of the state. Habitats characteristic of core populations occur in conjunction with the Algona, Altamont, Bemis, and Humbolt stagnation moraines. (USFWS Recovery Plan, 1988.) The species current rarity is probably best explained by the loss of its tallgrass prairie habitat. Mesic moderately damp to dry prairie favored by prairie bush clover was also prime cropland. Today's populations are threatened by conversion of pasture to cropland, overgrazing, agricultural expansion, herbicide application, urban expansion, rock quarrying, and right-of-way maintenance and rerouting. (USFWS Fact Sheet, April 2000.)

This species is not aquatic or aquatic-dependent, and will not be further considered in this biological evaluation.

Western Prairie Fringed Orchid (*Platanthera praeclara*)

This species is a terrestrial orchid which is listed as threatened under the Federal Endangered Species Act, and has additional protection as an endangered species under State law in Minnesota (USFWS Recovery Plan, 1996.). Approximately 90 percent of known western prairie fringed orchids in the United States occur in the Red River Valley of North Dakota and Minnesota. The preferred habitat is unplowed, calcareous prairies and sedge meadows. Plants have also been observed in successional communities such as borrow pits, old fields, and roadside ditches.

The major historical cause of the species' decline was conversion of habitat to cropland. Hydrologic changes that draw down or contaminate the water table may also adversely affect the species. (USFWS Recovery Plan 1996.)

Leedy's Roseroot (*Sedum integrifolium ssp.leedyia*)

This cliffside wildflower is a perennial member of the stonecrop family. It is listed as threatened under the Federal Endangered Species Act (USFWS Fact Sheet 1993), and as an endangered species under State law in Minnesota (USFWS, Federal Register, April 7, 1992). It is found today in only four locations in Minnesota (Fillmore and Olmstead Counties), and two locations in New York State. (USFWS Fact Sheet 1993.). This species grows on cool cliffs that are characterized by the presence of cracks in the rock, extending from the cliff face to cold underground caves.

This species' rarity is caused more by the infrequency of its unique habitat in the landscape than by direct habitat destruction. However, increased human activity could further degrade its habitat. Increased surface runoff from disturbed lands can dislodge plants or bury them during heavy rains and spring thaws. In Minnesota, groundwater contamination or changes in the groundwater hydrology are the greatest threats to Leedy's roseroot. Such changes could occur through misapplication of pesticides or synthetic fertilizers to nearby uplands, or by the use of sinkholes as dump sites. (USFWS Fact Sheet 1993.)

IV. Analysis of Potential of This Action to Affect Listed Threatened and Endangered Species

As stated in Section I above, MPCA is adding assessment factors to its water quality rules in order to provide interpretive language for three narrative water quality standards. In addition, MPCA has made minor changes to three additional rules. This action includes language changes to 11 sections of MPCA's water quality rules. The specific rule changes are summarized in Table 1 below, along with a brief description of the anticipated effects of these changes on listed threatened and endangered species, as well as on water quality.

Table 1. Summary of rule changes and anticipated effects.

RULE#	SUMMARY OF REVISIONS	ANTICIPATED EFFECTS ON LISTED SPECIES	ANTICIPATED EFFECTS ON WATER QUALITY
Minn.R.pt.7050.0150, Subpart 1. Policy and Scope	Adds language which defines the scope and purpose of the substantive changes to the following rule subparts.	No effect. This section is an introduction to the new listing factors.	No effect.
Minn.R. pt.7050.0150. Subpart 2. Other Standards Preserved.	"Disclaimer" language requiring the most stringent State standards to apply, in case the new rule language is in conflict with any language in existing standards.	No effect. Not anticipated to conflict with existing standards language. If conflicts exist, this section would have a beneficial effect in requiring the most stringent standards to apply.	No effect. Not anticipated to conflict with existing standards language. If conflicts exist, this section would have a beneficial effect in requiring the most stringent standards to apply.
Minn.R. 7050.0150, Subpart 3. Narrative Standards	Existing narrative standards language has been moved intact to this section from another section in Minnesota's rules.	No effect. No change to actual standards language.	No effect. No change to actual standards language.

RULE#	SUMMARY OF REVISIONS	ANTICIPATED EFFECTS ON LISTED SPECIES	ANTICIPATED EFFECTS ON WATER QUALITY
Minn.R. 7050.0150, Subpart 4. Definitions	Adds definitions for 15 terms that relate to the interpretation of the new assessment factors.	No effect. These definitions help to clarify the language in the new assessment factors.	No effect. These definitions help to clarify the language in the new assessment factors.
Minn.R. pt. 7050.0150, Subpart 5. Impairment of Waters Due to Excess Algae or Plant Growth	Adds the new listing factors for interpreting the narrative standard for impairment of waters due to excess algae or plant growth.	Beneficial effect. Excess algae growth is a leading cause of aquatic life impairment nationally. By establishing listing factors, it is more likely that impairments will be detected and corrected, making it more likely that listed species that depend on those habitats will be protected.	Beneficial effect. Methods for assessing attainment for surface waters will be standardized. This should improve water body assessments and make it more likely that impairments are detected and corrected.
Minn.R. pt. 7050.0150,Subpar t 6. Impairment of the Biological Community and Aquatic Habitat	Adds the new listing factors for interpreting the narrative standard for impairment of the biological community and aquatic habitat.	Beneficial effect. Biological data are extremely sensitive to impacts to aquatic organisms from a wide variety of sources. Protecting aquatic communities in general will also provide protection for listed species that are part of those communities.	Beneficial effect. Biological assessments are extremely sensitive to stressors and often detect impairments that are not detectable using chemical water quality data alone.
Minn.R. pt. 7050.0150. Subpart 7. Impairment of Waters Relating to Fish for Human Consumption	Adds the new listing factors for determining impairment of waters related to contaminants in fish tissue which can make fish unsafe for human consumption.	This standard is designed only for the protection of human health, and will not be evaluated in this biological evaluation. This is consistent with the Memorandum of Agreement between USEPA and USFWS	
Minn.R.pt. 7050.0150, Subpart 8. Determination of Compliance	Add language defining proper methods for sampling and analysis of water samples (including quality assurance and quality control procedures), and describing the retention of data used in assessments of water bodies.	No effect.	No effect, although this change should increase the quality of the data collected which should lead to more accurate and defensible assessments.

RULE#	SUMMARY OF REVISIONS	ANTICIPATED EFFECTS ON LISTED SPECIES	ANTICIPATED EFFECTS ON WATER QUALITY
Minn.R. pt.7050.0210, Subpart 5, Mixing Zones	Moves this provision (with only a very minor wording change) from 7050.0150 to 7050.0210.	No effect. Wording change clarifies an existing requirement.	No effect. Wording change clarifies an existing requirement.
Minn.R. pt.7050.0222, subp 4.	Corrects an error in the location of a decimal point for the Class2B chronic water quality standard for 1,2-dichloroethane. Changes the standard from 1.90ug/l to 190 ug/l.	No effect. Correction of a typographical error.	No effect. Correction of a typographical error.
Minn.R.pt.7050.0470,subpart 1.	Changes an incorrect reference ("subitem 130") to the correct reference ("subitem 129")	No effect. Correction of a typographical error.	No effect. Correction of a typographical error.

As summarized in Table 1, nine of the specific rule changes will have no effect on listed threatened or endangered species, and will not be discussed further in this biological evaluation. The following section discusses the two rule changes that may affect listed threatened or endangered species.

Minn..R.pt.7050.0150. Subpart 5. Impairment of Waters Due to Excess Algae or Plant Growth.

This rule change adds specific language that clarifies how the MPCA will apply the narrative water quality standard prohibiting the degradation of waters that would result in excess algae or plant growth. The narrative water quality standard (which is not changed by this rule) states in Minn.R.pt.7050.0150.Subpart 3: "For all Class 2 waters the aquatic habitat, which includes the waters of the state and stream bed, shall not be degraded in any material manner, there shall be no material increase in undesirable slime growths or aquatic plants, including algae..." The new Subpart 5 language clarifies how water bodies will be assessed to determine if this narrative standard is being met for the effect of excess nutrients. The four factors that will be used for this assessment are:

- representative summer-average concentrations of total phosphorus and total nitrogen
- representative summer-average concentrations of chlorophyl-a
- representative measurements of light transparency; and
- any other scientifically objective, credible, and supportable factor.

The rule also contains additional language on how to interpret the data from the four factors listed above. (See Appendix A of this document for the full text of this subpart.)

Listed aquatic species that may be affected by this rule include Higgins Eye Pearly Mussel, Mapleleaf Winged Mussel, and Topeka Shiner. Listed aquatic-dependent species that might be affected by this rule include the Bald Eagle, Piping Plover, and Eastern massasauga. This rule is not likely to affect non-aquatic species, which include the Karner Blue Butterfly, Dakota Skipper Butterfly, Canada Lynx, Gray Wolf, Minnesota Dwarf Trout Lily, Prairie Bush Clover, Western Prairie Fringed Orchid, and Leedy's Roseroot.

This rule change is not likely to adversely affect the listed aquatic and aquatic-dependent species, and may have a beneficial effect on these species. The rule change will allow the MPCA to have clear, consistent methods to detect water body impairments due to excess nutrients. This should make the process listing impaired waters and correcting water quality problems simpler and more defensible. Therefore, the rule change makes it more likely that listed species will be protected from impacts due to excess nutrients.

Minn.R. pt.7050.0150. Subpart 6. Impairment of the Biological Community and Aquatic Habitat.

This rule change adds specific language that clarifies how the MPCA will use biological monitoring tools to evaluate whether the narrative water quality standards designed to protect the aquatic community (Minn.R. pt.7050.0150) are being met. The new Subpart 6 language adds five factors to evaluate the biological community:

- An index of biological integrity calculated from measurements of the resident fish community
- An index of biological integrity calculated from measurements of attributes of the resident aquatic invertebrate community
- An index of biological integrity calculated from measurements of the resident aquatic plant community
- A quantitative or qualitative assessment of habitat quality;
- Any other scientifically objective, credible, and supportable factors.

The rule contains additional language on the specific data required under each of these factors listed above. (See Appendix A of this document for the full text of this subpart.)

Listed aquatic species that may be affected by this rule include Higgins Eye Pearly Mussel, Mapleleaf Winged Mussel, and Topeka Shiner. Listed aquatic-dependent species that might be affected by this rule include the Bald Eagle, Piping Plover, and Eastern massasauga. This rule is not likely to affect non-aquatic species, which include the Karner Blue Butterfly, Dakota Skipper Butterfly, Canada Lynx, Gray Wolf, Minnesota Dwarf Trout Lily, Prairie Bush Clover, Western Prairie Fringed Orchid, and Leedy's Roseroot.

This rule is not likely to adversely affect the listed aquatic and aquatic-dependent species, and may have a beneficial effect on these species. The rule change will allow the MPCA to have clear, consistent methods to evaluate the health of the entire aquatic community. According to

MPCA (Statement of Need and Reasonableness Document, April 2002), the state is currently using measurements of the quality of the fish community to represent the health of the whole aquatic community. Including the additional biological monitoring information in the new rule should improve the quality of MPCA's water body assessments, and make it more likely that Minnesota detects impairments that are not currently detectable using only water quality data or fish community data. Therefore, the rule change makes it more likely that listed species will be protected due to the state of Minnesota's improved ability to detect and therefore correct water body impairments.

V. Analysis of Cumulative Effects on Listed Species

- Cumulative effects of the different components of this action

The discussion above describes how, in all cases, the individual revisions are not likely to adversely affect listed species and may, in two cases, be beneficial to listed species conservation and recovery. The cumulative effect of the revisions should be similarly beneficial, due to the improved water quality assessment, standardization of the bases for listing waters as impaired, and more accurate evaluation of management activities, all of which should provide greater protection to aquatic organisms in Minnesota, including listed species.

- Cumulative effects of this action and other planned water quality standards revisions in Minnesota

In addition to these rule revisions, Minnesota has plans for two other major water quality standards revisions. These include a triennial review that will begin this year, and work on numeric water quality criteria for nutrients that is scheduled to be completed by 2007. The issues that are being considered as part of the triennial review of water quality standards include replacing the existing fecal coliform-based criteria for the protection of recreational uses with E. coli-based criteria, updating the existing human health criteria, updating the mercury criteria for the protection of human health, adopting revised ammonia criteria for the protection of aquatic life, adopting lake trophic level criteria (nutrient criteria), adopting new analytical methods for diesel and gasoline, reviewing the existing criteria for sulfates, chlorides and total dissolved solids, reviewing the existing criteria for boron and reviewing site-specific criteria for dissolved oxygen for waters in the Minneapolis-Saint Paul metropolitan area. The nutrient criteria effort is expected to result in numeric criteria for nutrients for rivers and streams in Minnesota.

It is difficult to evaluate the cumulative effects of these actions in combination with the revisions to Minnesota's water quality standards that are the subject of this biological evaluation because the rules have not yet been developed. However, the lake nutrient criteria being considered as part of the triennial review and the nutrient criteria development effort for rivers and streams will reinforce the portions of this rule dealing with identification of impairments resulting from excess algae and plant growth by providing numeric criteria for nutrients that will complement the existing narrative that is the subject of this revision. As a result, the cumulative effects of these elements of the different rules should be beneficial for listed species in Minnesota. In addition, the revisions to aquatic life contemplated as part of the triennial review should work with this rule revision to reduce the likelihood of adverse effects on the biota of Minnesota waters, especially given the fact that consultation will occur on the revisions under consideration. As a result, the cumulative effect of this rule and the other rule changes likely to occur in the foreseeable future are not expected to adversely affect listed species in Minnesota.

VI. Conclusion

This rule is not likely to adversely affect listed endangered or threatened species. Nine of the specific rule changes will have no effect on listed species. Two of the rule changes may have a beneficial effect on aquatic and aquatic-dependent species, due to the state of Minnesota's improved ability to detect and therefore correct water body impairments. The aquatic and aquatic-dependent species that may be beneficially affected by this rule include Higgins Eye Pearly Mussel, Mapleleaf Winged Mussel, Topkea Shiner, Bald Eagle, Piping Plover, and Eastern massasauga.

VII. Literature Cited

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U.S. Fish and Wildlife Service Fact Sheet on the Prairie Bush Clover, 2000 http://midwest.fws.gov/endangered/plants/prairieb.html

U.S. Fish and Wildlife Service Fact Sheet on the Leedy's Roseroot, 1993 http://midwest.fws.gov/endangered/plants/leedysro.html

Appendix A: Full Text of Pertinent Subparts from Minn. R. pt. 7050.0150

Subpart 5. **Impairment of waters due to excess algae or plant growth**. In evaluating whether the narrative standards in subpart 3, which prohibit any material increase in undesirable slime growths or aquatic plants including algae, are being met, the commissioner will use all readily available and reliable data and information for the following factors of use impairment:

A. representative summer-average concentrations of total phosphorus and total nitrogen measured in the water body throughout the summer growing season;

B. representative summer-average concentrations of chlorophyll-a measured in the water body throughout the summer growing season;

C. representative measurements of light transparency in the water body, as measured with a Secchi disk in lakes or a transparency tube in rivers and streams, throughout the growing season; and

D. any other scientifically objective, credible, and supportable factor.

A finding of an impaired condition must be supported by data showing elevated levels of nutrients in item A, and at least one factor showing impaired conditions resulting from nutrient over-enrichment in items B and C. The trophic status data described in items A to D must be assessed in light of the magnitude, duration, and frequency of nuisance algae blooms in the water body; and documented impaired recreational and aesthetic conditions observed by the users of the water body due to excess algae or plant growth, reduced transparency, or other deleterious conditions caused by nutrient over-enrichment.

Assessment of trophic status and the response of a given water body to nutrient enrichment will take into account the trophic status of reference water bodies; and all relevant factors that affect the trophic status of the given water body appropriate for its geographic region, such as the morphometry, hydraulic residence time, mixing status, watershed size, and location. The factors in this subpart apply to lakes and, where scientifically justified, to rivers, streams, and wetlands.

Subpart 6. **Impairment of biological community and aquatic habitat**. In evaluating whether the narrative standards in subpart 3, which prohibit serious impairment of the normal fisheries and lower aquatic biota upon which they are dependent and the use thereof, material alteration of the species composition, material degradation of stream beds, and the provention or hindrance of the propagation and migration of fish and other biota normally present, are being met, the commissioner will consider all readily available and reliable data and information for the following factors of use impairment:

A. An index of biological integrity calculated from measurements of attributes of the resident fish community, including measurements of:

(1) species diversity and composition;

(2) feeding and reproductive characteristics; and

(3) fish abundance and condition;

B. An index of biological integrity calculated from measurements of attributes of the resident aquatic invertebrate community, including measurements of:

(1) species diversity and composition;
(2) feeding characteristics; and
(3) species abundance and condition;

C. An index of biological integrity calculated from measurements of attributes of the resident aquatic plant community, including measurements of:

(1) species diversity and composition, including algae; and
(2) species abundance and condition;

D. A quantitative or qualitative assessment of habitat quality, determined by an assessment of:

(1) stream morphological features that provide spawning, nursery, and refuge areas for fish and invertebrates;
(2) bottom substrate size and variety;
(3) variations in water depth;
(4) sinuosity of the stream course;
(5) physical or hydrological alterations of the stream bed including excessive sedimentation;
(6) types of land use in the watershed; and
(7) other scientifically accepted and valid factors of habitat quality; and

E. Any other scientifically objective, credible, and supportable factors.

A finding of an impaired condition must be supported by data for the factors listed in at least one of items A to C. The biological quality of any given surface water body will be assessed by comparison to the biological conditions determined for a set of reference water bodies which best represent the most natural condition for the surface water body type within a geographic region.

<u>Subpart 7</u>. **Impairment of waters relating to fish for human consumption**. In evaluating whether the narrative standards in subpart 3, which prevent harmful pesticide or other residues in aquatic flora or fauna, are being met, the commissioner will use the residue levels in fish muscle tissue established by the Minnesota Department of Health to identify surface waters supporting fish for which the Minnesota Department of Health recommends a reduced frequency of fish consumption for the protection of public health. A water body will be considered impaired when the recommended consumption frequency is less than one meal per week, such as one meal per month, for any member of the population. That is, a water body will not be considered impaired if the recommended consumption frequency is one meal per week, or any less restrictive recommendation such as two meals per week, for all members of the population. The impaired condition must be supported with measured data on the contaminant levels in the indigenous fish.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

17 JUN 2003

RECEIVED

JUN 19 2003

REPLY TO THE ATTENTION OF:
WQ-16J

Mr. Rod Massey, Director
Policy and Planning Division
Minnesota Pollution Control Agency
520 Lafayette Road N.
St. Paul, Minnesota 55155-4194

Dear Mr. Massey:

On January 29, 2003, the Minnesota Pollution Control Agency (MPCA) submitted revisions of Minnesota's water quality standards rules to the United States Environmental Protection Agency (USEPA) for review. The submittal included revisions to Minn.R.pt.7050.0150, Determination of Compliance With Water Quality Standards and Water Quality Condition; Minn.R.pt.7050.0210, General Standards for Dischargers to Waters of the State; Minn.R. pt. 7050.0222, Specific Standards of Quality and Purity for Class 2 Waters of the State; and Minn.R. pt. 7050.0470, Classifications for Waters in Major Surface Water Drainage Basins. These revisions were adopted by Minnesota on January 27, 2003, and became effective on February 1, 2003. On May 19, 2003, MPCA submitted to USEPA a certification by the Minnesota Attorney General that the rule revisions submitted on January 29, 2003, were duly adopted by Minnesota.

The rule revisions submitted by Minnesota add "assessment factors", which are interpretive language describing the types of data and information used to apply three existing narrative standards in water quality assessments. In addition, Minnesota has made three "housekeeping" changes to Minn.R. ch 7050, correcting two typographical errors, and relocating the narrative standards within Minn. R. ch 7050. The purpose of these rule revisions is to provide a consistent framework for Minnesota to apply state narrative water quality standards to site-specific conditions when making determinations of whether or not the narrative standards are attained in a given water body.

As specified in the Federal regulations at 40 CFR 131.21, USEPA is required to review and approve new and revised State water quality standards. USEPA has reviewed the information submitted in support of the revised rules and determined that the revised rules comply with the requirements of Section 303(c) of the Clean Water Act (CWA) and 40 CFR 131. USEPA also reviewed the information provided by MPCA and determined that Minnesota's revisions complied with the procedural requirements of Federal regulations at 40 CFR 131.20. Finally, as stated previously, the revised rules were certified as to legality by the Minnesota Attorney General in a letter dated May 19, 2003. Therefore, USEPA hereby approves the revised rules pursuant to Section 303 of the CWA and Federal regulations at 40 CFR 131.21.

Consistent with Section 7 of the Endangered Species Act, USEPA is required to consult with the United States Fish and Wildlife Service (USFWS) on any action it takes that might affect federally-listed threatened and endangered species. Approval of new and revised State water quality standards under Section 303 of the CWA is an action requiring consultation. USEPA prepared a biological evaluation of Minnesota's revised water quality standards. Based on this evaluation, Minnesota's rules appear unlikely to adversely affect federally-listed threatened, endangered or candidate species in Minnesota. A copy of the biological evaluation prepared by USEPA and revised based on consultation with and comments from the USFWS is enclosed. The USFWS concurred with the findings of the biological evaluation but requested the inclusion of two candidate species, the Dakota skipper butterfly and the Eastern massasauga snake. It is the USFWS's and USEPA's determination that these two species would not be adversely affected by the Minnesota rule revisions. Based on our review and the consultation with the USFWS, the USEPA is approving the new and revised water quality standards referenced above.

If you have any questions regarding this action, please contact me or either David Pfeifer Francine Norling, or Thomas Poleck of my staff. Mr. Pfeifer may be reached at (312) 353-9024, Ms. Norling can be reached at (312) 886-0271, and Mr. Poleck can be reached at (312) 886-0217.

Sincerely yours,

Linda Holst

for Jo Lynn Traub
Director, Water Division

Enclosure

cc: Dan Stinnett, USFWS, Twin Cities Field Office
David Maschwitz, MPCA

Jeff D Maschwitz Julie
12/4/95 G Blaha
Official File

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

77 WEST JACKSON BOULEVARD

CHICAGO, IL 60604-3590

RECEIVED

DEC 04 1995

M.P.C.A.
Water Quality Div.

NOV 28 1995

REPLY TO THE ATTENTION OF:
WQS-16J

Duane L. Anderson, Manager
Assessment and Planning Section
Water Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road, N.
St. Paul, Minnesota 55155-4194

Dear Mr. Anderson:

In accordance with Section 303(c) of the Clean Water Act (CWA) and Federal regulations at 40 CFR §131, I am approving all portions of the water quality standards revisions at Minn. Rules ch. 7050 submitted by the Minnesota Pollution Control Agency (MPCA) on June 7, 1994, applicable to those waters that are properly under the authority and jurisdiction of the State of Minnesota. These revisions consist of changes to the standards including adding a definition of "wetland", developing use classifications and water quality standards specifically for wetlands, revising the nondegradation policy to address physical alteration of wetlands, adopting a narrative biological criteria statement, and modifying the aquatic life designated use class descriptions.

As part of the review process, the United States Environmental Protection Agency (USEPA) also evaluated the effect of the State's standards revisions on federally-listed threatened and endangered species within the State of Minnesota as required by the Federal Endangered Species Act. Minnesota considered all relevant data available to the State at the time revisions were adopted by the State, and has procedures in place for developing and implementing water quality criteria that include safeguards that are protective of threatened and endangered species. Consequently, USEPA concluded and the United States Fish and Wildlife Service concurred that approval of Minnesota's revised water quality standards is unlikely to have any adverse impacts on threatened and endangered species present in Minnesota.

Based on the information submitted by you on April 7, 1994, I find that MPCA has met the requirements of the Federal regulations at 40 CFR §131.10 (j), and I am approving these revisions by authority of 40 CFR §131.5 (d).

I would like to take this opportunity to commend the MPCA for your continued fine efforts in revising the water quality standards and for your patience in our review of your standards. If you have any questions concerning this letter, please contact Lisa Thorstenberg at (312) 353-1938.

Sincerely yours,

Joan Karnauskas for

Jo Lynn Traub
Director, Water Division

Minnesota Pollution Control Agency

93 OCT -6 PM 4:24

ADMINISTRATIVE
HEARINGS

October 6, 1993

The Honorable Allan W. Klein
Administrative Law Judge
Office of Administrative Hearings
100 Washington Square
Minneapolis, Minnesota 55415

RE: Final Comments of the Agency Staff Regarding Revision of Minn. Rules Ch. 7050

Dear Judge Klein:

Enclosed you will find the final comments from Minnesota Pollution Control Agency (MPCA) staff to comments not previously addressed in the September 29, 1993, Post Hearing Response. Attachment 19 of this document contains all the modifications Agency staff offer to make to the proposed rules. This attachment supersedes Attachment 2 of the Agency Staff Post Hearing Responses submitted on September 29, 1993.

A reference is made in the Statement of Need and Reasonableness at page 92 that Agency Exhibit C46 contains a copy of a September 13, 1991, MPCA Board Item dealing with the Gaylord Industrial Park wastewater treatment facility permit and variance. This referenced Board Item was inadvertently left out of this exhibit and therefore is not part of the hearing record.

Finally the enclosed letter from Mr. Bradovich dated September 27 was received by the MPCA on September 29, 1993. The letter was addressed to you and appears to be the original. This letter is being forwarded to you because it is assumed that you did not receive the letter. Please advice Mr. Greg Gross (296-7213) of my staff if the MPCA needs to further address this issue. We would be willing to send Mr. Bradovich a letter explaining the mix-up.

Thank you for your attention to these matters.

Sincerely,

Duane L Anderson

Duane L. Anderson, Manager
Assessment and Planning Section
Water Quality Division

COPY

DLA:ach

Enclosures

1993 Chapter 7050 Rulemaking File
Post-Hearing Submissions
Final Comments of the Agency Staff
No. 4

STATE OF MINNESOTA

MINNESOTA POLLUTION CONTROL AGENCY

IN THE MATTER OF THE PROPOSED REVISIONS TO THE RULES GOVERNING THE CLASSIFICATION AND STANDARDS FOR WATERS OF THE STATE, MINNESOTA RULES CHAPTER 7050

FINAL COMMENTS OF THE AGENCY STAFF

October 6, 1993

TABLE OF CONTENTS

I. INTRODUCTION

The Minnesota Pollution Control Agency (Agency or MPCA) submitted its Agency Staff Post Hearing Response to Public Comments to the Administrative Law Judge on September 29, 1993 (hereinafter Post Hearing Response). That document addressed public comments received through Friday, September 24, 1993, with the exception of the following comment letters: September 21, 1993 letter from Thomas W. Balcom, Minnesota Department of Natural Resources (DNR); September 17, 1993 letter from Darrell H. Lauber, Itasca County; September 24, 1993 letter from Gregory A. Wilkins, Ashland Petroleum Company; and September 17, 1993 letter from Norman W. Deschampe, Grand Portage Reservation Tribal Council. The purpose of this document is to respond to these public comments and comments submitted to the Administrative Law Judge after September 24, 1993.

Many of the issues raised in the statements of the parties that submitted comments after September 24, 1993 have been addressed by the Agency staff in the Statement of Need and Reasonableness (SONAR), exhibits, testimony, or the Post Hearing Response, and will not be further addressed in this document. This document contains staff responses to the new issues, or new information on old issues, submitted by the public. Because many issues were raised by more than one party, this response will be organized by issue rather than by the party commenting.

References to the proposed amendments to Minn. Rules ch. 7050 in this document are to the version including all the proposed staff changes submitted to the Administrative Law Judge on September 29, 1993. Attachments 1 and 2 to the Post Hearing Response, dated September 29, 1993.

Included with this submission, Final Comments of the Agency Staff, October 6, 1993, are 17 of copies of Attachments which are cited through out this text. Attachment 1 is a September 29, 1993 letter from the Minnesota Cultivated Wild Rice Council. This letter is discussed in more detail under II. Wetland Water Quality Standards, C. Late Letter. Attachments 2 through 18 are copies of comment letters regarding Center Creek that had been sent to the Administrative Law Judge prior to the close of the hearing record on September 29, 1993.

Attachment 19 is a summary of the modifications to be made to the proposed rule revisions as published in the State Register on July 19, 1993. Additional modifications have been identified since the September 29, 1993 Agency staff Post Hearing Response was submitted to the Administrative Law Judge. Therefore, Attachment 19 supersedes Post Hearing Response Attachment 2. A more detailed discussion of the rule modifications identified since September 29, 1993, is found under VI. Miscellaneous Issues, C. Changes to Proposed Rules.

II. WETLAND WATER QUALITY STANDARDS

A. General issues

1. Redundancy/consistency/cost of including mitigation sequencing.

The Agency staff received several comments that part 7050.0186 was duplicative of the Wetland Conservation Act (WCA), which would result in inconsistencies and increased cost [Sonnenberg letter, 8/25/93; Broberg letter, 9/27/93; Hanson letter, 9/28/93; Hoffman letter, 9/28/93; Knutson letter, 9/28/93; Kingston letter, 9/29/92; and Larson letter, 9/29/92]. The issues have been fully addressed in the Statement of Need and Reasonableness (SONAR) at 33-36 and the September 29, 1993 Agency Post Hearing Response at 2-4.

Using Minnesota Rules, Chapter 7050 as presently structured, the Agency cannot certify projects or certify them with conditions because any dredge and fill activity in a water of the state would violate water quality standards or effluent limits. The Agency can only deny certification or waive certification. Through an agreement with the St. Paul Office of the Corps of Engineers (COE) the Agency has been waiving certification of projects with conditions for those projects where the Agency determines that mitigation sequencing is required. If the Corps had not agreed to this arrangement, the Agency would have had to deny certification of the projects involved. However the Corps is not legally required to accept conditions when the Agency waives certification. Inserting the mitigation sequencing process in the nondegradation portion of Chapter 7050 will allow the Agency to issue conditional approvals that the Corps must accept.

The language in part 7050.0186 is consistent with the WCA, which ensures that all activities that impact wetlands, whether they involve the COE or not, will follow the same procedures. This consistency is further enhanced through monthly project coordination meetings involving agencies concerned with wetland protection and additional individual coordination meetings on projects when needed or requested by the applicant. These meetings are designed to minimize contradictory recommendations.

2. Wetland definition/delineation.

7050.0130 DEFINITIONS

The Agency staff received several comments that in part 7050.0130, subp. F, "Wetlands" was broader or different in some way from the definition in the Wetland Conservation Act (WCA) and the Agency role in delineations was not clear [Thomas Balcom letter, 9/21/93; Jeffery Broberg letter, 9/27/93]. The issues have been fully addressed in the SONAR at 18-19 and the addressed in the Post Hearing Response at 5-7.

The Agency is required by the United States Environmental Protection Agency (EPA) to insert the definition of wetlands from 40 C.F.R. sec. 230.3(t). Exhibit W17, page 2, Specific Comment 1. The federal definition introductory sentence is broader than the WCA introductory sentence since the latter is limited to the location of the water table while the former also mentions vegetation and soils. However, the three attributes listed in the WCA definition include soils, and vegetation. So, the net result is the only difference between the two is that the federal definition mentions "areas" while the WCA mentions "lands". There is no substantive difference between these two terms, and since EPA required the Agency to use the federal definition, that was the one chosen.

The issue of delineation is closely tied to the definition. Jeffrey Broberg [Rochester hearing, 9/8/93, at 18-34] raised the issue of whether the Agency will be using the definition to perform wetland delineations. As noted above, the COE is responsible for delineation review for Section 404 permit applications. For Clean Water Act (CWA) Section 402 NPDES point source permit applications and State Disposal System permits, the applicant is responsible for obtaining and submitting wetland delineation determinations.

If there is a question regarding a wetland delineation, the Agency would seek the expertise of individuals from the Board of Water and Soil Resources (BWSR) and the Department of Natural Resources, much in the same way that the Agency presently seeks lake boundary delineation information from the DNR.

Mr. Balcom also questioned whether all types of wetlands are surface waters. All wetlands are waters of the state (Minn. Stat. sec. 115.01, subd. 22), which includes all surface waters. Minn. Stat. ch. 115 gives the Agency broad authority to regulate point and nonpoint source impacts to protect water quality in waters of the state.

The Agency also received a comment that the definition is too narrow [Lynn Lewis letter, 9/29/93]. As noted above, EPA has required that the federal definition contained in 40 C.F.R. sec. 230.3(t) be used in the revised standards package. This definition is more narrow than the definition proposed by Ms. Lewis.

3. Wetland exemptions.

The Agency received a comment from Jeffery Broberg [9/27/93 letter] that the Agency staff should insert the exemptions found in the WCA into the standards. The issue has been fully addressed in the Post Hearing Response at 7.

The exemptions in the WCA exclude certain wetlands from use protection. The U.S. EPA will not allow language in Chapter 7050 that would exempt certain waterbodies from use protection. Exhibit W17, page 3, Specific Comment 7. Please note that "subpart 1a" noted in the letter referred to an early draft incorporating the exemptions into the water quality standards.

4. Agricultural exclusion.

The Agency staff received several comments that the agricultural exclusion found in part 7050.0222, subp. 6. should be expanded [Darrell Lauber letter, 9/17/93; Keith Hanson letter, 9/28/93]. The issues have been fully addressed in the SONAR at 81-82 and addressed in the Post Hearing Response at 7-8. As noted in the previous responses, the Agency staff does not concur with the expansion request. For the same reasons, the Agency staff does not concur with the proposed language by Mr. Hanson.

The Agency recognizes that these applications are regulated by the U.S. Environmental Protection Agency and overseen by the Minnesota Department of Agriculture and the Minnesota Department of Natural Resources. As long as label requirements are followed and as long as there are no Clean Water Act Section 402 or State Disposal System permits or Clean Water Act Section 401 certifications required, the Agency will not be active in regulating these compounds at this time.

The Agency staff received several comments that the agricultural exclusion does not belong in the water quality standards [David Zentner letter, 9/27/93; Lynn Lewis letter, 9/29/93; Cheryl Miller & Ken Nickolai letter, 9/29/93; Chuck

Meyer, Ginny Yingling, & Brett Smith letter, 9/29/93]. The issue has been considered in the SONAR at 81-82. The impacts noted in the letters are recognized in the Memorandum of Agreement between the EPA and the COE (Exhibit W27), but are considered non-significant and non-cumulative.

5. Agency activity/authority.

The Agency staff received a comment that part 7050.0110 be amended such that it repeats the areas of activity represented in part 7050.0185, subp. 9. [Greg Larson letter, 9/29/93]. The Agency staff does not concur. Subpart 9 applies only to wetland mitigation; moving that intent into the Scope could erroneously imply that non-wetland actions are subject to mitigation or that actions to other waters of the state are limited to activities that require a permit or certification.

The Agency staff received several comments that part 7050.0185, subp. 9 should not include phraseology that "limits" the Agency's activities in wetland sequencing [David Zentner letter, 9/27/93; Chuck Meyer, Ginny Yingling, & Brett Smith letter, 9/29/93]. The issues have been fully addressed in the SONAR at 9-11 and addressed in the Post Hearing Response at 9.

Permit and certification processes allow complete public participation, while allowing the regulated public to operate with full knowledge of the requirements to maintain water quality. The Agency staff recognizes that, in the case of an egregious water quality violation, enforcement activities are a viable option, even if permits or certifications are not required. This situation would not likely include non-significant violations, but would include actions where a substantial loss of one or more designated uses results from deliberate violations of the water quality standards.

6. Physical alteration.

The Agency staff received several comments that part 7050.0130, subp. 1 including the phrase "permanent inundations" in the definition "physical alterations" implied that restoring hydrologically degraded wetlands was being discouraged [Thomas Balcom letter, 9/21/93; Keith Hanson letter, 9/28/93; Greg Larson letter, 9/29/93 letter]. The issues have been fully addressed in the SONAR at 17-18, the Post Hearing Response at 4-5, and the Lawrence Foote letter, 9/17/93.

The Agency staff believes the proposed revision to the rule as addressed in the Post Hearing Response will adequately address the concerns of the commenters. As a result the staff does not concur with the proposed language in the letter from Mr. Balcom.

The main effect of the change proposed by Mr. Balcom would be to eliminate part 7050.0186, (wetland mitigation) whenever pt. 8420.0520 (sequencing) was used, since, according to the proposed language, an impact being addressed pursuant to part 8420.0520 would be outside the authority of the wetland mitigation section.

If the language proposed by Mr. Balcom was adopted, the Agency staff's ability to conditionally approve wetland projects requiring a Section 401 certification would be pre-empted by the local governmental unit, which would be a violation of the CWA, Section 401. Situations could arise where local governmental unit approval of an activity in a wetland would cause a violation of ch. 7050. This could occur, since the Wetland Conservation Act and its rule do not directly address water quality standards.

The Agency staff received a comment that the definition of 'physical alterations' in part 7050.0130, subp. D is too narrow and there are other activities besides dredging, filling, draining, and permanently inundating that impact wetlands [Cheryl Miller & Ken Nickolai letter, 9/29/93]. The issues have been fully considered in the SONAR at 17-18.

The key issues are whether additional impacts are severe enough to cause a significant impairment or loss of one or more designated uses and whether the impact can be measured. The impacts selected are not subtle; any wetland subjected to any of these four actions almost always result in a complete loss of use. Although other impacts may, on a case-by-case basis, result in a loss of use, the data or the empirical evidence is not yet available. Based on new information that becomes available, the Agency staff may propose changes to the definition of physical impacts. Any proposed revisions would be part of a rule revision process involving full public participation.

B. Specific comments

1. The Agency staff received several comments that part 7050.0186, subp. 1 should be expanded [Thomas Balcom letter, 9/21/93; Greg Larson letter, 9/29/93]. The policy statement is intended to reflect the goals of wetland mitigation. The guidelines are found in the remaining subparts. The Agency staff does not concur that a modification is warranted.

2. The Agency staff received a comment that part 7050.0186, subp. 3 should be modified for clarity [Thomas Balcom letter, 9/21/93]. The Agency does not concur. There is no substantial difference between the proposed Agency language and the recommended modification.

3. The Agency staff received several comments that the term "significant adverse impact" be defined in the rule [Thomas Balcom letter, 9/21/93; Charles Hoffman letter, 9/28/93]. The Agency staff does not concur. The issues have been fully considered in the SONAR at 6-7 and 17), Exhibit W54 and above in A. 6. (last paragraph). On page 17 of the SONAR, specific significant impacts are related to specific designated uses. This type of discussion is not amenable to condensation into a definition.

4. The Agency staff received a comment that the term 'diminished wetland' in part 7050.0186, subp. 2(C)(1) be defined, using the definition of 'impacted wetland' in part 8420.0110, subp. 24. The Agency staff concurs that the terms are synonymous but do not concur that it is necessary to include it as a definition in the rule because it is not a significant one. Many terms found in the rule are not formally defined but are understood based on their common usage.

5. The Agency staff received a comment that part 7050.0186, subp. 6(B) be expanded to specifically include the banking language found in part 8420.0540, subp. 2. [Greg Larson letter, 9/29/93]. The Agency's Section 401 water quality certifications have recognized MnDOT wetland banking for many years [Exhibit W59]. Banking would be allowed for either restored or created wetlands. As a

result, the Agency staff does not concur the banking must be specified in the rule.

6. The Agency staff received a comment that the term 'watershed' found in part 7050.0186, subp. 6 be defined as it is in part 8420.0110, subp. 50 (Exhibit W10 at 8 and 70) [Greg Larson letter, 9/29/93]. The Agency staff concurs that the referenced definition is the same as the term used in this rule but does not concur that it needs to be included as a formal definition. The Agency staff has been using the same watershed map for many years and will continue to use it to maintain consistency with DNR and BWSR.

7. The Agency staff received a comment that part 7050.0186, subp. 6 should be expanded to include monitoring requirements [Cheryl Miller & Ken Nickolai letter, 9/29/93]. The Agency staff concurs that monitoring is an essential key to assessing whether designated uses have been replaced over the long term (Exhibit W49). Staff believes it is more appropriate, however to include details such as monitoring into Chapter 7001, the Agency's permit rule, which is currently under internal review. This issue will be considered in that review.

8. The Agency staff received a comment that part 7050.0186, subp. 6, item C be modified, since the term 'feasible' could be interpreted too broadly [Keith Hanson letter, 9/28/93]. The issue has been fully addressed in the Post Hearing Response at 4-5 and the Larry Foote letter (9/17/93). The term 'feasible' has been changed to 'prudent and feasible".

9. The Agency staff received a comment that part 7050.0186, subp. 6, item D be modified to allow phased restorations [Keith Hanson letter, 9/28/93]. The issue has been fully addressed in the Post Hearing Response at 4-5 and the Larry Foote letter (9/17/93). The phrase 'prudent and feasible' has been added to allow more flexibility.

10. The Agency staff received a comment that part 7050.0130, item F be modified to change the sentence referring to 'constructed wetlands' [Keith Hanson, 9/28/93]. The issue has been fully addressed in the Post Hearing Response at 8.

The Agency does not concur with his recommended change. The definition of 'other wastes' in Minnesota Statutes, Chapter 115.01, subd. 9 is very broad, and it includes ash pile run-off. If Mr. Hanson's wording was accepted, it would be possible for a sewage lagoon or storm water treatment lagoon to count toward replacement acreage. The proposed language is in conflict with 40 C.F.R. sec. 232.3(q).

11. The Agency staff received a comment that physical alterations of wetlands classified as Outstanding Resource Value Waters (ORVW) should not be allowed [Cheryl Miller & Ken Nickolai letter, 9/29/93]. At this time, the only wetlands classified as Outstanding Resource Value Waters are calcareous fens. The issue has been fully considered in the SONAR at 30-32. The Agency staff does not concur because the water quality standards regarding ORVWs do not allow protection beyond that discussed in the SONAR.

C. Late Letter

The September 29, 1993 letter from Beth C. W. Nelson, Minnesota Cultivated Wild Rice Council, was received by the MPCA on October 4, 1993, and was not found by at the Office of Administrative Hearings on September 30, 1993 when Agency staff reviewed the comments submitted to the Administrative Law Judge. See Attachment 1. It appears that Ms. Nelson did not understand the comment submittal process and sent the comment letter to Howard Markus at the Agency instead of to the Administrative Law Judge at the Office of Administrative Hearings. Even though this letter was not submitted correctly and received after the deadline of September 29, 1993, the Agency staff will respond briefly to the comments contained in the letter.

SONAR

1. The Agency staff concurs that the word 'wild' should be used before the word 'rice'.

2. The Agency staff concurs that Best Management Practices (BMPs) development require wide coordination. Broad coordination was an important element of the three BMP manuals that are available to the public already.

RULE

1. The Agency staff recognizes both Circular 39 and the Cowardin system and will work comfortably using either. The Agency staff recognizes that not all replacement wetlands could occur in the same watershed. Part 7050.0186, subp.

6, item C has flexibility through the use of the term 'to the extent prudent and feasible' [note the proposed language change in the Agency staff Post Hearing Response September 29, 1993, at 4-5.

2. The Agency staff recognizes that dissolved oxygen levels can vary widely. This issue was covered in detail in the SONAR at 80-81.

The issue of redundancy has been covered in extensive detail in the SONAR at 33-36, the Post Hearing Response dated September 29, 1993 at 2-4, and in these Agency staff final comments. The issue of exemptions has been addressed in the Post Hearing Response at 7 and in this final comment at A. General Issues, 3. Wetland Exemptions above.

III. AQUATIC LIFE STANDARDS

A. Iron and Manganese Standards

Several parties commented on the proposed iron standard. The Department of Natural Resources (DNR), letter dated September 21, 1993), Cleveland Cliffs (letter dated September 28, 1993), Northern States Power (NSP), (letter dated September 29, 1993) and U.S. Steel (letter dated September 29, 1993) commented on locally high natural background concentrations of iron relative to the proposed iron standard. The Agency staff is proposing to withdraw both the proposed iron and manganese standards, as stated in the Post Hearing Response at 10-12. The Agency staff agrees that the issue of high background concentrations, and the use of the background concentrations as the standard, as provided for in pt. 7050.0170, can be better addressed through the application of site-specific criteria for iron and manganese.

Both the DNR letter (September 21, 1993) and the Cleveland Cliffs letter (September 28, 1993) state that dissolved measurements of iron are preferred over total measurements. While the standard was proposed as total iron (SONAR at 68), the Agency staff agrees that in some situations a dissolved measurement would be appropriate, and some effluent limitations are now expressed as dissolved iron (SONAR at 109). This issue, also, is better addressed on a case-by-case basis through the use of site-specific criteria.

Agency staff welcomes U.S. Steel's proposal in their letter of September 29, 1993 to monitor Kinney Creek and other creeks and rivers pertinent to their operations to establish background iron conditions. These data will be valuable in the event iron effluent limitations for discharges to these creeks need to be established or existing limitations evaluated.

NSP suggests, on page two of their September 29, 1993 letter under "Water Quality Toxic Standards", the Agency staff uses biocriteria in situations where background concentrations exceed criteria or standards. The Agency staff agrees; the addition of biocriteria to ch. 7050 will give the Agency another tool to assess the health of aquatic communities in situations where numerical standards may not be the best tool due to background conditions.

NSP also expressed a concern that the provisions of pt. 7050.0170 do not address evaporative losses of water and the resulting concentration of constituents in non-contact cooling water. (Note: NSP mistakenly cited pt. 7050.0180 in their letter but meant pt. 7050.0170, as confirmed in a phone call with Jim Bodensteiner.) The Agency staff agrees that pt. 7050.0170 does not deal with evaporative losses as part of an industrial process (even just cooling) but deals with background concentrations as measured upstream of a discharge. While in the case of non-contact cooling, pollutant concentrations may be elevated as a result of the need to achieve thermal limitations in the case of non-contact cooling, non-contact cooling water discharges must meet applicable water qualify standards like any discharge. Issues of this sort are best dealt with on a permit-by-permit basis.

B. Alachlor Standard

One commenter [The United States Department of Interior, Fish and Wildlife Service (USFWS), September 29, 1993 letter] is concerned that the proposed Class 2D standard for Alachlor of 59 ug/L is not protective enough for some aquatic plants found in wetlands.

When the Agency staff developed the Alachlor criteria, there were very little data available on toxicity to aquatic plants (see Exhibit T1, summary sheets and Table 4 for Alachlor). The Agency staff found the plant toxicity data to be inconclusive. The duckweed (Lemna minor) study that the USFWS cites, had an inadequate description of how the experiment was performed in addition to the fact that the various concentrations of Alachlor used in the test, were not measured analytically. For these two reasons, the Agency staff did not use the duckweed study. The other plant toxicity data, especially the sago pondweed (Potamogeton pectinatus) study, indicates that the 59 ug/L proposed Class 2D Alachlor standard will be protective for aquatic plants.

The Agency will be glad to work with the USFWS in the future to assist in establishing appropriate protocol and methodologies for other aquatic toxicity research studies that the USFWS is interested in conducting. The Agency would also consider updating the proposed Alachlor standard in future ch. 7050 triannual reviews as acceptable toxicity data becomes available.

C. Cobalt Standard

Two commenters [DNR, September 21, 1993 letter; and Cleveland Cliffs, Inc., September 28, 1993 letter] point out that the bioassay data used for the site-specific evaluation of the LTV/Erie Corporation discharge from the Dunka mine pit into Birch Lake, was not used in the final evaluation of the proposed cobalt standard. It should be noted that DNR's letter cites the Class 2A portion of the rule, however, their discussion is about the Class 2B, 2C, and 2D proposed cobalt standard.

As stated in the SONAR at 114, the 50 ug/L limitation for this discharger is based on chronic bioassay testing for the Dunka stockpile seeps. The water from the seeps has a very high total hardness. The bioassay data for cobalt indicated that high hardness can mitigate cobalt toxicity. This is true to some extent for other trace metals, however, the data base for cobalt does not contain enough data to support a hardness based standard. Under pt. 7050.0222, subp. 8 of the rule, the same site-specific consideration can be applied to a site-specific modification of the proposed standard as was done with the Dunka mine pit if local conditions and data support such modification.

Two commenters [DNR, September 21, 1993 letter; and Northern States Power Company (NSP), September 29, 1993 letter] state that natural cobalt concentrations in northern Minnesota (DNR letter) exceed the Class 2B, 2C, and 2D proposed cobalt standard of 5 ug/L. The Agency staff assumes that NSP is referring to the Class 2B, 2C, and 2D proposed cobalt standard of 5 µg/L, when they state that they have measured cobalt concentrations at various sites on the Minnesota and Mississippi Rivers above the proposed ambient standard.

The Agency staff has data to dispute DNR's statement in regards to natural cobalt concentrations exceeding the 5 ug/L standard in northern Minnesota. These data show that out of 521 water samples tested for cobalt in Northern Minnesota, only one sample was above the standard. Concerning NSP's statement, the Agency staff has found that the Class 2B cobalt standard is exceeded only on occasion in the Minnesota and Mississippi Rivers. Additionally, in situations where the natural background conditions exceed the proposed cobalt standard, the natural background levels may be used as the standard in place of the proposed cobalt standard as provided for in pt. 7050.0170.

D. Thallium Standard

One commenter [DNR, September 21, 1993 letter] expressed concern that the proposed thallium standards should not be adopted because they are below the analytical limit of detection for thallium of 1 ug/L.

As discussed in the SONAR at 71, the Agency recognizes that the Class 2A and 2Bd proposed standard of 0.28 ug/l for thallium is below the level of detection. This discussion in the SONAR at 72 assumes a detection limit of 0.5 µg/L, which is what is achieved by the Minnesota Department of Health Labs.

The Agency believes that the standards must be set at the level necessary to protect aquatic life and human health. To achieve this, the standard setting process must remain independent of the detection limits.

In a situation in which a permittee has to meet the proposed standard at the point of discharge, the Agency staff recognizes the difficulty in achieving compliance with the standard. To help a permittee to comply with a standard which is below the detection limit, the Agency utilizes methods to assist in the monitoring of the pollutant in question. These methods include: measuring the effluent in the process stream before there is any dilution, predicting final effluent concentrations through modeling of the influent loadings and treatment removal rates, monitoring the pollutant in sediments that precipitate in the treatment process(s), and measuring fish tissue to monitor for bioaccumulative pollutants. By using one or more of these methods, compliance with an effluent limitation below detection may be ascertained.

E. Proposed Arsenic Standard

One commenter [DNR, September 21, 1993 letter] is concerned that the revised arsenic standard does not adequately address naturally high background concentrations.

This is discussed by the Agency in the SONAR at 75. In situations in which the proposed arsenic standard is exceeded by natural background concentrations, the natural background levels may be used in place of the proposed arsenic standard as described in pt. 7050.0170.

F. Nickel Standard

The U.S. Fish and Wildlife Service (letter dated September 29, 1993) states that the nickel standard may be under protective of zooplankton in general and of Daphnia magna in particular. This comment pertains to the part of the Class 2 nickel standard that protects fish and other aquatic organisms from nickel toxicity. This part of the nickel standard is not being proposed for change in these amendments. Only the human health portion of the Class 2 standard is proposed for change. Regardless, the Agency staff believes that the current nickel standard should be protective of zooplankton including Daphnia species. Zooplankton in the genus Daphnia (water fleas) are very sensitive to nickel toxicity. However, the Daphnia study by Biesinger and Christensen (1973), cited by the Fish and Wildlife Service, is just one of many studies on the toxicity of nickel to Daphnia species available to the Agency when the standard was promulgated in 1990. The Agency staff and the EPA utilize all the available data that meets minimum quality assurance requirements in developing standards and criteria. The toxicity part of the current nickel standard, is the same as the EPA criterion for nickel published in 1986.

G. Mercury Standard

Mr. Elnabarawy of the 3M Corporation (letter dated August 23, 1993) raises several issues regarding the current Class 2 Standard for mercury. Minnesota's current standard is 0.0069 ug/l compared to the EPA criterion of 0.012 ug/l as stated in his letter. The mercury standard is not proposed for change in these amendments despite the change to the reference dose (RfD) in the Integrated Risk Information System (IRIS) as explained in the SONAR at 76.

The EPA criterion and the Minnesota standard differ because the latter incorporates bioaccumulation information for mercury not available to the EPA when the EPA criterion was published in 1985. Also, the Agency uses several human exposure assumptions that are more stringent than the EPA uses in the calculation of EPA criteria.

Mr. Elnabarawy questioned whether or not the Agency could continue to use the RfD of 1.6 X 10-4 mg/kg/day for mercury, used to calculate the standard in 1990, and not use the new mercury reference dose of 3.0 X 10-4 mg/kg/day. Using the new RfD would result in a mercury standard of 0.013 ug/l. As explained in the SONAR at 76, the Agency staff believes a mercury standard of 0.013 ug/l would be under protective of aquatic and wildlife resources in Minnesota.

The Agency staff does not believe it is technically appropriate to automatically amend a standard when one of the several variables that determine a final standard changes. All the variables that impact the calculation of a mercury standard, including bioaccumulation, need to be evaluated before the Agency staff could propose a new mercury standard. Also, the effects of mercury on wildlife need to be assessed under pt. 7050.0218, subp. 9. Agency staff lacked the time and resources to thoroughly research the new mercury data for this round of amendments, and choose to leave the current mercury standard unchanged for the time being.

Mr. Maschwitz and Mr. Elnabarawy discussed these mercury issues on the phone and agreed that a committee should be established in the future to address establishing a new mercury standard, and to discuss the problems of measuring mercury in effluents. This committee would be comprised of members from both industry and MPCA staff.

H. Sulfate Standard

One commenter [DNR, September 21, 1993 letter] recommends that the Class 4A sulfate standard of 10 ug/L be eliminated. The sulfate standard, found in part 7050.0224, subpart 2 of the proposed rule, is not part of the proposed amendments to the rule. The Agency staff believes the deletion of the sulfate standard now would be a substantial change. Agency staff has reviewed the sulfate standard in past and have concluded there is a lack of data showing that the current standard is inappropriate and should be revised or altered.

IV. ANIMAL FEEDLOT STANDARDS

In this proceeding, the Agency proposed to revise pt. 7050.0215 by eliminating an existing effluent limitation for nonpoint source pollution from animal feedlots and manure storage areas and replacing the limitation with a pollution rating model that is based on the evaluation and implementation of Best Management Practice (BMPs). Subsequent to the public hearings and in light of the need for additional time to evaluate the environmental and technical implications of allowing a pollution model rating of less than zero as the regulatory requirement, the Agency staff has proposed to withdraw the rule revision and to maintain the existing requirements of pt. 7050.0215, subp. 2.A. Post Hearing Response at 12-16.

In a letter dated September 27, 1993, Jeffery S. Broberg of McGhie & Betts expressed some concern that the Agency had not made sufficient efforts to work with the agricultural community on the proposed rule revision, and suggested that those attendees at the Rochester hearing were the only farmers who were aware of the proposed rule revision. Mr. Broberg's statements are simply not accurate and completely ignore the efforts by Agency staff to work with the agricultural community to promote the use of BMPs and BMP evaluation tools like the feedlot computer model and to educate that community on the regulatory changes.

The Agency worked with other agricultural-related state and federal agencies to develop and promote the use of the feedlot computer model. SONAR at 44-45; Nelson, Tr. September 9 at 167. In addition to the model's actual and ongoing use in the field offices by numerous agencies, the Agency staff has openly discussed the proposed changes with numerous agricultural producer representatives, including this past summer, with members of the FeedLot Advisory Group (FLAG). This group includes agricultural producer representatives of the Minnesota State Cattlemen's Association, the Minnesota Farm Bureau, Minnesota Farmers Union, Minnesota Dairy Herd Improvement Association, Minnesota Pork Producers, National Farm Organization, Minnesota Turkey Growers Association, as well as staff from the Soil Conservation Service, Minnesota Extension Service, Soil and Water Conservation Districts, Board of Water and Soil Resources, Department of Natural Resources, Department of Agriculture, University of Minnesota, and representatives of environmental groups such as the Minnesota Lake Association. Representatives were also sent ch. 7050 hearing notices.

FLAG has a task force set up to identify and evaluate lower cost alternatives to runoff collection for solving existing pollution hazards from feedlot runoff. A number of comments in the hearings advocated looking for such BMPs. The proposed change to the rules was discussed by this task force on July 1, 1993 and the use of the model was seen as a way to actually facilitate the use of such BMPs in lieu of more costly collection and storage measures.

The number of farmers and broad nature of their comments at the Rochester hearing seems to reflect a lack of information and understanding of how the model could actually reduce costs and promote use of BMPs. Despite that situation, the Agency will continue its productive dialog with agricultural producers as well as with environmental groups on the best way to mitigate feedlot pollution hazards.

In a letter dated September 28, 1993, and a facsimile dated September 29, 1993, the Goodhue County Soil and Water Conservation District (SWCD) and the Area 7 of the Minnesota Association of SWCDs respectively requested the Agency to revise ch. 7050 to allow the use of feedlot BMPs rather than adherence to the proposed feedlot rating system. For clarification, ch. 7050 provisions do not prohibit use of feedlot BMPs or create disincentives to BMP use. Under the regulatory and permitting program of the Agency's feedlot program, ch. 7020, cost effective BMPs are promoted as alternatives to costly collection and storage systems.

In addition, use of the feedlot computer rating system will promote use of BMPs by evaluating the effects of proposed BMPs and thus, educating the farmer on what BMPs may be effective and cost efficient. Nelson, Tr. September 9 at 164 and 173. As indicated in the Post Hearing Response at 12-16, Agency staff proposes to evaluate the rating system to see how it might be used to promote cost-effective BMP use with a rating greater than zero for compliance determination purposes. In this evaluation process, Agency staff will consider the SWCDs' proposal of using BMPs as a regulatory standard. However, Agency staff will not propose any specific proposals for BMP-related standards in this rulemaking because there has not been sufficient time to draft and evaluate such standards and to notice potential affected persons of the proposals.

In a letter dated September 28, 1993, Mr. Owen Knutson of the Minnesota Soil and Water Conservation Districts requested that the Agency consider dropping its proposal to incorporate use of the feedlot evaluation system model in pt. 7050.0215, subp. 2 and replace it with a requirement to utilize feedlot best management practices. Agency staff has already decided to drop the proposed changes to pt. 7050.0215 in response to comments received during the public hearing process. Feedlot operators are already encouraged to use best management practices on a voluntary basis by Agency staff. Including the mandatory use of best management practices in pt. 7050.0215 would be a significant change at this point in the rulemaking process. Staff has therefore decided not to take this action but will consider this and other proposals for addressing feedlot requirements during the next triennial review period.

V. RECLASSIFICATIONS

A. Center Creek

Pursuant to existing pt. 7050.0430 (1991), Center Creek is currently classified in Class 2, and specifically in Class 2B. SONAR at 95. In this rulemaking proceeding, the Agency has not made any proposal to amend or revise Chapter 7050 with regard to the current classification of Center Creek.

During the fall, 1992, the Agency public noticed a draft NPDES/SDS permit for the City of Fairmont's wastewater treatment plant. Gross, Tr. September 7 at 15. During that re-permitting process, the City submitted a variance request to the Agency on the ammonia and copper requirements. Id. The re-permitting process and the Agency's consideration of the variance request was placed on hold, by mutual agreement of the Agency and City, pending the outcome of the City's request for a rule change during the Chapter 7050 triennial review. Id. at 15-16.

The City of Fairmont has requested that the Agency amend ch. 7050 with regard to the current classification of Center Creek. Under the City's proposed amendment to classify Center Creek as a Class 7 waters, pt. 7050.0470 (1991) would be amended to include Center Creek as a listed Class 7 water.

Center Creek is approximately 31 river miles in length, with the City of Fairmont located at the Creek's uppermost reach. Agency Exhibits 14 and 15. After it leaves Fairmont, this prairie stream meanders for approximately 29 miles until it reaches the confluence with the Blue Earth River. Id. Center

Creek flows through the City of Granada and near the Cities of Winnebago and Huntley. Id.

During the public hearings, the City of Fairmont had numerous City residents, including city employees, testify in favor of the City's proposed rule change. Most, but not all, of these City residents were emphatic that they had never observed recreation uses, such as fishing, wading and swimming, being made of Center Creek. In the City's post-hearing comments and despite the City's own-submitted evidence of substantial man-induced point and nonpoint pollution sources which have not yet been regulated and controlled, the City has concluded that Center Creek will never be a stream that will support any fish or recreational use. See City of Fairmont's Post Hearing Brief and Comments (City Brief). Despite record evidence to the contrary, the City implies that it is the sole creator of flow for Center Creek for significant periods of time. City Brief at 21 (Without Fairmont's effluent, no stream would exist at all, above or below the plant.) (City's emphasis).

In light of the City employees' and residents' testimony and the substantial availability of fishing and recreational opportunities in the City's five lakes within its City limits and the potential implications of the proposed draft NPDES/SDS permit, it can be understood why there is such emphatic opinion held by the City and its residents about the 31 mile-long Center Creek. However, the Agency's water quality regulatory scheme, including the classification system, incorporates a more holistic, integrated approach and view to waterbody reclassification proposals. Such proposals must be evaluated not only in light of the evidence presented and opinions held by the proposer, but on the totality of the relevant circumstances. The Agency's evaluation must then also consider other evidence, including evidence of existing and potential recreational uses, derived from throughout the 31 mile reach of Center Creek.

It is apparent that the City of Fairmont's conclusions and opinions regarding Center Creek and the Creek's future uses are not universally held by other entities. The following public entities oppose the City's proposal to downgrade Center Creek to a Class 7 status: City of Granada (Attachments 10 and 13), Faribault County (Attachments 16 and 17) and Verona Township (Attachment 18).

Based on an evaluation and consideration of the totality of the evidence from throughout the 31 river-mile reach of Center Creek, there is no evidence from which to rationally conclude that the federal Clean Water Act goals are not feasible in Center Creek. The Class 2 designated uses currently exist in Center Creek and future federal, state and local efforts to protect those existing and other potential uses through both point and nonpoint source control efforts cannot be totally discounted. Agency staff continues to oppose the City's proposed rule amendment to downgrade Center Creek to the Class 7, Limited Resource Value Water classification.

In regard to specific issues raised in the City Brief and in the City's accompanying enclosed attachments, Agency staff hereby provides the following responses:

1. Center Creek Stream Flows

The City, in its enclosure number 4, entitled "Estimation of Depth of Water in Center Creek Downstream of the WWTF During Dry Weather Periods," (hereinafter referred to as City Enclosure 4), attempts to estimate the water depth in Center Creek downstream of the wastewater treatment facility (WWTF) when the WWTF effluent is the only flow in the creek. The discussion relates to the depth of water at the station at river mile 23.7. See Agency Exhibit 14. Through the use of the Manning formula, and an assumed roughness coefficient (Manning's n), the City attempted to predict the water depth in Center Creek during the drought conditions, the summer of 1988. The City, in its computations, used flow measurements and reach velocities cited in the Addendum to the Wasteload Allocation Study for Center Creek, in Agency Exhibit C51 and from testimony presented on September 9, Tr. Blaha at 79-80. The City concluded that at 3.7 cubic feet per second (cfs), the water depth at this site would be approximately 4.75 inches deep. The City went on to conclude that flows at this shallow depth provide such limited habitat so that it is nearly impossible to maintain a viable fishery. (City Enclosure 4 at second page).

Agency staff does not concur with either of these conclusions. As indicated in City Enclosure 4, the discharge, (Q) is equal to the velocity (V) times the cross-sectional area (A). The cross-sectional area is determined by multiplying width times depth. There is adequate field measurement data contained in Appendices A and B of the above referenced Addendum, which can be utilized in order to determine an approximation of the average depth at the cross-section at river mile 23.7 when the flow was 3.7 cfs. In using this first hand data, assumptions of Manning's n need not be made. Using the cited velocity in the Center Creek segment between river mile 23.7 and 21.7 of 0.208 feet per second, and the width of the river at this site of 26 feet, at a flow rate of 3.7 cfs, the average depth at the cross-section is 8 inches, not 4.75 as predicted by the City in its use of the Manning formula.

Be that as it may, the more important issue is the City's inference that the average depth at the cross-section is an accurate reflection of the overall depth of the creek. This may be a valid assertion if the morphological conditions represented at the cross-sectional flow measurement point at river mile 23.7 were indicative, on a uniform basis, of other locations along the creek. In otherwords, if the creek morphology was homogeneous throughout its length, which predominantly is the case in channelized watercourses such as county and judicial ditch systems, then an average depth at a cross-sectional measurement at a given point along the watercourse will be a reasonable representation of other stream depths at cross-sectional areas at other points along the watercourse's reach. This is not the case with Center Creek. Evidence presented in Agency Exhibit C51 for station CC-2, (RM-23.7); in testimony Tr. September 9, Blaha at 79-80,85-86; and Agency Post Hearing Response at 36-37 shows that there are pools along the creek, (in excess of 4 feet deep during the 1992 survey), which document that the creek does not have a uniform cross-section throughout. The creek does have a diverse instream morphology, and this diversity contributes towards and supports its fisheries and recreational uses.

Statements were made in the City's Brief at 20-21 to the effect that without Fairmont's WWTF effluent discharge, no stream would exist at all, above or below the plant; and that on many occasions, there is not enough flow below the WWTF to sustain fish on a continuous basis. The Agency has addressed this issue in its Post Hearing Comments at 29-38. In addition, as shown in the data presented in Agency Post Hearing Response Attachment 9, even during drought year of 1976 when many of the surrounding watercourses had zero cfs flow measurements, there was flowing water in Center Creek. The following are summaries of comments contained in letters submitted into the hearing record that Agency staff believes also refute the City's claims. The cited river miles correspond to those as indicated on Agency Exhibit 14.

a) Hansen (Attachment 2) indicates that when growing up near Center Creek in Faribault County, never remembers it going dry even during the drought years of the 70's.

a) Dwayne and Eleanor Cartwright (Attachment 3), living about 1000 feet from Center Creek in Faribault County, lower reach, indicate they have never seen this creek dry up.

b) H. Johnson (Attachment 4), river mile 1.6, comments that people he talked to who have resided in the area have never seen Center Creek completely dry.

c) D. Cartwright (Attachment 5) farms along river mile 1.6 and 4.0, comment that there are artesian wells that flow into the creek.

d) Jenkins (Attachment 8) rents pasture at river mile 7.3, drought year of 1988 the stream did not go dry and that it is spring-fed.

In summary, evidence entered into the record indicates that while the Fairmont WWTF discharge may be a continuous flow contributor to Center Creek, it is not the only source of water in the creek and even under extreme drought conditions, there are pools along the creek downstream of this sustaining flow which can serve as fish refuges for the maintenance of the instream fishery.

2. Center Creek Fisheries.

The City states that in effect, the purpose of the WWTF upgrade is to make the Creek into a good quality sport fishery and a good quality recreation stream. City Brief at 9-10. Agency staff in its Post Hearing Response at 30 explained the rule provisions of pt. 7050.0210, subp. 7 concerning 7Q10 flows and the maintenance of water quality standards in waters of the state under 7Q10 flow conditions. Defining what good quality means is difficult, since what is a good quality fishery to one person may mean something quite different to another. Similar difficulties are encountered when defining "good quality" as it relates to recreational uses. Agency staff can understand the perceptions and sentiments adamantly expressed by Fairmont residents concerning Center Creek in light of the degradation from pollution impacts that have occurred for years in and around the Fairmont area. An accurate estimation of the creek's value and future potential to the Fairmont community, (City Brief at 13) is complicated even further because of the close proximity to the area lakes which offer high quality recreational opportunities. A succinctly written comment submitted by a Granada area resident which characterizes Center Creek as "Grenade's 'Lake'" is a telling reminder that describing and evaluating the quality of a water's resource value must be considered in a broader perspective than only through the eyes of Fairmont residents.

In summary, the information from the MPCA and DNR assessments, reports from local residents and also historical accounts indicate that Center Creek supports a diverse and sustaining fishery which includes sport fish such as walleye, northern pike, channel catfish and yellow perch; rough fish including bullheads, carp, buffalo, suckers and sheephead; and many other minnow and darter species that are typical fish species found in the Blue Earth River Watershed. Also as examples of evidence of the existing and potential fisheries value of the creek, listed are summaries of comments concerning Center Creek fisheries.

a) Hansen (Attachment 2) comments that when visiting from New Mexico, her children fish Center Creek in Faribault County.

b) Dwayne and Eleanor Cartwright (Attachment 3) live near stream in Faribault County(lower reach approx. RM. 1- 4), children and grandchildren fish the creek.

c) H. Johnson (Attachment 4) at river mile 1.6, fishes with nine grandchildren on Center Creek. Has caught northerns, walleyes, catfish, bullheads, and carp.

d) D. Cartwright (Attachment 5) farms along river mile 1.6 and 4.0. Their family fishes in Center Creek in this vicinity. Also has observed people from Winnebago and Blue Earth fishing off bridge over Center Creek.

e) Rynearson (Attachment 6) lives near river mile 4 and fishes Center Creek.

f) Seetin (Attachment 7) farms at river mile 5.5, grandchildren fish in 1.5 mile stretch of the creek in this vicinity. Noted 1993 catches of catfish and walleye.

g) Jenkins (Attachment 8) rents pasture at river mile 7.3, sees fishing line caught on fence.

h) Kessling (Attachment 9) lives near river mile 7.3, comments that people fish off the bridge.

i) Evans (Attachment 10) Granada resident near river mile 17.8, comments that children fish off the bridge.

j) Goodwill (Attachment 11) Granada resident (R.M. 17.8), comments that kids ask to fish the creek from her backyard and fish off the bridge.

k) Sparks (Attachment 12) lives near Granada (R.M.17.8) and their children fished stream when they were young.

l) Hiatt (Attachment 13) Granada resident (R.M. 17.8) that grew up fishing in Center Creek.

m) Mortensen (Attachment 14) Granada resident,(R.M. 17.8) fished Center Creek as a young person and knew people fished for catfish in the stream. Cites a Huntley area resident who knew of walleye being caught in Center Creek.

n) Perrine (Attachment 15) fished and saw people fish downstream of the Lake George dam (R.M. 31.3), and at RM 28.9 and at bridge between R.M.28.9 and 30.2.

The preceding attachments confirm the evidence presented by MPCA and DNR staff that there is not only an existing fishery present along the entire reach of Center Creek, but that fishing is also a known, existing recreational use.

3. Aquatic Recreational Uses of Center Creek.

Testimony and comment letters which have been submitted into the record make reference to the fact that Center Creek is used for aquatic recreational uses, including bathing. It is important to note that while the Class 7 water use classification protects for secondary body contact uses, whole body (primary) contact uses are not a protected use. Secondary body contact uses include such activities as boating, fishing and limited contact with water associated with shoreline recreational activities. Swimming, tubing, and wading by children and other activities where there is a likelihood of incidental surface water ingestion and/or immersion are considered as whole body, or primary contact uses.

In similar fashion as previously presented above, the following are summaries of comments letters which provide information relating to the aquatic recreational uses of Center Creek.

a) Hansen (Attachment 2) comments that family when visiting from New Mexico waded and tubed down Center Creek near parent's home in Faribault County.

b) Dwayne and Eleanor Cartwright (Attachment 3) live near stream in Faribault County, lower reach, children did and grandchildren do swim, wade and inner tube in Center Creek.

c) David Cartwright (Attachment 5) river mile 1.6 and 4.0, family wades, swims, tubes and canoes in Center Creek in this vicinity.

d) Rynearson (Attachment 6) near river mile 4, comments on Boy Scout activities including swimming tests by Center Creek.

e) Seetin (Attachment 7) farms at river mile 5.5, grandchildren swim and tube in area. They indicate scout troop tubes as well.

f) Evans (Attachment 10) Granada resident (R.M. 17.8), comments children raft and wade in the creek.

g) Goodwill (Attachment 11) Granada resident (R.M. 17.8), comments kids swim in the creek.

h) Sparks (Attachment 12) lives near Granada (R.M. 17.8), their 6 children swam and rafted in Center Creek when they were young. Their conversations with many people of all ages indicated that many residents in the area have swam, rafted, and also fished Center Creek.

i) Hiatt (Attachment 13) Granada resident (R.M. 17.8) indicated that he and his friends swam in Center Creek while growing up.

g) Perrine (Attachment 15) indicated by canoeing Center Creek from R.M. 28.9 to R.M. 23.7 that the stream is navigable with a few portages in this segment under higher flow conditions.

In commenting on the amount of evidence placed in the record by staff of the MPCA and the DNR, the City reasoned that " no one in Fairmont and the surrounding communities uses Center Creek for aquatic recreation such as swimming, bathing, or wading on a regular basis." See City Brief at 30. The written comments in the preceding attachments attest to the fact that aquatic recreational uses have historically been made and are currently being made of Center Creek.

4. Process Related Issues.

The City, by way of footnoted commentary, raised the issue of the use of the word "limited" versus the use of the words "severely limited" in describing existing and potential fisheries in Class 7 waters. See City Brief at 15. The City was concerned that the Agency was establishing a more restrictive test for Center Creek by using the term "severely limited" instead of the term "limited" as used elsewhere in describing fisheries use and potentials for other waters being considered for reclassification during this rulemaking proceeding.

No distinction was intended, nor should be presumed, in the descriptive use of the term "limited" in deference to the use of the words "severely limited" in descriptions relating to fisheries potential of a given waterbody. The SONAR at 89 clearly specifies that one of the Class 7 criteria conditions is that "The existing fishery and potential fishery are severely limited by natural conditions as exhibited by poor water quality characteristics, lack of habitat or lack of water;" (from Minn. Rules pt. 7050.0200, subp.7). Agency staff has this descriptive criteria condition in mind when evaluating the fisheries potential of all waters considered for Class 7 reclassification. Center Creek is not being held to a higher standard test when it comes to the evaluation of its existing and potential fisheries uses.

Another process related issue raised by the City concerns the comparisons made of Center Creek to other Class 2 waters in the general vicinity and to Class 7 waters also in the area. See City Brief at 23.

Agency staff agrees with the City's statement that each stream needs to be evaluated on its own merits. The Agency has assessed Center Creek based on information obtained through numerous surveys and historical accounts and believes that the evidence supports the existing fisheries and recreational use classification. Agency staff also believes that comparing watercourses within similar geographical areas is a useful approach to provide the needed perspective and to set the necessary framework to allow for a discussion of achievable and non-achievable goals for a given water body.

A third process related issue has to do with the aerial video of Center Creek that was submitted as Agency Exhibit 16. Testimony was presented on September 7, (Tr. Roloff at 94-95), concerning the timing of the overflight and the high water conditions present along the creek at the time. This certainly was a high water condition, and viewers of this video should bear in mind that if the overflight were to have been made under more normal flow conditions, areas of stream bank erosion would likely have been more evident. The main purpose of the overflight was to 1) show the lack of channelization of Center Creek and to show its sinuosity, and 2) to show the nature of the riparian zone along the creek, including vegetative areas and trees along the watercourse.

5. Water Quality

In response to Judge Klein's inquiry regarding the contributions of other sources of ammonia to Center Creek, (Tr. September 9, Klein at 100), the City presented: 1) data on WWTF effluent and instream Total Kjeldahl and ammonia concentrations based on the City's monitoring efforts during the winter of 1990 and 1991; and 2) a comparative analysis of an intermittent discharge to Center Creek at a point downstream of the WWTF discharge. This information is presented in an attached enclosure to the City's Brief entitled "Other Sources of Nitrogen on Center Creek". This attachment will be referred to as City Enclosure 3.

The City's analysis contained information under winter time conditions and focused on concentrations versus mass loadings since flow measurement results presumably,and understandably, were not available for the days the samples were collected. This approach compares to the Agency staff's analysis of mass loadings of the various forms of nitrogen for the summer time survey data that the Agency had previously collected.

The City's analysis points to the existence of additional point/nonpoint sources of pollution entering the creek downstream of WWTF effluent discharge. This information supports both the City's and the Agency's observations that there are other pollution sources which impact Center Creek. While a more accurate representation of the relative contributions of nitrogen sources for this period may have been accomplished if data were presented as mass loadings as opposed to concentration values, often times you have to make do with available data, and the City did a good job of graphically showing these increases in instream concentrations.

Agency staff does take exception to the statements made in City Enclosure 3 at page 11, and to statements in City Brief at 34. In effect, the City makes the argument that if the City were to remove its WWTF effluent from Center Creek, there would be less dilution water available in the stream for other pollution sources impacting the creek. On its face this may be a valid statement. But from an Agency staff's perspective, the proper approach to improving Center Creek is to address and remove pollution sources so that dilution water is not as critical a concern. This is especially true for the intermittent discharge from the agricultural operation cited. Id. This point source, along with the other point and nonpoint sources cited by the resource managers who completed the nonpoint source survey are anthropogenic in nature and presumably at least have the potential for correction. (See discussion in City Enclosure 2 entitled "Review of: 1992 Minnesota Water Quality Report Appendix 2" for the cited pollution sources and effects.)

Another water quality related statement which needs to be addressed concerns the City's comments that if Center Creek were to be reclassified as a Class 7 water then "The MPCA has no reason to be concerned that reclassifying Center Creek will impair its water quality in the future." (City Brief at 32). Indeed, the Agency has a great deal of concern if Center Creek were to become a Class 7 water. First of all, it would result in a change in the allowable loading rates that would be established for future dischargers discharging to this watercourse. The City has committed, on the record, to not only maintain its present quality of WWTF effluent, but to dechlorinate and increase the effluent dissolved oxygen concentrations as well. However, under a Class 7 scenario, future dischargers to Center Creek would be assigned effluent limits based on the protection of Class 7 uses which generally means they would be allowed to discharge at less restrictive levels than they would be allowed to under the Class 2 use classifications.

The second reason for concern is the precedent such a classification would have concerning other watercourses both in that part of the state as well as on a larger statewide basis. Here, the natural watercourse affords fisheries and aquatic recreational uses, has the habitat and flow conditions to sustain these uses, and even has the potential for improved fisheries and recreational uses through the control and/or elimination of both point and nonpoint sources of pollution. The evidence clearly demonstrates that Center Creek is a fisheries and recreational use stream. To make the call otherwise, is not supportable and would most certainly set a bad precedent in the Agency's attempts to provide for protection of attainable uses.

The Agency staff is very much aware of the estimated, potential costs associated with meeting the ammonia effluent limitations and what those costs may mean to the residents and businesses in Fairmont and in a broader sense to the regional area as well. Agency staff in its previous discussions with the City have repeatedly made clear that the issues associated with the upgrade costs and economic impacts should be dealt with within the context of the permit issuance and variance provisions afforded by the rule, instead of challenging the existing use classification of the stream. If there is any potential for economic relief from the costs associated with the assignment of the ammonia effluent limitation it is through the variance review process and not through a reclassification of the stream. Center Creek is not a Class 7 watercourse.

6. Classification.

The City has submitted comments on its view of how the Agency should implement the requirements of the Agency's statutes regarding water quality, including the State Water Pollution Control Act and Minn. Stat. sec. 115.44 and of the federal Clean Water Act, and classifications to protect designated uses. City Brief at 10-12. The City also provided comments on its interpretation and application of Minn. Rules pt. 7050.0220, subp. 3, item C (1991). Id. at 14-20.

The Agency staff's response to these City comments have been substantially addressed in the Agency's Post Hearing Response at 19-24. However, the following response is also applicable and relevant.

First, the City attempts to interpret and apply the Agency's requisite procedures and rules in a vacuum and as if the federal Clean Water Act and its applicable water quality standard requirements were nonexistent. The Agency is the state's agent for administering, implementing and enforcing the federal National Pollutant Discharge Elimination System (NPDES) program under the Clean Water Act. SONAR at 6. In that capacity, the Agency has been given "the authority to perform any and all acts minimally necessary" which are applicable to the state's participation in the NPDES program. Minn. Stat. sec. 115.03, subd. 5 (1992). Under the CWA, the states are required, with federal oversight and approval, to institute certain requirements to assure protection of the quality of all state waters. Section 303(a), (b), and (c)(1), 33 U.S.C. sec.

1313(a), (b), and (c)(1). These requirements include the promulgation of water quality standards that include the "designated use" of the water body. See Section 303(c)(2), 33 U.S.C, 1313(c)(2); Section 303 (d)(4)(B), 33 U.S.C. 1313(d)(4)(B); 40 C.F.R. Pt. 131, subp. B.

A water quality standard defines the water quality goals of a water body by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. 40 C.F.R. sec. 130.3 (1992); 40 C.F.R. sec. 131.2 (1992). These standards serve the dual purpose of establishing water quality goals for a specific water body and serve as a regulatory basis for the establishment of water quality-based treatment controls and strategies beyond the technology-based level of treatment. Id.

Each state must include use designations in its standards that are consistent with and serve the purposes of Section 101(a)(2) of the Act. 40 C.F.R. sec. 131.6(a) (1992); see 40 C.F.R. sec. 131.2 (1992). This means that the standards should, wherever attainable, provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water. Each state must specify the appropriate water uses to be achieved and protected. 40 C.F.R. sec. 131.10 (1992). These "designated uses" are those uses specified in water quality standards for each water body or segment whether or not they are being attained. 40 C.F.R. sec. 131.3 (f) (1992). In essence, the national water quality goals of "fishable/swimmable" waters must be designated in the water quality standards for all waters, wherever attainable, including those waters where they are not currently being attained.

In compliance with 40 C.F.R. pt. 131, the Agency has grouped the waters of the state into one or more of seven major classes based on designated uses. See pt. 7050.0200 (1991). Class 2, fisheries and recreation, is the main class that serves the national "fishable/swimmable" goal of Section 101(a) of the Act. All waters of the state have a Class 2 designation unless the water body has been downgraded to a Class 7, the limited resource value water classification.

The City expressed some concern with the Agency staff's discussion of the federal regulations regarding the fishable/swimmable national goals. City Brief at 18-19. The federal regulations require a rigorous analysis demonstrating that a waterbody cannot attain fishable/swimmable status before designated uses can be removed. See 40 C.F.R. sec. 131.10. Thus, it appears that Agency staff accurately portrayed the federal process that presumes the national goals can be met unless the rigorous analysis demonstrates otherwise. This process is also reflected in Chapter 7050 which has been approved by EPA. Class 2 waters either currently meet those national goals, or are in such a state that those goals are attainable. The Class 2 designated uses are only removed when and if it is determined that the waterbody should be downgraded to a Class 7, limited resource value waters.

In summary, Minn. Rules ch. 7050 establishes the water quality standards and the beneficial use classifications for all waters of the state consistent with the goals of the federal Clean Water Act to provide fishable and swimmable waters wherever attainable. See SONAR at 1. This judicial forum has recognized that the federal Clean Water Act superimposes the requirement that state water quality standards are consistent with those federal goals and has concluded, that, in essence, there are two major classes of waters: (1) those where the national goal is attainable and (2) those where the national goal is not attainable. See Report of the Hearing Examiner, Minnesota Office of Hearing Examiners, Docket No. PCA-80-004-AK, at 11, paragraph 23 (August 21, 1980).

In regard to the City's legal interpretation and application of the Agency's classification rules, the pertinent part of Minn. Rules pt. 7050.0220, subp. 3, item C (1991) reads as follows:

> The quality of this class of surface waters shall be such as to permit the propagation and maintenance of cool and warm water sport or commercial fishes and their habitats and be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable.
>
> (emphasis added)

For approximately 30 years, the Agency has been required to maintain a classification system and have the waters of the state grouped into these classes. See Ch. 874, 1963 Minn. Laws 1642; Minn. Stat. sec. 115.44 (1992). Since adoption of the federal water pollution control laws and for over 20 years, the Agency has had water quality standards, including classifications that identified and protected designated uses, that have been consistently interpreted and applied to achieve the federal goals and consistent with state water pollution policy. The purpose of the classification system, in part, is to safeguard the waters of the state from pollution by (a) preventing any new pollution and (b) abating pollution existing when Minnesota Laws 1963, Chapter 874 became effective. Minn. Stat. sec. 115.42 (1992).

The Agency promulgated Class 2, fisheries and recreation, as the main class that serves the national "fishable/swimmable" goal of Section 101(a) of the Act. All waters of the state have a Class 2 designation unless the Agency has determined that the state and federal goals are not attainable, in which case, the water body is downgraded to a Class 7. Class 2B contains designated uses of fishable and swimmable, and such uses are specified for each water body grouped under the Class 2B, as required by law, whether, or not those uses are being attained. See 40 C.F.R. sec. 131.3(f) (1992).

The City's preferred legal interpretation does not take into account the state and federal policies and goals to be achieved and would, if applied, defeat the federal CWA goals and the policies of the state water pollution control laws. The City wants the rule to be read and applied as follows: before Center Creek can be classified as a Class 2 water, the Creek shall be required to have (1) year-round propagation and maintenance of sport fish; and (2) recreational uses of all kinds, including boating, swimming and fishing, that are regularly used by Fairmont residents. See City Brief at 16-17, 19-20, and 28-29.

Consistent with the City's logic, no waters of the state would be allowed to have a Class 2 designation if the numeric water quality standards found following all Class 2 designated use narratives were not met. In essence, the City's logic dictates that if the Class 2 numeric standards are exceeded, a waterbody does not meet the requirements of Class 2 and, thus, the Agency is prohibited from giving that water body any Class 2 classification. The water body would have to be designated a Class 7 water.

Consider the implications of the application of the City's logic. If a water body does not have existing, actual Class 2 uses, or comply with Class 2 numeric standards, the Agency cannot give the water body a Class 2 designation. The

Agency would have to classify water bodies in their present condition and under present actual use and would be prohibited from abating pollution to create better conditions. Under the current MPCA rules and the City's interpretation of those rules, if the water body currently does not have existing Class 2 uses, then the water body must be designated a Class 7 water body.

The City's legal interpretation of Minn. Rules pt. 7050.0220, subp. 3, item C and resultant application would create unreasonable results. The Agency would be required to ignore the state's statutory policies and the federally mandated national goals, and redesignate numerous waters. However, the City would have those waters, not currently having existing Class 2 uses, be classified as Class 7. The City has provided no explanation as to how the Agency should classify waters that did not meet the Class 2 requirements but also do not demonstrate the requisite conditions for Class 7 designation under Minn. Rules pt. 7050.0200 (1992). The Agency's rules should not be interpreted to create these unreasonable results or to defeat the state and federal legislative mandates.

The Agency's interpretation of the classification narratives and the resultant classification of waters of the state is one of long standing duration. As the previous discussion of the state/federal partnership demonstrates, and as this judicial forum has historically recognized, the fishable/swimmable national goals are reflected in the Agency's rules and in the interpretation and application of these rules. See Report of the Hearing Examiner, Minnesota Office of Hearing Examiner, Docket No. PCA-80-004-AK, at 57, paragraph 84 (August 21, 1980). Deference should be given to the Agency when its interpretation is one of long-standing. Wenzel v. Meeker County Welfare Board, 346 N.W. 2d 680, 683 (Minn. App. 1984).

In addition, the City has attempted to promote a unique legal interpretation to an Agency rule. In this situation, the Agency's interpretation of its own rule should be given considerable deference. See St. Otto's Home v. Minnesota Department of Human Services, 437 N.W. 2d 35, 40 (Minn. 1989). Assuming arguendo that the narrative description in Minn. Rules pt. 7050.0220, subp. 3, item C (1991) is ambiguous, the Agency's interpretation should be given considerable deference because it is reasonable in the context of the goals and requirements of the state and federal water pollution control laws. Id.

The second issue raised by the City is its continuing refusal to recognize that numerous waters of the state, including Center Creek, have been specifically classified by the Agency as Class 2B waters. Under Minn. Stat sec. 115.44, the Agency has historically been required to conduct public hearings (e.g. formal rulemaking) during the adoption and revision of water quality standards and classifications. The Agency has complied with those requirements. In addition, the notices of those public hearings since 1963 and up until 1993 received newspaper coverage in all Minnesota counties, including Martin County. See Minn. Stat. sec. 115.44, subd. 7 (1992). Finally, the City fails to recognize that Center Creek was specifically listed as a Class 2B water in a prior Agency regulation. Post Hearing Response at 18. Currently, Center Creek is considered an unlisted waters and, as such, is in the Class 2 waters group. Minn. Rules pt. 7050.0430 (1991).

In conformance with state requirements, the Agency has classified all of the waters of the state giving consideration to all requisite factors and incorporating, where required or necessary, the federal Clean Water Act provisions. In this case, the Agency's Center Creek assessments and the record evidence demonstrates that the Agency's prior rulemaking decisions with regard to Center Creek were accurate and reasonable.

7. Miscellaneous Issues

The City commented that it feels the Agency had not demonstrated the need and reasonableness to classify Center Creek as a Class 2B waters. City Brief at 7-8. The City also asserted that the Agency did not comply with Minn. Stat. sec. 14.11, subd. 1 (1992) with regard to the Agency's "proposed action." City Brief at 6-7, n.1.

A review of some relevant facts are necessary to address these City comments. Pursuant to existing Minn. Rules pt. 7050.0430 (1991), Center Creek is currently classified by the Agency in Class 2, and specifically in Class 2B. SONAR at 95. In this triennial rulemaking proceeding, the Agency has not made any proposal to amend or revise Chapter 7050 with regard to the current Class 2B classification of Center Creek.

However, the City has requested that the Agency amend or revise its current Chapter 7050. The City's proposed rule amendment would require the revision of Minn. Rules pt. 7050.0470 (1991) to include Center Creek as a listed Class 7 water.

In a regulatory NPDES/SDS permitting proceeding, separate from this rulemaking proceeding, the Agency public noticed a draft NPDES/SDS permit for the City's wastewater plant. Gross, Tr. September 7 at 15. The proposed permit included a number of effluent limitations, including ammonia, that are based on the current 2B classification. Id. In that permit proceeding, and as a result of the city's apparent $9 to 12 million estimates for plant upgrading to meet the ammonia limit proposed in the draft permit, the City has submitted a variance request to the Agency that is currently on-hold pending the completion of this rulemaking process. Id. at 15-16.

Minn. Stat. sec. 14.11, subd. 1 is not a requirement applicable to the City's proposed reclassification of Center Creek. The potential expenditures of the City, a public body, to meet the proposed ammonia standards are costs that are associated with a NPDES/SDS permitting process based on the current, existing rules which specifies Center Creek as a Class 2B water. The City's estimated $9 to 12 million potential cost is not an incremental cost required by any of the Agency's proposed revisions or amendments to Chapter 7050 in this current rulemaking proceeding.

The Agency has not proposed a rule or rule amendment with regard to Center Creek reclassification. Minn. Stat. sec. 14.11, subd. 1 does not require an administrative agency to estimate the costs to public bodies of rules that are not proposed for revision or amendment. Costs which are not attributable to current Agency-proposed rule amendment (but rather are attributable to the fact that the City's plant cannot meet proposed draft effluent limits for ammonia based on an existing classification rule) should not be require to be considered and evaluated under Minn. Stat. sec. 14.11. The Agency has complied with Minn. Stat. sec. 14.11, subd. 1 for those Agency-proposed rule revisions or additions in this current proceeding. SONAR at 126-127.

Applying the City's logic and interpretation, the Agency would be required to comply with Minn. Stat. sec. 14.11, subd. 1 by preparing a reasonable cost estimate of every applicable provision of Chapter 7050 to every Minnesota public body during every chapter 7050 triennial review. This cost estimate would be required to be prepared even if the applicable rule provision was not being amended or revised. In such case, the Agency would have to survey every public body every three years to make a determination for each body what relevant actions are going to occur. The result of the City's interpretation and application of Minn. Stat. sec. 14.11, subd. 1 is unreasonable and likely impossible in terms of administrative execution. Clearly, the legislature did not intend such an absurd result. See Minn. Stat. sec. 645.17 (1992).

In a similar manner, the City asserts that the Agency has not demonstrated the need and reasonableness of classifying Center Creek as a Class 2B water. The City ignores the facts that Center Creek, under existing rules, is a Class 2B water, and that the Agency has not proposed any rule amendment or revision with regard to that Center Creek classification. The City's logic and interpretation would create unreasonable and absurd results. Under the city's application, the Agency would be required to demonstrate the need and reasonableness for each individual water body during every triennial review even if no classification change was being proposed. The City has failed to identify the statutory requirement for such an evaluation when the proposed classification (rule) amendment is not one made by the administrative agency.

However, the Agency has in fact demonstrated both the need and reasonableness for the continued classification of Center Creek as a Class 2B water. The details of the demonstration are explained in the SONAR, the Agency's exhibits and testimony, in the Agency's Post Hearing Response and in these final comments; but in summary, the evidence clearly demonstrates the existence of fisheries throughout the Creek's 31 mile reach. The evidence also demonstrates both substantial recreational opportunities and actual recreational uses such as fishing, wading and primary or direct body contact. The Class 2B standards are necessary to protect both the creek environment and the public health as a result of the primary body contact. Most of the current point and nonpoint pollution sources are man-induced and subject to future remediation through federal, state and local pollution control efforts. Thus, there is not sufficient evidence to conclude that the Class 2B requirements and goals are not attainable. In addition, the Class 7 designation would not provide the necessary protection of public health based on the primary body contact that is occurring in the creek. Class 7 only protects for **secondary** body contact (e.g. adult wading). Finally, the Agency has taken a reasonable position in light of the pending permit variance process. The Agency has considered the cost issue and in light of this substantial site-specific issue which is directly at issue in the variance process, it is reasonable to make the classification determination in this process and allow variance-related matters to proceed in the permit/variance proceeding. In conclusion, the need and reasonableness has been demonstrated for the Class 2B classification for Center Creek.

The City also commented that it felt the Agency had not addressed the provisions of Minn. Stat. § 115.43, subd. 1 and 116.07, subd. 6 (1992) with regard to the economic implications of the existing Class 2B designation on the City. City Brief at 2-7 and 34-36. The record evidence demonstrates that the Agency has given substantial consideration to such matters including economic issues, affecting the feasibility and practicality of maintaining the existing Class 2B classification for Center Creek, and has taken actions or provided for such actions to address those matters.

This issue has to be evaluated in light of the long history regarding the proposed draft permit that includes the ammonia effluent limitations. As early as 1973, scientific surveys showed the existence of fisheries in Center Creek. Exhibit C51, DNR 1986 Fish Survey, p. 2, sec. (19) and p. 12, sec. (39) (summary of University of Minnesota 1973 fishery study). In 1986, the DNR conducted a fish and habitat survey that also identified substantial existing fisheries. Exhibit C51. In August, 1987, the Agency completed a habitat quality evaluation for Center Creek which concluded that the Class 2B classification should be maintained. Agency Exhibit 21. In addition, from a period of August, 1975, to September, 1987, a total of five water quality surveys were conducted on Center Creek. Agency Exhibit 20 at 18-29.

Finally, in 1988, the Agency completed a waste load allocation study which included recommendations for ammonia effluent limitations for the City's plant. Agency Exhibit 20 at 3. When the City's current NPDES/SDS permit was about to expire (expiration date June 30, 1992), the Agency apprised the city of the final effluent limits, including ammonia, that would be proposed for permit reissuance. _See_ Agency Exhibit 23 at 1.

Since 1987, the Agency and the City have been negotiating on the best method to address the City's concern regarding the ammonia effluent limit. Read, Tr. September 7, vol. VI at 88. These negotiations included numerous meetings addressing matters related to the Center Creek classification. _Id._

At the City's request, the Agency and the DNR conducted another stream assessment survey of Center Creek in September, 1992. Gross, Tr. September 7, vol. VI at 16.

After the Agency public noticed a draft NPDES/SDS permit in the fall of 1992, the City submitted a variance request as provided for in both Minn. Rules ch. 7001 and 7050. See Gross, Tr. September 7, vol. VI at 15-16. The variance request addressed the ammonia and copper limits. Id. By mutual agreement, the variance process was put on hold. Id. at 15-16.

However, as a means to accommodate the City's concerns with the high costs of meeting the copper effluent limitations, the Agency, as early as June, 1993, indicated that it is likely the Agency would support a variance to the proposed copper limit. Agency Exhibit 23 at 1.

In June, 1993, the Agency completed a cost analysis of nitrification (ammonia removal) for the City's plant. Agency Exhibit 23. The Agency evaluation included a cost review of two treatment alternatives. Id. at 2. The Agency study indicated that the ammonia removal could be achieved using one-stage nitrification. Id. Those associated costs to upgrade the existing plant would be in the $9 million range. Hensel, Tr. September 9 at 92. Given the current 20 year old City plant, the Agency also evaluated a scenario that would delay ammonia removal until a new facility was built. Agency Exhibit 23 at 6-7. Under the delayed effective date evaluation for the ammonia limit, the incremental cost increase of adding ammonia removal to a new facility compared to a new facility without ammonia removal was approximately 16 percent

($1,770,000). Id. at 9; Hensel, Tr. September 9 at 93. Using that same delayed effective date evaluation for the ammonia limit, the Agency determined that the incremental user cost increase associated with adding ammonia removal to a new facility compared to a new facility without ammonia removal was approximately 11 percent. Agency Exhibit 23 at 7 and 9; Hensel, Tr. September 9 at 93.

In light of the results of the Agency's cost analysis of ammonia removal and the Agency's current position to support a variance on the copper limit, the Agency has stated that an alternative that would delay the implementation of ammonia removal until a new facility was considered and built will be given serious consideration in the permit/variance process. Hensel, Tr. September 9 at 94. In essence, the effective date of the ammonia effluent limitation could be delayed by variance until a new facility was in the facility planning stage.

In the context of this permit/variance process and this classification evaluation process, the Agency has given the City's economic matters significant consideration. Again, at the City's request, the Agency conducted another stream assessment survey to verify the City's concerns that Center Creek was not a Class 2B water. That 1992 survey substantiated the numerous historical surveys that had been conducted to evaluate possible permit issues for the City. In addition, the Agency itself has evaluated the ramifications of the proposed copper and ammonia limits and preliminarily determined to support a copper variance and indicated that very serious consideration would be given to an alternative that would delay the ammonia limit effective date and likely result in user cost increases in the 11 percent range compared to estimated 100 percent increase in user costs if the effluent limit compliance had to be achieved with an immediate upgrade of the existing plant. Finally, the Agency made special arrangements to hold approximately seven hours of hearings in Fairmont to accommodate the City's presentations.

The economic considerations, however, must also be taken into context in light of the potential environmental and public health risks that may result from a Class 7 redesignation. Despite the City's assertions that it would not degrade Center Creek, the Agency's legal authority to protect children and adults who use the Creek for direct and primary body contact is substantially weakened. Class 7 waters are only protected for secondary body contact use (i.e. adult wading). The evidence clearly indicates that Center Creek is used for full body contact and that children frequent its banks and waters. The public's health cannot be ignored or put at risk in an effort to maintain economic security. Minnesota Chamber of Commerce v. Minnesota Pollution Control Agency, 469 N.W. 2d 100, 104 (Minn. App. 1991).

The likelihood of resultant dangers and risks to the public health from a resulting Class 7 reclassification in this case is not remote or speculative and the potential impacts to the City from the implementation of the ammonia limits will not be determined with any certainty until the completion of the permit/variance process. On that basis, the balance should weigh to maintain the protections of the Class 2B classification. See Reserve Mining Co. v. Herbst, 256 N.W. 2d 808, 841 (Minn. 1977).

Finally, the Agency has, as a means to incorporate the provisions of Minn. Stat. §§ 115.43, subd. 1 and 116.07, subd. 6, historically provided procedural means outside of the actual water quality standards and classifications rulemaking process to give detailed evaluation of economic matters on a site-specific basis. Minn. Rules pt. 7050.0190, subp. 1 (1991) provides for a variance from applicable standards where exceptional circumstances cause undue hardship and strict conformity would be unreasonable, impractical or not feasible under the circumstances. Minn. Stat. §§ 115.43, subd. 1 and 116.07, subd. 6 are also applicable to that variance process. The variance process also provides the Agency the means to scrutinize the alleged economic hardship arguments. See Minn. Rules pt. 7000.0200, subp. 2, items E, G, and H (1991).

The record demonstrates that the Agency has given consideration to the City's economic concerns. In balance, the evidence supports the Class 2B classification, and a rational division of functions supports the conclusion that the detailed evaluation attendant to the variance request, including the details of economic impacts from various regulatory alternatives including a delay in the ammonia limit application, should be completed in the current NPDES/SDS permitting process. On the record, the Agency has not acted in an arbitrary or capricious manner with regard to consideration of the City's economic concerns.

B. Hay Creek

In this rulemaking proceeding, the Agency has proposed a reclassification of a portion of Hay Creek from a current Class 2B to a proposed Class 2A designation. SONAR at 125. In response to discussion at the September 9 hearing regarding the actual Hay Creek segments that are proposed for reclassification, the Agency provided additional clarification in the initial response comments. Post Hearing Response at 69.

By letter dated September 29, 1993, S.B. Foot Tanning Company provide additional written comments to the record and six exhibits. These comments will be referred to as Foot Comments. Each of the comments raised is addressed below.

1. Existing Trout Fishery

As noted in the Agency's Post Hearing Response at 69, the segment of Hay Creek being proposed for Class 2A classification corresponds exactly with the segment of the creek which last year was designated as a trout water by Minnesota Department of Natural Resources Commissioners Order No. 2450. The length of Hay Creek not previously designated as trout waters extends from its confluence with the Mississippi River upstream approximately 3.6 river miles. The distance from the point of discharge from the S.B. Foot WWTF into Hay Creek downstream to Hay Creek's confluence with the Mississippi River is approximately 1.7 river miles. The legal description for the segment of Hay Creek being proposed for Class 2A classification is as follows: T.112, R.15, S.1; T.113, R.15, S.24,25,36. The S.B. Foot Tanning Company discharge outfall to Hay Creek is in section 36.

In the 1989 DNR Stream Population Assessment of Hay Creek, (Post Hearing Response, Attachment 49, same as Foot Exhibit 5), electroshocking results indicate the capture of four adult brown trout, two of which measured between 12.0-12.4 inches in length and two which measured between 14.0-14.9 inches. As noted in the Agency's Post Hearing Response at 67, Agency staff assisted in this stream assessment with the primary purpose of collecting fish for dioxin analyses. Given the limits of analytical detection for dioxins in water, and the fact that dioxins bioaccumulate, the water quality in Hay Creek was indirectly assessed through a measure of dioxin levels in the captured brown trout.

As noted in the 1989 stream population assessment, the brown trout that were collected for dioxin analysis were electroshocked at station 1 which is located in section 36, downstream of the S.B. Foot discharge. The length of station 1 that was electroshocked was 265 feet long; this compares to a station 2 length of 1358 feet and a station 3 length of 1156 feet. The physical conditions of Hay Creek at station 1 were evaluated by MPCA field survey staff and these observations were recorded on the MPCA fish collection field sheet. See Post Hearing Response, Attachment 50. The average width of the stream was 25 feet, and the average depth ranged between 1-2 feet. The stream bed substrate included both gravel and sand.

As noted in the Post Hearing Response at 67, additional electroshocking survey work was performed on Hay Creek at station 1 on August 26, 1993. The length of the station electroshocked during this survey was 780 feet. See Post Hearing Response, Attachment 51. Twenty-one adult brown trout ranging in length between 8.8-16.5 inches were collected. Brown trout fingerlings were also collected at this station during that survey as well. Id.

2. MPCA/DNR Evaluation

Contrary to Foot Comments at 7-8, consideration and evaluation of the physical conditions of the stream, the water quality of the stream, the point and nonpoint contributing sources to the stream, and an assessment of the habitat suitability of the stream were made by Agency and DNR staff. It is Agency staff's belief, and DNR's belief, as demonstrated by the DNR Commissioner's Order, that trout uses of the lower segment of Hay Creek are both current uses and future attainable uses. It is interesting to note Foot Comments at 7 that "The DNR's designation of Lower Hay Creek as a trout stream serves the purpose of propagating the trout population by limiting fishing and the taking of minnows. S.B. Foot does not take issue with the methods used by the DNR for assessing Lower Hay Creek as a trout stream for the limited purposes within the DNR's statutory authorities." Agency staff read this statement to mean that the company does not challenge the methods of assessment used by the DNR to establish whether a stream is or is not a trout stream, with the qualifier that it be limited to the statutory authorities of the Department, one of which regulates the catching of trout from these designated trout stream segments. In the next paragraph at 7 Id., Foot Comments go on to assert that the Agency has failed to establish that the proposed reclassification of this segment of Hay Creek is reasonable by stating "No evaluation has been done by either the Agency or the DNR as to whether or not the proposed use of Lower Hay Creek as a trout stream is appropriate or attainable." Clearly if one approves of the methods of assessment, and recognizes that a stream segment which demonstrates through the electroshocking data its ability to be used by trout fishes, then not only is the need for the protection of this type of fishery established, but it must also be concluded that it is reasonable to protect it as a Class 2A water in order to maintain its attainable uses.

The DNR authorities and functions go beyond just the regulating of the taking of fish. As shown in the copies of the completion reports cited in Agency Post Hearing Response at 68, habitat improvement projects are ways in which the DNR has provided for habitat protection along various segments of Hay Creek. While these particular habitat improvement projects are upstream of the segment being proposed for Class 2A classification during this rulemaking, it is anticipated that upstream improvements will lead to improved water quality conditions in the downstream reaches of the creek as well.

Foot Comments at 8 refer to testimony entered into the record asserting that lower Hay Creek flows primarily through industrial, commercial, and residential areas. Foot Exhibits 1-4 are aerial photographs of the area which reportedly show these commercial and industrial establishments and housing developments along with roadways on most of the land adjacent to the S.B. Foot WWTF outfall. While these areas of development can produce conditions that have certain impacts on the instream habitat and water quality of Hay Creek, these are not necessarily considered incompatible uses of the areas bordering the stream. There are a number of designated trout streams that flow through municipalities where commercial, industrial, and residential developments exist. Several examples of trout stream segments within municipalities currently designated in Minn. Rules pt. 7050.0420 as Class 2A waters include Gilmore Creek at Winona and Garvin Brook at Stockton, Minnesota.

Testimony and exhibits were entered into the record concerning the temperature standard of "no material increase" for Class 2A waters. (See Tr. September 9, Huber at 31, Foot Comments at 13, September 27, 1993, comment letter from the Minnesota Division of the Izaak Walton League). A discussion of this issue is contained in the Agency's Post Hearing Response at 70. In that response, the Agency acknowledges the need for a re-examination of this thermal standard and that it would most appropriately be addressed during a future rulemaking effort.

While Agency staff does not support the proposed amendment of Minn. Rules pt. 7050.0470 offered in Foot Comments at 14, the Agency staff agrees with the company that the language in part 7050.0420 as proposed could be improved (see Agency Exhibit 3 at 203). As opposed to the proposed modification language offered at 14 Id., the Agency staff would propose that a citation date be included in part 7050.0420 citing the adoption date for designated trout lakes and trout streams. The Agency staff's proposed modification to this rule part is as follows:

> 7050.0420 TROUT WATERS
> Trout lakes identified in part 6262.0400, subpart 2, as adopted on July 12, 1993, are classified as trout waters and are listed in part 7050.0470. Trout streams and their tributaries within the sections specified that are identified in part 6262.0400, subpart 4, as adopted on July 12, 1993, are classified as trout waters. Trout streams are listed in part 7050.0470. Other lakes that are classified as trout waters are listed in part 7050.0470. All trout waters are classified as Class 1B, 2A, 3B, 3C, 4A, 4B, 5, and 6 waters.

Foot asserts its belief that the Agency has not accurately considered the factors identified in Minn. Stat. sec. 115.44, subd. 3 (1992). Foot Comments at 9-10. In light of the proposed use classification modification, the Agency has given substantial consideration to those factors, including other uses and the nature of the surrounding area.

Foot's comments appear to be based on a presumption that Hay Creek is not currently protected by the Agency's classification system. Foot's comments ignore the approximate 30 years of Agency efforts to adopt and administer water quality standards to protect designated uses. In this case, the current classification of Hay Creek includes the 2B, 3B, 4A, 4B, 5 and 6 class protections. See Minn. Rules 7050.0430 (1991). Under the proposed reclassification, Hay Creek would be a trout water and would be classified as Class 1B, 2A, 3B, 3C, 4A, 4B, 5 and 6 waters. See Minn. Rules pt. 7050.0420 (proposed).

The proposed classification scheme expressly addresses the factors in Minn. Stat. sec. 115.44, subd. 3. As indicated, the water body remains protective of the designated uses that were protected prior to the Agency's action; that is, Classes 2,3 4, 5 and 6. These classifications, as required by the CWA, protect designated uses, both existing uses and the uses identified in the classes that may not yet be occurring at this time.

In addition and as discussed above, the Agency reviews data on existing NPDES/SDS discharges, including their permits, and available information on nonpoint sources. Hay Creek has not been identified as a water quality limited stream and that fact is reflected in the current terms and conditions of S.B. Foot's permit. The DNR and Agency assessments discussed also attempt to identify current and past uses. These evaluations, as identified above, give substantial consideration to uses which have been made or are being made of Hay Creek.

As summarized above and in the Post Hearing Response, the Agency does rely on the DNR's expertise in providing information relevant to the Minn. Stat. sec. 115.44, subd. 3 considerations. This reliance is well placed and cost effective. The Agency has a long-standing working relationship with DNR and the two agencies cooperate closely to protect the natural resources common to both agencies' jurisdictions. As this judicial forum has recognized, the Agency has used substantial DNR-generated information in making rulemaking determinations in such areas as outstanding resource value waters including DNR designated scientific and natural areas, designated wild river segments, state designated scenic and recreational river segments and calcareous fens. In addition, the Agency has historically evaluated and considered DNR's input on the designation of DNR-identified trout lakes and other trout streams as trout waters for classification purposes. The DNR-developed information, under their expertise for water body and related habitat management, provides a significant information base for the Agency's consideration of the factors identified in Minn. Stat. sec. 115.44, subd. 3 (a)-(d). It must be recognized that the type of information developed by DNR for the Agency's consideration for designation of trout waters significantly parallels the type of assessments prepared by the Agency and DNR for Class 7 designations - all of the statutory factors are evaluated and considered in both types of assessments.

In conclusion, the Agency's reliance on the DNR-generated information, data and evaluations is well-founded. In addition to all of the Agency's other evaluations, the Agency's consideration of the DNR assessments for the proposed Class 2A designation addresses the factors in Minn. Stat. sec. 115.44, subd. 3. In light of all of the circumstances, the Agency has acted reasonably and shown a rational connection between all evaluations, including those of DNR, and the considerations under Minn. Stat. sec. 115.44, subd. 3.

3. Economic Considerations.

In its latest written comments, Foot indicates its belief that the Agency's technical and cost analysis did not accurately reflect the type of modifications that may need to be made at the wastewater treatment facility to comply with possible ammonia effluent limits and the costs associated with those modifications. Foot Comments at 10-13. In addition, Foot raised several issues regarding the technical evaluation. Id. at 11-12.

In summary, the Agency has prepared a technical and cost evaluation that reflects both the types and timing of information supplied to the Agency by Foot. Exhibits C59 and C60. Further Agency technical and economic evaluation was provided after the public hearings. Post Hearing Response at 71-75. In regard to the Agency's Post Hearing Response, there are two clarifications (administrative) needed. First, in the top paragraph on page 71, the citation of the Foot report should be to Public Exhibit 12 and not to Attachment 56. Second, in paragraph number 3 on page 73, that periodical should have a citation to Attachment 56. See Post Hearing Response at 71 and 73.

As discussed below, the technical differences of opinion between the Agency and Foot are not so significant that it prevents a reasonable conclusion, with a reasonable degree of certainty, that minor modifications to address ammonia removal can be made in a cost effective manner. The first point is that many of the costs identified by Foot are not costs associated directly as a result of the proposed classification. Instead, Foot's cost analysis includes many modifications that should be made regardless of the new ammonia standards. The Agency's analysis concludes that costs associated with the ammonia limit and resultant plant modifications are approximately $92,000. Excluding costs not attributable to the reclassification, Foot's analysis indicates the cost tied directly to ammonia removal can range from $20,000 to $30,000. The details are discussed below.

In a September 29, 1993 letter, Delmar Ehrich submitted comments concerning the economic impacts the proposed reclassification of Hay Creek to a Class 2A would have on the S. B. Foot Company. See Foot Comments at 10-13.

Plant data available from S. B. Foot Company indicates that the existing facility, prior to any upgrade, is currently meeting or exceeding potential future ammonia permit limitations except for the summer discharge period (June - September). This information is shown in the MPCA memo of July 29, 1993 and in the report from Jordan, Jones & Goulding Incorporated (JJG), dated August 1993. The 1992 data indicates that the Red Wing industrial wastewater treatment plant is currently removing approximately 71% of the ammonia load being applied to aeration. Any future upgrade at this facility should be directed to the reduction of ammonia during the summer discharge period.

As indicated in oral testimony and as noted in the above referenced report, JJG believes that the Red Wing Industrial Wastewater Treatment Plant (WWTP) should be able to meet the proposed ammonia effluent limitations with the improvements (and costs) listed below:

1. Redirection of the side stream flow from the sludge holding ponds. ($40,000 - $50,000)

2. Increase the dissolved oxygen levels in the aeration basin. ($20,000 - $30,000)

3. Modification of the return activated sludge (RAS) pumping and control. ($75,000 - $90,000)

The total capital cost for these improvements is in the range of $135,000 to $170,000 to meet the summer discharge period effluent limitation.

In evaluating the three JJG recommendations for ammonia reduction listed above, only item number two can be associated directly with the plants ability to meet future effluent ammonia limitations. The Agency staff believes that items number one and number three are design deficiencies (and certainly not in compliance
with current design practice for a normal activated sludge process) and have contributed in the past to permit violations. Further discussion on these items is as follows:

1. Side stream flow.

The Agency was unaware, and was never informed by S.B. Foot or any other party, that the Red Wing Industrial WWTP system was set up with the side stream loading being discharged to the final clarifier. If this information had been included in the discussions held with S.B. Foot prior to preparation of the July 29, 1993, memorandum, this item would have been evaluated and the additional costs would have been included in the MPCA memo. The Agency does not concur with the JJG opinion that all costs associated with piping modifications to correct inappropriately designed side stream discharges to the final clarifier are directly tied only to ammonia reductions for S. B. Foot Company. This existing piping configuration could lead to permit violations for constituents currently referenced in the permit, and may have contributed to violations in the past, due to the additional loadings being discharged to the final clarifiers in this manner.

2. Additional aeration.

Costs for additional aeration and mixing are included in both the Agency estimate and the JJG estimate. The Agency estimate for aeration alone is $45,000 which is 1.5 to 2.25 times more than the JJG estimate as listed above.

3. Modifications of the return activated sludge (RAS).

The Agency does not concur with JJG's opinion that all costs associated with the return activated sludge pump modifications and additional controls are directly tied to NH3-N reductions for S.B. Foot Tanning Company. It appears that the JJG report also states this fact in item 3, page 2-14; in that the return sludge pumping capacity is not directly affecting the NH3-N concentration in the effluent. As noted in the MPCA's July 29, 1993, memorandum, Agency Exhibit 6, mixed liquor volatile suspended solids/mixed liquor suspended solids (MLVSS/MLSS) control and low MLVSS/MLSS concentrations and/or fluctuating MLSS concentrations have been credited, in part, to past NPDES/SDS permit violations (the RAS controls these parameters). It was also noted in that memorandum that normal recirculation ratios (the problem to be fixed with the modification of the RAS system) for plants without ammonia (NH3-N) reduction requirements are designed to permit variable sludge return from 10 percent to 100 percent of the raw waste flow. This capacity is not available at the Red Wing plant and can be considered another design deficiency.

In addition, the clarifiers are too shallow when compared to normal design practices for many activated sludge wastewater treatment plants. This factor will also affect the RAS system and will decrease what can be considered normal plant efficiencies. The problems associated with the RAS system causes a decrease to normal plant efficiencies and causes problems in the current system regardless of the requirements for ammonia reductions.

Design deficiencies at this plant not related to NH3-N reduction requirements hinder current plant efficiencies and performance. If the facility would have been originally designed using normal design parameters, these deficiencies would not be present. Hence, it is not appropriate to assign all improvement costs for a plant upgrade for NH3-N reductions when the improvements are required to correct plant deficiencies that have been in the past attributed to permit violations.

Items number two and three were identified in the MPCA memorandum of July 29, 1993. Exhibit C60. If the side stream piping revisions are added to the MPCA's previous cost estimate, a total capital cost of approximately $142,000 is calculated. If the return activated sludge pump modifications and additional controls costs are subtracted from the JJG proposal, the JJG cost estimate for upgrading this facility to treat NH3-N limits is approximately $60,000 to $80,000, which is less than the estimate previously given by the MPCA in its July 29, 1993, memorandum. If side stream piping revisions are also removed from the JJG proposal, the costs to treat NH3-N according to JJG would be approximately $20,000 to $30,000.

The September 29, 1993 correspondence from S. B. Foot Tanning Company (Foot comments at 11-12) also commented on four areas of the MPCA's analysis of the treatment facility and the economic impact of the reclassification. The responses to these items are as follows:

A. Dissolved oxygen.

A literature search was performed during the evaluation of this facility with regards to reaction rate coefficients. As noted in the periodical, "Nitrification and Denitrification of Tanning Wastewaters, Wat. Res. Vol. 25, No. 11, 1991," recent research indicates that "The rate coefficients for nitrification and for denitrification were comparable to the values for domestic sewage." Post Hearing Response, Attachment 56. Hence, the Agency assumptions that were made in the analysis of this waste and of the Red Wing Industrial WWTP are reasonable. As noted above, the Agency's cost estimate for added aeration/mixing is approximately $45,000. This is 1.5 to 2.25 times greater than that noted by JJG. The implication made by DeLmar Elirich in his September 29, 1993 correspondence that adequate costs were not included for this item is not justified.

B. SRT time (or cell retention time).

As referenced above, current research indicates that rate coefficients for Ammonia reduction in this type of waste are relatively the same as the values used for normal domestic strength wastewater. As referenced in the Agency memorandum of July 29, 1993, (Exhibit C60), S.B. Foot does not have information on sludge wasting, annual sludge production, actual SRT's values or sludge yield coefficients. In addition, the JJG report used basically the same sludge yield coefficient as was used in the Agency analysis. No data have been provided which would support the statement that the current system has a SRT of 100 to 133 days. In addition, no data are available from which a determination can be made as to what the actual value is. The statement that the actual cell retention time far exceeds what is normally required for nitrification is therefore open to question. The data previously submitted by S.B. Foot would suggest that the Red Wing Industrial WWTP is already in compliance with the proposed future NH3-N winter limits. As complete nitrification is not required from this facility in the winter. No additional improvement in the current ammonia removal during the winter months is required .

C. Alkalinity.

Information in the JJG report reinforces the Agency's previous position that alkalinity adjustment is required. A pH range between 7.2 and 7.4 is too low and not in the optimal range for NH3-N conversion. With the additional pH suppression from ferric chloride (a portion of which is returned to aeration) and the limited amount of alkalinity available, it is believed that an alkalinity supplement is required. Other animal processing WWTPs in this state have similar problems, specifically the Worthington Industrial WWTP. At the Worthington WWTP, soda ash is used for alkalinity augmentation.

D. Side stream loadings and final clarifier modifications

Side stream loadings. As indicated above, the Agency was not aware and was never informed by S.B. Foot or any other party, that the Red Wing Industrial WWTP system was set up with the side stream loading being discharged to the final clarifier. If this information had been included in the discussions held with S.B. Foot prior to preparation of the July 29, 1993, memorandum, this item would have been evaluated and the additional costs would have been included in the MPCA memo of 7-29-93. The MPCA does not concur with the JJG opinion that all costs associated with piping modifications to correct inappropriately designed side stream discharges to the final clarifier are directly tied only to ammonia reductions for S. B. Foot Company. This existing piping configuration could lead to permit violations for constituents currently referenced in the permit, and may have contributed to violations in the past, due to the additional loadings being discharged to the final clarifiers in this manner.

Final clarifiers. As previously stated, the clarifiers are also too shallow when compared to normal design practices for any activated sludge wastewater treatment plant. This factor will affect the RAS system and will decrease normal plant efficiencies. The problems associated with the RAS system causes a decrease to normal plant efficiencies and causes problems in the current system regardless of the requirements for ammonia reductions.

As previously discussed, design deficiencies at this plant, not related to NH3-N reduction requirements, hinder current plant efficiencies and performance. If the facility would have been originally designed using normal design parameters, these deficiencies would not be present. Hence, it is not appropriate to assign all improvement costs for a plant upgrade for NH3-N reductions when the improvements are required to correct plant deficiencies that have been in the past attributed to permit violations.

In summary, initial data on S.B. Foot Company, Red Wing Industrial WWTP was obtained from S.B. Foot in March and April of 1993. The Agency's first draft of the system evaluation was faxed to S.B. Foot on May 12, 1993. The final draft of the Agency's system evaluation was sent to S.B. Foot on August 11, 1993. As noted in the JJG report, the Red Wing Industrial WWTP should be able to meet the assumed limitations with the plant modifications previously discussed. Estimated costs for plant modifications solely for the reduction of NH3-N in the plant's discharge are estimated to be in the range previously identified in in the Agency's July 29, 1993 memo, with the addition of a portion of the costs associated with the modification of the side stream loadings to the final clarifiers.

As the above comments demonstrate, the Agency has given substantial consideration to both the technical and potential economic impacts on Foot that may occur as a result of the reclassification. As noted above, Foot's cost analysis overestimates possible costs and takes into account costs not associated with the proposed reclassification. As this judicial forum has recognized, the Agency's considerations will and should reflect the impacts which are the result of the proposed reclassification and that costs not attributable to the new situation need not be considered. <u>See</u> Report of the Hearing Examiner, Minnesota Office of Hearing Examiners, Docket No.

PCA-80-004-AK (August 21, 1980), at 21-22, paragraph 38. The Agency's technical and economic considerations are reasonable and demonstrate that there is a reasonable degree of certainty that Foot can meet the new limits in a cost-effective manner.

In addition and if circumstances substantially change, Foot can use the Agency's variance process if undue hardship occurs or if strict conformity would be unreasonable, impractical or not feasible under the circumstances. This variance process is provided for in Minn. rules ch. 7050 as a means to address economic considerations. See Minn. Rules pt. 7050.0190, subp. 1 (1991). Minn. Stat. §§ 115.43, subd. 1 and 116.07, subd. 6 are also applicable to that variance process.

The record shows that the Agency has given the Foot-related issues, including economic matters, substantial consideration. The Agency has not acted in an arbitrary or capricious manner with regard to the consideration of Foot's economic concerns.

C. Grand Portage Tribe

In a letter dated September 17, 1993, the Tribal Council of the Grand Portage Reservation commented that Minn. Rules pt. 7050.0470 incorrectly lists as waters of the state four bodies of water located within the Grand Portage Reservation. The four water bodies are Grand Portage Creek, Hollow Rock Creek, Red Rock Creek and Reservation River. The Tribal Council also stated that the Council, rather than the State, has authority to regulate these waters because the Council has inherent authority to regulate activities and natural resources within and outside the exterior boundaries of the Grand Portage Reservation and its waters.

To the Agency, the four bodies of water are waters of the State of Minnesota and, as such, are appropriately included in the scope of Minn. Rules ch. 7050. The issue of who has jurisdiction to regulate activities by persons affecting these bodies of water need not and cannot be definitively determined in this rulemaking proceeding because who has jurisdiction depends on many variables. To the extent that jurisdiction is an issue, case law supports state jurisdiction over activities on these bodies of water.

Minn. Rule pt. 7050.0110 provides that ch. 7050 applies to all "waters of the state" as defined in Minn. Stat. { 115.01. Minn. Stat. { 115.01, subd. 22 broadly defines waters of the state to mean:

> all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies of accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof.

Lands within the boundaries of states have always been considered to be geographically part of the state. F. Cohen, Handbook of Federal Indian Law 649 (1982 ed.) and case cited therein. Likewise, bodies of water located within Indian reservations are also geographically a part of the state.

The fact that these four bodies of water are waters of the state is also supported by results of the public waters inventory which was performed pursuant to Minn. Stat. { 105.391. Stat. { 105.391 was repealed in 1990 after completion of the public waters inventory. Minn. Stat. 103G.201 (1992) requires the commissioner of the DNR to prepare and file with the county auditor a public water inventory map for each county showing the waters of the state that were designated as public waters under the public waters inventory process. The Cook County public waters inventory map is filed with the Cook County Auditor's Office.

The four bodies of water described in the rule (Grand Portage Creek, Hollow Rock Creek, Red Rock Creek and Reservation River) were designated as public waters and waters of the state in 1985 under the public waters inventory process. See Cook County public waters inventory published in the Cook County New Herald on December 19, 1985.

These four bodies of water may also be waters of the state under the "equal footing" doctrine. The equal footing doctrine provides that as a general principal, the federal government holds the bed and banks of navigable waters in trust for future states to be granted to such states when they entered the Union so that they could assume sovereignty on an "equal footing" with the established states. <u>Montana v. United States</u>, 101 S. Ct. 1245, 1251 (1981). There is a strong presumption that the federal government did not convey the bed and banks of navigable waters to others prior to a state's admission to the Union. <u>Id.</u> at 1251. In Montana, the Court found that the title to the bed and banks of a body of water passed to the State of Montana upon admission under the equal footing doctrine and was not granted to the Indian tribes through treaties enacted prior to admission. <u>Id.</u> at 1254.

A similar conclusion was reached by the U.S. Supreme Court with respect to Minnesota. In U.S. v. Holt State Bank, 270 U.S. 49, 70 L.Ed. 465 (1926), the Court concluded that the ownership of the bed of Mud Lake passed to the State of Minnesota upon admission to the Union, and that the September 30, 1854, and February 22, 1855, treaties with the Chippewa establishing reservations did not grant rights to the beds of navigable waters. These treaties established a number of reservations in Minnesota including the Grand Portage Reservation. See Article 2, 5th paragraph of the September 30, 1954, Treaty with the Chippewa, published in Kapler, C.J. Indian Affairs: Laws and Treaties, vol. II (1904). Thus, if the four bodies of water listed above were navigable at the time of admission into the Union, the beds and banks of these waters would have passed to the State of Minnesota.

Thus, based on the above information, Grand Portage Creek, Hollow Rock Creek, Red Rock Creek and Reservation River are waters of the state for purposes of classification under Minn. Rules ch. 7050.

The Tribal Council states that it, rather than the State, has jurisdiction over these waters and that, consequently, the waters should be removed from the classifications.

The issue of who has jurisdiction to regulate persons whose activities may affect these bodies of water need not and cannot be determined in this rulemaking. It is not necessary to determine the jurisdictional issue in this rulemaking because Minn. Rule ch. 7050 merely designates water quality uses and indicates what water quality standards apply to bodies of water based on these designations. It does not indicate who has jurisdiction over persons whose activities may affect the quality of such waters. The issue of who has jurisdiction to regulate activities on Indian reservations depends on many variables, including whether the person engaging in the activity is an Indian or a non-Indian. The Grand Portage Reservation, like many Indian reservations in Minnesota, has a "checkerboard" pattern of land ownership with a mix of Indian trust land and non-Indian owned land within the reservation boundaries.

To the extent that jurisdiction is an issue in this proceeding, the following is a summary of the principles that apply to determining jurisdiction on an Indian reservation.

Ordinarily, a tribe will have authority to regulate the activities of Indians on Indian reservations (White Mountain Apache Tribe v. Bracker, 448 U.S. 136, 144 (1980)) but not off the reservation. Mescalero Apache Tribe v. Jones, 411 U.S. 145, 148-49 (1973)(absent express federal law to the contrary, Indians going beyond the reservation are subject to state law).

A state does not ordinarily have authority to regulate the activities of Indians on Indian reservations unless Congress has specifically authorized a state to regulate such activity. Bryan v. Itasca County, 426 U.S. 373 (1976); McClanahan v. State Tax Comm'n of Arizona, 411 U.S. 164 (1973). A possible exception to this general rule that the state does not have jurisdiction over non-Indians on the reservation may be where an Indian activity on the reservation seriously affects substantial state interests. See, e.g., California v. Cabazon Band of Mission Indians, 107 S.Ct. 1083, 1091-92 (1987).

With respect to the regulation of non-Indians on an Indian reservation, the U.S. Supreme Court has stated that the general rule is that the inherent sovereign power of an Indian tribe does not extend to the activities of nonmembers of the tribe. Montana v. U.S., 101 S.Ct. 1245, 1258 (1981). However, an Indian tribe may have authority to regulate the conduct of non-Indians on non-Indian owned land within a reservation if (1) the non-Indian has entered a consensual relationship with the tribe or its members through commercial dealings, contracts, leases, or other arrangements, or (2) the conduct of the non-Indian threatens or has some direct, demonstratively serious impact that imperils the political integrity, economic security, or the health and welfare of the tribe. Brendale v. Confederated Tribes & Bands of Yakima, 109 S.Ct. 2994, 3008 (1989); Montana v. U.S., 101 S.Ct. 1245, 1258 (1981). A tribe may also have authority over non-Indians if such authority is expressly delegated by Congress. Id. at 1258.

Whether the Grand Portage Tribal Council has authority to regulate activities on these bodies of water can be determined on a case-by-case basis in the future based on the principles governing jurisdiction on Indian reservations.

In their letter, the Tribal Council requested that the Agency develop water quality standards that will enhance and maintain wild rice waters and habitat. The Agency is required by the Clean Water Act to develop water quality standards which protect waters of the state for all designated uses. One of the the designated use classes for all known wild rice waters is 4A. This use class is protected for the growth of crops or vegetation usually grown in the designated waters or the area. The chemical and environmental factors which protect and promote the growth of wild rice are not well understood. One of the water quality standards currently associated with the class 4A use designation is a 10 mg/l standard for sulfates because there is some evidence that wild rice may be damaged by high sulfate concentrations. As research identifies other chemical and environmental factors which have a detrimental effect on wild rice growth, standards for those factors will be considered in future revisions of Minnesota Rules, Chapter 7050.

The Tribal Council also recommended that wild rice be listed as a biological criterion. In this revision of Minnesota Rules, Chapter 7050, the Agency staff, at the direction of the EPA, is proposing to include a narrative or qualitative biocriteria statement. Quantitative biocriteria are still under development and research support for them in lakes and wetlands is not sufficiently advanced to permit quantitative biocriteria to be incorporated into this rulemaking. One of the proposed biological indicators for lakes, being researched by EPA, includes a measure of the area covered by macrophytes. This is one manner in which wild rice might be included in a future quantitative biological criterion. As useful quantitative biological criteria are developed, they will be considered in future revisions of Minn. Rules ch. 7050.

The Tribal Council also recommended that the few remaining quality wild rice waters in the state should be designated at Outstanding National Resource Waters (ONRWs). Agency staff is not sure of what criteria would presently be used to identify a quality wild rice water. Such criteria would have to be discussed with the Minnesota Department of Natural Resources. Furthermore, staff believes that designation of such waters as ONRWs at this time would constitute a substantial change to the propose rule and will therefore not pursue such an action for this rulemaking.

Finally, the Tribal Council recommended that the Agency support the Great Lakes Water Quality Initiative (GLI). MPCA staff has been intimately involved in the development of the GLI proposal and have submitted substantial comments on the proposal as published in the Federal Register of April 16, 1993. Agency staff intends to continue to work with the EPA to develop a proposal which is both protective of Great Lakes resources and implementable.

D. Fraser Mine Pit Lake

In this rulemaking proceeding, the Agency is proposing to reclassify Fraser Mine Pit Lake (Fraser Lake) as a 1C, 2Bd, 3B, 3C, 4A, 4B, 5 and 6 class water. SONAR at 119. Blaha, Tr. September 9 at 141. This proposal is based, in part, on the Minnesota Department of Health's identification of Fraser Lake as a water supply source for a public water supply system. SONAR at 88. The City of Chisholm has also requested that Fraser Lake be reclassified to reflect its use as the city's main water source. Exhibit G2e. In addition to Fraser Lake, the Agency is also making similar reclassification proposals for three other mine pit lakes that serve as city water sources. SONAR at 119.

Subsequent to the completion of the public hearings, additional written submittals were made by concerned citizens, the City of Chisholm and Minnesota Aquafarms, Inc. (MAI). The citizen letters have been reviewed and they have not identified issues other than those already addressed in this process, including the Post Hearing Response, or below. In a letter dated September 27, 1993, the City of Chisholm responded to MAI's oral presentation with additional comments and evidence. The City's written response will be referred to as City Letter in these comments. The City Letter did not raise any additional issues necessitating independent Agency staff response. Finally, MAI provided a 43-page comment letter with numerous exhibits; that document will be identified as MAI below. The following Agency staff responses are provided in response to the issues addressed by MAI:

1. Reclassification-related Effect

Throughout their comments, MAI has adopted a common theme that the proposed reclassification: (1) attempts to define legal rights between the City and MAI; (2) attempts to adjudicate a water use dispute between the City and MAI; (3) attempts to force the Agency's preference for land and water use; (4) grants some guaranteed right to the City to withdraw water from Fraser Lake; (5) adopts a use restriction for Fraser Lake; and (6) denies MAI's use of Fraser Lake. See MAI at 3, 6, 21, 23 and 33. As discussed in the Post Hearing Response, MAI's interpretation and conclusions are not accurate or correct. Post Hearing Response at 47-50.

The proposed reclassification of Fraser Lake to Class 1C (and associated classes) does not exclude other uses, existing or potential, assuming that those uses comply with applicable water quality standards and law. By rule, the classifications should not be construed to be an order of priority, nor considered to be exclusive or prohibitory of other beneficial uses. Minn. Rules pt. 7050.0140 (1991).

The proposed reclassification reflects the City's existing use of Fraser Lake as a water supply source for domestic consumption and the Agency's regulatory scheme that protects those designated uses as well as other uses. If in the future, the City ceases to use Fraser Lake as a water supply source, the Agency, on its own initiative or by petition, could consider reclassification to reflect changing circumstances. However, the reclassification to Class 1C does not have the legal effect of defining legal rights or adjudicating a water use dispute between the City and MAI. The reclassification is not an attempt to force the Agency's preferences; rather, it is the regulatory process used by the Agency in a historic, consistent basis to protect the waters of the state based on considerations of use in the public interest. The reclassification does not grant any guaranteed right to the City for access to Fraser Lake or to withdraw water from Fraser Lake. Finally, the reclassification does not deny MAI's use of Fraser Lake or adopt a use restriction, assuming such uses can be conducted in compliance with all applicable regulatory requirements and law.

With those clarifications, it should be noted that MAI is currently prohibited by permit conditions from using Fraser Lake for aquaculture and this prohibition expires if and when Fraser Lake is no longer used as a drinking water source. Exhibit C56, Part I.C.5.

2. City Water Use

MAI has commented that the reclassification is not necessary because the City has not established Fraser Lake as a permanent water source. MAI at 7-8 and 41.

The Agency must act in accordance with the state's policies to provide for the prevention, control and abatement of pollution of all waters of the state in furtherance of protection of the public health. <u>See</u> Minn. Stat. § 115.42

(1992). Fraser Lake is a water supply source for domestic consumption by a major city. If the standards in Minn. Rules pt. 7050.0220 (1991) are exceeded, it is considered indicative of a polluted condition which is actually or potentially deleterious, harmful, detrimental or injurious with respect to the designated uses. Minn. Rules pt. 7050.0220, subp. 1 (1991). There is a substantial need to avoid unnecessary risk to public health by taking precautionary means to prevent pollution of water supply sources used for public consumption. By reclassification to Class 1C, the water body is protected such that, with treatment, the treated water will meet primary and secondary drinking water standards and thus, minimize public health risks.

In this case, the City has used Fraser Lake as a supply source for approximately 16 years and is currently using it for domestic consumption use. Even under the alleged MAI license, the City has MAI's apparent permission to use Fraser Lake as a water supply source until December 31, 1997, over four years in length. Post Hearing Response, Attachment 22. MAI has made a historic representation that it had no intention of terminating the alleged license prior to the 1997 expiration date. MAI, Exhibit V at 2.

The City has taken certain actions to establish a new permanent pumping station for use at Fraser Lake. City Letter at 5, para. 11; 6, para. 12; and 7, paras. 17 and 1a; Post Hearing Response at 46.

In light of all circumstances, it is reasonable to reclassify Fraser Lake to reflect its use as a water supply source for domestic consumption.

3. Minn. Stat. sec. 115.44 Rulemaking

In their letter, MAI comments on the belief that the Agency does not have the authority to classify private bodies of water. MAI at 22-23, 29 and 41. MAI raised this issue during the public hearing and it was addressed in the Agency's Post Hearing Response at 57. By statutory definition, waters of the state include both public and private waters, and natural and artificial waters. See Minn. Stat. § 115.01, subd. 22 (1992). Fraser Lake is a waters of the state no matter what category MAI wants to place it in. As a waters of the State, Fraser Lake is subject to the provisions of Minn. Stat. ch. 115 and Minn. Rules ch. 7050.

There is ample statutory authority empowering the Agency to adopt rules regarding standards and classifications of waters of the state, including Fraser Lake. A summary of this authority includes the following statutes. The Agency is required to group the designated waters of the state into classes and adopt classifications and standards therefor. See Minn. Stat. § 115.44, subd. 2 (1992). The Agency is required to design and adopt standards for each classification necessary for the public use or benefit contemplated by such classification. See Minn. Stat. § 115.44, subd. 4, as amended, Chapter 180, 1993 Minn. Laws 658.

The Agency is also given and charged with powers and duties to make such classifications of the waters of the state as the Agency deems advisable and to establish and alter pollution standards for any waters of the state in relation to the public use to which they are or may be put. See Minn. Stat. § 115.03, subd. 1, (a), (b), (c) and (e) (1992). The Agency also has authority to perform any and all acts minimally necessary to maintain the state's participation in the federal Clean Water Act NPDES program. Minn. Stat. § 115.03, subd. 5 (1992). This summary demonstrates that the Agency has the requisite authority to adopt rules regarding standards and classifications for all waters of the state, whether private or public, including Fraser Lake.

In their letter, MAI reiterates the issues that they raised at the hearing regarding the belief that the Agency could not reclassify Fraser Lake using the rulemaking process but, instead, was required to hold a contested case hearing. See MAI at 2-3 and 21-30. MAI's bases for the contested case preference are similar or the same as those raised by MAI at the public hearing and include most, if not all, of MAI's incorrect interpretations and conclusions identified in this response comment under 1. Reclassification-related Effect above. Those bases can be summarized as follows with MAI page numbers in parentheses: forum is used to decide land and water use issues (2); forum defines legal rights between City and MAI (3); rule gives guaranteed right to City to withdraw water (21); property rights taken by proposed rule (22); rule relates to private property (water) rights (26-28); and rule involves private property rights in the lake (28-29).

These issues have been addressed by the Agency staff in detail in the Agency's Post Hearing Response at 50-60, so only a summary response is provided below. The plain language in Minn. Stat. § 115.44, as amended by Chapter 180, 1993 Minn. Laws 658, clearly means a public hearing within the required rulemaking process. The Agency is authorized and required to implement the provisions of Minn. Stat. § 115.44, including the grouping of designated waters of the state, through rulemaking. See Minn. Stat. §§ 115.43, subd. 2 and 115.44, subds. 2 and

7, as amended, Chapter 180, 1993 Minn. Laws 658. After 30 years of grouping designated waters of the state using the required rulemaking process, the Agency initiated efforts to allow the use of informal rulemaking, Post Hearing Response at 51-54, and the legislature amended the rulemaking provisions to allow that informal process. Id. at 54-56.

MAI also bases its assertion for a contested case proceeding on inaccurate interpretations and conclusions regarding the effects of the rule reclassification. Those errors should not form the basis for a contested case proceeding before this Agency; especially in light of the Agency's lack of jurisdiction over property ownership, and access or withdrawal rights from Fraser Lake. Post Hearing Response at 58-59.

MAI has also had sufficient notice, time, means and opportunities to present its case on these matters in this formal rulemaking proceeding. Post Hearing Response at 59-60. As early as May 1992, MAI representatives were aware of the Agency's consideration of the Fraser Lake reclassification. Exhibit G2o. Despite that notice, MAI chose only to make a brief oral presentation on the last hearing date. As discussed, the Agency staff believes that the requisite rulemaking process for grouping designated waters of the state into classifications has been complied with and MAI has been provided ample opportunities to present its issues and concerns.

In their letter, MAI comments on the Agency's consideration of small business issues, agricultural-related issues and Minn. Stat. § 115.43, subd. 3. MAI at 30-41. Before addressing those comments, some additional background information is provided below to provide a context for a review of the Agency's proposed reclassification.

In evaluating the ramifications of reclassifications, the Agency staff evaluates the known or determinable (predictable with certainty) effects on other dischargers to those waters. In the case of the four mine pit lakes proposed for Class 1C reclassification, Agency staff was not able to identify any permitted discharges to the lakes. SONAR at 120. In the case of MAI, this determination is based, in part, on the existing permit prohibition which prohibits MAI from conducting aquaculture activities in Fraser Lake. See Exhibit C56, Part I.C.5. at 8. This prohibition expires if and when Fraser Lake is no longer used as a source of drinking water. Id. On the basis of that prohibition, MAI cannot discharge pollutants from its operations to Fraser Lake.

After MAI was issued an Agency permit in July 1988, the operations began exceeding certain permit trigger and action levels. Post Hearing Response, Attachment 43 at 3, F.3. In May 1989 and as a result of these permit exceedances, MAI and the Agency entered into a stipulation agreement that required MAI to remove fish from Fraser Lake by December 31, 1989. Id. at 5, F.9. Subsequent to that stipulation agreement and in September 1992, the Agency and MAI again entered into a second stipulation agreement to address alleged permit violations that were continuing. Post Hearing Response, Attachment 44; see Attachment 43.

The 1992 agreement required, among other things, an engineering report evaluating and discussing the effectiveness (i.e., capability and reliability) of a prototype collection system that was installed on some net pens in July 1992. Post Hearing Response, Attachment 43 at 7, F.18 and at 14, II.B.4.a.

Collection and treatment systems are required on all net pens in Sherman Lake by December 17, 1993. Id. at 20. MAI is required to provide a report that includes an analysis of changes in water quality trends of all five lakes. Id. at 24.

The 1992 agreement also reiterates the Fraser Lake prohibition. Id. at 26. In addition, the agreement reiterates the permit conditions that, assuming the prohibition becomes moot, MAI must comply with the existing permit limitations for any aquatic animal production practices in Fraser Lake. Id.

MAI has contended that the current Agency permit conditions are not reasonable based on their opinion that the lakes can be restored to preoperational levels in a minimal period of time after aquaculture activities cease. Post Hearing Response, Attachment 44 at 4. The lake restoration study will assist in evaluating MAI's hypotheses regarding lake restoration. Id. In addition, the agreement's information from modeling, testing of collection and treatment, and the restoration study will be used for Agency staff determinations regarding potential changes in the Agency permit during the permit reissuance process. Id. Under certain conditions, the Agency permit reissuance process will be initiated in November 1996. Post Hearing Comments, Attachment 43 at 18.

In summary, several key conclusions can be drawn from this brief review of record evidence. First, it is currently not known whether the existing permit prohibition regarding Fraser Lake will be retained, modified or eliminated during the permit reissuance process that is currently planned to begin in November 1996. Second, the long-term environmental effects of having collection and treatment on all net pens in Sherman Lake is currently not known. Third, the results of the Twin City South Lake restoration activities which are scheduled to be completed by November 1, 1995, are not currently known. Finally, the Agency staff does not currently know what MAI may propose in their permit application with regard to the future permit when the MAI application is submitted in November 1996. See Post Hearing Response, Attachment 43, at 18, II.B.6.b.

In addition, it is speculative as to what water levels will eventually be obtained in the mine pit lakes. Exhibit C44, St. Louis County Health Department letter, September 23, 1992. MAI has asserted that certain lakes may connect within 10 years but no citations to record evidence are provided. MAI at 1. The one piece of record evidence that discusses this issue in detail demonstrates how speculative any conclusion regarding lake levels may be.

Information in an apparent late 1990/early 1991 report regarding City water supplies indicates that any surface connections that may occur will do so well beyond 14 years from now. See MAI, Exhibit AA, "Water Supply Options, City of Chisholm, by John Baker Engineering, Inc. (Baker). According to Baker, over 80 percent of the water entering the mine pit lakes is ground water seeping into the pit from the surrounding aquifer. Id. at 1. In December 1989, the Fraser Lake water elevation was at 1380. The current rate of annual rise in water level is about 6 feet per year. Id. at 2 and 10. The Minnesota Geological Survey indicates the elevation of the aquifer in the Fraser Pit area is about 1450. Id. at 5. Baker predicts a 6/ft. rise until the Fraser Lake level reaches 1450, at which time the lake elevation will then equal the normal aquifer surface elevation. Id. at 10.

Based on a December 1989 starting point of 1380 and a 6 ft./yr. rate, it would be approximately year 2001 before lake level reached the elevation 1450. In keeping with the laws of nature that would indicate that as pressure differentials decrease between water levels, rates of rise will decrease, Baker predicts that the rates of discharge and rise in Fraser Lake water elevations should decrease. Baker at 10. Baker indicates that Fraser Lake and Sherman Lake will combine and overflow south at elevation 1490. Even if the rate of rise did not decrease, (an eventuality that Baker does not predict) and remained at the 6 ft./yr. rate, it would be about year 2008 before the water rose from 1450 to 1490, approximately 15 years from now. Of course, the rate of rise will depend upon precipitation in the Fraser Lake watershed. Baker at 10. Thus, even using the most liberal rise rate for the last 40 feet of elevation, Baker's data shows that any lake connection would occur substantially farther out in time than even MAI predicts.

This brief summary demonstrates how uncertain certain factors are with regard to MAI's situation. Given the vagaries and indeterminate basis of these factors, the Agency's determination that there is no identifiable economic impact on MAI's current operation is reasonable. The Agency can only evaluate that which has some certainty or existing basis in fact. Given MAI's problems with meeting the regulatory requirements regarding trigger and action levels in its existing permit and all of the unknowns related to the results from projects identified in the 1992 stipulation agreement and the resultant effect on the late 1996 permit process and water levels in nearby lakes, it would be unreasonable to require the Agency to evaluate any other alternatives other than what is currently known, with some certainty, about MAI's situation.

Given that summary, MAI commented that the Agency had not given it sufficient consideration under the small business rulemaking provisions. MAI at 30-33. MAI does admit that the reclassification of Fraser Lake does not affect it as a result of having to comply with discharge limitations, reporting or permit requirements. Id. at 33. However, the basis for MAI's comments is its assertion that the Agency failed to evaluate MAI's interpretation of the effect of the classification as stated: "[I]t denies Aquafarms' use of the Fraser Mine Pit waters."

As previously discussed in these responses and the Agency's Post Hearing Response, the reclassification does not prohibit MAI's use of Fraser Lake. By rule, the classifications should not be considered to be exclusive or prohibitory of other beneficial uses. Minn. Rules pt. 7050.0140 (1991). The proposed classification scheme would include Class 2Bd. SONAR at 119. Class 2Bd includes the same designated use for cool or warm water sport or commercial fishes and their habitats as does the Class 2B uses that currently apply to Fraser Lake.

MAI surmises that the reclassification may preclude current uses of therapeutants and water treatment chemicals. MAI at 33. This conclusion is speculative in light of the current permit prohibition. Any discharge of water treatment and chemical additives must comply with Minn. Rules pts. 7050.0218 and 7050.0220. Minn. Rules pt. 7050.0216, subp. 6.E. (1992 Supp).

As MAI admitted, the first four factors of Minn. Stat. § 14.11, subd. 2 are not implicated by this reclassification rule revision. The variance process under factor No. 5 is available to MAI as a means to request relief from undue hardships resulting from the reclassification. For example, MAI asserts that no net pen aquaculture can comply with the primary and secondary drinking water standards. Depending upon the nature of those operations and other circumstances, the variance process may provide relief from strict conformance with applicable rules.

In summary, the Agency has complied with the small business considerations in this rulemaking proceeding. The Agency evaluated available information and given the MAI existing permit prohibition in Fraser Lake, it was reasonable to conclude there were no identifiable economic impacts. MAI's interpretation is not correct and should not be a basis for concluding that the Agency acted in an arbitrary or capricious manner with regard to the small business considerations.

In their letter, MAI asserts that the Agency has not given sufficient consideration to rulemaking provisions regarding agricultural lands. MAI at 35. Again, the basis for MAI's criticisms is its misinterpretation of the effect of the reclassification; that is, the rule application removes Fraser Lake from use in its fish farming operation. MAI at 38. MAI asserts that the Agency failed to comply with Minn. Stat. §§ 17.82-.83 (1992). Id. at 35-38. Specifically and by bold print, MAI seems to imply that the reclassification implicates Minn. Stat. § 17.81, subd. 2, items (1) and (2). MAI at 36.

The Agency's Post Hearing Response addressed these MAI issues, at 60-63. Specifically, the Agency staff indicated that a reclassification of a waters of the state does not equate to any of the four provisions defined in Minn. Stat. § 17.81, subd. 2 (1992).

With regard to Minn. Stat. § 17.81, subd. 2, item (1), the Agency is not acquiring any agricultural lands for a nonagricultural use. The reclassification does not grant or give any right to the City to make an acquisition in respect to agricultural land for a nonagricultural use. The reclassification to Class 1C and the current Class 2B designation do not result in the acquisition of agricultural land for a nonagricultural use.

With regard to Minn. Stat. § 17.81, subd. 2, item (2), the Agency is not granting any "official authorization" with respect to agricultural land for nonagricultural uses. An Agency reclassification does not "grant" anything and it does not give any Agency "permission" to any person or entity allowing a nonagricultural use of agricultural land that has the effect of substantially restricting the agricultural use of the land. MAI's misinterpretation of reclassification as equating to the "granting" of an "official authorization" is not a reasonable interpretation of that statutory provision.

The Agency has complied with the provisions of Minn. Stat. § 17.83. SONAR at 128-129; Post Hearing Response at 60-63; Exhibit G11a, G11b and G11c. Notice has been provided to the commissioner. Agency Exhibit 7. The Agency evaluated available information and reasonably concluded there were no identifiable economic impacts or substantial and direct effects on agricultural lands regarding MAI.

In their letter, MAI commented on its perception that the Agency had not given sufficient consideration to matters in Minn. Stat. § 115.44, subd. 3. MAI 39-41. Agency staff believes that substantial consideration has been given to those statutory factors in the context of the Agency's regulatory history at

MAI's mine pit lakes location and MAI's regulatory history, and the preparation for the Agency's proposed reclassification.

First, the Agency has given the requisite consideration to Fraser Lake. MAI has opined that mine pit lakes should be downgraded to Class 7 limited resource value waters. Exhibit G2o. In light of known circumstances, including historic use of mine pit lakes as domestic water supply sources and for fish stocking, Agency staff has not proposed to conduct Class 7 assessment surveys. See Exhibit C44, Agency letter of June 17, 1992; MAI, Exhibits F and K. These mine pit lakes have been classified as Class 2 waters, fisheries and recreation. Currently, Fraser Lake is in Class 2B.

Since 1987, during the MAI permitting process, and subsequent to that period, the Agency has monitored and continually evaluated the physical characteristics, local use characteristics and past lake history of the mine pit lakes like those factors identified in Minn. Stat. § 115.44, subd. 3(a)-(e). These evaluations are used in ongoing environmental review, and in permitting processes where MAI permit limitations were developed for all five pit lakes, Exhibit C56, Part I.B.1., and B.2, and for ongoing regulatory functions, including this proposed reclassification of Fraser Lake.

Information that has been evaluated by the Agency includes:

1. lake surface area and watershed area;
2. mean lake depth, maximum lake depth and morphometric maps;
3. background data on phosphorus, total nitrogen, total Kjeldahl nitrogen, ammonia, Secchi depth, and chlorophyll a (summer months);

4. temperature and dissolved oxygen profiles;
5. data on nitrate and nitrite;
6. measures of water flows to and from the lake (data on rate of lake level rise per week);
7. Minnesota Department of Natural Resources fisheries survey data;
8. information on current and potential future public fisheries and recreation uses of the lakes; and
9. information on interaction of lake water with ground water and nearby surface waters.

See MAI, Exhibit I.

With the permit issuance, MAI is required to monitor and submit, for Agency evaluation, numerous data related to the physical characteristics of the lakes, including Fraser Lake. This data includes surface water elevations and temperature profiles. Exhibit C56, Part I.B.1.

MAI was also required to complete and submit a Preliminary Hydrogeological Assessment as required by the MAI permit and the 1989 stipulation agreement. Exhibit C56, Part I.G; Post Hearing Response, Attachment 43 at 5, I.F.9.e. That assessment addressed characteristics of the areas surrounding the lakes, including locations and identification of roads, drainways, diversion ditches and culverts; locations and identifications of surface waters near the facility; well use in the area; and identification of persons that may have affected well supplies as a result of aquaculture activities in the lakes. Exhibit C56, Part I.G.

In regard to Fraser Lake, Agency staff has not been able to identify other entities interested in using Fraser Lake at this time. Since abandonment as a mining pit, Fraser Lake has been used by the City since 1977 as a water supply source. In addition, MAI stocked fish in Fraser Lake which were subsequently removed. Post Hearing Response, Attachment 43 at 5. The 1992 stipulation agreement includes the testing of collection and treatment systems and lake restoration studies. The future results of these efforts will be evaluated to determine future permit conditions and these conditions will probably affect the aquaculture uses that will be made of the surrounding district and the lakes.

The City is currently using Fraser Lake as a water supply source for domestic consumption water as has been identified by the Minnesota Department of Health. MAI has a permit prohibition which currently prevents it from conducting aquaculture activities in Fraser Lake. The City has made substantial efforts to maintain Fraser Lake as a water source. At this time, it is uncertain and speculative as to what conditions may ultimately be included in a reissued permit to MAI with regard to Fraser Lake (permit process to begin in November 1996). The Agency is not aware of any other transportation, bathing, or disposal uses being made of Fraser Lake.

The current permit also contains numerous sampling requirements by MAI in Fraser Lake. Exhibit C56, Part I.B.1. and 2. This information is evaluated by the Agency to determine current water conditions and the effects of past activities.

These Agency evaluations clearly fulfill any considerations identified under Minn. Stat § 115.44, subd. 3(a)-(e). The Agency has acted reasonably in these considerations given the uncertainty associated with many future events.

In conclusion, the Agency staff has attempted to clarify for MAI what occurs as a result of the proposed reclassification. MAI's interpretations that it prohibits, or denies other uses is not accurate. MAI's interpretations were then used as a basis for their numerous arguments. Agency staff has indicated that the rulemaking process is the required method to adopt rules relating to water quality standards and classifications, and that there is probably no jurisdiction over some subject areas that are in apparent dispute between the City and MAI. Given the uncertainty and speculative nature surrounding certain factors related to MAI, the Agency has made a reasonable determination of the probable effect of the reclassification. In addition, the Agency has fulfilled the considerations regarding small business, agricultural lands and Chapter 115 classifications. The Agency's proposal to reclassify Fraser Lake to a Class 1C is needed and reasonable.

E. Morton Mine Pit Lake

In a letter dated September 28, 1993, Cleveland-Cliffs Inc., Mr. Charles Hoffman expressed his opinion that the Morton Mine Pit Lake should be deleted from consideration as a Class 1C water as proposed in the rule. The Morton Mine Pit Lake is not identified in the NPDES/SDS permit for Hibbing Taconite Company (permit number MN0049760) as being part of the active mining operations within the permitted facility; therefore, it is considered to be waters of the state. Since the company uses water from this mine pit lake for public water supply purposes, the Agency continues to propose the assignment of the Class 1C Domestic Consumption water use classification to this waterbody.

F. North Branch Rush River (County Ditch No. 55) at Gaylord, Minnesota

In the Minnesota Department of Natural Resources comment letter dated September 21, 1993, DNR Fisheries staff indicated that they cannot support the proposed Class 7 reclassification of the North Branch Rush River, also identified as County Ditch No. 55, at Gaylord, Minnesota. The following comments supplement the information contained in the MPCA stream assessment report (Agency Exhibit C46) and SONAR at 91-92, and 126 and are intended to explain the Agency staff's rationale for continuing to propose the Class 7 use reclassifications. [Note: reference is made on page 92 of the SONAR that Exhibit C46 contains a copy of the September 13, 1991, Agency Board item dealing with the discharge permit and the variance request for the Gaylord/ M.G. Waldbaum WWTF. The purpose of attaching this board item to the exhibit was to provide background information on the permitting process and variance request for this WWTF discharge and it was not intended as support documentation for the proposed reclassifications. This board item was inadvertently left out of Exhibit C46 when it was originally filed into the record and cannot be included at this date because it is beyond the date of the prior comment period.

A stream assessment survey was performed on June 18, 1991, in order to assess the existing and potential uses of Lateral Ditch C of County Ditch No. 55 and the North Branch Rush River (County Ditch No. 55). Based on the results of this survey, Agency staff proposed to reclassify certain segments of these two watercourses as Class 7 waters since both watercourses have been extensively channelized as documented by the comments, maps, and photographs contained in the Agency stream assessment survey report. (Agency Exhibit C46.)

DNR conducted test netting survey work along various reaches of the North Branch Rush River (Co. Dt. 55) between June 17-19, 1991. The test netting result totals combined for the surveyed sites within the proposed Class 7 reach included 2 carp, 3 bullheads, 5 orange-spotted sunfish, 1 green sunfish, 9 common shiners, 3 fathead minnows, and 1 spotfin shiner. The test netting results are contained in the DNR stream survey report in Agency Exhibit C46. It should be noted that these test nettings were initiated on short notice and of a short duration. Due to the high water conditions, gamefish distribution within the Minnesota River and the Rush River may have been affected. The DNR survey comments also indicated that the upper reaches of this watercourse have been ditched and that the ditched segment contains little habitat for gamefish. Id. at 10. All of the fish (minnows and carp) observed during the MPCA stream assessment survey within the reaches proposed for reclassification were found at station GA-1. The carp were observed feeding on the effluent being discharged from the Gaylord stabilization ponds that was occurring at the time.

As part of the conditions of the NPDES/SDS permit for the Gaylord/M.G. Waldbaum WWTF, instream monitoring is required in order to assure that Class 2 water quality standards are maintained at the point along the watercourse where the proposed Class 7 segment ends. DNR had planned additional survey work on the North Branch Rush River (Co. Dt. 55), but either scheduling conflicts or high water conditions precluded completion of this additional survey work.

Due to the fact that there is limited fisheries habitat in the upper reaches of this watercourse as a result of the instream channelization, the existing and potential fisheries value of the proposed Class 7 reaches, are in the Agency staff's opinion, thought to be limited. Under relatively high flow conditions, experienced during the test netting and assessment surveys (ranging between 19-37 cfs), the number and kinds of fish netted does not support the continued Class 2 classification for this upper reach. Also since there has been such extensive instream channelization, there would be very few, if any, pools along the length of the proposed Class 7 reach which would serve as fish refuges under low flow conditions. Hunting was the only identified potential recreational use noted in the MPCA stream assessment survey. Based on the foregoing information, Agency staff believes the proposed segments of Lateral Ditch C of County Ditch No. 55, and County Ditch No. 55 should be reclassified as Class 7 waters.

Agency staff, in discussions with DNR Area and Regional Fisheries staff, have communicated our intentions to go forward with the reclassification of these two watercourses as Class 7 waters since the summer of 1991. While we have a difference of opinion on the use classification of the North Branch Rush River (County Ditch No. 55), the instream monitoring requirements specified in the discharge permit should allay the DNR's primary concern regarding impacts to the Rush River.

VI. MISCELLANEOUS ISSUES

A. Biological Criteria

There were two letters received during the post-hearing comment period regarding the incorporation of biological criteria into ch. 7050.

In a letter dated September 29, 1993, Mr. Jim Bodensteiner, Northern States Power Company (NSP) commented on the use of the most natural condition as the only reference condition cited for determining biological integrity. The Agency staff's understanding of his concern is that many uses are made of waterbodies which include human activities and that the goals of the other non-aquatic life use classes should be taken into account when establishing the reference condition for biological quality determination.

The Agency staff agrees that waterbodies are subjected to many other uses other than maintaining aquatic life. The other uses described in the Chapter 7050 include domestic consumption, agriculture and wildlife, industrial consumption, aesthetic enjoyment and navigation. However, for setting benchmarks of overall biological quality the Agency staff does not agree that these other uses should be taken in consideration. Reference conditions should represent the most natural quality to insure that biological quality values that are developed are consistent with the CWA goal to restore and maintain the biological integrity of the Nation's waters, as stated in Agency Exhibit B3 at 7.

Certainly, however, when selecting regional reference sites, locations may not be available that are pristine in condition. It can be argued that no surface water in Minnesota is free from anthropogenic sources as stated in SONAR at 22. Nonpoint source pollution or atmospheric deposition of pollutants are widespread and affect most waters in the state. Reference sites will therefore be established that are considered minimally impacted or least impacted (the most natural in most cases) rather than pristine. In this sense, reference condition developed will take into account pollution and environmental impacts that are ubiquitous in nature and the reference conditions established will not set unrealistic benchmarks. In cases where areas have been significantly disrupted and extensively degraded, the reference condition may be established by historical information and/or consensus of expert opinion as indicated in SONAR at 20 and Agency Exhibit B3 at 7.

In a letter dated September 24, 1993, Mr. Gregory A. Wilkins, Ashland Petroleum Company, commented on several aspects of narrative biological criteria. The response to these comments pertain to questions raised regarding: 1) the need and application of biological criteria and biosurveys; 2) the procedures used to determine the reference conditions and biological quality; 3) the scientific validity of biological assessments; 4) the responsibility for biological criteria development and biosurveys; and 5) the application of biological survey information in regard to permitted point dischargers.

1) The need and application of biological criteria and biosurveys

The Agency staff disagrees with Ashland Petroleum Company's assertion that the EPA is not requiring adoption of narrative biological criteria but just providing guidance and advice to states concerning biological criteria. As stated in Agency Exhibit B2 at 3, "To meet the objectives of the [CWA] Act and to comply with statutory requirements under Sections 303 and 304, States are to adopt biological criteria in State standards." The adoption of narrative biological criteria is considered by U.S. EPA as a required first step in meeting the statutory requirements under Sections 303 and 304, and providing criteria to protect biological integrity under the main objective of the Act (101). The Agency Exhibit B2 at 3 further states "in accordance with the FY 1991 Agency Operating Guidance, States and qualified Indian tribes are to adopt narrative biological criteria into State water quality standards during the FY 1991-1993 triennium".

The EPA has overview authority in insuring that the States comply with its directives. Section 303(c)(3) of the Clean Water Act provides that the EPA must review any new or revised state standards for conformance with the requirements of the Act. If the EPA finds that the new or revised state standards are not in compliance with the Act, the EPA shall promulgate acceptable standards for the state. Prior to the 1990 revision of Minnesota Rules, Chapter 7050, EPA published guidance on the adoption of toxic standards. The MPCA adopted toxic standards in conformance with that guidance. Twelve states that failed to follow that guidance, however, recently had toxics standards promulgated for them by EPA. The point is that although EPA issues guidance documents on changes it wishes the states to make in their water quality standards, the documents are guidance documents in name only. EPA has exercised their right to review and change standards they find deficient or otherwise unacceptable. A state which ignores EPA guidance documents runs the very real risk of losing control of its standard setting process and having EPA dictate its water quality standards. The Agency declined to take that risk and therefore is proposing narrative biological criteria in this rule revision.

Beyond these statutory requirements discussed above, Sections 305(b), 314(a), and 319(a) of the Clean Water Act, require the Agency to make assessments of waterbodies. As part of these assessments, determinations are made as to whether the condition of a waterbody is such that its aquatic life uses are impaired and whether the water quality is at a level sufficient to provide for the protection and propagation of balanced biological communities. Section 305(b) requires a biennial report submission to EPA to include an analysis of the extent to which all navigable waters provide for the protection and propagation of a balanced population of shellfish, fish and wildlife. Section 314 requires a biennial report that includes a list and description of those publicly owned lakes for which uses are known to be impaired. Section 319 requires a report regarding a list of waters, which without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of the Act.

Biological criteria and accompanying biological surveys provide for a direct measurement for assessing aquatic life uses and the extent to which waterbodies within Minnesota are meeting the goals of the CWA Section 101(a) and Section 101(a)(2) as indicated in the SONAR at 13. Measurements of biological quality will be used therefore, to determine whether various waterbodies are in attainment/nonattainment with their aquatic life use class designation. Such information will be used to address the statutory and reporting requirements for aquatic life use support assessments under the sections of the Clean Water Act mentioned above. The responsibility of conducting these assessments and determining the biological quality of a receiving stream, in this context, is the responsibility of the Agency, through its delegation from the EPA. The outline of how aquatic life use support will be determined using biological information will be provided by the Agency on a biennial basis through the 305(b) report.

Once waterbodies are found to have degraded biological quality, or for that matter, violations of numerical criteria, the Agency addresses them conditions through water quality management(WQM) plans. WQM plans, as indicated under 40 Code of Federal Regulations (CFR) sec. 130.6(a) "consist of initial plans produced in accordance with sections 208 and 303(e) of the Act and certified and approved updates to those plans". As stated in 40 CFR 130.6(b) "WQM plans are used to direct implementation. WQM plans draw upon the water quality assessments to identify priority point and nonpoint water quality problems, consider alternative solutions and recommend control measures, including the financial and institutional measures necessary for implementing recommended solutions". Sections 205(j), 208 and 303 of the Act specify water quality planning requirements. In this sense, degraded biological quality that are considered of priority will be addressed through continuing water quality planning process.

The Agency staff believes that the CWA provides the need and the context for application of biological criteria and biosurvey information, and how actions will be developed to address degraded biological quality or impaired aquatic life uses. The Agency staff does not believe that the discussion of the various applications of biological criteria and surveys must be reiterated in the state rule to demonstrate the benefit and need for biological criteria.

2) The procedures used to determine the reference conditions and biological quality of surface waters.

The Agency staff does not consider it necessary in a narrative statement to indicate procedures for how the reference conditions will be determined for each water body type at this time. EPA, as indicated in Agency Exhibit B3 at 4; does not consider it necessary for states to list in the narrative statement the sampling procedures and parameters to be employed. For some resource types such as wetlands, biological criteria development are still in the research stages and sampling techniques are presently being developed. On the other hand, biological criteria development methods and standardized sampling protocols are developed and well established for rivers and streams and were alluded to in the SONAR at 21 in the discussion of the fish community based index, the Index of Biotic Integrity (IBI). Techniques for the development of the IBI and sampling techniques are discussed in Agency Exhibit B5. The techniques are one the Agency will use to assess biological technical quality in rivers and streams.

Mr. Wilkins indicates the need for a standardized method by which assessments will be accomplished. The Agency staff believes that there cannot be one standardized method to assess all waters. The differences among biological communities in rivers and streams, wetlands, and lakes and reservoirs, make it impossible to have one standardized method. The Agency staff plans to follow consistent and standardized sampling and analysis procedures for each different resource types. EPA guidance will also be followed in the formation of the sampling and analysis protocols used. The determination of the cause of the impairment will follow the procedures indicated in Agency Exhibit B3 at 38-40.

Mr. Wilkins' questioned why the Agency would deviate from EPA protocols and what deviation from EPA protocols were planned. The reference discussed in the SONAR at 20 was the establishment of control sites for evaluating water quality effects and habitat alterations. This particular outline was specific for rivers and streams. The methodology may need to be changed for lakes or wetland situations because of the differences of these resource types. This is why the SONAR at 20 was worded " the methods for establishing controls will follow procedures similar to those given in EPA's Rapid Bioassessment Protocols for Use in Streams and Rivers".

3) The scientific validity of biological assessment.

Mr. Wilkins questioned the scientific validity of biological assessments as a means of determining the biological quality of a waterbody, particularly the biological quality of a receiving stream. He further questioned the results of Ohio EPA's (Exhibit B1) comparison between biological survey results and water chemistry data.

In response, Agency staff would agree that biological communities are affected by natural conditions as well as man-made variables. The purposes of establishing reference conditions for difference water resource types within different geographic regions is to take into consideration that natural variability. It is also true that biological communities are affected by manmade activities and certainly factors other than water chemistry. This is one reason that biological monitoring is needed as stated in SONAR at 13, because water chemistry monitoring alone cannot assess impacts of nonchemical factors such as habitat alteration, sedimentation, and hydrologic modifications. The results of the Ohio EPA(Exhibit B1) comparison showed agreement between water chemistry monitoring and biological assessments in 34.5 percent of the sites assessed. At sites where the biological survey data indicted impairment of aquatic life but the water chemistry standards were not violated, Ohio EPA diagnosed the cause of the impact to be due to the impacts of habitat degradation and low dissolved oxygen/organic enrichment. Water chemistry monitoring cannot assess habitat problems nor can grab sampling necessarily detect dissolved oxygen problems that may occur on a diurnal basis. Certainly biological surveying has limitations and biosurvey monitoring programs must incorporate quality assurance/quality control measures. However, the limitations and assumptions that are made in determining biological quality may be different but are of no greater magnitude than those limitations and assumptions made in determining the chemical quality of water.

4) Responsibility for biological criteria development and biosurveys and related costs.

Mr. Wilkin's letter indicated that he thought the cost of performing biological assessments was prohibitive and the Agency would shift the financial burden for these assessments onto the regulated community.

The Agency staff disagrees with the assertion made in Mr. Wilkins' letter that the expense of conducting biological assessments is prohibitive. As indicated in Agency Exhibit B2 at 45, states such as Ohio that have implemented extensive biological criteria programs have found it to be cost effective for determining aquatic life use support. In addition, for the purposes of detecting impairment of aquatic communities, biosurveys may require less monitoring than more traditional chemical testing methods.

Agency staff does not believe that a shift in responsibilities for conducting assessments and costs for assessments will be placed on the regulated community. It is the Agency's responsibility to monitor and assess waterbodies of the state for water quality condition determination. As stated in 40 CFR sec. 130.4(b) State water monitoring program must include collection and analysis of physical, chemical, and biological data and quality assurance and control programs to assure scientifically valid data. The Agency has in the past and continues to conduct surface water monitoring through program funding under CWA Section(106). The Agency under special 106 grants has conducted biological criteria development projects. The Agency has also received monies for specific biological survey projects from the state legislature through the Legislative Commission on Minnesota Resources. Section 106 program funding is a continuing source of funding for the Agency. The Agency may also request in the future additional monies from Legislative Commission on Minnesota Resources for biocriteria development.

The Agency does have limited funding for reference condition development for supporting the narrative criteria in all the various waterbody types within the many geographic areas of the state. The Agency staff believes that, for this reason among others mentioned previously, the development of reference condition values will be a slow process. However, the Agency staff does not believe this is a justification or an indication that the financial burden for the development of this program will be shifted to the regulated community. The Agency does have the authority to require under Minn. Rules ch. 7001, a permittee to undertake monitoring and testing. The requirements under Minn. Rules ch. 7001 "must specify the type, interval, and frequency of monitoring and testing activities that are sufficient to yield representative data to determine whether there is compliance with the terms and conditions of the permit or compliance with Minnesota and federal pollution control statutes and rules". The Agency has required instream water chemistry monitoring under permit conditions. However, there are very few cases where this has occurred and usually due to special circumstances related to concerns about the discharger's effluent quality on a receiving waterbody. The Agency staff does not foresee instream chemical monitoring or instream biological surveys as a routine condition of a permit. These requirements will be invoked only under special circumstances on a permit-by-permit basis. Regarding the permit issuance, there are public participation and review requirements under Minn. Rules ch. 7001, so any issues raised regarding monitoring requirements would be open to public comment and review.

For the reasons stated, the Agency staff does not believe that the Agency will place the cost burden of biocriteria development and biosurvey monitoring on permittees nor that assessments based on biosurveys are cost prohibitive.

5) The application of biological survey information in regard to permitted point dischargers.

The Agency staff in SONAR at 105-106 discusses how biological assessments will be used as an integrated diagnostic assessment tool. In the SONAR at 106, possible Agency options were discussed if the biological quality of a receiving stream was considered impaired due to a permitted discharge. From this discussion Mr. Wilkin's questioned whether this meant that a biological assessment may result in permit limits below those based on existing numeric water quality standards. The answer to this question is no as indicated in the SONAR at 106: " The actual setting of the effluent limits and changes in treatment that would occur, however, are ultimately based on effluent toxicity evaluations and the numerical chemical criteria that are established." The value of conducting a biological survey, however, is that they may indicate the need for further evaluations of the water chemistry to determine if existing numeric water quality criteria are being maintained in the receiving stream.

B. Miscellaneous Comments

1. September 27, 1993, letter from Jeffrey S. Broberg

In a letter dated September 27, 1993, Jeffrey S. Broberg of McGhie & Betts expressed concern about alleged lack of public discourse on changes proposed for feedlots and wetlands. He indicated that certain proposed changes should be referred back to the Agency because of his belief there was not information available in a timely manner. Mr. Broberg's assertions do not cite any alleged procedural defects with any statutory or rule requirement and instead, appear to be based on his perceptions of public involvement in the public hearings. Because his assertions lack any specificity, Agency staff's response is general in nature. Agency staff disagrees with Mr. Broberg's evaluation and the record evidence demonstrates that the Agency has fulfilled all relevant substantive and procedural requirements, and the Agency has made numerous efforts to communicate with and involve potentially affected persons on all issues, including wetland standards, substantially in advance of the August, 1993 public hearings.

In regard to Mr. Broberg's concern about the feedlot rule changes, previous Agency staff discussion in these final comments and in the Agency's Post Hearing Response shows it's the Agency staff's recommendation to withdraw the revision to Minn. Rules pt. 7050.0215, subp. 2.A. As a result, these comments will not address the Agency's record in publicizing that proposed change.

As early as February, 1992, the Agency notified the public of potential rule revision considerations that included wetland standards. SONAR, Exhibit G1. Agency staff communicated with numerous interested parties about these revisions and again, in August, 1992, the Agency solicited input. SONAR, Exhibit G3. In early 1992, the Agency was communicating with entities involved in agriculture, including the Minnesota Department of Agriculture and the Minnesota Farm Bureau, about the wetland standards to be included in the Chapter 7050 process. See SONAR, Exhibits G2i and G2j. These Agency-initiated informational efforts continued throughout the pre-hearing process including the fall, 1992. See SONAR, Exhibits G4a, G5a, and G6a. These informational efforts provided details about what was being considered. SONAR, Exhibit G7. In addition to complying with the required notice requirements of Minn. Stat. chs. 14 and 115, the Agency made numerous mailings to numerous groups of potentially interested parties. See SONAR, Exhibit G11a-c.

In summary, Mr. Broberg's conclusions do not take into account the Agency's substantial historical efforts to notify the public of the Chapter 7050 issues. Mr. Broberg's vague and nonspecific assertions have no foundation and thus, Agency staff opposes his request that the wetland standards be withdrawn.

2. September 21, 1993 letter from Thomas W. Balcom, DNR

In the letter dated September 21, 1993, Thomas W. Balcom recommends that Agency staff includes page numbers and titles as part of rule citations made within the text under part 7050.0210, subpart 13a. Agency staff acknowledges that the length of Chapter 7050 makes finding cited rules difficult for persons that are not familiar with the Chapter and the Agency is making revisions to make the rule easier to use. For example, the Agency is proposing to summarize the water quality standards applicable to the use classes under part 7050.0220, subparts 3, 4, 5 and 6. SONAR at 49. However, Agency staff does not believe it is practical to add page numbers to the rule citations. The standard format for citing rules does not include page numbers from the Minnesota Rules and Agency staff does not believe that page number citations would be approved by the State Revisor of Statutes. In addition, the rule drafting process does not provide for an opportunity to add page numbers because the text is not formatted for printing in the hardbound books until after the rule has been adopted and the rule language finalized.

3. The DNR, September 21, 1993 letter, points out that in their draft of the Minn. Rules ch. 7050, that there is an equation missing in part 7050.0218, subpart 4, item B., subitem 4 (g).

The DNR had an early draft of the rule which did not illustrate the mathematical equation for the Final Acute Value (FAV). The FAV equation can be seen in the existing rule in part 7050.0218, subpart 4, item B., subitem 4 (g). The Revisor of Statutes does not have this equation in the computer version of the rule text for Chapter 7050. The equation is pasted into the rule text at the time of printing. Agency staff used the computer generated text from the Revisor's Office to draft the proposed rule revisions. Therefore, the equation was not a part of the early draft used by DNR. Agency staff did not take steps to include the equation in the rule draft because no changes to the equation were being considered by the Agency.

4. Reclassification of portions of the Minnesota and Mississippi Rivers

Several parties suggested the Agency staff makes classification changes to river segments.

a. The DNR (September 21, 1993 letter) expressed interest in the reclassification of the lower Minnesota River and the Mississippi River below the Metropolitan Wastewater Treatment Plant from a Class 2C water to a Class 2B water.

b. The Izaak Walton League of America (September 27, 1993 letter) would like to see the the portion of the Mississippi River below Dayton, Minnesota to Hastings, Minnesota be designated an outstanding natural resource value waters.

c. In view of the establishment of the Mississippi National River and Recreation Area (MNRRA) designation, the Sierra Club (September 29, 1993 letter) indicated that in the portion of the Mississippi River from Anoka, Minnesota to river mile 830 being given a uniform classification of a highly protective nature. The Sierra Club also felt that the same classification should be used on that portion of the Minnesota River which falls within the MNRRA.

To reclassify these portions of the Minnesota and Mississippi Rivers would be a substantial change to the rule. The Agency staff will arrange to discuss this issue with the interested or affected parties before the next triennual review begins.

Some clarifications and corrections of information contained in the Sierra Club's letter need to be addressed. The Agency would like to point out that the the Sierra Club is mistaken in stating that some portions of the Mississippi and Minnesota Rivers referenced in their letter are not protected for swimming. Both the Mississippi River from Anoka, Minnesota to river mile 830 and the lower

Minnesota River are protected for swimming usage. Also, the portion of the Mississippi River from Anoka to St. Anthony falls is protected for potable water usage.

5. Other requests for ORVW designation

In a letter dated September 29,1993, from Lynn Lewis, United States Fish and Wildlife Service, a suggestion was made to consider (a) refuges, (b) sites within joint venture project areas under the North American Waterfowl Management Plan, and (c) wildlife management areas as possible areas for future Outstanding Resource Value Water (ORVW) designation. To designate any of these areas as ORVWs at this time would be a substantial change to the rule. The Agency will consider this proposal before the next triennual review of Minn. Rules ch. 7050.

6. Dredge disposal facilities

Two comment letters included concerns about the conditional exemption of dredge disposal facilities from secondary effluent limitations. In a letter dated September 29, 1993, Jim Bodensteiner from Northern States Power made similar comments to those NSP made in response to our Notice to Solicit Outside Opinion. Mr. Bodensteiner's comments were generally supportive of the proposed rule amendment. The Agency staff responded to these comments in SONAR, at 42, last paragraph.

The Sierra Club, in a letter dated September 29, 1993, commented that the Agency did not present an adequate case that secondary effluent limitations for discharges from dredge disposal facilities are not necessary to adequately protect water quality. This is correct. The case that we presented was that requiring permittees to meet secondary limitations has not been effective in protecting water quality. The SONAR, page 40, last paragraph discusses the limitations of current technology to meet the secondary treatment standard. The ability of Agency staff to analyze treatment alternatives, review the design of the treatment system, require the use of best practicable technology, and specify the operating procedures and other management practices in the permit (as stated in the SONAR, pages 41 and 42) will be more protective of the receiving waters than setting limitations in the permit that may not be able to be met.

The Sierra Club also commented that the rule did not make it clear that the exemption to secondary effluent limitations only applies if the designated uses of the receiving water are maintained. Part 7050.0212, Subp. 2a, Item B states that the designated uses of the receiving water body must be maintained.

7. Fond du Lac Nation

A letter from Fond du Lac Reservation Business Committee dated September 24, 1993, raised several rule revision issues similar to those raised by Fond du Lac Reservation representatives at the Duluth Hearing. Peterson, Tr. September 2, at 41-53. Agency staff responses to these issues are included in the Post Hearing Response at 77-78.

8. Thermal Standard for Class 2A

The Izaak Walton League, September 27, 1993 letter, suggests that the Agency set a thermal standard for cold water streams. The thermal standard for Class 2A waters is currently: no material increase, as stated in pt. 7050.0222, subp. 2.

C. Changes to Proposed Rules

Agency staff has changes that they would like to make to the proposed rule revisions as they were noticed in the State Register on July 19, 1993. These changes were summarized in Attachment 2 of the Post Hearing Response. Item 7 of Post Hearing Response Attachment 2 was not discussed in detail within the text of the Post Hearing Response.

As identified in Item 7, Agency staff proposed to change the phrase "none currently classified" to "none currently listed" under pt. 7050.0470, subp. 8 and 9, item B. The phrase "none currently listed" is proposed under pt. 7050.0470, subps. 1, 2, 4 and 6, item C and subps. 7 and 9, item D. Agency staff wanted to use the word "listed" instead of "classified" because it more accurately reflects the status of waters identified under part 7050.0470. Waters that are not listed under part 7050.0470 are classified according to parts 7050.0425 or 7050.0430. The phrase "none currently classified" gives the reader the false impression that lakes within the Cedar-Des Moines Rivers Basin and the Missouri River Basin that do not have their names included under subps. 8 and 9 do not have beneficial use classifications.

Since the Post Hearing Response was submitted to the Administrative Law Judge on September 29, 1993, Agency staff has identified additional changes that should be made to the proposed revisions for Chapter 7050. These additional changes are summarized below.

1. Citation of the EPA Drinking Water Standards

Part 7050.0221, subp. 2 through 5 of the proposed rule are being amended to update the citation for the EPA primary and secondary drinking water standards applicable to Class 1 waters. Judge Klein asked whether a note should be added to the rule to notify readers that new EPA drinking water standards could come along between triennial reviews of Minnesota's rule. The Agency staff suggests that dating the reference to the drinking water standards and deleting the words "revisions, amendments, or supplements" may be the best solution to this problem (Staff Response at 80). Agency staff consulted with staff at the Minnesota Department of Health (MDH) on the best way to cite the federal drinking water standards. The MDH is planning to notice in the <u>State Register</u> this month a proposed update to the citation of the EPA drinking water standards in their drinking water rule, specifically Minn. Rules pt. 4720.0350. The changes the Agency staff suggests below will parallel the MDH proposed changes. The MDH has the responsibility to administer the Safe Drinking Water Act and protect drinking water at the tap. The Agency uses the same drinking water standards to protect drinking water in its raw state.

Agency staff suggests the following changes to pt. 7050.0221, subpart 2 through 5 to make the citation to federal standards more explicit.

Language as originally proposed (using pt. 7050.0221, subp. 2 as an example):

Subp. 2. Class 1A waters; domestic consumption. The quality of Class 1A waters of the state shall be such that without any treatment of any kind the raw waters will meet in all respects both the primary (maximum contaminant levels) and secondary drinking water standards issued by the United States Environmental Protection Agency as contained in Code of Federal Regulation, Title 40, part 141, subparts B and G, and part 143, and any revisions, amendments, or supplements. These Environmental Protection Agency standards are adopted and incorporated by reference. These standards will ordinarily be restricted to underground waters with a high degree of natural protection.

Language as now proposed:

Subp. 2. Class 1A waters; domestic consumption. The quality of Class 1A waters of the state shall be such that without any treatment of any kind the raw waters will meet in all respects both the primary (maximum contaminant levels) and secondary drinking water standards issued by the United States Environmental Protection Agency as contained in Code of Federal Regulation, Title 40, part 141, subparts B and G, and part 143 <u>(1992); and sections 141.61 and 141.62 as amended through July 17, 1992</u> ~~and any revisions, amendments, or supplements~~. These Environmental Protection Agency standards are adopted and incorporated by reference. These standards will ordinarily be restricted to underground waters with a high degree of natural protection.

Parallel language for citing the drinking water standards is proposed for pt. 7050.0221, subparts 3 through 5.

These citations and incorporations by reference will make the latest drinking water standards, as of October 6, 1993, available to Agency staff and any users of the rule. July 17, 1992 is the date of the <u>Federal Register</u> that contains the last set of drinking water standards finalized by EPA (Exhibit T35). If changes are made in the future by EPA, the reference in the Agency's rule will be updated in subsequent triennial reviews. As explained in the Post Hearing Response at 81, this should not pose a threat to the Agency's ability to adequately protect drinking water, and it will be less confusing to all users of the rule to cite specific standards.

2. Corrections to drinking water standards

In reviewing these changes to the drinking water standards, the Agency staff found three errors in the drinking water standards listed in proposed part 7050.00220 subparts 3 and 4, which the staff proposed to correct at this time.

a) Pt. 7050.0220, subparts 3 and 4, Under Miscellaneous:

Foaming agents	mg/l	500(S)

The units listed should be <u>ug/l</u>, not mg/l.

b) pt. 7050.0220, subps. 3 and 4, Under Miscellaneous

In the current proposed rule the drinking water standards for cyanide are listed as follows:

Cyanide, free	ug/l	[no drinking water standard listed]
Cyanide, total	ug/l	200

The cyanide drinking water standard should be changed to read:

Cyanide, free	ug/l	200

The drinking water standard was incorrectly listed with total cyanide, the cyanide drinking water standard is for free cyanide only (Exhibit T35 at 31847). The listings for "cyanide, total" are not needed in pt. 7050.0220, subparts 3 and 4, and should be deleted.

c) Pt. 7050.0220, subparts 3 and 4, Under Organics:

Hexachlorocyclopentadiene	ug/l	8(S)

The listing of this compound and the secondary standard of 8 ug/l should be deleted.

There is no proposed or final secondary drinking water standard for Hexachlorocyclopentadiene and the Agency staff proposes to delete it. The primary drinking water standard of 50 ug/l is correct as proposed.

3. "Calcareous Fens," pt. 7050.0470

In their letter of September 21,1993, the DNR encouraged the Agency staff to change the headings in the proposed rule from "Fens" to "Calcareous Fens" in Minn. Rules pt. 7050.0470. The Agency staff agrees with this recommendation and the the proposed part 7050.0470 entry header changes are listed in Attachment 20 of this Agency Final Response dated October 6, 1993.

4. Pt. 7050.0420, trout waters

This issue is discussed in more detail in this document under Reclassification, Hay Creek, MPCA/DNR Evaluation.

While Agency staff does not support the proposed amendment of Minn. Rules pt. 7050.0470 offered in Foot Comments at 14, the Agency staff agrees with the company that the language in part 7050.0420 as proposed could be improved (see Agency Exhibit 3 at 203). Instead of the proposed Foot modification language, the Agency staff would propose that a citation date be included in part 7050.0420 citing the adoption date for designated trout lakes and trout streams. The Agency staff's proposed modification to this rule part is as follows:

7050.0420 TROUT WATERS

Trout lakes identified in part 6262.0400, subpart 2, as adopted on July 12, 1993, are classified as trout waters and are listed in part 7050.0470. Trout streams and their tributaries within the sections specified that are identified in part 6262.0400, subpart 4, as adopted on July 12, 1993, are classified as trout waters. Trout streams are listed in part 7050.0470. Other lakes that are classifieds trout waters are listed in part 7050.0470. All trout waters are classified as Class 1B, 2A, 3B, 3C, 4A, 4B, 5, and 6 waters.

5. Pt. 7050.0222

See page 191 of proposed rule. Under new subp. 3, Class 2Bd waters, the reference to item A should be changed to read subp. 2.

CONCLUSIONS

Dated ____________________

____
Charles Williams
Commissioner

5. Pt. 7050.0222

See page 191 of proposed rule. Under new subp. 3, Class 2Bd waters, the reference to item A should be changed to read subp. 2.

CONCLUSIONS

The Agency staff has found the review of Minn. Rules ch. 7050 to be a constructive and beneficial process. The Agency staff recognizes the public's concern and interest in Minn. Rules ch. 7050 and appreciate the numerous comments provided by many parties.

Since the proposed amendments were noticed in the State Register on July 19, 1993, the Agency staff have tried to response to all the substantive comments. These responses were made verbally at the public hearings, and in written form in the post hearing comments dated September 29 and October 6, 1993. Many of the constructive comments made have resulted in the Agency staff offering modifications to the original proposed rule language. The Agency staff believes that the result is an improved proposed rule.

Where issues were raised that were not part of the issues being considered by the Agency during this rule revision, these issues will be considered in the next rule amendment process which is anticipated to occur in 1996.

The Agency staff believes that the record in this case supports the need for and reasonableness of the amendments to Minn. Rules ch. 7050 as proposed by the Agency. The staff urges the Administrative Law Judge to recommend the Agency to adopt the rules as proposed with the changes described in and attached to this document.

Dated: 10/6/93

for Gordon E. Wegwart
Charles W. Williams
Commissioner

VII. ATTACHMENTS

1 September 29, 1993 letter from Beth C. W. Nelson, Minnesota Cultivated Wild Rice Council, received by the MPCA on October 4, 1993.

2 Letter, date stamped September 20, 1993, from Kay Hanson, regarding Center Creek.

3 September 23, 1993 letter to Administrative Law Judge from Dwayne and Eleanor Cartwright, Winnebago, Minnesota, regarding Center Creek.

4 September 17, 1993 letter to Judge Allan Klein from Harlen Johnson, Winnebago, Minnesota, Center Creek river mile 1.6.

5 September 27, 1993 letter from Mr. and Mrs. David Cartwright, Winnebago, Minnesota, Center Creek river miles 4 and 1.6.

6 Letter, date stamped September 27, 1993, from Matt Rynearson, Winnebago, Minnesota, Center Creek river mile 4.

7 Letter, date stamped September 15, 1993, from Wilma and Alvin Seetin, Winnebago, Minnesota, Center Creek river mile 5.5.

8 September 23, 1993 letter from Sharon and LeRoy Jenkins, Winnebago, Minnesota, Center Creek river mile 7.3.

9 September 11, 1993 letter from Mrs. Robert Kesseling, Winnebago, Minnesota, Center Creek river mile 7.3.

10 September 8, 1993 letter from Donald Evans, City of Granada, Center Creek river mile 17.8.

11 Letter, date stamped September 24, 1993, from Susan Goodwill, Granada, Minnesota, regarding Center Creek.

12 September 9, 1993 letter from Mr. and Mrs. Mike Sparks, Granada, Minnesota, regarding Center Creek.

13 September 9, 1993 letter from Bruce Hiatt, City of Granada Councilman, regarding Center Creek.

14 September 9, 1993 letter from DeWane Mortensen, Granada, Minnesota, regarding Center Creek.

15 Letter, date stamped September 28, 1993, to Administrative Law Judge from Rich Perrine, Center Creek river mile 30.2.

16 September 27, 1993 letter from Loren Lein, Faribault County Commissioner.

17 September 27, 1993 letter from Orville Goemann, Faribault County Soil and Water Conservation District Supervisor.

18 September 28, 1993 letter from Duane Larson, Chairman for Verona Township.

19 Summary of additional changes to be made to proposed Minn. Rules ch. 7050 revisions as noticed in State Register on July 19, 1993. This Attachment supersedes Post Hearing Response Attachment 2.

CONCLUSIONS

The Agency staff has found the review of Minn. Rules ch. 7050 to be a constructive and beneficial process. The Agency staff recognizes the public's concern and interest in Minn. Rules ch. 7050 and appreciate the numerous comments provided by many parties.

Since the proposed amendments were noticed in the State Register on July 19, 1993, the Agency staff have tried to response to all the substantive comments. These responses were made verbally at the public hearings, and in written form in the post hearing comments dated September 29 and October 6, 1993. Many of the constructive comments made have resulted in the Agency staff offering modifications to the original proposed rule language. The Agency staff believes that the result is an improved proposed rule.

Where issues were raised that were not part of the issues being considered by the Agency during this rule revision, these issues will be considered in the next rule amendment process which is anticipated to occur in 1996.

The Agency staff believes that the record in this case supports the need for and reasonableness of the amendments to Minn. Rules ch. 7050 as proposed by the Agency. The staff urges the Administrative Law Judge to recommend the Agency to adopt the rules as proposed with the changes described in and attached to this document.

Dated: 10/6/93

for Gordon E Wegwart
Charles W. Williams
Commissioner

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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

Submitted to:

Minnesota PCA
Environmental Outcomes Division
Surface Water Monitoring Section
520 Lafayette Road N
St. Paul, MN 55155-4194
Will Bouchard, Program Contact

Submitted by:

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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.

TABLE OF CONTENTS

LIST OF TABLES

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
Joel Chirhart	EAO-SWMS-South Biol. Mon. Unit	joel.chirhart@state.mn.us
Mike Feist	EAO-SWMS-South Biol. Mon. Unit	mike.feist@state.mn.us
Dan Helwig	EAO-SWMS-South Biol. Mon. Unit	daniel.helwig@state.mn.us
John Genet	EAO-SWMS- South Biol. Mon. Unit	john.genet@mn.state.us
Mark Tomasek	EAO-WAS-WQS Unit	mark.tomasek@mn.state.us
Chris Yoder	Midwest Biodiversity Institute	cyoder@mwbinst.com
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.

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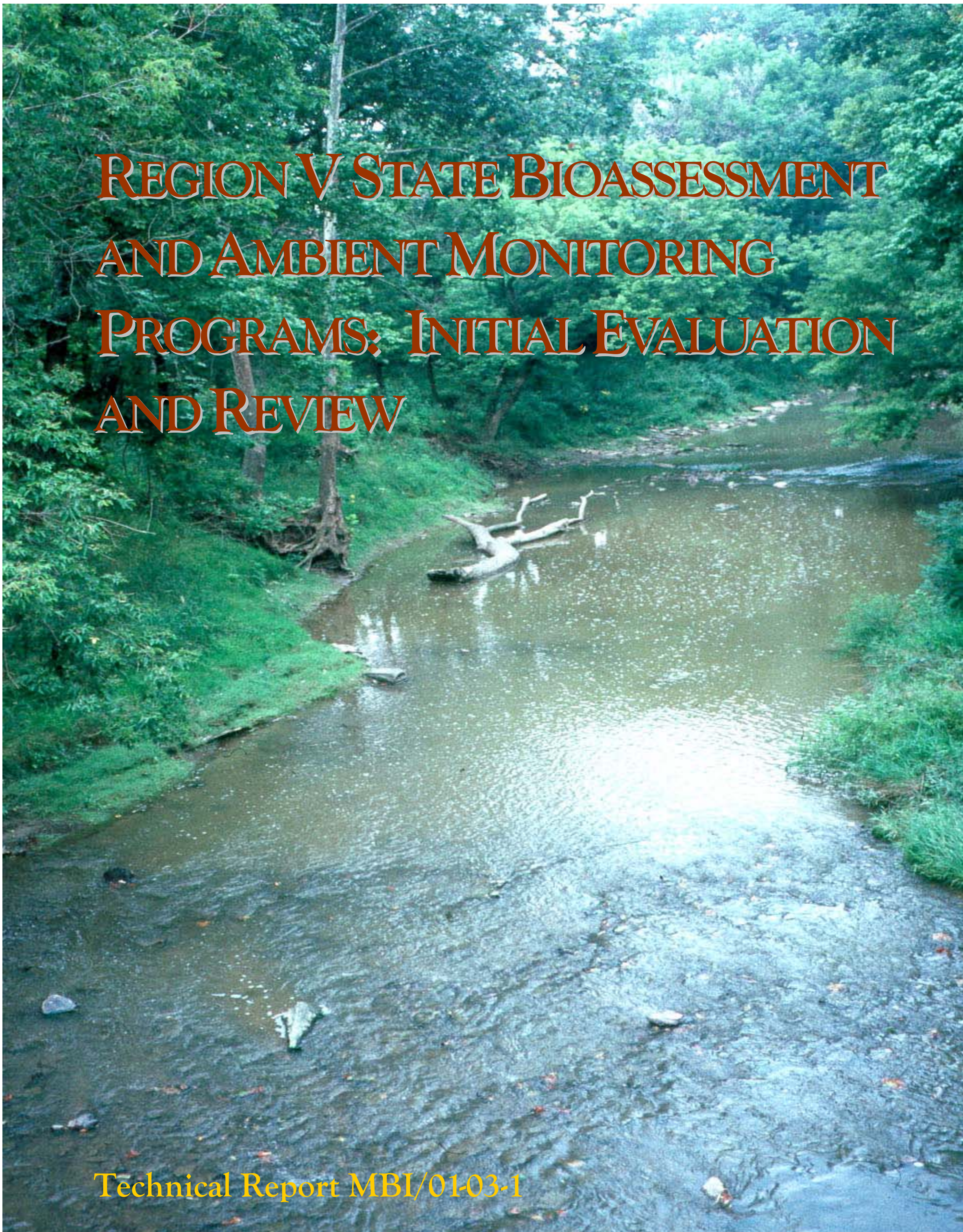

REGION V STATE BIOASSESSMENT AND AMBIENT MONITORING PROGRAMS: INITIAL EVALUATION AND REVIEW

Technical Report MBI/01-03-1

Region V State Bioassessment and Ambient Monitoring Programs: Initial Evaluation and Review

February 28, 2003
(Revised January 30, 2004)

Final Report

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Executive Summary

The purpose of this report is to provide an initial assessment of the current status of the monitoring and assessment programs in the Region V states and initiate a process to determine what is needed to improve the capacity and quality of those programs. This review specifically emphasizes biological assessment as a critical linchpin to the success of state monitoring and assessment programs. Specifically, the report focuses on the use of biological assessments to support the integrated assessment of status and trends, reporting, and other primary water quality management programs (WQS, planning, TMDLs, permitting) **for aquatic life uses**. It was prepared based on information gathered during on-site interviews with each state that took place in January 2002, information that is published by each state, and other information and experiences gained by MBI in supporting various U.S. EPA and state projects. Furthermore, the extent of overlap with national and regional EPA initiatives was exploited and evaluated whenever possible. The guiding principles of this report are based on the belief that monitoring and assessment programs should achieve the highest levels of standardization, rigor, reliability, reproducibility, accuracy, comparability, comprehensiveness, and cost-effectiveness that is reasonably attainable under current technologies. Achieving these depends largely on the ability and willingness of states to access and effectively execute the use of that technology.

While all of the states operate monitoring and assessment (M&A) programs, the quality and make-up of each varies widely in terms of organization, design, indicator development and use, and extent to which water quality management programs are directly supported by M&A. The assessment of status for 305b reporting and 303d listing purposes is a significant, and in some cases the *de facto* driver of state M&A programs. The recent emphasis on TMDLs and now the CALM process has amplified this dependence. However, there is evidence that an over-emphasis on this function of M&A can deter the ability of states to address emerging issues such as refined uses, use attainability analyses, and improved integration between and within water quality management programs in general.

The report is organized by the major program areas addressed in the interview process: Monitoring and Assessment, Reporting and Listing, Water Quality Standards, Assessment and Integration, and Biological Monitoring and Assessment. Each section was subdivided into a summary and description of general findings, major issues and challenges, and program implications and recommendations. A principal goal of this review is to determine the status of the biological M&A programs in each of the six Region V states, with emphasis on how it is integrated with other monitoring tools and programs and how it used to support *all* water quality management programs. While there has been a great deal of emphasis on the role of M&A in producing reliable estimates of status, this review focused on how the M&A framework simultaneously supports baseline water quality management functions such as water quality standards (WQS), watershed assessment and management (including nonpoint sources), TMDLs, and permitting programs such as NPDES permits, CSO/SSO, stormwater phase I and II, 404/401 dredge and fill, and other related issues (e.g., CAFOs).

The report also includes information regarding important details about key technologies and approaches that will be needed to successfully address many of the findings and recommendations of this review. These are appended to the report and include the key conceptual underpinnings, elements, and concepts of an adequate approach to M&A and surface water monitoring design options. Such detail is necessary to develop a blueprint by which the Region and the states can better develop an integrated program that will address deficiencies noted by recent reviews (e.g., GAO 2000, 2003a,b; NRC 2001; Karr and Yoder 2004). Making informed choices about monitoring network design, indicators, and technical issues such as indicator development and calibration will need to be under girded by ongoing technical assistance and applied research aimed at answering specific questions before and as they arise. Gaining management understanding and appreciation for the principles of adequate M&A is crucial to realizing improved management outcomes. This includes addressing embedded issues that have thus far served as serious impediments and disincentives to the development of more comprehensive programs (e.g., negative perceptions of refined uses, impact on 303d listings, implications for permitting, policy of independent application, etc.). Managers must be engaged in and comprehend this process and understand the pitfalls of operating water quality management programs in its absence. The following are important highlights of the findings and conclusions:

Monitoring and Assessment Issues

- Each Region V state operates an active M&A program, which includes biological, habitat, and chemical/physical sampling methods, indicators, and assessment techniques. Each state believes that current resources are insufficient to meet present and future M&A demands (true of biological assessment in particular). This not only includes staff, facilities, and logistical support, but also includes technological needs in terms of sampling designs, indicator development, data management, data analysis, and assessment and reporting.

- States are genuinely interested in further developing and improving their M&A programs. Regional support should be made available via direct assistance to support detailed technical assistance with the development of state monitoring strategies and implementation of improved monitoring programs. Grants should also emphasize the types of applied research that are needed to provide improved and new tools, indicators, and integrated assessment processes.

- Although M&A programs have recently become a more visible priority for the states, each receives varying levels of comprehension and understanding from their respective program management. This ranges from solid conceptual understanding and a genuine interest in how the results can be used to support water quality management to a principal interest in singular M&A derivatives (e.g., 303d listings) and an acceptance of limited programs. It is recommended that training and orientation be developed and aimed at program managers to accomplish a greater appreciation of the need for and utility of improved M&A.

- There is a need to better frame and organize the issues and questions that determine M&A design and use. This includes explicitly communicating how adequate M&A can improve and streamline water quality management end outcomes and what is required to attain truly adequate M&A. This includes the conceptual principles and processes outlined in the report's appendices.

- Water quality management in most states is focused primarily on administrative outputs, especially in the permitting and TMDL programs. The explicit disconnection of administrative actions (i.e., termed outputs after GAO 2003a) from the M&A program has the effect of limiting the further development of the latter as an *end outcome* of water quality management. Even in states with well-developed and integrated assessment processes, there is tendency to digress to a principal reliance administrative outputs. Successful implementation of an environmental outcomes driven approach requires adherence to the principles outlined in the appendices and time to develop and implement the supporting indicators and integrated assessment processes. Accomplishing this in each state first requires an assessment of where the state M&A program stands in terms of attaining the professionalism, technology, facilities, and process needed to execute an environmental outcomes driven approach to water quality management.

- M&A program design in some states has been driven predominantly by status. This mirrors a similar emphasis by U.S. EPA at the national level. An important question remains: does an emphasis on status affect the ability of state M&A programs to support other water quality management program needs at the same time? Perhaps the greatest influence of this issues is on spatial sampling design, which ultimately influences the usefulness of M&A to support all water quality management program needs.

- A number of spatial monitoring designs are employed by the Region V states; the attributes of each are described in detail in the appendices. However, there are two strategic approaches being employed in Region V. One approach attempts to cover all aquatic resources within a 5-year cycle and represents an important trade-off emphasizing statewide coverage at the expense of spatial detail due to limited resources. The second approach opts for concentrating available resources emphasizing a spatially intensive approach in individual watersheds. In the latter, states have made the opposite trade-off, favoring spatial intensity and detail over statewide coverage. In these cases, complete coverage of the state is accomplished over a longer time frame (e.g., 10-15 years or more) or 100% coverage is not an overriding goal, with subsets of assessed waters used to evaluate long-term trends and program effectiveness. There are important consequences involved with these trade-offs, which are in need of a more critical and thorough evaluation.

- Assessment error tendencies and biases in different types of indicators used by the states needs to be better understood and documented. The propagation of type I and II assessment errors can occur as a result of these choices, with the latter being more prevalent in programs that emphasize surrogate indicators. The assessment "trickle-down" affects all resulting management products including impaired waters listings; it is a major source of inconsistency between the states (NRC 2001).

- The role of a consistent, standardized, and robust M&A program to produce a spatially robust dataset that supports applied research and development is largely unrecognized by the states and EPA. Yet this strategic function of M&A is critical to the continued improvement of water quality management. This type of support is critical to the refinement of WQS (i.e., designated uses and criteria), indicators (e.g., appropriate roles and process), assessment tools (e.g., improved chemical, physical, and biological criteria), and implementation tools (e.g., better TMDL development). Some of the Region V states showed tangible evidence of a process to support the type of research and development process that is needed to achieve this vital program function, but it varies widely in terms of consistent conceptual understanding and support.

Water Quality Standards: Designated Uses

- Refined uses were identified as a critical developmental and implementation need in the NRC (2001) TMDL report as a replacement for the prevalent one-size-fits-all approach employed in most states. This would serve to more appropriately scale protection and restoration requirements to the capabilities and potentials of individual water bodies, thus making assessments of status more accurate. This is a pivotal issue for the Region and the states and will be a national program priority in the near term. This is also consistent with the U.S. EPA headquarters initiative and working group on refined aquatic life uses.

- Use designations in four states consist of either general aquatic life or fishery based uses. Only one state has a fully developed set of refined uses that are codified in the WQS. Use attainability analyses (UAAs) are used extensively in two states, sparingly in three states, and not at all in one state. The one state with refined uses is where UAAs are employed as a routine outcome of M&A. Some states are reluctant to develop refined uses due to uncertainties in terms of the resources needed to manage them, the difficulties in supporting and maintaining the administrative rulemaking process, and concerns about abuses such as inappropriate downgrading.

- The value of M&A in support of the development of improved and refined water quality criteria, designated uses, and implementation tools is generally not recognized by most states. Making this connection is essential to improving its use and meeting the goals described by this review. Much more needs to be done in terms of communicating the benefits of refined and tiered uses.

Status and Trends Reporting

- Determining status is the principal driver of M&A in several states. The 305b process in all of the states drives the 303d list, in part. In some states the 303d list is a subset of the 305b impaired waters list while in others it is nearly identical. Only one state reports trends in aggregate status (i.e., statewide or region wide) over a significant time period. Most states either do not have sufficient data over a sufficient time period or do not have it sufficiently organized to analyze and show trends.

- While the 305b reporting process has been supplanted by the Integrated Report, the basic M&A process still has the potential to be an effective filter for the 303d process. However, a general lack of discipline in the level and types of data that are "admitted" into the assessment process affects its ability to fulfill that role. Dealing effectively and systematically with the underlying issues outlined in this report and the appendices should result in a more consistent database and assessment process for producing more reliable outputs like 303d listings.

Biological Assessments and Biological Criteria

- All six Region V states operate biological assessment programs with at least two organism groups sampled on a routine basis. Most commonly macroinvertebrates and fish are sampled in rivers and streams, with some states adding algal indicators. Some states are developing indicators for other waterbody types including higher plants and other aquatic invertebrates and vertebrates in wetlands and primary headwater streams. The development of biological assemblage indicators for lakes and reservoirs has lagged behind these other waterbody types, although noteworthy efforts exist in at least two states.

- Variability in terms of methods, protocols, equipment, and assessment procedures exists between the states. The significance of these differences are variable and range from inconsequential to significant, the latter of which influences the effectiveness and utility of the resulting data and assessments. There is a need to compare the net effect of different methods and protocols between states to objectively determine if different methods, equipment, protocols, etc. have a significant influence on the resulting biological assessments. A standardized framework for developing biocriteria is needed to guide the states in this process.

- One Region V state has developed and adopted numeric biological criteria in the WQS. The remaining states are in various stages of developing and working through the process from which numerical biological criteria could be developed. At least two other states have adopted a narrative biological criterion and one of these has a plan to develop numerical biocriteria.

- Some states questioned the need to formally adopt numeric biocriteria when they see their current biological assessment framework as delivering the same end result. Some face internal barriers to developing biological criteria, the most prevalent of which is a perceived negative impact on NPDES permits.

- The policy of independent applicability has historically been seen by the states as a prohibitive issue for the eventual adoption of biocriteria. Some, but not all, of the Region V states echoed this view. In terms of ambient assessments, at least four adhere to a weight-of-evidence approach; one state strongly advocated an adherence to independent application.

Principal Recommendations

Building and maintaining a capacity to conduct integrated assessments that serve multiple water quality management program needs is the highest priority identified in this review. This means that in addition to the collection of adequate chemical, physical, and biological data, a consistent and meaningful process for translating that data into information and assessments must be developed. Such an approach requires the intellectual capacity to execute and communicate the results and effectively translate these into criteria, standards, plans, and management actions. While we recognize the limiting influence of current budget and administrative issues, we strongly recommend that this be accomplished in-house as much as possible. This better institutionalizes the conduct and use of M&A tools, information, and outputs within the state program. The most critical needs for each Region V state M&A program are as follows:

1) Building and maintaining adequate M&A must become institutionalized, i.e., it must be an integral part of water quality management by validating the environmental **end outcomes** of management program **outputs**. This must be based on meeting the needs of programs beyond the determination status to include support at all scales, especially at the same scale(s) at which management is being applied.

2) Adequate facilities and resources are an equally important issue in each state. We found that each state provided some or all of the basics, but the capacity to deliver the quantity of assessments and at varying scales is an issue. Each state should have the capacity to support multiple field crews capable of conducting integrated assessments at different spatial scales. A more detailed analysis of FTEs and their utilization is needed to determine the resource, capacity, and technology needs of each state.

3) Better integration between different programs is needed, especially in how M&A supports all management programs without the need to create and maintain separate efforts for each. Some problems include disparate goals and how each program measures success (e.g., 305b may be measured in biological terms, yet NPS uses load reductions and chemical quality). This reflects the absence of a comprehensive and integrated approach to M&A and a lack of integration to how programs are managed. Adherence to the baseline principles of adequate M&A and sound indicator discipline would solve many of these disparities.

4) Better integration of M&A and WQS is needed, especially in the development of tiered uses and the simultaneous adoption and implementation of biocriteria. Adequate M&A and WQS is vital to the success of watershed based management programs and initiatives. Accomplishing this also makes standardized and robust environmental indicators, methods, QA/QC standards and best practices, assessment methodologies, and assessment criteria available to external users. By providing such a supporting infrastructure of indicators and WQS, state programs fulfill their custodial role for M&A and WQS. This not only makes the data and information produced by each state of sufficient quality and reliability, but makes it comparable and of a known quality. Other users, i.e., watershed

groups, academic institutions, the regulated community, and other organizations would have a consistent and standardized process to follow in conducting their own assessments. These latter efforts now constitute an important supplement to the baseline M&A provided by a state and would help fulfill many baseline M&A goals. Presently, the lack of such a systematic approach in most states results in the production of external data that is of highly variable quality, quantity, and reliability.

5) The water quality management programs that stand to benefit from an adequate approach to M&A must be willing to incorporate the findings of such in their programs, policies, and actions. This report documents how well designed and executed M&A can support better implementation and end outcomes in these programs. However, the management programs must be convinced that this is in their best interest. Thus far, there has only been limited success as most programs are driven by programmatic outputs, not environmental end outcomes. The former functionally serves as a strong deterrent to building and maintaining adequate monitoring and assessment. One example is the strong perception that resources to carry out administrative functions are either inadequate or insufficiently managed and allocated. Hence the emphasis frequently is on making the execution of management programs and the delivery of administrative outputs better, oftentimes at the implicit expense of monitoring and assessment. A major conclusion of this review is that producing better information about environmental end outcomes can achieve better administrative management programs, thus resulting in the streamlining desired in the latter and the environmental outcomes of the former.

6) If the benefits of M&A in terms of supporting all water quality management programs and activities is to be more fully realized, it must be performed routinely and regularly over long periods of time. Unpredictable support frequently debilitates two of the most important functions of monitoring and assessment; 1) building a systematic and consistent database that serves as a resource for developing new and improved tools and criteria, and 2) addressing emergency needs as they arise and developing trends through time. Examples of how long term databases have been used to support the development of new and improved tools and criteria and demonstrate changes through time need to be marketed to state managers.

Region V State Bioassessment and Ambient Monitoring Programs: Initial Assessment and Review

INTRODUCTION

The Midwest Biodiversity Institute (MBI) was tasked by U.S. EPA, Region V to conduct an assessment of the Region V state bioassessment and ambient monitoring programs with emphasis on how data and information are used in support of water quality management programs. This was done to better define and understand the uses of M&A information in each state and determine the opportunities, incentives, challenges, and barriers to the fuller use of this information in support of *all* relevant water quality management programs.

This report was prepared based on the information gained during on-site interviews with each state that took place in January 2002, information that is published by each state, and other information gained later via additional interactions with the Region and the states. The interviews consisted of a two-day meeting arranged by the state representatives of the M&A and water quality standards programs and attended by other relevant water quality management program representatives. The interview template is appended to this report (Appendix A-1). State responses to the recently completed U.S. EPA bioassessment program evaluation (U.S. EPA 2002) and additional information that was made available that describes the state's use of M&A information was also reviewed for this evaluation.

The evaluation of each state program was focused on current, planned, and potential uses of M&A information in support of water quality management programs. This includes water quality standards (WQS), reporting and listing (integrated reporting, watershed assessments, 303d listings, TMDL development and implementation), planning, nonpoint source assessment and management, dredge and fill (404/401), and NPDES permitting as these represent the in-common elements of state water quality management programs. **It is a fundamental premise of this evaluation that ambient M&A should function to support *all* relevant water quality management programs in addition to its more commonplace role of supporting status assessments**. Determining the linkages to the state's water quality standards (WQS) and reporting (305b, 303d) obligations was especially emphasized as they are fundamental to the broader use of environmental data in management decision-making. This emphasis is consistent with contemporary efforts to revitalize and improve the use of environmental data in water resource management (ITFM 1992, 1995; U.S. EPA 1995a,b; Yoder 1998; NRC 2001; GAO 2000, 2003a,b) and emerging efforts at EPA to more effectively translate environmental data and indicators to defensible criteria and standards (e.g., refined aquatic life uses, biological criteria development and implementation, CALM process).

This review emphasizes the assessment of aquatic life related issues and concerns since aquatic life uses and criteria frequently drive many water quality management criteria and decisions. Aquatic life uses apply to virtually all jurisdictional waters, thus it is a universally relevant water quality management issue. It is recognized that there are other management concerns such as water supply, human and wildlife health, and recreational uses that must be supported by different kinds of monitoring and assessment. However, programs that incorporate the underlying concepts and principles which support more detailed definitions of aquatic resource types and refined uses for aquatic life are better able to transfer the conceptual underpinnings and the improved technology this fosters to these other uses and issues. Simply put, a well conceived and integrated biological assessment program is a key underpinning of sound water quality management.

Biological indicators of resource condition and health serve as a key and integrative response indicator (Figure 1). This model outlines the process of linking stressors (i.e., the focus of water quality management) and how these affect and change the key attributes of aquatic resources (i.e., Karr's five factors; Karr et al. 1986) and measuring the integrated result of these interactions by measuring and interpreting a biological response. This supports a feedback-based process in which the interactions between stressors and environmental attributes that are neither additive nor linear (Karr and Yoder 2004) can be better understood through the integration of their cumulative effects as portrayed by the biological response. It is the correct measurement and interpretation of the biological response that is key to making this process work.

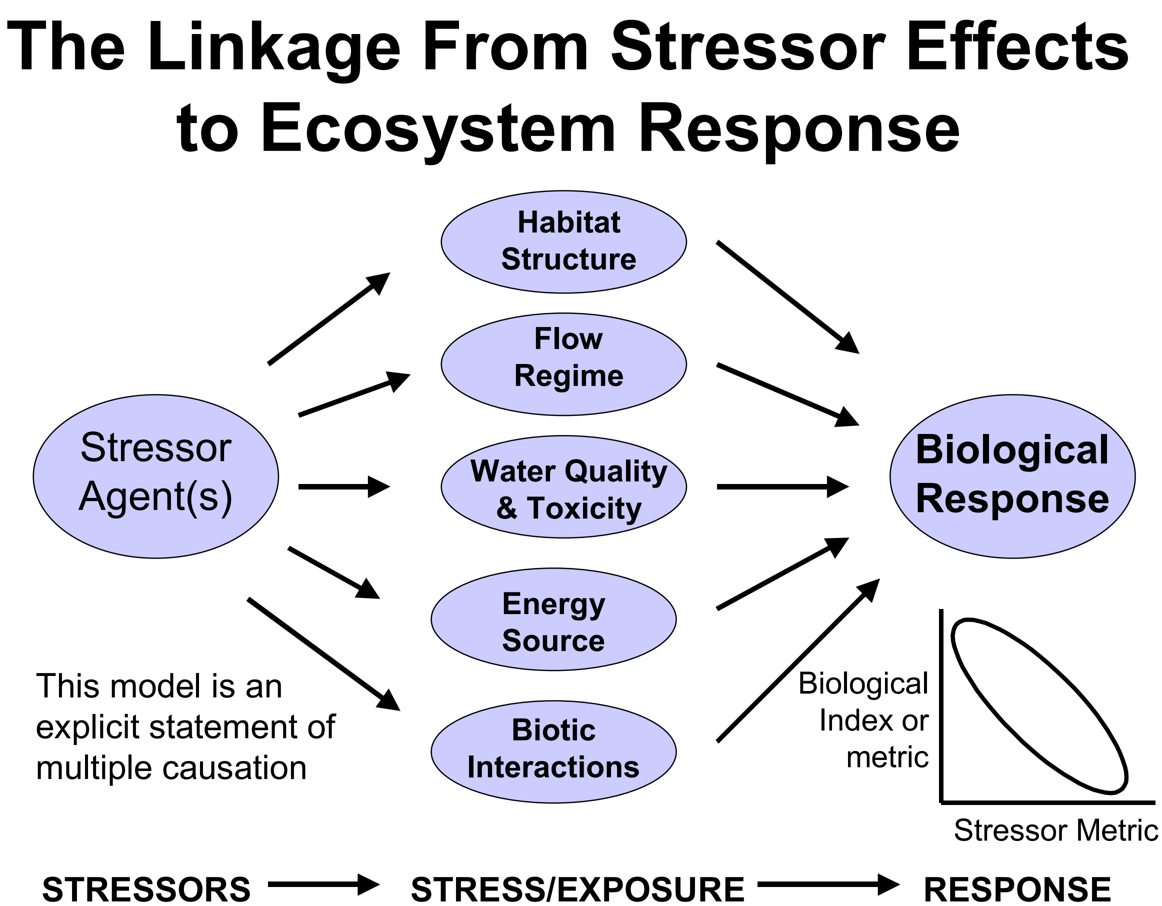

Figure 1. The linkage of the effect of stressors through Karr's five factors to the resultant biological response. The indicator roles represented by each category are identified in accordance with Yoder and Rankin (1998). [used by permission of J.D. Allan, originally presented at the 2002 U.S. EPA Refined Aquatic Life Uses conference; modified from Karr and Yoder 2004].

Important conceptual and methodological issues are detailed in the appendices and include a detailed description of preferred spatial monitoring design and indicator options (Appendix A-3) and *Important Concepts and Elements of an Adequate State Watershed Monitoring and Assessment Program* (Yoder 1998; Appendix B-1). These serve to communicate the concepts and technological details upon which much of this review is based.

Interview and Evaluation Process

Two-day interviews were conducted in each state in January 2002 and were arranged primarily through the WQS program manager. The first day consisted of a review and discussion of major programs that are supported by monitoring and assessment. Key water quality management program managers and staff were included at the discretion of each state. The guide for this process appears as Appendix A-1. A brief summary of each interview area included follows:

Monitoring and Assessment Program

In terms of achieving the goal of supporting water quality management with indicators of environmental exposure and response, the state's M&A program is vital to achieving that goal. Monitoring includes the systematic collection of standardized chemical, physical, and biological data in the ambient environment. Assessment includes the analysis and transformation of data into meaningful information and assessments that include attainment/non-attainment determinations (status), changes through time (trends), characterization of impairments (extent and severity), associations between impaired states and causes (i.e., agents) and sources (i.e., activity or origin), and providing data and information to develop improved tools, indicators, criteria, and policies. This process should also support reporting that is required by the Clean Water Act (305[b], 303[d], 319, etc.) and that used by the state for allied purposes (watershed assessments, site-specific assessments, planning, TMDL development, etc.) without the need to develop separate or piecemeal monitoring efforts.

Reporting and Listing (305b/303d)

Reporting and listing here refers to the process of producing the biennial 305b report and the 303d list of impaired waters, both of which have received greater emphasis during the past decade. The information contained in these reports and lists are not only important to determining the effectiveness of a state's water quality management efforts, but are increasingly being used to set program priorities and allocate funding (i.e., Section 106 allocations). M&A information is an indispensable element of this process and how it is generated and used determines, in part, the accuracy of the statistics that are reported via 305b and 303d. This is a major issue as there is ample evidence of gross inconsistencies between states (Yoder 1998; NRC 2001). Thus, it is important to determine and understand the process used by each state in order to determine the reliability of M&A outputs. The problem is that any type of underlying data can be converted to a status and trend assessment – the key question becomes are the determinations of status and trends reliable and do they precipitate a consistent error bias?

Water Quality Standards
Water quality standards (WQS) provide the basis for water quality management in terms of benchmarks and criteria for designing management programs and judging the effectiveness of those programs. Of interest to the interview is the emphasis by U.S. EPA on refined aquatic life uses and biological criteria. Thus, the interview process emphasized these parts of the WQS process. Again, this is a major program area identified by the NRC (2001) as needing improvement, particularly in the development of refined uses, the use attainability analysis (UAA) process, and biocriteria.

Assessment Integration Issues
The integration of M&A information within water quality management programs is an important and emerging issue and ultimately fulfills the most important purpose of monitoring and assessment. In this process chemical, physical, and biological data and information assessed in an integrative manner and with respect to the most appropriate role of each (Yoder and Rankin 1998). It also includes the process by which administrative actions and responses by stakeholders to those actions are systematically and sequentially evaluated using an assessment process that relies on environmental end outcomes to communicate the success and effectiveness of administrative program outputs (Karr and Yoder 2004). Region 5 is also working with the states to develop shared environmental goals and milestones. This will partially fulfill efforts to implement the National Environmental Performance Partnership System (NEPPS), which promotes joint priority setting and planning through the increased use of environmental goals and indicators. The shared goals and milestones will be used to more comprehensively report to the public and environmental decision-makers about the status of water resources in the Region and document progress to meeting these goals. The goals and milestones will also be used to more effectively target programmatic efforts at the national, state, and local levels. It is important that we are able to document environmental successes so that they are recognized, funding is maintained at appropriate levels, and effective management programs continue to be implemented. Key to successfully achieving this level of integration is dependent wholly on the baseline information and indicators that comprise the process. Again, consistency between states in terms of key attributes of monitoring and assessment, indicators development, WQS, the assessment process, and reporting is critical to achieving the desired outcomes of integrated assessment.

Biological Monitoring and Assessment Program
A principal goal of this review process was an assessment of the state biological M&A programs. This included determining the extent to which biological data and information are being used to support water quality management programs and assess important goals and milestones. An on-site visit to the state's laboratory and field facilities and interviews with staff biologists was important to ascertain the infrastructural provisions for producing the quality and rigor of biological assessments that are needed to attain the programmatic support goals in each state. In 2002, each state completed a questionnaire in support of U.S. EPA's *Update of State Bioassessment Programs: Success of EPA's Technical Transfer Efforts and Building State Capacity* (U.S. EPA 2002). This portion of the interview process was focused on many of the same topics covered by the questionnaire and afforded an opportunity to amplify them and more thoroughly examine important details and context that could not be communicated in a questionnaire format. The

states were each requested to provide important program documentation and examples of outputs (reports, methods, protocols, etc.) that characterize the current usage of biological assessments and criteria.

Summary of Monitoring Program Elements and Attributes (Tables 2 through 6)
The summaries presented in Tables 2 through 6 show the general levels of effort, summary of methods, monitoring designs, assessment process, and extent of water quality management program support provided by M&A in each Region V state. These were compiled from several sources including the interview process, methods and protocol documentation provided by each state, and information provided to U.S. EPA for the biological assessment program questionnaire. The information that is complied here is necessarily general and does not account for some of the important details embedded within a particular state program. Some attributes may also be in the process of being upgraded or changed, thus for specific and up to date information we advise checking with the appropriate state agency. We are aware of these efforts and their importance and they will be considered as important details are addressed through field visits and follow-up interviews with each state in the near future.

Goals of the Review Process

A principal goal of this review is to determine the status of M&A programs in each of the six Region V states, with specific emphasis on how it is being used to support *all* water quality management programs. While there has been much recent emphasis on the role of M&A in producing more reliable estimates of water resource status, this review also focused on how the same M&A framework should simultaneously support baseline water quality management functions such as water quality standards (WQS), watershed assessment and management (includes nonpoint sources), TMDLs, and permitting programs including NPDES permits, CSO/SSO, stormwater phase I and II, 404/401 dredge and fill, and other related issues (e.g., CAFOs). One major issue identified by this evaluation is that the design and operation of the M&A program in some states has been driven predominantly by status, rather than a focus on supporting all relevant water quality management programs *at the same scale at which each is being applied.* An important question remains - **does an emphasis on status affect the ability of a state M&A program to support other water quality management programs at the same time**?

This review was conducted based on the premise that ambient M&A should be designed and conducted to support *all* relevant aspects of water quality management ***at the same scale at which the management is being applied***. This not only includes assessing and reporting on status and trends, but also supporting WQS, planning, watershed and nonpoint source management, TMDL development and implementation, and regulatory functions such as permitting (including compliance and enforcement). The review also focuses primarily on streams and rivers, although the lessons learned here should be applicable to lakes and reservoirs, wetlands, large and great rivers, and the Great Lakes (termed here as "ecotypes"). As with rivers and streams, the experience and applications developed by leading states will serve as examples for these aquatic ecotypes.

Table 2A. Attributes and characteristics of Region V State biological monitoring and assessment programs: Macroinvertebrate field protocols and applications.

State	**Sample Collection Methods**[1]						**Field Process**			**Capa-city**	**Aquatic Ecotypes**							
Agency	Quant. Sample	Effort Index	Qual. Sample	Effort Index	Stan-dard-ization	Index Period	Habitat Protocol	Sort	I.D.	#Sites/ Year	Primary HW	Head-water	Wade-able	Large River	Great River	Wet-lands	Lakes/ Res.[2]	Great Lakes
IL EPA	Multiple Habitat Dipnet	Sampling Surface Area	Dip Net/Hand Pick	Time (>60 min.)	NO	June 1-Oct. 15	Quanti-tative Transect	NO	Qual only[3]	80-120	–	–	◐	◐	–	–	–	–
IN DEM	Mod. Hester-Dendy[4]	Sampling Surface Area	Kick Net (1 m^2)	Surface Area	YES	July-Sept.	RBP-type Assess-ment	NO	NO	100	–	◐	◐	◐	–	○	○	–
MI DEQ	Mod. Hester-Dendy[5]	Sampling Surface Area	Dip Net/Hand Pick	Time (>30 min.)	YES	June 1 Sept.30	RBP-type Assess-ment	YES	Family level	700	–	–	◐	–	NA	–	–	–
MN PCA	NONE	NA	D-Net/ Hand Pick	20 sweeps	YES	Septem-ber	RBP-type Assess-ment	NO	NO	90-100	–	◐	◐	◐	–	◐	○	–
OH EPA	Mod. Hester-Dendy	Sampling Surface Area	Dip Net/Hand Pick	Time (>30 min.)	YES	July 1-sept.30	Site description (No Index)	NO	Qual only[2]	450-500	◐	●	●	●	◐	◐	–	◐
WI DNR	NO	NA	D-Net/ Hand Pick	Visual Based (2-3 min.)	YES	Spring/ Fall	Wisconsin Protocol	NO	NO	400	–	○	◐	–	–	◐	○	–

● - Method and assessment are fully developed and used and numeric biocriteria are adopted in WQS.
◐ - Method and assessment are fully developed and used, but not adopted in WQS (may include general narrative biocriteria).
○ - Method and assessment are in development and in initial phases of usage.
– - Method and assessment are not developed.

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[1] Principal methods are in shaded boxes.
[2] Includes biological assemblage assessments; **does not** include trophic state and other lake assessments or fishery management surveys.
[3] Gross field identification to determine if new taxa are being included.
[4] Used in lieu of kick net.
[5] Used historically – no longer a principal method – replaced by qualitative method.

Table 2B. Attributes and characteristics of Region V State biological monitoring and assessment programs: Macroinvertebrate laboratory protocols.

State	Sorting Process		Identification & Curation					Capacity	QA/QC				
Agency	Scan/pre-pick[6]	Sub-sample	Taxonomic Resolution	Where/ Who	Time Req'd.	Ref Collect.	Archives	#Samples /Year	Check Samples	Sorting QC Check	Taxonomic QC Check	SOPs	QC Officer
IL EPA	NO	300 orgs.	Lowest Practicable (Genus/ species)	IEPA Reg. Staff & Lab	4-8 hrs.	YES	YES; Retained At IEPA	80-120	NO	10%	Informal	YES	NO (Informal Process)
IN DEM	YES[7]	100 orgs.	Family	IDEM Staff & Lab	3-4 hrs.	YES	YES; Retained At IDEM	100	?	10%	YES	YES	NO (Informal Process)
MI DEQ	YES[8]	100 orgs.	Family	MDEQ Staff; minimal lab time	1.5-2 hrs.	YES	YES; Retained At MDEQ	700	?	?	?	YES	NO (Informal Process)
MN PCA	YES	300-600 orgs.	Genus	MPCA Staff & Contract Lab	4-6 hrs.	YES	YES; Retained At MPCA	90-100	NO	YES	YES	YES	YES (mostly chemical)
OH EPA	YES	Sample Split Up to 16X (n >500-1000)	Lowest Practicable (Genus/ species)	OEPA Central Lab; OEPA Staff	8-16 hrs. (quant.); 3-4 hrs. (qual.)	YES	YES; retained at OEPA	200-250 Quant.; 400 Qual.	YES	Each staff tested once/year	Informal	YES; In WQS	NO (Informal Process)
WI DNR	NO	125 org. minimum	Lowest Practicable (Genus/ species)	U. Wisc. Central Lab; WDNR Field Staff	4-6 hrs.	YES	YES; retained at U. Wisc.	400	YES	?	?	YES	?

[6] Scan and pick for large and rare organisms.
[7] Scan for large and rare taxa not included in sample.
[8] Performed in field.

Table 3A. Attributes and characteristics of Region V State biological monitoring and assessment programs: Fish assemblage field protocols and equipment (symbols same as Table 1A).

State	Wadeable Methods						Non-Wadeable Methods					Aquatic Ecotypes						
Agency	Back-pack	Tow-boat	Electrode Config.	Effort Index	Other Gear	Samp-ling Direc-tion	Boat Electro-fishing	Gene-rator-Pulsa-tor	Electrode Array & Config.	Effort Index	Sam-pling Direc-tion	Primary HW[9]	Head-water	Wade-able	Large River	Great River	Lakes/ Res.[10]	Great Lakes
IL EPA	Small Stream Only[11]	AC	Electric Seine	100 yds. or 1 meander	NONE	Up-stream	16' john boats	3-phase AC	Droppers	1 mile (1800 sec. Min.)	Ust. & Dst.	–	–	◐	◐	–	–	–
IN DEM	Pulsed D.C.; Small Str.[11]	Pulsed DC (2.5 GPP)	Ring Anode; 2 netters	15X Width; 50 m min.; 500 max.	NONE	Up-stream	16' john boats	Pulsed DC; VVP-2E	Electro-sphere; boat hull cathode	15X Width; 500 max.	Ust. & Dst. (both banks)	–	◐	◐	◐	◐	○	–
MI DEQ	Pulsed D.C.; <15' Width[11]	Pulsed DC (2.5 GPP)	Ring anode; 2 netters	10-15X Width; 50-200 m (>1800 sec)	?	Up-stream	Electro-fishing Barge	Pulsed DC; 5.0 GPP	Boom droppers (+); Bow droppers (-)	In Devel-opment	?	–	–	◐	○	NA	–	–
MN PCA	Pulsed D.C.; Small Stream	Pulsed DC	Ring Anode; 1-2 netters	35X Width; 150-500 m	NO	Up-stream	John boat; Electro-fishing Barge	Pulsed DC; Type VI-A	Boom droppers (+); Bow droppers (-)	35X Width; 150-500 m	Down-stream	–	◐	◐	◐	–	○ MnDNR	–
OH EPA	Pulsed D.C.; Restric-ted[11]	Long-line; Towed Array	Net Ring Anode; 1 Assist Netter	Fixed Distance: 150-200 m[12]	Seines (Infrequ ent)	Up-stream	12-16' custom john boats[13]	Pulsed DC; 2.5-5.0 GPP	Boom droppers (+); bow droppers (-)	Fixed; 0.5 km[12]	Down-stream	○[14]	●	●	●	●	◐	●
WI DNR	Pulsed D.C.; Head-water[11]	Pulsed DC (Wisc. Design)	Ring Anode; 2-3 netters	35X Width; 100-500 m[12]	?	Up-stream	Custom john boats	Pulsed DC; Wisc. Design	Ring anodes; side-rail droppers	Fixed; 1 mile[12]	Down-stream	○	○	◐	◐	◐	◐	–

9 Includes other vertebrates in addition to or inlieu of fish.
10 Includes biological assemblage assessments; **does not** include trophic state and other lake assessments or fishery management surveys.
11 Guidelines for use established; most powerful unit accessible is used.
12 Sampling distance determined experimentally by State.
13 Larger boats and night electrofishing for great river (Ohio R.) and great lake (Lake Erie shoreline)
14 Amphibians substituted for fish assemblage.

Table 3B. Attributes and characteristics of Region V State biological monitoring and assessment programs: Fish sample processing and laboratory protocols.

State	Field Data			Field Logistics			Identification & Curation			QA/QC					
Agency	Para-meters	Anom-alies	Habitat	Crew Compo-sition	Hrs./ Site; Sites/ day	Samples/ Year	Where/ Who	Ref Collect.	Archives/ Vouchers	Verifica-tion	Methods Dev.[15]	Sorting QC Check	Standard-ization	SOPs	QC Officer
IL EPA	Species, Counts, Weights, Lengths	NO	Qualitative Eval.	IDNR Crew (3-6)	1-3 hrs; ?	100	Field; IDNR Crew Leader	?	YES: INHS and SIU	YES; INHS and SIU	YES	?	? (Needs Improve-mentk)	YES	NO
IN DEM	Species, Counts, Weights, Lengths	YES (DELTs)	Qualitative Eval.	2 FTE, 1 intern	1-6 hrs; 3 sites/ day	45	Field; IDEM Crew Leader	YES	YES: IBS Aq. Res. Center	YES; T. Simon	NO	?	YES	YES	NO
MI DEQ	Species, Counts, Weights, Lengths	?	RBP Type Eval.	3 FTE; few or on interns	1.5-2 hrs; 4-5 sites/ day	100	Field; MDEQ Crew Leader	YES	?	?	YES	?	YES	YES	NO
MN PCA	Species, Counts, Weights, Lengths	YES (DELTs)	Wisc. DNR Quant.; Qual. at Non-Wade	2 FTE, 2 Interns	1.5 – 4 hrs; 2-4 sites/ day	100	Field; MPCA Crew Leader	YES	YES; U of Minn.	YES; U of Minn.	NO	YES (in field by crew leader)	YES	YES	YES (mostly chemical)
OH EPA	Species, Counts, Weights, Lengths	YES (DELTs plus all external)	QHEI	1 FTE, 2-3 interns	1-3 hrs; 4-8 sites/ day	600	Field; OEPA Crew Leader	YES	YES; OSU Museum	YES; OSU Museum	YES	In Develop-ment	YES	YES	NO (Infor-mal Process)
WI DNR	Species, Counts, Weights, Lengths	YES (DELTs)	Wisc. DNR Quant.	1 FTE, 2 Interns	2-4 hrs; 2-3 sites/ day	250	Field; WDNR Crew Leader	YES	YES; UW Stevens Pt.	YES; UW Stevens Pt.	YES	?	YES	YES	?

[15] Consistency of effort devoted to methods and assessment development.

Table 4. Structure and elements of water quality standards (WQS) and procedures related to the use of monitoring and assessment information in Region V States.

State	**Aquatic Life Uses**		**Biocriteria[16]**		**Criteria Modifications**			**Biological Monitoring & Assessment Support**			
Agency	Structure	Criteria	Narrative	Numeric	Site-Specific	UAAs	Other	Use Designations	ALUS Support	Antidegradation	TMDL Listings
IL EPA	General; Non-specific	Numeric Chemical	NONE	NONE	NONE	Limited for AQL (case-specific)	Adjusted Standards Reviews (20-30 total)	NONE	Informal Process (via 305b)	Biological Stream Classification (BSC)	305(b) Monitored Level
IN DEM	General; Fishery-Based (Warm & Cold water)	Numeric Chemical	Proposed	NONE	5-6 Cases Statewide	Very Limited	NONE	NONE	Informal Process (via 305b)	NONE	Subset of 305(b)
MI DEQ	General; Fishery-Based (Warm & Cold water)	Numeric Chemical	NONE	NONE	6-7 Cases (most for copper)	NONE (no <CWA use categories available)	NONE	NONE	Informal Process (via 305b)	NONE	Close Subset of 305(b)
MN PCA	General; Fishery-Based (Warm & Cold water) with Limited Use	Numeric Chemical	1994; More specific adopted 2001	NONE	Three cases (ammonia & copper)	Class 7 (Limited Use) designations; 230 segments)	Outstanding Resource Waters	NONE	Informal Process (via 305b)	NONE	Subset of 305(b)
OH EPA	Tiered Warmwater Uses; Cold water fishery use	Biological & Chemical Criteria	Tiered AQL Use Descriptions	YES (Fish and Inverts; adopted 1990)	2 Cases	Routine Outcome of 5 Yr. Basin Process; >1500 since 1978	Biocriteria Caps on DMT; Biocrit. Derivation of chem.. crit.	Directly tied to bioassessment results	Codified in WQS via AQL and Biocriteria	Formal criteria & procedure	Direct translation of 305(b)
WI DNR	Tiered Uses	Chemical criteria	NONE	NONE	<10 Cases Statewide	Developing Guidance; 104 changes proposed	NONE	Indirectly influenced	Informal Process (via 305b)	NONE	Subset of 305(b)

[16] Formally adopted in State administrative code or regulations.

Table 5. Attributes and characteristics of Region V State biological monitoring and assessment programs: Watershed and water body assessment process.

State	Watershed Assessment Design		Spatial Sampling Design						Assessment Process					
Agency	Temporal	Spatial	Fixed Station	Targeted Synoptic	Targeted Intensive	Prob-ability	Geo-metric	HUC Unit[17]	ALUS[18] Arbiter	ALUS Delinea-tion[19]	Assessment Chain-of-Custody[20]	Site Extra-polation	Cause/ Source	IA/Weight-of-Evidence
IL EPA	Five-Year Rotating Basin Process	Statewide Coverage Every 5 Years	◐	●	◐	—	—	8 digit	Biological Assessment	Pass/Fail	Lead Biologist follows established guidance	10-25 mi. (per EPA guidance)	Structured process (based on chem./phys. data)	Weight-of-Evidence
IN DEM	Five-Year Rotating Basin Process	Statewide Coverage Every 5 Years	●	—	◐	●	—	8 digit	Chemical and/or Biological Assessment	Pass/Fail	Consensus Decision by Study Team	A "few" miles; mostly case specific	Follow EPA guidance; H,M,S	IA tendency
MI DEQ	Five-Year Rotating Basin Process	Assess 80% wadeable in each cycle	◐	—	●	—	—	11 digit	Biological and/or Chemical Assessment	Pass.Fail (Poor to fail)	Lead Biologist follows established guidance	Case specific (3-5 mi. max.)	Follow EPA guidance; H,M,S	IA
MN PCA	Rotating Basin Process	Statewide coverage by 2007	◐	—	◐	●	Future Design	8 digit	Chemical & Biological Assessment	Pass/Fail	Consensus Decision by Study Team	Varies (10 mi. on average)	Follow EPA Assessment Database	Weight-of-Evidence
OH EPA	Five-Year Rotating Basin Process	Intensive Coverage of Priority Subbasins	◐	—	◐	○	●	11-14 digit	Numeric Biocriteria	Numeric, Increment-al Scale (Biocond. Gradient)	Lead Biologist asst. by Study Team; Mgmt. Approval	Case specific; 0.5-1.0 mi. default	Integrated Process; Lines-of-Evidence; Biol. Response Signatures	Weight-of-Evidence
WI DNR	Five-Year Rotating Basin Proce	Intensive Coverage of Priority Basins	◐	—	●	○	—	11 digit	Biological and/or Chemical Assessment	Pass/Fail	Lead Biologist asst. by Study Team	BPJ	Do Not use H,M,S	Weight-of-Evidence

● - Principal method and design used to support WQ management.
◐ - Method/design used in a secondary support role.
○ - Method/design used on an infrequent or experimental basis.
— Method and assessment are not developed.

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17 Basin size within which watershed specific assessment is most commonly planned and conducted – gets at spatial intensity and resolution within a watershed sampling unit.
18 ALUS – Aquatic Life Use Support.
19 Pass/fail is assigned to 305b delineations of full, partial, non-attainment; incremental scale is assigned for calibrated numeric biocriteria that are fully implemented.
20 Process for developing site and/or reach assessment.

Table 6. Relative degree to which major water quality management program areas are supported by monitoring and assessment in each of the Region V states.

State	Basic Reporting		WQS Program					Watersheds/ NPS		TMDL/303d		NPDES/Other Permitting							
Agency	Status[21]	Trend[22]	Tiered Uses[23]	UAA[24]	Refined WQC[25]	Anti-deg.	Site-Specific Crit.Mod.[26]	NPS/BMP Effective-ness	Hab-itat[27]	List/ Delist	TMDL Dev.[28]	WQ BELs[29]	Priority Setting[30]	CSOs/ SSOs	Storm-water Ph. I&II	WET Limits/ Cond.[31]	Sever-ity/ Extent[32]	Enforce ment[33]	404/401 Dredge & Fill[34]
IL EPA	●	○	–	○	–	–	○	○	◐	◐	○	◐	○	○	–	–	○	◐	–
IN DEM	●	○	–	○	–	–	–	○	○	○	○	○	–	–	–	–	–	○	–
MI DEQ	●	○	–	–	–	–	○	◐	◐	●	◐	●	○	○	–	○	–	◐	–
MN PCA	●	○	–	◐	○	–	–	◐	◐	○	○	◐	○	–	–	○	○	○	–
OH EPA	●	●	●	●	●	●	⦿	●	●	●	●	⦿	⦿	⦿	⦿	⦿	●	●	⦿
WI DNR	●	○	○	◐	–	○	–	◐	●	○	○	◐	–	–	◐	–	◐	◐	–

● - Well developed and routine process for using monitoring & assessment for at least 5-10 years; based on an integrated indicators framework process and comprehensive watershed design.
⦿ - Process and tools are available, but usage is no longer routine and occurs only on a project or issue specific basis.
◐ - Project or site-specific use of monitoring & assessment consisting of upstream/downstream studies, paired stream studies (no comprehensive watershed design).
○ - Occasional or infrequent usage or under development.
— No support from ambient monitoring & assessment.

[21] Basic attainment/non-attainment assessment for aquatic life use status including delineation of causes and sources of threat and impairment.
[22] Sufficient information to report aggregate status of ecotypes over at least a 10 year period; does not refer to analysis of fixed station chemical trends.
[23] Tiered uses that are developed based on assemblage assessments and which correspond to EPA's biological condition axis; does not include fishery based or general uses.
[24] Includes any use of ambient monitoring data to change designated uses, both "upgrades" and "downgrades".
[25] Ambient data is used to develop water quality criteria and/or influence the application or implementation of WQC (exclusive of pH, hardness, and other single modifiers).
[26] Ambient survey data is used to ground truth EPA's site specific criteria process (water effects ratio).
[27] Habitat assessment is linked to biological assessment and listed as a cause of impairment.
[28] Includes using ambient data to support TMDL development and determine success of TMDL implementation beyond basic calibration data.
[29] Water quality based effluent limits – ambient data is used to develop an assessment of the overall effect of the subject discharge on the receiving waters.
[30] Ambient data is used to influence priority setting for NPDES permitting and/or SRF funding priorities.
[31] Ambient survey data is used to develop WET testing requirements and/or effluent limits in NPDES permits.
[32] Assessment framework allows for determination of incremental departures and changes beyond pass/fail and communicates severity of problem over space & time.
[33] Direct use of ambient survey data to support enforcement in terms of demonstrating that action is both legal and reasonable.
[34] Direct support of general policy and site-specific decisions for the 401 certification of 404 dredge and fill permits.

FINDINGS AND RECOMMENDATIONS

This effort is intended to be investigatory as opposed to a comprehensive determination of the adequacy of the Region V state programs. That will come later through Regional review and determining adequacy consistent with the Comprehensive Assessment and Listing Methodology (CALM) implementation process, the Region V Indicators Initiative, and other ongoing efforts (i.e., Refined Aquatic Life Uses, Critical Bioassessment Program Elements) to improve state approaches to the assessment of aquatic life uses. As such, this review does not represent a detailed audit of a particular state program, but rather is intended to generate a focused analysis of the major issues that represent significant challenges for state M&A programs. It is also intended to introduce the development of an ongoing process by which the Region and states can together determine the status of the current M&A program, identify and assess gaps and shortfalls, determine incentives and disincentives, and determine ways in which M&A can be improved to meet the important goals and objectives shared by each. As such the findings and recommendations of this review are intended to highlight the major areas on which the emerging CALM, Indicator Initiative, tiered uses, and other processes can better focus. It was not possible to use all of the data and information collected during the interview process, but rather we are choosing here to focus on major conceptual and thematic issues first, with any missing details being covered as a consequence of a more painstaking and thorough process over time.

This section of the review is organized by the major program areas addressed in the interview process: Monitoring and Assessment, Reporting and Listing, Water Quality Standards, Assessment and Integration, and Biological Monitoring and Assessment. Each section is broken down into a listing and description of general findings, major issues and challenges, and program implications and recommendations for each subcategory.

Monitoring and Assessment Program

Monitoring and assessment includes the design, purpose, and conduct of how environmental data are collected from a spatial, temporal, logistical, and strategic standpoint. Subcategories included here include monitoring program concepts, spatial design and scale, resources and facilities, data management, and reference condition. A brief description of each state's M&A approach and program appears in Appendix A-2.

Monitoring Program Concepts and Development

Some states specifically indicated a need to frame M&A issues better and in more detail; all of the states echoed this at least indirectly. We believe that all states share the vision of the ITFM and subsequent efforts that intend for M&A to play a central role in producing the data and information to *more effectively guide water quality management.* What is lacking is a complete understanding of the specifics and the potential and realized implications to water quality management programs such as WQS, TMDLs, and permitting. At least two states were interested in having an outside entity audit their programs and several were engaged in their own internal efforts. This is seen as an important and positive first step as it indicates a genuine interest in determining and ultimately using ambient M&A in support of water quality management. There is uncertainty, however, about how much this is shared by upper management since it was evident that administrative outputs are valued as the primary measure of water quality management program effectiveness and success.

General Findings

- States are genuinely interested in improving their M&A programs and all are actively using data to report on the status of their surface waters, most commonly wadeable streams and publicly-owned lakes and reservoirs. There is a range of sophistication in state programs ranging from a sole emphasis on status reporting to integrated uses of M&A to support key water quality management programs.
- All six states have produced a monitoring strategy and most believe this is the appropriate vehicle to communicate design and indicator quality specifications and objectives. Most have either been revised in the past 2-3 years or are in the process of being revised.
- M&A programs receive varying levels of support and understanding from their respective program management in each state. This ranges from solid conceptual support and a genuine interest in how the results can be used to tepid support and a more ready acceptance of a limited program. Gaining management appreciation and buy-in for the more comprehensive and integrated process envisioned in this review is essential to achieving the goals of this process.
- The proportion of resources dedicated to ambient M&A in each state varies and needs to be quantified in real terms (i.e., FTEs).
- None of the states rely extensively on volunteer monitoring as a direct substitute for their own efforts. Some states support extensive efforts to track and incorporate volunteer organization data into the 305b report, but limit the "regulatory" use of this information. The use of volunteer organization data is much more extensive and better organized for lakes than for streams and rivers.

Critical Issues and Challenges

- There is a need to better frame and organize the issues and questions that determine M&A design and use. This would also include explicitly communicating how adequate M&A could help and improve water quality management outcomes. This should include the principles and processes outlined in Appendix A-3.
- Water quality management in most states is focused primarily on the administrative outputs of specific programs, most commonly including permitting and more recently TMDLs. A disconnection between administrative actions and the results of M&A has the effect of limiting the further development of M&A in terms of resources, indicators development, criteria, and the integration of environmental information into water quality management. This is true even in the states with well developed and integrated M&A and environmental indicators processes. Improved management buy-in and reliance on M&A is critical to truly achieving environmental results based management (Appendix A-3).
- The propagation of assessment error and biases in different types of indicators needs to be better understood by most states. One of the most pressing problems in the use of indicators "taken at face value" is the inappropriate substitution of stress and exposure indicators for response indicators (Yoder and Rankin 1998). This has a strong tendency to

propagate a type II assessment error, i.e., problems and impairments that actually exist are either under-rated or not detected at all. This has a "trickle-down" effect into all resulting assessment products including those associated with the TMDL process and impaired waters listings and other products such as State of the Environment Reports and national compendia (e.g., Index of Watershed Indicators, National Status Statistics).

- The appropriate role of volunteer monitoring data and assessments is a recurring issue that needs to be better understood and defined. This issue is of concern due to the pressure exerted by volunteer groups to use their data, the notion that it is "free", and legitimate concerns about the quality and reliability of the data and information. One issue is the perception of volunteer organization data as a low cost substitute for state agency collected data. This overly simplistic view needs to be examined from the standpoint of data quality objectives, technological rigor, the integrity of the assessment process, the integration of data into the direct support of water quality management, and infrastructure issues within state programs.

Programmatic Implications/Recommendations

- Explicit documentation of the key elements and concepts of an adequate state watershed M&A program including guidelines and checklists of the various monitoring networks and indicators is needed to provide a blueprint for states to follow. Some of this is available in general and conceptual terms (e.g., CALM, Yoder 1998), but specifics in important areas are lacking. Making choices about monitoring network design(s), indicators, and technical issues such as indicator development and calibration will need to be under girded by applied research aimed at answering specific questions.
- Gaining management understanding and appreciation for adequate M&A is crucial to realizing improved management outputs and environmental end outcomes. This includes addressing embedded issues that have thus far served as serious impediments and disincentives to the development of more comprehensive programs (e.g., perception of refined uses, implications for permitting, policy of independent application, etc.). Managers must be engaged in and comprehend this process and understand the pitfalls of operating water quality management programs in its absence. An orientation/training session for managers is recommended as one possible approach to better communicating the virtues of improved M&A.
- The usefulness of data collected outside of the primary custodial agency needs to be evaluated by an objective process based on data and measurement quality objectives (MQOs/DQOs) that are defined by the state's WQS and/or monitoring strategy. It is essential that each state address this issue by first establishing *adequate* MQOs/DQOs that will meet the needs of water quality management and adequate monitoring and assessment and which follow current **best practices**. State's need to take the lead and establish these in-house prior to delegating this function, either directly or indirectly, to outside organizations. This will preserve the proper role of the state agency as the principal custodian of M&A and WQS and the essential integration of each.

Spatial Design and Scale

All of the Region V states operate a rotating basin approach as the principal M&A framework. All of the states have successfully shifted from a fixed station design and most still operate skeletal networks as an EPA program requirement. What differs between the states is the specific spatial design of the basin approach with respect to spatial intensity. It seems that EPA's historical emphasis on achieving 100% coverage of all water resource types *within five years* has driven some decisions on spatial design specifics. This also seems to be driven, at least in part, by an emphasis on status and trends and in response to past criticisms that M&A could not deliver on this important question. What has received less attention is the implication of these decisions on the ability to *simultaneously* support site and watershed specific water quality management questions and issues. Some Region V states have chosen to emphasize the former while others have emphasized the latter, each with its own consequences on the ability to deliver on other goals and objectives.

General Findings

- Each Region V state operates a five-year rotating basin assessment process employing one, both, or a combination of two general approaches; 1) a statewide approach with widely distributed sampling locations (targeted and/or probabilistic) intended to cover the entire state in five years and address status issues, or 2) a spatially more intensive design designed to provide information in support of key water quality program needs such as permitting, WQS, TMDLs in addition to status and trends.

Critical Issues and Challenges

- At the risk of oversimplification, there are two broad and different spatial design approaches being employed by the Region V states. The first attempts to cover all or a majority of wadeable aquatic resources within a 5-year cycle. Some states have used a probability design supplemented by selected targeted sites while others have relied on a targeted, synoptic approach. In each case the degree of extrapolation beyond single sampling sites can be large and some states follow the recent U.S. EPA CALM guidance by using a 10/25-mile "rule-of-thumb" for extrapolating single sites in wadeable and non-wadeable rivers and streams. In short, these states have made a trade-off emphasizing statewide coverage at the expense of spatial intensity and detail. The second group of states opts for a more spatially intensive approach at the expense of complete coverage within a 5-year cycle. These states have made the opposing trade-off, favoring spatial intensity over statewide coverage. In some cases complete coverage of the state is accomplished over a much longer time frame (e.g., 10 years or more) *or* 100% coverage is not an overriding goal, with subsets of assessed waters used to determine long-term trends. There are, of course, important consequences involved with these trade-offs, all of which are in need of a more critical evaluation and documentation.
- States are being urged to improve status reporting given the emphasis on this activity by U.S. EPA at the national level. We need to seriously examine if this emphasis is resulting in a narrow focus of M&A and precipitating a consequence of making the data and information less useful for other purposes. For example, does a less intensive synoptic survey design, which is geared to assessing all waters in a given rotating basin cycle, make

the resulting data and information less useful to site and reach specific WQ management? (e.g., complex mainstem segments sampled with a small number of sites vs. 10s of sites – what do we miss?). And does this result in M&A being kept at "arms length" from water quality management (i.e., can WQ management claim undue credit for improvements that are inferred by broad scale M&A, yet which are not linked to the reach or site-specific resolution of management?)? Also, can water quality management claim credit for compliance with stressor indicators absent of the linkage with exposure and response via the hierarchy of indicators and lines of evidence processes outlined in Appendix A-3? The scale of M&A is an important consideration in this process.

- Another issue is that of sampling production in terms of sites sampled per unit of effort. The protocol employed by a state in terms of chemical/physical, biological, and habitat assessment can affect productivity. Here, again, there seem to be two divergent approaches. One is to employ what might be categorized as rapid assessment approaches, which take a 1-3 hours to accomplish in which several sites can be sampled in one field day. This approach generally employs representative sampling and qualitative techniques. The other approach employs more quantitative protocols, which take longer at each site resulting in fewer sites sampled in a field day. Some of these approaches also require a larger field crew. A key question is do the data and information produced by the more intensive quantitative methods offset the reduced productivity in terms of sites sampled and hence reduced spatial intensity and coverage? Do the more rapid and qualitative methods omit essential data and information? What are the programmatic implications in terms of spatial scale and resolution in terms of meeting key water quality management program objectives?

Programmatic Implications/Recommendations

- Spatial design in the basin assessment process is a critical issue because of the risks associated with the disadvantages of each individual approach. The broader, statewide approach may risk overlooking or underrating significant site-specific problems, which if known about, could have been addressed by refocused management programs. This approach also risks incomplete documentation of the extent and severity of indicator exceedences and responses.
- There is also the risk of having an incomplete database regarding stressor gradients and the biological condition axis due to the omission of specific types of impacts that occur only in proximity to specific types of sources, occur in specific aquatic ecotypes or regions, or the highest quality resources that occur in only a few selected locations.
- The spatially intensive approach has the disadvantage of taking longer to develop comprehensive listings and other tasks that require broad spatial coverage, and it can be vulnerable to statistical criticism and bias.
- Applied research is needed on this issue so that unambiguous guidance can be developed concerning the choices that the states have either already made or are in the process of making. States face a growing need to develop increasingly detailed and sophisticated M&A programs to support both contemporary issues and future needs. Resolving the conflict between resources and the needs universe necessarily forces trade-offs that can only be made from an informed and strategic perspective.

Resources and Facilities
Resources and facilities comprise the essential infrastructure of M&A programs. This includes not only the direct personnel who carry out sampling and analysis, but also supporting personnel in terms of management, laboratory, and data processing support. Facilities include equipment and space in which the equipment is maintained and housed, and laboratory facilities in support of basic sample processing.

General Findings

- Each Region V state operates an active M&A program with complements of supervisory management and staff. Each state includes biological, habitat, and chemical/physical sampling and data collection methods and techniques. Each state operates structural facilities that include office, laboratory, and field staging and warehousing facilities.
- Each state has professional staff that are capable of conducting chemical, physical, and biological assessments and the associated field, laboratory, and data analysis tasks. With the exception of the Illinois fish assemblage assessments, all work is performed in-house. Some states utilize contractors to deal with excess capacity issues and backlogs and this practice is increasing as artificial personnel ceilings are imposed.
- Each state gave indications that their current resources are insufficient to meet the present and future demands that will be placed on M&A and biological assessment in particular. This not only includes staff, facilities, and logistical support, but also includes technological needs in terms of sampling design, data management, data analysis, and assessment and reporting.
- None of the states use volunteer monitoring data as a substitute for the role filled by their frontline professional staff. We were not made aware of any volunteer groups with the capability to meet the professional qualification, data quality objectives, or monitoring design necessary to function as a substitute or supplement to state programs. The only significant use of volunteer organization data is with the citizen lake monitoring programs that employ comparatively simple measurements and observations.
- Some states cited burdensome and lengthy hiring practices as a major impediment to better M&A production and progress. In at least one state, personnel policies make it difficult to hire qualified staff for positions requiring specific skills. States are being forced to utilize contractual support, but all would prefer to have in-house staff.

Critical Issues and Challenges

- All of the states face resource shortfalls in many areas including personnel, acquisition of personnel, and competition with other water quality management programs. These shortfalls have the net effect of precipitating bottlenecks in the timely production of assessments and unpredictability in terms of improving M&A programs with new technologies.
- M&A is frequently regarded by management as being less important than established regulatory programs and hence the resources are less apt to be increased and in fact may be usurped by these other programs. If M&A is to fulfill the goal of supporting a data driven water quality management focus (as opposed to issue driven), then resources must be stable

and predictable over time. The flow of data and information must happen routinely through time to in order for assessments to be available when they are needed.

Programmatic Implications/Recommendations

- If we are to realize the benefits of M&A in terms of supporting all water quality management programs and activities, it must be performed routinely and regularly over long periods of time. Unpredictable support frequently debilitates two of the most important functions of monitoring and assessment; building a systematic and consistent database that serves as a resource for developing new and improved tools and criteria and addressing emergency needs as they arise and developing trends through time.
- Examples of how long term databases have been used to report trends and develop new and improved tools and criteria need to be marketed to state managers.

Data Management

This is a high priority area of interest and need for the states given its critical function in the overall process of making M&A information usable and readily available.

General Findings

- All of the states have either developed their own data management systems and/or have used the EPA STORET system to enter, store, retrieve, and analyze data. Each state allocates at least one FTE and most allocate up to 3 FTEs to this task.
- Each state identified various needs and shortfalls in terms of data management. These ranged from improving current systems, building new systems, and overcoming basic operational tasks such as data entry and retrieval. In-house programming support is needed to customize existing applications to fill the specific needs of individual states.
- There were mixed reviews about the utility of the new STORET system.

Critical Issues and Challenges

- States need the ability to manage chemical, physical, and biological data simultaneously and achieve the integration necessary to achieve the goals and objectives stated in this review. This means seamless operation of databases and ease of access by users.

Programmatic Implications/Recommendations

- Data management is a critical function in the operation of an adequate M&A program. We suggest this as an important area for further follow-up and discussion among the states. We feel that more emphasis needs to be placed on functional uses of data within the custodial state agencies as opposed to the current emphasis of entry, retrieval, and sharing for external users.

Reference Condition

Reference condition is a fundamental aspect of adequate M&A programs. While it has been highlighted by the biological criteria process, it is essential to the assessment and indicator development process in that it accounts for naturally occurring patterns and variability. As such, it is important to the development of background thresholds and ranges of expected performance for various chemical and physical parameters such as baseline chemical/physical properties (pH, hardness, temperature, alkalinity, etc.) and key chemical parameters (dissolved oxygen, ammonia, nutrients, and other selected pollutants in water and sediments, etc.).

General Findings

- All of the states are either in the process of choosing or have developed a network of reference sites primarily for the development of biological indicators and criteria.

Critical Issues and Challenges

- There exist different levels of understanding and sophistication regarding the conceptual foundation and development of reference condition among and between the states. Some have fully developed and working concepts while others are still struggling with basic concepts.

Programmatic Implications/Recommendations

- There needs to be a consistent conceptual foundation for the development and use of reference condition between the states. This is one of the pivotal, operational areas of M&A that will determine the reliability and comparability of state products such as integrated reporting and 303d listing, WQS, and virtually any application of M&A in support of water quality management. As such, this should be a focus of Regional and state efforts in the near term, including the development of best practices.

Water Quality Standards Program

Water quality standards (WQS) include designated uses and criteria used to determine the status of attainment of a use. In this review, the focus is entirely on the aquatic life uses. The critical importance of WQS to M&A and water quality management cannot be overstated. WQS provide the basis for assessment, implementation, and compliance. This is a key area that the NRC (2001) review of the TMDL approach identified as needing significant attention and development. This review focused on the structure of aquatic life uses, adjustments and refinement to water quality criteria, antidegradation applications, and use attainability analyses. Table 4 summarizes the characteristics and attributes of each state's WQS program and its use and application in support of water quality management. The attributes of Region V state WQS that pertain to this review are summarized in Table 4.

Aquatic Life Uses

Designated aquatic life uses are the key component of a state's water quality management program that essentially determines the level of detail at which that program operates. Recently, EPA's interest in refined uses has been exemplified by the Aquatic Life Uses working group composed of EPA offices, laboratories, academic institutions, and the states (includes three Region V states). Major products include the development of a biological condition gradient which is intended to unify biological assessment and biological criteria development efforts. Efforts related to this initiative include exploring the use of biological criteria to refine and develop water quality and other criteria and improvements in how Use Attainability Analyses (UAA) are conducted.

General Findings

- Use designations in four states consist of general aquatic life or fishery based uses. One state has multiple fishery uses and one state has a fully developed set of refined uses that are codified in the WQS.
- States with general uses operate a default classification system. Those with refined systems designate individual streams and rivers.
- Use attainability analyses (UAAs) are used routinely in one state, recently in another state, sparingly in three states, and not at all in the remaining state. The state with refined uses is where UAAs are routinely employed as a management outcome of the M&A program. All other states employ a program of UAAs that are developed as a result of specific issues and requests.
- Most states have employed adjustments to water quality criteria and/or their application in permits. Most endorse the EPA site-specific criteria modification procedure, but this method has been used only a few times in any one state. One state has an adjusted standards process that essentially functions as a variance procedure.
- The use of M&A to support antidegradation is fully integrated in only one state; ancillary information drives this process in all of the other states.

Critical Issues and Challenges

- Some states are reluctant to develop refined uses due to uncertainties in terms of the resources needed to manage them, the difficulties in supporting and maintaining the administrative rulemaking process, and concerns about abuses such as inappropriate lowerings of designated uses.
- An extensive database, consistent support in terms of stream and river specific assessments, and the necessary structure in the state WQS is needed to develop and implement refined uses. All of the states have the basic infrastructure that is needed to implement this system, but many lack the database and tools necessary to routinely use and maintain it. Again, this would be one of the outcomes of developing an adequate approach to M&A in each Region V state.

Programmatic Implications/Recommendations

- The value of M&A in support of the development of improved and refined water quality criteria, designated uses, and implementation tools is generally not recognized by the states. Making this connection is essential to improving its use and meeting the goals described earlier by this review.
- Refined uses were identified as a critical developmental and implementation need in the NRC (2001) TMDL report as a replacement for the prevalent one-size-fits-all approach employed in most states. This would serve to more appropriately scale protection and restoration requirements to the capabilities and potentials of individual water bodies, thus making assessments of status more accurate. This is a pivotal issue for the Region and the

states and should be a high priority in the near term. This is also consistent with the U.S. EPA initiative and working group on refined aquatic life uses.

Assessment and Integration

Assessment and integration pertains to the process by which M&A information is assembled and interpreted via an assessment process and then used to directly support and influence water quality management programs. It includes reporting and listing processes such as 305b reporting and 303d listing, which inherently include the determination of causes and sources that are associated with measured impairments. The reliability of impairment determinations and cause/source associations is determined by the capabilities of the environmental indicators used in the integrated assessment process. These are basic program functions that pertain to the determination of status based on monitoring data and the exceedences of chemical and/or biological thresholds and criteria. The attributes and characteristics of the Region V state water body assessment processes are summarized in Table 5.

Status and Trends

This is fulfilled by the Section 305b reporting process and includes the aggregate assessment of impairment by water body type. Each Region V state fulfills the basics of this process and maintains a database of impaired and threatened waters. Each state also produces and maintains a list of impaired waters as required by Section 303d, which is theoretically an extension of the 305b process. This, however, varies considerably between the states and the quality of 305b reports (NRC 2001).

General Findings

- Completing the 305b report is a principal driver of M&A in all of the states. Each state maintains adherence to the EPA waterbody system (now the Assessment Database) in reporting the results of the 305b process.
- The 303d list is driven in part by the 305b process in all of the states. In some states the 303d list is a subset of the 305b impaired waters list while in others it is nearly equivalent.
- Only one state reports trends in aggregate status over a significant time period. Most states either do not have sufficient data over a sufficient time period to show trends or the database is not sufficiently organized to produce a cohesive trend assessment.
- All of the states assign causes and sources to threats and impairments, but with varying degrees of detail, consistency, and confidence.
- Some states are reluctant to determine threatened waters due to the implications for listing and uncertainty regarding water quality management obligations. Other states believe that threatened waters determinations are essential to the protection of vulnerable and high quality waters.

Critical Issues and Challenges

- The 305b assessment process has the potential to be an effective filter for the 303d list. However, a general lack of historical discipline in the types of data that have been allowed

into state 305b reports deter the ability of this report to fulfill that role. This is much less of a problem in the states with a more structured approach to data quality objectives, indicators, and M&A design.
- Trend reporting is a critical function of M&A programs and can be used to more effectively guide and prioritize water quality management programs. A comparative lack of continuity in data management,, indicators, and design have deterred the production of meaningful assessment by the states.

Programmatic Implications/Recommendations
- Ensuring consistency in status determinations and the eventual uses of that information is a critical issue in the Region. This ultimately resides in the adequacy of the state's M&A program. Demonstrating that addressing this issue will result in meeting other M&A goals and objectives is essential to gaining management buy-in and the resources that are needed to achieve it.

Integration includes the "assembly" of multiple indicators in a sequential process using each within its most appropriate role. This process has been described by U.S. EPA (1990, 1995b) and Yoder and Rankin (1998). Central to the success of achieving a high level of integration is the development of environmental indicators, which are essentially the measurable outputs of an adequate M&A program. As such, the implementation of an adequate M&A framework should naturally result in the desired degree of integration so long as the principles and process of sound indicators discipline is practiced. Subcategories that are reported here include environmental indicators development and usage and the sequential process used to achieve integration with water quality management.

Environmental Indicators Development and Use
An environmental indicator is defined here as a scientifically valid and managerially useable measure that is capable of communicating information about the status of a resource and trends in that status. There have been numerous initiatives to develop processes and frameworks for the use of environmental indicators to act as effectiveness measures for water quality management programs. However, too few of these efforts have recognized or addressed the need for adequate M&A to undergird the essential information gathering and assessment processes. Simply stated, environmental indicators are only as good as the underlying data collection and assessment process. This is a critical area given the Regional shared goals initiative.

General Findings
- Only one state has a fully developed process for the integration of multiple indicators in making ambient assessments over space and time. None of the other states can currently report temporal trends on aggregate water resource condition in a manner that is consistent with previous indicators development frameworks.

Critical Issues and Challenges
- Consistent and standardized M&A is essential to the development of a robust and reliable environmental indicators and their use as effectiveness measures. This includes more than

the collection of data and information, but the maturity of efforts that integrate this data and information into meaningful assessments.
- Key to having good environmental outcomes is a thorough understanding of the what, when, why and where of the ultimate uses of the assessment. This must be understood by upper management with buy-in from managers, front line supervisors, and staff. This is crucial to good performance by staff in the field and it ultimately determines the effectiveness and credibility of the entire approach.

Programmatic Implications/Recommendations
- Given the status of most of the state M&A programs, the development of this process will take time. However, the efforts of the Region to assist the states with improving their M&A programs should lead to the ability to use environmental measures as envisioned by the shared goals initiative.

Biological Monitoring and Assessment

All of the Region V states operate biological monitoring programs and all employ the capability to use at least two organism groups, usually fish and macroinvertebrates. Each state has developed an assessment process for determining if the sampling results indicate an impairment of the biological assemblage. The results are used for reporting status in all six states - uses beyond status vary by state. Tables 2 through 4 describe the attributes and characteristics of the state's biological assessment program. A detailed checklist that will help determine the present status of the bioassessment program, how it fulfills the desired goals of monitoring and assessment, and in which areas the development of improved capabilities are needed is under development and will be piloted with the Region V states in 2004.

Biological Assessment Methods and Procedures
How biological data is collected, the level of resolution in terms of sampling and taxonomy, standardization, and operator skill and training can individually and collectively affect the accuracy and adequacy of the data produced. Also, states must develop biological assessment procedures that are not only robust, but which can be performed in a cost-effective manner. Generally, a cost-effective bioassessment protocol is one that can be executed at a sampling location in 1-3 hours supporting sampling of multiple locations in a day, 10s of samples in a week, and 100s of samples in a year. Thus some balance between absolute comprehensiveness and adequate representation of an assemblage must be struck. For state programs, producing a larger number of sites sampled at a reasonable cost and investment of personnel is of critical importance.

General Findings
- All six Region V states operate biological assessment programs with the capability to assess two organism groups. Three states collect two groups at virtually all sampling sites, while the others selectively apply each group singly.
- Macroinvertebrates and fish are most commonly sampled, with some states emphasizing macroinvertebrates more than fish. A few states have the capability to assess algae and

some have broadened to include higher plants and other aquatic vertebrates and invertebrates in wetlands and primary headwater streams.

- With one exception the states support and retain an in-house capacity to assess both macroinvertebrates and fish.
- All of the states retain qualified full-time biologists and employ interns to assist with field work during a summer-fall index period. A few states outsource some laboratory work to contractors.
- Variability in terms of different methods, protocols, equipment, and procedures exists between states. The significance of some of these differences is likewise variable and ranges from inconsequential to potentially significant, the latter of which could influence the effectiveness and utility of the resulting data and assessments for region-wide assessment purposes.

Critical Issues and Challenges

- While there are general similarities between the Region V state biological assessment programs, there are some potentially important differences in methods and approaches between states. The critical issue is in determining the comparability of the biological assessment and how these affect the ability to fulfill key reporting and water quality management support functions.
- The net effect that some of these differences have on the eventual outcome of the resulting use of the biological data can be surmised at a general level, but others require further applied research and evaluation.
- Some differences in methods are the result of initial decisions made regarding how the eventual data and assessments might be used. In some cases, basing these decisions on a comparatively narrow set of goals and objectives has potentially resulted in a less comprehensive program.
- The development of biological assessment techniques should correspond to the U.S. EPA biological condition gradient so as to accurately discriminate along the gradient in an ordinal, if not linear fashion so that discriminatory power and resolution is increased beyond mere pass/fail pronouncements of status and beyond the present full/partial/non-attainment paradigm. Key to this will be an adequate resolution in terms of programmatic elements and attributes in WQS (refined uses and criteria) and M&A protocols and how reference condition is determined and how biological evaluation mechanisms are constructed and calibrated. The development of biological assessment procedures must be evaluated in this light and key areas of the process defined and highlighted. This also must be done with knowledge and insight about how M&A should support all aspects of WQ management, not just status and trends.
- Standardization between and among crews and operators is not only a critical issue and should be evidenced in the state's QA/QC procedures, but also practiced in the field. An important aspect of this is the attitude of workers towards the sampling. Much of field sampling is skill and effort dependent such that all involved need to have a positive attitude towards the work. This also means that everyone needs to have a good understanding about the importance of good data quality and how it potentially affects the results, particularly the quality of the results and the negative consequences of bad data.

This may be a case for dedicated crews rather than having one crew performing all or multiple sampling tasks.

Programmatic Implications/Recommendations

- There will be a need to compare the net effect of different methods and protocols between the states, not as a means to second guess the individual development and use of specific biological sampling protocols, but to objectively determine if different methods, equipment, protocols, etc. exact a significant change or influence on the resulting biological assessment. This could be done by taking the more commonly used approaches and performing comparative sampling in different states. Without this type of direct comparison there is simply no way to determine if the resulting assessments of individual states are directly comparable and what types of errors are being accrued, if any.

Biological Criteria Development and implementation

Biological criteria are narrative or numeric expression based on aquatic community data acquired through biological monitoring. These provide benchmarks for determining the status of aquatic life uses more directly and accurately than by using chemical water quality exceedences alone. The development and adoption of biological criteria is an important program priority for U.S. EPA and a growing number of states either have or are within a few years of adopting biological criteria in their WQS.

General Findings

- One state has fully developed and adopted numeric biological criteria into the WQS - two states have adopted a narrative biological criterion. The remaining states are in various stages of developing and working through the process from which biological criteria could eventually be developed.
- Some variability exists in key aspects of the state biological monitoring programs and includes methods, level of taxonomic resolution, and existing assessment criteria and decision benchmarks for attainment/non-attainment designations.

Critical Issues and Challenges

- Some of the states questioned the need to formally adopt numeric biocriteria when they see their current biological assessment framework as delivering the same end result, particularly for status determinations. These states employ a narrative translator linked to their informal assessment criteria.
- Some states face internal barriers to further developing biological criteria, the most prevalent of which is the perceived impact on NPDES permits and the potential added burden for WQS rulemaking.
- The effect of the policy of independent applicability on biological criteria development has historically been seen as a deterrent to the further development and use of biocriteria. This was echoed by some, but not all of the Region V states. In terms of ambient assessment, at least four states adhere to a weight-of-evidence approach. Only one state strongly advocated an adherence to independent application.

Programmatic Implications/Recommendations

- Biological criteria offer some substantial advantages in terms of improving the accuracy and capabilities of a state water quality management program. These advantages need to be better communicated to state program managers along with the value added aspects of the approach to water quality management program support.

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Appendix A

Appendix A-1: Region V State Monitoring & Assessment Program Interviews: Annotated List of Discussion Topics

Appendix A-2: General Overview of Region V State Basin Assessment Designs

Appendix A-3: State Monitoring and Assessment Programs: Preferred Design and Indicator Options

Appendix A-1

Region V State Monitoring & Assessment Program Interviews: Annotated List of Discussion Topics

Introduction

The Midwest Biodiversity Institute (MBI) has been tasked by U.S. EPA, Region V to conduct an assessment of the Region V State bioassessment and ambient monitoring programs with emphasis on how data and information are used in support of various aspects of water quality management. In order to accomplish this task, MBI is conducting detailed interviews of key program State program managers and staff in order to understand the extent of data-driven water quality management, where it exists. We are using these interviews as an opportunity to better define and understand the uses of monitoring and assessment information in each State and determine the opportunities, incentives, impediments, and barriers to the fuller use of this information in support of water quality management programs. MBI will be preparing a report based, in part, on these interviews and additional information that is available which describes the State's use of monitoring and assessment information.

Who Should Attend

The evaluation of each State program is focused on current and planned uses of monitoring and assessment information in support of water quality management programs. This includes water quality standards (WQS), reporting and listing (305b, watershed assessments, 303d listings, TMDL development and implementation), planning, nonpoint source assessment and management, dredge and fill (404/401), and NPDES permitting as these represent the most in-common elements of State water quality management programs. Thus, managers and staff who can speak to the operation and management of these programs should attend at least that portion of the interview.

The following topics are intended to generally outline the interview process and ensuing discussion of each topic. These are intended to guide the interview and serve as a guide for State preparations for the discussions. Each interview is intended to occupy one and one-half days. Day one will focus on the use of monitoring and assessment information to support water quality management and the second one-half day will focus on specific bioassessment issues.

Day One: The Use of Monitoring and Assessment Information in Support of Water Quality Management

Monitoring and Assessment Program

In terms of achieving the goal of supporting water quality management with indicators of environmental exposure and response, the State's monitoring and assessment program is vital to achieving that goal. Monitoring includes the systematic collection of chemical, physical, and biological data in the ambient environment. Assessment includes the analysis and transformation of that data into meaningful assessments that include attainment/non-attainment determinations, characterization of impairments (extent and severity), associations between impaired states and causes (i.e., agents) and sources (i.e., activity or origin), and providing data and information to develop improved tools, indicators, criteria, and policies. This process then supports reporting that is required by the Clean Water Act (305[b], 303[d], 319, etc.) and that used by the State for allied purposes (watershed assessments, site-specific assessments, planning, TMDL development, etc.).

Monitoring &Assessment Topics

1. Spatial design:
    - Rotating basin approach (sequence and cycle; linkages to management. activities)
    - Probability-based
    - Fixed station
    - Resource types (wadeable streams, large rivers, great rivers, lakes, wetlands, headwater streams, etc.)
2. Basin assessments:
    - Scale (major basin, subbasin, watershed, subwatershed)
    - Site-selection – targeted, random, other
    - Site density (how many sites sampled in a study area)
    - Stratifying factors (watershed area, stream order, other)
    - Number of sites, surveys each year
    - Data analysis and reporting sequence
    - Bottlenecks in data analysis and reporting?
    - Logistical issues
    - Study planning process – are different disciplines integrated?
3. Index Periods:
    - Seasonal sampling index periods (summer-fall, monthly, other).
    - Flow attenuated considerations (loading estimates, event related)
4. Chemical/physical assessment:
    - Media (water, sediment, tissues, etc.)
    - Purpose of sampling (ambient characterization, model calibration, long term trends, reference/background, etc.)
    - Parameter groups, how selected
    - Laboratory support
    - Sampling design and logistics (survey design, frequency, grabs vs. composites)
    - Exceedence issues (magnitude, duration, frequency)
5. Resources:
    - FTEs devoted to M&A by discipline (chemical/physical, biological assessment, TMDL/modeling, etc.)
    - Proportion of FTEs devoted to water quality management programs (please provide a table of organization)

- Funding sources and limitations
- Cost determinations
- Are current resources adequate? if not, what is needed?

6. Reference Condition
   - Have reference sites been established? For what purposes (biocriteria, nutrients, background conditions, etc.)
   - How many reference sites?
   - Spatial organization and stratification (ecoregions, hydrologic units, physiographic regions, other)
   - How is reference determined (data driven, cultural, least impacted)?
7. Data processing and management
   - How is data stored (STORET, other system)
   - How is data accessed for analysis?
   - Resources dedicated to data management
   - QA/QC procedures for ensuring data quality
   - Timetable for entry and validation
   - Ease of availability within and outside agency
   - Demand for data from outside agency
8. Monitoring Strategy
   - Latest update available (please provide a copy)
   - Is it a useful document?
   - Should the strategy serve as a documentation of data acceptability?
   - Are data quality objectives defined?
   - Frequency of update.

Reporting and Listing (305b/303d)

Reporting and listing here refers to the process of producing the biennial 305b report and the 303d list of impaired waters, both of which have received greater emphasis during the past decade. The information contained in these reports and lists are not only important to determining the effectiveness of a State's water quality management efforts, but are increasingly being used to set program priorities and allocate funding (i.e., Section 106 allocations). Monitoring and assessment information is an indispensable element of this process and how it is generated and used determines, in part, the accuracy of the statistics that are reported via 305b and 303d. Thus, it is important to determine and understand the process used by each State.

1. Delineation of impaired/threatened waters
   - Procedures, protocols for determining extent and severity of impaired waters – arbiters of impairment and threat.
   - Monitored, evaluated, survey assessment hierarchy?
   - Extent of extrapolation from single or aggregate sampling sites, how was this developed and has it been tested?
   - Which uses are reported?

- Aquatic life impairment – based on which data (biological, chemical/physical, mix of both, best professional judgment, etc.)
- Determination of causes and sources of impairment and threat – is this always linked to an impairment or threat?
- Determination of severity, extent, incremental changes
- Any impact or implications from 106 allocation formula (based on impairment information)?
- Universe of resource definition (miles of rivers and streams, lake acres, etc.)
- Do we need to assess 100% of all resources? Would better targeted subsets serve as well?

2. Assessment process
   - "Chain-of-custody", i.e., do the same staff who collect and analyze sampling data produce the assessments?
   - Volunteer organization data – how used? "admission" requirements? any testing of accuracy? pressure to accept data?
   - Other organization data – acceptance requirements?
   - Credible data legislation? proponents, agency position
3. 305b Report
   - Trend assessment – tracking of aggregate condition through time, by resource type, designated uses, etc.
   - Extent of use by agency to guide water quality management – is it viewed by management as a report card? other value? does it distinguish impairment by point and nonpoint sources? subsets within each?
   - Extent of use by outside groups
   - What would impact of changes in statistics be?
4. 303d/TMDLs
   - Relationship between 305b report and 303d list – conversion process, issues, concerns, gaps and shortfalls
   - Should 303d be aligned with 305b?
   - Influence of EPA's CALM guidance
   - Is TMDL development coordinated or aligned with ambient monitoring and assessment?
   - Use of biological data in TMDL process – for? opposed? issues and concerns
   - Ramifications of listing beyond TMDL development (additional implications, perceptions of liability, etc.)
   - Are there sufficient tools available to develop defensible TMDLs that will contribute to restoration of impaired uses? What is needed and how long will it take?
   - What are important underlying components of the TMDL process? Are these sufficient?
   - Is there sufficient data available to develop TMDLs? what's missing?

Water Quality Standards

Water quality standards provide the basis for water quality management in terms of benchmarks and criteria for designing management programs and judging the effectiveness of those programs. Of interest to the interview is the recent emphasis by EPA on refined aquatic life uses and biological criteria. Thus, the following topics emphasize this part of the WQS process.

1. General WQS Issues:
   - Describe the structure of the State's WQS – designated uses, criteria, and antidegradation policy.
   - How are chemical WQ criteria derived? any modifiers or adjustment factors?
   - Any special WQS application language?
   - Existing use issue – what is the State's view? how is it determined?
   - Site-specific criteria issues? dealt with? how many?
   - How would better M&A help the WQS process?
   - Is rulemaking an issue, i.e., burdensome, difficult, risk of unintended outcomes?
2. Designated uses
   - Description of designated uses in the State WQS (a copy of the relevant parts of the WQS is requested)
   - Are individual waters designated? default uses? other?
   - What triggers individual designations? are they downgrades? does anything trigger an upgrade? is there a regular process for inventorying these needs?
   - Less than CWA goal uses? how defined?
   - EPA ALUS process – familiarity with?
   - Level of interest in refined uses (advantages, disadvantages, barriers to development and implementation)
3. Use Attainability Analysis (UAAs)
   - Experience with UAAs (number, problems, issues)
   - Outline/describe UAA process – is it a routine? special project oriented? what triggers a UAA? what are preferred data and information requirements?
   - Stakeholder perceptions of UAA process (pro and con, requests, etc.)
   - Has the emphasis on 303d listing increased the interest in UAAs?
   - Are UAAs seen as an "easy" exit off of the 303d list?
   - Attainability issue – can a water be impaired in perpetuity? criteria for determining attainable use.
   - What are some specific attainability issues? urban? agricultural? other?
4. Biological Criteria:
   - Have biocriteria been adopted or proposed (narrative, numeric)?
   - Impact of EPA's Policy of Independent Application
   - Linkage to designated uses – pros and cons
   - Impact of EPA ALUS model and refined use initiative
   - Advantages, disadvantages of biocriteria in WQS, in-house barriers?

- Would biocriteria force reconsideration of any "downgrades" or any other revisions to uses?
- Habitat criteria?
- Stakeholder perceptions and views

Assessment Integration Issues

The integration of monitoring and assessment information within water quality management programs is an important and emerging issue and ultimately fulfills one of its most important purposes. Region 5 is working with the States to develop a set of shared environmental goals and milestones. This will partially fulfill efforts to implement the National Environmental Performance Partnership System (NEPPS), which promotes joint priority setting and planning through the increased use of environmental goals and indicators. The shared goals and milestones will be used to more comprehensively report to the public and environmental decision-makers about the status of water resources in the Region and document progress to meeting these goals. The goals and milestones will also be used to more effectively target programmatic efforts at the national, state, and local levels. It is important that we are able to document achievements so that our 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 State's efforts to develop and use indicators and integrate them into water quality management.

1. Indicators for Surface Waters
    - Describe any efforts 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 EPA indicator development efforts, i.e., national indicators for surface waters, hierarchy of indicators, etc.
    - Is there any recognition of indicator roles (i.e., EMAP stress, exposure, response paradigm)?
    - What is (are) the most important measure(s) or indicator(s) of water quality management program success in your program? why?
2. Program Integration
    - Cite 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? 404/401 process? stormwater phase I or II? 319/NPS planning and implementation? brownfields? other?
    - How is monitoring and assessment information and resulting assessments, reports, etc. regarded by the above programs (essential, useful, nice to have, inconsequential)?

3. Training
   - Are training opportunities afforded staff and/or management?
   - How do these relate to indicators development, monitoring and assessment, biological assessment, or ecological principles in general?
   - Requests for field demonstrations (fish, bugs, sampling, etc.) for internal and external purposes

Other Information
The results of the interview process will provide important information for a report that will be submitted to Region V. This report will summarize the issues facing each State in reaching the goal of increased usage of ambient monitoring and assessment information to support water quality management. The State is encouraged to provide any documents or information that they feel would be useful in generating a fair and accurate summary of the interview process and the status of the use of monitoring and assessment information in water quality management. Follow-ups with each State will take place as the report is developed.

Day Two: Review of the State's Biological Monitoring and Assessment Program

Each State should have received and completed the questionnaire in support of U.S. EPA's *Update of State Bioassessment Programs: Success of EPA's Technical Transfer Efforts and Building State Capacity.* This portion of the interview process will focus primarily on the topics covered by the questionnaire and will afford an opportunity to provide important details and context that could not be communicated in that format. Again, the State is requested to provide copies of program documentation and any examples of outputs (reports, etc.) that characterize the current usage of biological assessments and criteria.

1. Biological Assessment Procedures (by assemblage)
   - Methods, field procedures
   - Lab procedures and logistics
   - Independent methods development
   - Field crew composition and deployment
   - Field logistics (time spent per site, travel, work week, etc.)
2. Sampling History
   - Number of sites, samples/year
   - Purpose (watershed assessments, special studies, site assessments)
   - Applied research and support (examples of each)
3. Facilities (lab/facility) tour and evaluation
   - Sampling equipment
   - Laboratory process, logistics
   - Training and qualifications

Appendix A-2

General Overview of Region V State Basin Assessment Designs

The following is a brief description of the overall monitoring and assessment designs employed by each of the six Region V states. This information was compiled from notes taken during the interview process and from the various documents provided about each State program. It is possible that changes have taken place or been initiated by the states since the January 2002 interviews. In addition, the following do not cover all of the monitoring and assessment activities that are conducted by the state. Therefore, each state's web site should be accessed for more detailed and current information.

Illinois

Illinois operates a monitoring design, which includes approximately 500 targeted sites allocated among 33 major basins. Approximately one-fifth of these sites (81-114/year) are sampled each year for fish and macroinvertebrates. These are further targeted at order 4 streams where perennial flow is likely to be maintained. No trends in biological condition are reported, but IEPA expects this will be forthcoming when sufficient data is collected and assessed.
http://www.epa.state.il.us/water/water-quality/monitoring-strategy/index.html

Indiana

Indiana employs a 5-year rotating basin approach in which the entire state is covered in that time period. This is accomplished by using a probability design within each of five major aggregations of river basins in Indiana. Approximately 50 macroinvertebrate and fish sites are randomly selected from 1-4 order streams. No trend assessment is performed, but IDEM expects this to be forthcoming once the basin process matures.
http://www.in.gov/idem/water/planbr/wqs/quality.html

Michigan

As of 1997, Michigan visited 200 wadeable stream sites per year representing 2.5 percent of the state's wadeable stream miles. By 2001, approximately 700 macroinvertebrate samples per year are being collected from 80% of the wadeable streams in each basin. Sampling sites are selected using a targeted approach and consider the complexity of the study area and the landscape setting. The information from these surveys is used to support selected water quality management actions including NPDES permit reissuance, the cycle of which was reconciled to basin monitoring in 1983. MDEQ expects that trends in biological resource condition will be forthcoming once the basin assessment process matures.
http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728--,00.html

Minnesota

Minnesota recently implemented a rotating basin approach with the goal of assessing the entire state by 2015. Sampling is conducted in each of 10 major basins over a 2-year period with an additional year of follow-up sampling. Biological assessments include both fish

and macroinvertebrates at both targeted and randomly selected wadeable stream locations. Approximately 125-150 targeted sites and 50 probability sites are located in each basin area. The purposes of the targeted sites are to provide reference data for the development of biocriteria and other assessment criteria and a dataset over a gradient of different disturbance types and impacts. Stratifying factors include ecoregions and subregions and watershed area. MPCA expects that this design will yield information about trends in the future as the basin cycle process matures. No trend reporting on biological resources takes place at this time.
http://www.pca.state.mn.us/monitoring/index.html

Ohio

Ohio has employed a rotating basin approach since the early 1980s. Fish and macroinvertebrates are sampled at approximately 500 targeted sites within 3-4 basin areas each year. Ohio has 23 major basins and 93 subbasins, which are used to conduct and plan the basin approach. A geometric site-selection process has been used since 1998 in an effort to pre-assess subbasins targeted for TMDL development. The information from this monitoring design directly supports all water quality management programs including water quality standards, NPDES permitting, TMDLs, nonpoint sources, planning, and specific local and watershed issues. This database has provided information to support detailed trend assessment and forecast analyses in the 305b report.
http://www.epa.state.oh.us/dsw/bioassess/ohstrat.html

Wisconsin

Wisconsin has essentially operated a rotating basin approach within a basin planning process since the mid-1980s. In the mid-1990s, a more focused approach was organized within the 23 major geographic management units (GMU) developed by WDNR. Approximately 20 sites are sampled for fish and macroinvertebrates within each GMU. Sites are targeted and are aimed at specific management issues within each GMU. No trends are reported for biological resource condition.
http://www.dnr.state.wi.us/environmentprotect/water.html

Appendix A-3

State Monitoring and Assessment Programs: Preferred Design and Indicator Options

INTRODUCTION

The Midwest Biodiversity Institute (MBI) was requested by U.S. EPA, Region V to conduct an assessment of state surface water monitoring and biological assessment programs. This effort, in addition to the review accomplished by Region V as part of the CALM process, is intended to lead to improvements in surface water monitoring throughout Region V. A principal focus of this effort is in determining the spatial design(s) and environmental indicators that will serve to make more effective use of monitoring and assessment in support of *all relevant aspects of water quality management.* As such this appendix focuses on; 1) communicating the essential underlying concepts and principles of a comprehensive and adequate monitoring and assessment program, 2) determining the design and indicator options available to the states and EPA, and 3) evaluating the advantages and applicability of each option.

This assessment is focused on current, planned, and potential uses of monitoring and assessment information in support of water quality management programs. These programs include water quality standards (WQS), reporting and listing (305b, watershed assessments, 303d listings, TMDL development and implementation), planning, nonpoint source assessment and management, dredge and fill (404/401), and NPDES permitting as these represent the most in-common elements of state water quality management programs. **It is a fundamental premise of this assessment that ambient monitoring and assessment should function to support *all* relevant water quality management programs in addition to its more commonplace role of supporting status assessments**. Determining the potential linkages to the state's water quality standards (WQS) and reporting (305b, 303d) obligations are especially emphasized, as these are fundamental to the broader use of environmental data in management decision-making. This is consistent with contemporary efforts to revitalize and improve the use of environmental data in management decision-making (ITFM 1992, 1995; U.S. EPA 1995a,b; Yoder 1998; NRC 2000; NRC 2001; The Heinz Center 2002) and emerging efforts at EPA to more effectively translate environmental data and indicators to defensible criteria and standards (e.g., refined aquatic life uses, biological criteria development and implementation, EPA's Consolidated Assessment and Listing Methodology [CALM] process).

This review is focused primarily on the assessment of aquatic life in the lotic (flowing) freshwaters of Region V. The lentic (standing open waters), wetland, and primary headwater ecotypes are also important resources and many of the essential concepts and principles discussed here are applicable to these systems. Obviously, there will be different indicators and designs that better suit the needs of assessing and managing these ecosystems and some are being developed, at least conceptually, through ongoing efforts. This assessment emphasizes aquatic life related issues and concerns since these frequently determine water quality management needs and policies in freshwater systems. Aquatic life uses apply to all jurisdictional water bodies, thus it is a universally relevant water quality management issue. It also requires a deliberate stratification process including attention to watershed size (i.e., headwater, wadeable, non-wadeable), ecotype (i.e., cold water, warmwater, coastal plain), and appropriate ecological indicator assemblages (i.e., fish, macroinvertebrates, algae). Co-occurring concerns such as water supply, human and wildlife health, and recreational uses that must also be supported by adequate monitoring and assessment are recognized and these can be addressed as overlapping concerns. However, programs that incorporate the underlying concepts and principles which support more detailed definitions of aquatic resource types and refined uses for aquatic life are better able to transfer the conceptual underpinnings and the improved technology this fosters to other water uses and concerns; hence the emphasis on aquatic life and ecological assessment. This approach can provide the type of informational feedback that fosters a more integrated and interdisciplinary approach to water quality management.

The Relationship Between Monitoring and Watershed Management

There is abundant evidence and a growing appreciation that our air, land, and water resources are subject to a wide variety of effects from human activities on local, regional, national, and global scales. However, the mere recognition that these effects occur, that many are potentially detrimental, and some can be addressed through prescriptive management programs is simply insufficient. The ability to measure the extent and severity of these effects and further understand their causes and origins is needed to construct accurate, effective, and proportionate management responses. Simply put, adequate monitoring and assessment is the key to enabling this process. Some estimate that upwards of $500 billion to $1 trillion have been spent on water pollution abatement nationally since the Clean Water Act revisions of the early 1970s. Yet, with only a few exceptions, the effectiveness of these expenditures has not been consistently nor accurately documented in environmental terms (GAO 1986; 2003a). One reason may lay in the fact that only 0.2% of the amount spent on water pollution abatement was devoted to ambient monitoring in the 1970s and 1980s (ITFM 1992). Federal and state agencies during that time period were primarily focused on regulatory and pollution source abatement - adequately documenting the effectiveness of those activities was not a significant part of the process.

Few, if any, state monitoring programs were sufficiently funded, developed, or designed to deliver an accounting of environmental results on a systematic basis. Simply put, state and federal agencies were neither equipped nor motivated to develop the types of monitoring and assessment efforts that were needed to both assess and guide water quality management. Inevitable questions about the results of the large expenditures of public and private funds could not be satisfactorily answered by most state and federal agencies, a situation that persists into the present (National Research Council 2001; GAO 2003a). This resulted in a number of efforts to revitalize environmental monitoring at the federal level, the most noteworthy of which was the Intergovernmental Task Force on Monitoring Water Quality (ITFM 1992, 1993, 1995). When coupled with the technical developments in sampling methods, indicators, data management, and assessment tools that occurred during the same period, this delivered the type of process that was needed earlier. However, progress in reaching the goal of adequacy (Yoder 1998) requires several years to accomplish. This task was forced to compete with other water program priorities and crises, some of which were an outcome of a lack of adequate monitoring and assessment (i.e., the TMDL process) hence progress has been incomplete. The challenge of adequately and consistently measuring, characterizing, and understanding the significance of environmental impacts has been met in only a few instances. Having such a capacity is crucial to the effective management and protection of water resources within state water quality management programs. Adequate monitoring and assessment is an indispensable component of achieving this goal (ITFM 1992, 1995; Yoder 1998; NRC 2001).

A major problem in promoting the wider usage of monitoring and assessment information to guide water quality management is the legacy of assessing the effectiveness of these programs based on administrative activities termed here as "outputs". This situation exists despite the repeated calls of national compendia (e.g., ITFM 1992, 1995) and panels (NRC 2001; The Heinz Center 2002; GAO 2000, 2003a,b) to strengthen and increase the use of environmental measures, or "end outcomes". Monitoring has for too long been viewed as an analog of the radar "gun" used to identify speeders - it detects when environmental criteria are exceeded. While important for that purpose, monitoring serves other needs as well (Karr 1991; Karr and Chu 1999): diagnosing the causes of degradation, evaluating restoration efforts (Yoder 1998; Yoder and Rankin 1998), and providing information on status and trends about the "infrastructure" of the aquatic environment. state water quality management agencies should devote as much effort to tracking resource condition as to enforcing compliance. Today, the latter function dominates at the expense of former, and little has been accomplished towards integrating the two tasks.

The U.S. General Accounting Office (GAO 2003a) notes that a primary dependence on administrative performance measures (e.g., number of environmental standards established, permits issued, and enforcement actions taken, all referred to as *outputs*) still limits evaluations of program effectiveness, including EPA's ability to assess risk. In 1999, for example, 86% of 278 performance measures listed by U.S. EPA were *outputs* rather than *end outcomes* (measures that directly measure environmental conditions). The proportion of environmental performance measures increased from 7% in 1999 to 27% in 2003. But even so, most of the end outcomes are for individual chemical pollutants, not more comprehensive biological responses. If states are to heed the calls for a more environmental results driven process of measuring program performance, then adequate monitoring and assessment must become a real priority for water quality management programs. The urgent need is to have adequate environmental information routinely available so that agencies and stakeholders will embrace it as a fundamental need and priority that is equal in importance to administrative programs and outputs. A significant problem with many of the recent environmental indicators initiatives is that they have resulted mostly in a compilation of lists of different indicators, sometimes without regard to their appropriate roles and/or without a systematic process for evaluating their meaning. A companion process to label indicators in accordance with their most appropriate roles (Yoder and Rankin 1998) and a systematic process for integrating the different indicators (U.S. EPA 1990, 1995a) is also required to ensure quality assessment products. This companion process has not been adequately linked to indicator development and use in most cases. An important goal for EPA and the states should be to have the effectiveness of administrative actions determined by environmental *end outcomes* as measured by the information and indicators gained from adequate monitoring and assessment. Inherently embedded in achieving this goal is the adequacy of other essential components of water quality management infrastructure including water quality standards (WQS).

Why is all of this important? One reason is to avoid the unnecessary propagation of assessment error, i.e., incorrectly designating waters as impaired when they are not (type I error) or failing to detect degradation and impairment at all (type II error). Common sources of type I and II errors include improper stratification of ecological potential across regional landscapes (e.g., not incorporating the influence of stream size) or poorly developed or improperly selected indicators of water body condition (Karr and Yoder 2004). For aquatic life uses, assessments may reach substantially different conclusions if based on chemical sampling versus biological assessments. Poorly conceived and implemented biological indicators can lead to similar errors. Type I errors receive substantially more attention (NRC 2001) because of their visibility to stakeholders. Type II errors may receive little or no notice, despite this being the predominant assessment error in many places (Karr and Yoder 2004). The adequate monitoring framework envisioned by this strategy should lead to a minimization of both types of assessment error.

More is at stake than incorrectly designating the status of water bodies and includes the identification of the causes and sources that are associated with observed impairments. Again, adequate indicators and assessment design is equally important in ensuring desirable outcomes in the assessment process. The ignorance or underrating of important degradation agents (altered flows, changes in physical habitat, adverse effects associated with invasive alien taxa, and so on; NRC 2001) is a problem when assessments rely on narrowly focused concepts and indicators. The TMDL process in particular emphasizes a small set of individual pollutants (the top five are sediment, pathogens, metals, nutrients, and organic enrichment; GAO 2003b) while many serious pollutants and forms of pollution, not to mention important interactions among them, go unrecognized (Karr and Yoder 2004). *Pollutants* are substances added to waters by human activity [CWA section 502(6)]. The Clean Water Act further defines *pollution* as human-induced alteration of waters caused by pollutants as well as non-pollutant agents, such as flow alteration, degradation of riparian zones, physical habitat alterations, and invasive alien taxa [CWA section 502(19)]. An adequate approach to monitoring and assessment is needed to ensure that significant limiting factors are not overlooked.

Intergovernmental Task Force on Monitoring Water Quality (ITFM)

Improving monitoring in the states requires a strategy that has generally been outlined by the ITFM process and federal 106 monitoring guidance (U.S.EPA 1994). The following represent the key principles of adequate monitoring and assessment as articulated by the ITFM (1995). Accordingly, water monitoring has four major aspects:

Context: Monitoring should be the foundation of water resource policy-making and management. This means that monitoring information should not only be available to managers and policy makers, but also be sufficiently comprehensible and conclusive. A critical aspect is not just providing data and information, but an assessment of what that information means. This includes a determination of whether or not important criteria, standards, and other management requirements are being achieved and the degree (both quantitatively and qualitatively) to which any are being exceeded or abrogated. This process requires the use of multiple classes of indicators, each functioning within their most appropriate roles (Yoder and Rankin 1998) and in their proper relationships to each other.

Scope: Monitoring includes the following activities: articulating objectives; collecting, storing, and interpreting data; conversion of data to information; preparing assessments of the information (conveying its meaning); communication of assessment results; and evaluation of management program performance. This organization allows water quality management programs to become more appropriately focused on the resource at issue, as opposed to an emphasis on the care taking of administrative systems and processes. This fosters an approach of managing for results in the environment where administrative processes are tools to improve the environment, not an exclusive endpoint of water quality management.

Scale: Monitoring includes all relevant scales such as site-specific investigations, regional descriptions and comparisons, and statewide summaries at various temporal scales. State monitoring strategies need to be constructed so that the same basic core data supports assessments at all of these scales. The specific designs, indicators, and assessment tools used must be tailored to the regional peculiarities in climate, soils, land use, geology, ecological resources, socioeconomic influences, and geography. Thus the indicators that are used need to be sufficiently developed and calibrated to reflect these influences and the scales at which the monitoring program must operate. This also means that monitoring and assessment must be designed to address objectives other than status and trends, which means assessing at the same resolution, i.e., at the same spatial and temporal scale at which water quality management is being applied. Failure to reconcile the scale issue risks "disconnecting" the results of water quality management from the validation of adequate monitoring. This would also call into question claims of environmental improvement or problems based on administrative measures alone.

Objectives: Generally, monitoring program objectives include: 1) determining status and trends; 2) identification of existing and emerging problems; 3) support of water quality management policy and program development; 4) evaluating program effectiveness; 5) responding to emergencies, and 6) continued development and improvement of the understanding of the basic chemical, physical, and biological processes that affect environmental quality. Achieving all of these objectives requires not only adequate monitoring and assessment, but also full integration of the results into the details of each management program.

Effective monitoring and, by extension, water quality management, requires a sufficient infrastructure and capacity in terms of personnel, facilities, and logistical support to carry out monitoring from a "cost-of-doing-business" standpoint. Initial estimates of the proportion of a state water quality management program that should be dedicated to monitoring and assessment activities ranges from 15-20% in terms of staffing and funding (although this may vary from place to place). This also includes an equitable distribution of effort between chemical/physical and biological assessments and monitoring aimed at watershed scale assessment and planning in addition to the determination of status and trends. More precisely quantifying these needs is an important goal of ongoing efforts to more thoroughly analyze state programs in the Regions and across the U.S.

U.S. EPA Section 106/604(b) Monitoring Guidance
Revised monitoring guidance issued under sections 106 and 604(b) of the Clean Water Act became available in October 1994 (U.S. EPA 1994) following a lengthy review process. This, too, was largely an outgrowth of the ITFM process. The 1994 strategy lists five key objectives for surface water monitoring programs:

1) identification of impaired waters throughout the U.S.;
2) increasing the number of waters assessed (i.e., miles, acres, etc.) by utilizing cost-effective techniques and methods appropriate to the condition of and goals for specific water bodies;
3) achieving greater comparability in parameters and methods to enable improved data sharing and geographical comparability;
4) using in-common indicators to report on the condition of the nation's waters; and,
5) improving information sharing with both public and private organizations and in the context of watersheds.

These were further allied with the theme of revitalizing state monitoring programs and reporting core information in a comparable manner.

The overall goal of the 106/604(b) strategy is to develop and implement a surface and ground water monitoring strategy to help achieve the goals and objectives of the Clean Water Act (CWA) and related environmental initiatives. This requires the use of a mix of approaches that provide for the design, collection, measurement, storage, retrieval, assessment, and biological/ecological data necessary to efficiently and effectively meet the objectives of the CWA.

An acceptable monitoring strategy includes the following purposes:

1) determining status and trends;
2) identifying causes and sources of impairment and threats and ranking in priority order;
3) designing and implementing water quality management programs;
4) determining program effectiveness; and,
5) responding to emergencies.

Implementing a monitoring strategy consistent with these purposes in Rhode Island should support the development and attainment of water quality standards (WQS), TMDL/303(d) listing and development, RIPDES permitting, nonpoint source assessment and management, watershed and ecosystem protection, and the development and use of environmental indicators.

Environmental Indicators for Surface Waters

An environmental indicator is defined as ". . . a measurable feature which singly or in combination provides managerially and scientifically useful evidence of ecosystem quality, or reliable evidence of trends in quality." (ITFM 1995) This definition generally provides some of the underlying ground rules by which environmental indicators should be developed and used. Indicators should not only have a firm basis in science, but also have relevance to management needs and uses. This includes being expressed or translated to terms that are commonly understood and comprehended by non-practitioners. Environmental indicators, when used within their most appropriate roles, provide the means by which water quality management programs can successfully link management actions to environmental results. This approach is most successful when direct measures (as opposed to surrogates) are used to determine the attainment of goals such as those embodied in the designated uses defined within state WQS (NRC 2001).

A vision for environmental indicators can result in the institutionalization of indicator usage throughout the water quality management process. This should result in better environmental communication, forecasting, policymaking, program evaluation, and budget decisions. Furthermore, environmental indicators can become an integral component of environmental decision-making by supplementing administrative activity measures. Indicators have been accepted as objective measures of environmental quality, not necessarily as negative or positive sources of environmental information. However, to achieve the fuller use and integration of environmental indicators in accordance with the vision of having environmental measures drive management processes still requires some significant changes in which measures water quality management programs value as the most meaningful indications of overall success.

Consolidated Assessment and Listing Methodology (CALM) Process

In March 2003, U.S. EPA published *Elements of a State Water Monitoring and Assessment Program* (U.S. EPA 2003). Clean Water Act Section 106[e][1] and 40 CFR Part 35.168[a] provide that EPA award Section 106 funds to a state only if the state has provided for, or is carrying out as part of its program, the establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor and to compile and analyze data on the quality of navigable waters in the state, and provision for annually updating the data and including it in the Section 305[b] report. The *Elements* document recommends the basic elements of a state water monitoring program and serves as a tool to help EPA and the states determine whether a monitoring program meets the prerequisites of CWA Section 106[e][1]. This guidance is intended to provide a framework for states to clearly articulate their programmatic and resource needs and a reasonable time line for meeting those needs. EPA expects this effort will identify efficiencies to be gained through a holistic approach to program implementation. The *Elements* document further clarifies its intent as follows:

> "EPA and states need comprehensive water quality monitoring and assessment information on environmental conditions and changes over time to help set levels of protection in water quality standards and to identify problem areas that are emerging or that need additional regulatory and non-regulatory actions to support water quality management decisions such as TMDLs, NPDES permits, enforcement, and nonpoint source management. This information also informs EPA and state decision makers, the Congress, the public, and other stakeholders of the progress that the Agency and state partners are making in protecting human health and the environment. Without this information, it is difficult for EPA and the states to set priorities, evaluate the success of programs and

activities, and report on accomplishments in a credible and informed way (U.S. GAO 2000)."

As such, monitoring and assessment is clearly viewed as a program support function for all water quality management activities, not just reporting on status and trends.

EPA acknowledges that the variability in existing state programs is partially the result of requirements not being adequately articulated in the past. EPA also expects that state water monitoring programs will evolve over the next 10 years such that all states will have a common foundation in their monitoring programs that support state decision making needs. EPA expects that states will employ an iterative process to fully implement a monitoring program that reflects the *Elements* document, and will work with states to identify annual monitoring milestones. States should develop, over time, a monitoring program addressing the 10 elements summarized and described in the *Elements* document. The first of the elements is a long-term state monitoring strategy. This strategy will be state specific, be designed from the monitoring capabilities each state already has, and should include a timeline not to exceed 10 years to full implementation. EPA expects states to revise their monitoring strategies in FFY 2004 and begin to implement monitoring and assessment program improvements in FFY 2005.

The 10 elements are:

1) Monitoring strategy - a long-term and detailed implementation plan not to exceed ten years.
2) Monitoring Objectives – these are critical to the design of a monitoring program that is efficient and effective in generating data that serves management decision needs.
3) Monitoring Design - an approach and rationale for the selection of monitoring designs and sample sites that best serves the monitoring objectives.
4) Core and Supplemental Water Indicators - a tiered approach to monitoring that includes core indicators selected to represent each applicable designated use, plus supplemental indicators selected according to site-specific or project-specific decision criteria.
5) Quality Assurance - quality management plans and quality assurance program/project plans are established, maintained, and peer reviewed to ensure the scientific validity of monitoring and laboratory activities, and to ensure that state reporting requirements are met.
6) Data Management - an accessible electronic data system for water quality, fish tissue, toxicity, sediment chemistry, habitat, biological data, that timely data entry, data description, and public access standards.
7) Data Analysis and Assessment - methodologies for assessing attainment of water quality standards based on analysis of various types of data (chemical, physical, biological, land use) from various sources, for all waterbody types and all state waters are developed and used.
8) Reporting - timely and complete water quality reports and lists called for under Sections 305[b], 303[d], 314, and 319 of the Clean Water Act and Section 406 of the Beaches Act are published.

9) Programmatic Evaluation - the state, in consultation with its EPA Region, conducts periodic reviews of each aspect of its monitoring program to determine how well the program serves its water quality decision needs for all state waters, including all waterbody types.
10) General Support and Infrastructure Planning - the state identifies current and future resource needs it requires to fully implement the monitoring program strategy.

More detailed descriptions of each are available in the Elements document, which appears in Appendix C.

ADEQUATE MONITORING & ASSESSMENT

Some of the contemporary efforts to revitalize and better define the role of monitoring and assessment in state and federal programs (ITFM 1992, 1995; U.S. EPA 1994) and the emergence of workable, ecological indicator concepts (Karr and Dudley 1981; Karr et al. 1986) offer detailed frameworks that are the basis of what is termed here as "adequate" monitoring and assessment (Yoder 1998). The term "adequate" was deliberately chosen as a theme on which to base the template for evaluating individual state programs. It is an attempt to avoid usage of the term "minimum" which is what EPA has historically accepted. The term comprehensive was considered, although it can imply doing more than is necessary to achieve the basic goals and objectives outlined by the above referenced processes.

The baseline components of an adequate monitoring and assessment program were described in *Important Concepts and Elements of an Adequate State Watershed Monitoring and Assessment Program* (Yoder 1998; Appendix B). This document relied principally on the products and recommendations of the ITFM process, EPA's environmental indicators initiatives, and the experiences of selected states in operating consistent and adequately funded programs. In turn, these efforts have given critical foundational support to EPA's CALM process. It is important to recognize that achieving adequacy is about process as much as it is about data sufficiency. Successfully addressing the process issues are key to resolving the current deficiencies and inequities within and between state programs and questions about the reliability of state and national 305(b) reports and, by extension, 303(d) listings, nonpoint source and watershed management, and water quality standards.

This effort is intended to be complimentary with the goals of EPA's Comprehensive Assessment and Listing Methodology (CALM) process, which requires adherence to ten basic elements (U.S. EPA 2002). What is different here is the greater level of detail and specificity regarding specific roles and types of indicators and parameters and the tie-in to water quality standards, specifically designated uses and criteria. **It is a fundamental premise of this review that achieving the level of integration and detail implied by the contemporary efforts to improve and revitalize the role of ambient monitoring and assessment is contingent on actually executing an adequate approach to monitoring and assessment.** This includes the incorporation of essential, underlying concepts in addition to the *adequacy* of what is measured and monitored and over what spatial scales that it takes place. It also includes "infrastructure" issues such as staffing (including professional qualifications), facilities (e.g., laboratory, equipment, instrumentation), and support (e.g., data management, fiscal and administrative support).

Information from *adequate* monitoring and assessment is critical to the ability of the states and EPA to track, manage, and report on environmental quality and the important attributes that comprise and indicate that quality. Adequate information is needed to track trends and long-term patterns in environmental quality. It should be used to measure progress and decide where and how to focus water quality management resources. As such, adequate monitoring and assessment fulfills a key role in the management of surface water resources by driving the progression of events from initial problem identification and characterization through the making of management decisions in such areas as pollution abatement, planning, standards setting, and enforcement of laws and regulations. Just after passage of the 1972 CWA amendments, EPA regulations related the purposes of water monitoring directly to management goals and objectives (Figure 1). This provides a simple, yet comprehensive template on which the integration of monitoring and assessment and water quality management can be based.

Fundamental Objectives of Adequate Monitoring and Assessment Approaches

Function: Surface Water Assessment

- Collect and analyze baseline information.
- Establish cause/effect (causal associations).
- Compare results to criteria and goals (use attainment).
- Publish results - statewide, regional, site-specific.

Function: WQ Mgmt./Pollution Abatement

- Attainability analyses & criteria development (maintain WQS).
- Formulate/revise abatement strategies (TMDL development).
- Assess effectiveness of programs (WQ Management).

Function: Compliance Evaluation

- Monitor to determine compliance.
- Monitor to support enforcement.

after 40CFR Part 35

Figure 1. Objectives addressed by adequate monitoring and assessment programs (after 40 CFR Part 35).

An adequate monitoring and assessment framework includes not only what is measured, but also includes the spatial and temporal design of the data collection, the development of chemical, physical, and biological indicators, the processes used to assemble the data and information into meaningful assessments, and the organizational infrastructure within which it is accomplished. As such, this framework includes more than the mere collection of environmental data, but rather emphasizes the development of assessments based on that data. Guidance for developing an adequate monitoring and assessment process emanates primarily from the Intergovernmental Task Force on Monitoring Water Quality (ITFM) including their development of an integrated indicators framework (ITFM 1992) and a national strategy for water monitoring (ITFM 1995). This was followed by a description and outline of an adequate state watershed monitoring and assessment program by ASIWPCA and EPA (Yoder 1998). Simply stated, these latter efforts were aimed at not only revitalizing the role of monitoring and assessment in state and federal water quality management programs, but also accomplishing the long-held objective of integrating environmental information into management decision-making. This goes well beyond the often emphasized task of assessing status and trends in water quality nationwide and includes the much more difficult task of realizing integration with water quality management programs on a day-to-day basis. There are few examples of actually accomplishing a meaningful degree of integration. EPA and state water quality management programs are driven largely by administrative activities; their effectiveness are judged on the basis of administrative outputs (Figure 2). An important goal for EPA and the states should be to have the effectiveness of administrative programs determined by environmental *end outcomes* as measured by the information and indicators gained from adequate monitoring and assessment. Inherently embedded in achieving this goal is the adequacy of the essential components of water quality management infrastructure including water quality standards (WQS).

Key Concepts and Attributes

An important prerequisite to achieving an adequate monitoring and assessment approach is the incorporation of fundamental concepts in the development of the indicators and criteria that operationally determine the status of aquatic resources, designated uses, and the effectiveness of water quality management. These include a comprehensive approach to developing indicators and endpoints leading to the appropriately detailed and refined criteria and standards that guide management programs and measure their effectiveness. This approach addresses two of the principal issues identified by the National Research Council (NRC 2001) in their review of the role of science in the TMDL process; 1) adequate monitoring and assessment, and 2) appropriately refined and detailed water quality standards (WQS). Adequate monitoring includes the following key attributes and principles:

- Indicator development, position, and selection adhere to baseline theoretical concepts (i.e., Karr's five factors; NRC position of the standard [NRC 2001]);
- Use indicators that are cost-effective, yet comprehensive;
- Use indicators within their *most appropriate* roles (stress, exposure, or response);
- Indicators are directly tied to WQS via designated uses and numerical or narrative criteria;

Administrative Output vs. Resource Outcomes Based Management

	ADMINISTRATIVE OUTPUTS BASED	RESOURCE END OUTCOMES BASED
Goal:	**Program Performance** (Program execution)	**Environmental Performance** (Attain designated uses)
Measures:	**Administrative Actions** (Lists, Permits, Funding, Rules)	**Indicator End-points** (Biological, Chemical, Physical)
Results:	**Improve Programs** (Reduce backlogs, improve timeliness)	**Programs are Tools to Improve the Environment** (Admin. outputs evaluated by environmental end outcomes)

Figure 2. Administrative outputs and environmental end outcomes based water quality management. Adequate monitoring includes maturing towards an environmental end outcomes approach to water quality management.

- Measurement and data quality objectives (MQO/DQO) are defined by the WQS and are adequate to support accurate assessments and perform diagnostic functions;
- The program can adapt quickly to improved science and technology;
- The program is supported by adequate resources, facilities, and professionalism;
- The spatial design(s) matches the scale at which management is applied; and,
- The end product is an integrated assessment, not just the data.

Theoretical Concepts – Karr's Five Factors

One of the most important concepts developed over the past three decades is the recognition of how diverse human activities alter water resources and the extent to which those activities interact with topographical, geological, climatological, and biological differences among watersheds (Karr and Yoder 2004). Five features (or factors) of water resources that are altered by the cumulative effects of human activities (Figure 3; Karr et al. 1986; Karr 1991) are:

Energy source: includes changes in the food web including nutrients, organic material inputs, seasonal cycles, primary and secondary production, and sunlight.
Chemical variables: includes changes in chemical water quality including D.O., pH, turbidity, hardness, alkalinity, solubilities, adsorption, nutrients, organics, toxic substances, temperature, sediment, and their interactions.
Flow Regime: includes modification of flows including precipitation, seasonal patterns, land use, runoff, velocity, ground water, daily and seasonal extremes.
Habitat structure: includes alteration of physical habitat including bank stability, current, gradient, instream cover, vegetative canopy, substrate, current, sinuosity, width, depth, pool/riffle ratios, riparian and wetland vegetation, shorelines, sedimentation, channel morphology.
Biotic factors: includes changes in biotic interactions such as introductions of alien taxa, feeding, reproduction, predation, harvest practices and rates, diseases, parasitism, competition.

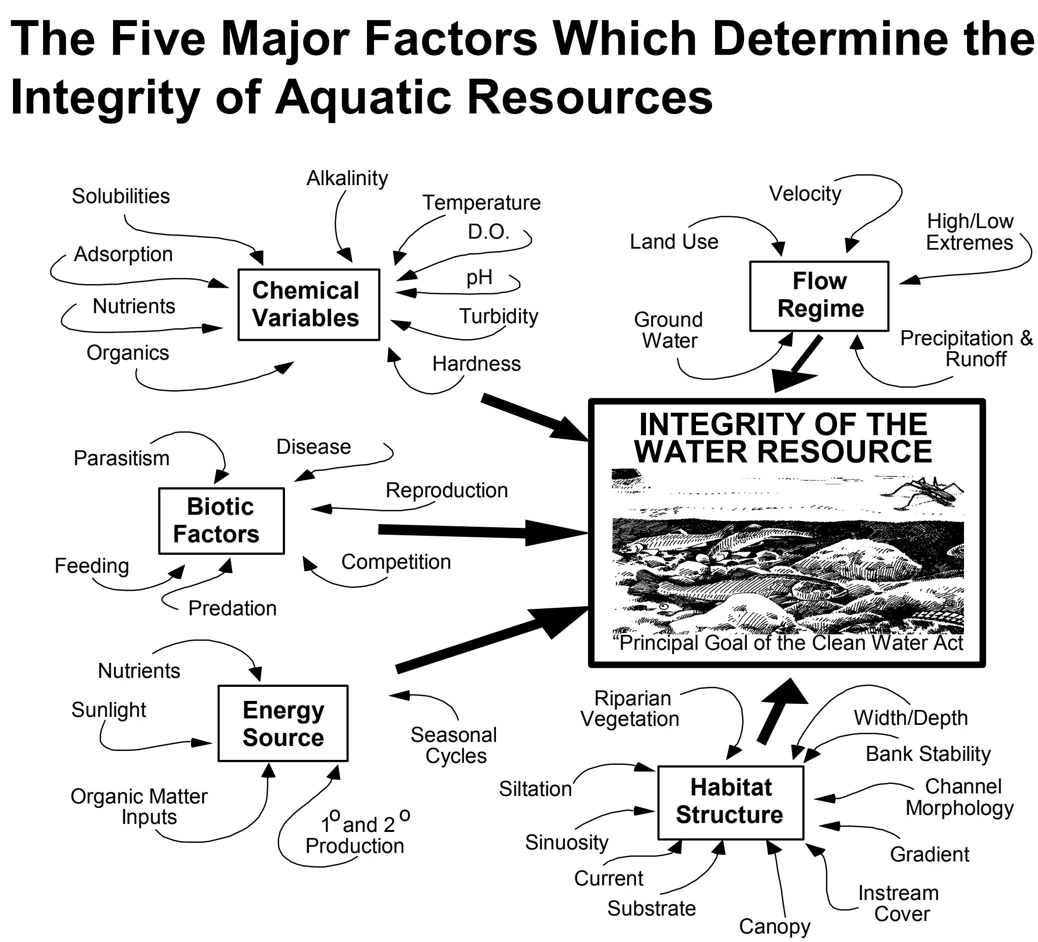


Figure 3. The five factors which determine the integrity of aquatic ecosystems with selected attributes of each (modified from Karr et al. 1986).

First, this model essentially defines the role and relevance of various chemical, physical, and biological attributes, some of which can be measured and used as indicators. It is the interaction of the attributes of the five features that produces the state or quality of a water resource. A measurable attribute of one of the five features by itself is seldom, if ever, a reliable indicator of the whole system or its state. However, measures that approximate the condition of the system as a whole are "positioned" closer to the endpoint of concern and hence function as more reliable indicators of condition (NRC 2001). Second, it provides a conceptual basis for choosing and using various chemical, physical, and biological indicators and measures within an adequate monitoring and assessment framework. An understanding of these interactions is an important guide to the selection of indicators for monitoring programs (Karr 1991; Yoder 1998). Third, it places biological measures in the role of an integrative response indicator that represents the synthesis of the interactions of the chemical, physical, and biotic attributes of a water resource. It provides a comprehensive signal to evaluate management actions that are inherently limited to measuring and controlling only *some* of the attributes. Lastly, it provides the basis for an additional model by which the sequence of stress and exposure can be validated by the observation of ecosystem response (Figure 4). Indicators of stress and exposure are routinely used in water quality management as design criteria and as compliance thresholds. Used alone, these may not achieve the desired result (i.e., restoration of an impaired designated use) or they may have unintended consequences, unless they are evaluated through the lens of biological response (Karr and Yoder 2004). It is the accurate measurement of biological response that is key to making this process work in actual practice, much more so than our ability to precisely measure stress or exposure. Stress and exposure criteria are determined through indirect means and as such function as surrogates for true biological response. This process offers a way to ground truth the application of water quality and other criteria in relation to the totality of the interactions that result in a biological response, but which cannot be accounted for on a parameter-by-parameter basis. Sequencing the management of stress through how it affects key attributes of the five factors through to the eventual biological response provides a process by which adequate monitoring and assessment can be used to validate the effectiveness of management actions to control stressors (Figure 4). The severity and degree of the biological response to these impacts is ultimately what is important, not the mere presence of an impact.

Cost-Effective Indicators

Cost-effective indicators are based on proven sampling methods and procedures that can be executed in a reasonable time frame and with reasonable effort. A commonly used description are measures that can be accomplished at a sampling site in a "few" hours, allowing several sites to be sampled each day, tens of sites per week, and hundreds of sites per year by a single field crew[1]. However, it includes indicators that are sufficiently developed, calibrated, and proven so as to ensure accuracy and precision. Accuracy includes the minimization of type I and II assessment error, i.e., the under or over estimation of status. It also includes the ability to extract meaningful diagnoses of observed responses using multiple chemical, physical, and biological parameters and measures, each used in their most appropriate roles as stressor, exposure, and response indicators.

[1] A field crew is a 2-4 person team dedicated to the collection of data for a specific indicator category (chemical, physical, biological).

Precision includes reliable estimates of chemical, physical, and ecological properties and that produce statistical rigor. Frequently, statistical rigor implies attention to sampling frequency and

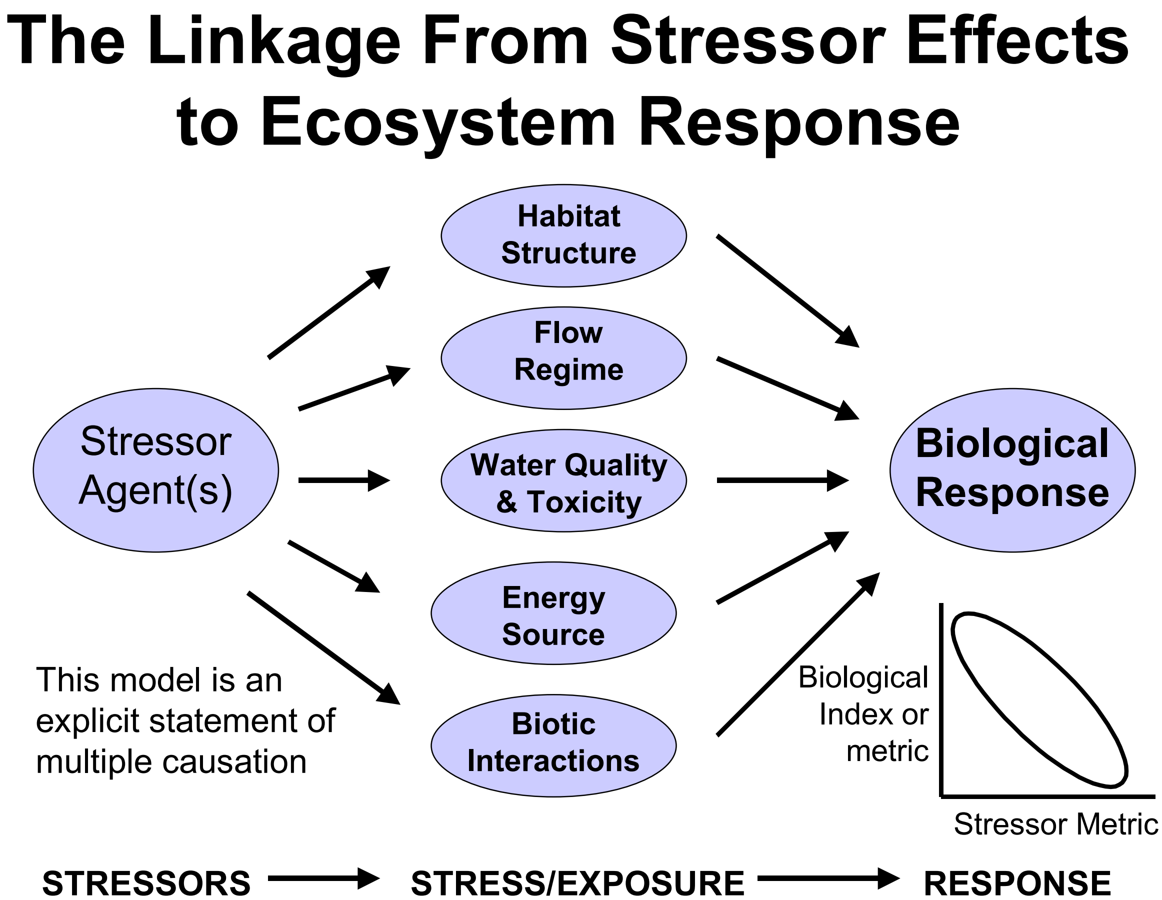


Figure 4. The linkage of the effect of stressors through Karr's five factors to the resultant biological response. The indicator roles represented by each category are identified in accordance with Yoder and Rankin (1998). After Karr and Yoder (2004).

reducing variance estimates. However, it is also important to understand the assessment capacity of each indicator and its position within the five factors that determine the integrity of a water resource (Figure 3). For aquatic life assessments, basing measures of condition on a biological indicator incurs the power of assessment inherent to the position of this indicator relative to the endpoint of concern, i.e., the health and well-being of the biota. Whereas attempting to estimate biological status using chemical or physical surrogates introduces the need to achieve statistically valid estimates for the parameter of concern, which may mean expending significant analytical and sampling resources. The use of the most direct measure of the endpoint of concern can in effect "leap frog" the statistical (i.e., sampling frequency) issues involved with surrogates and reduce the need for a higher degree statistical rigor for the surrogate indicator. In turn, the surrogates fulfill the role of stress and exposure indicators, which requires less statistical rigor and fewer samples. The trade-offs involved result in a more cost-effective monitoring and assessment program.

Another aspect of a cost-effective approach to monitoring and assessment is determining which indicators and parameters are measured in a given situation. The ITFM (1992) indicators process arranged indicators according to their role and value for first determining the state of the aquatic system and adding key parameters and indicators in accordance with specific designated uses and the complexity of the setting. The different types of measurements that comprise an adequate watershed monitoring and assessment approach consist of core and supplemental indicators and parameters (Figure 5). The **core** parameters are collected in *all* situations regardless of the assessment, regulatory, and management issues of concern. These represent the key, essential chemical, physical, and biological elements of water resource integrity (Karr et al. 1986) and reflect the most basic components of all aquatic ecosystems (living biota, habitat, and primary water quality). These fulfill the need to first characterize the condition and status of the baseline

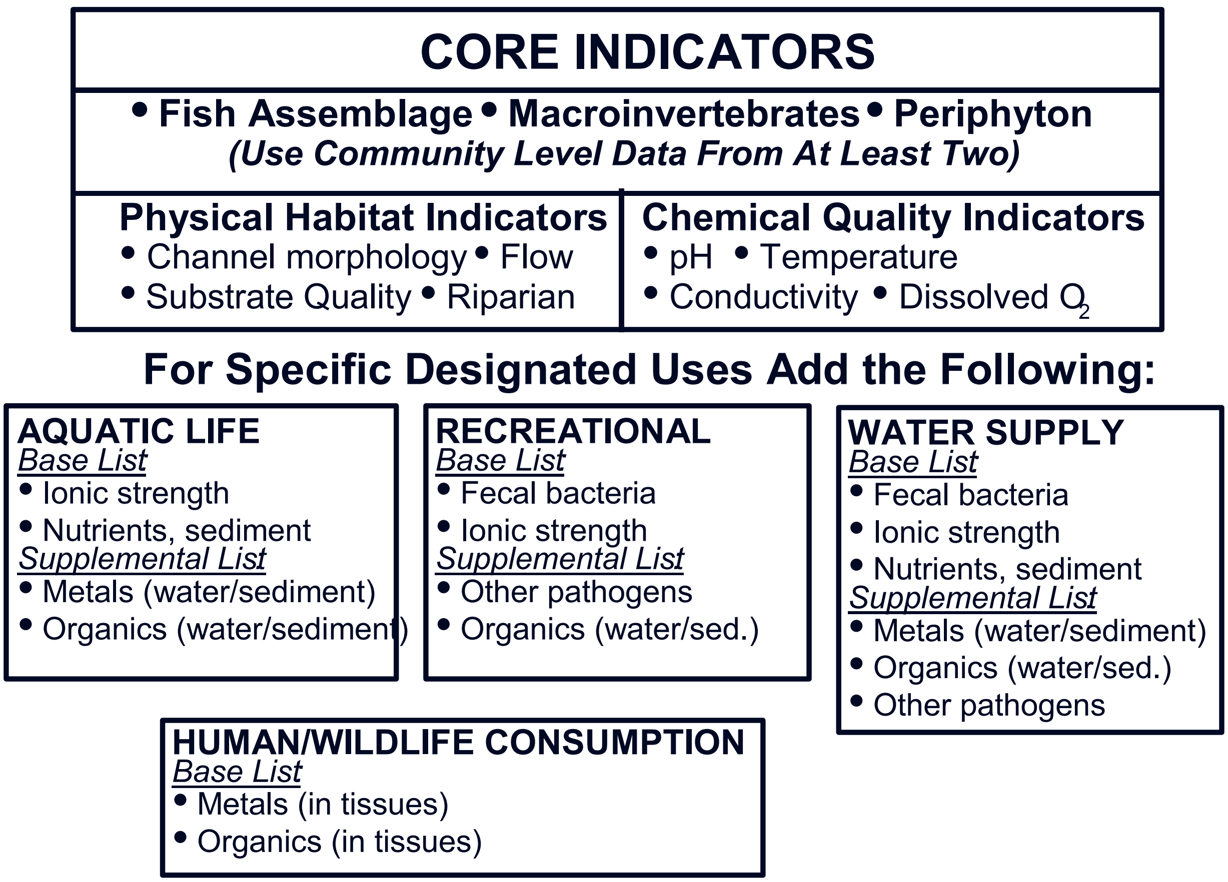


Figure 5. Core indicators and parameters by designated use to support an adequate watershed monitoring and assessment approach (after ITFM 1992 and Yoder 1998).

attributes. They are also measured directly in the field, thus providing rapid feedback to qualified analysts. Conventional approaches to monitoring and assessment attempt to formulate the assessment questions prior to deciding what to measure. However, adequate monitoring generates data and information about the core parameters in order to determine what the assessment questions should be, some of which cannot be sufficiently formulated without such data and information. Furthermore, they directly represent the fundamental attributes of aquatic ecosystems and, as such, comprise the baseline of adequate information needs for fundamental and recurrent assessment questions such as use attainment status, water quality standards compliance, use attainability analyses, delineation of associated causes/sources of threat and impairment, and basic reporting (305b report) and listing (303d listings). The **supplemental** parameters are added as the assessment needs (or questions) increase in diversity, quantity, and complexity of the setting. For example, a comparatively simple setting with one or two principal stressors may be adequately addressed by the core parameters plus the base list for aquatic life and recreation. As the complexity of a study area increases in terms of stressors and uses, the list will increase to include more of the supplemental parameters, the frequency of their collection and analysis, and the spatial intensity of the sampling design. This is a reasoned and stepwise selection of additional measurements, most of which require laboratory analysis. It can also include media in addition to the water column such as bottom sediments and organism tissues. All of this is dealt with in the initial planning of the watershed assessment and the development of a detailed plan of sampling.

Another dimension of cost-effectiveness is the capture of all relevant management objectives with the chosen suites of indicators. Table 1 relates indicator categories to classes of common water resource management program objectives. These may be addressed as part of the field sampling or accessed later in the analysis and reporting phases of the assessment process. These are critical components of the sequential analysis of the monitoring data and information, which relates designated use impairments to associated causes and sources. This approach also economizes sampling resources by scaling the intensity and complexity of the monitoring and assessment effort in accordance with the management issues to be addressed. This type of approach also allows for more flexible management responses that are attenuated by the information revealed about the environmental complexity of the setting, the quality of the aquatic resource, and the potential pollution problems encountered. Effective implementation of this process is improved through the experience and knowledge gained by conducting monitoring and assessment for many years and over a wide geographical area.

Indicator Discipline – Adherence to Indicator Roles

An important factor in achieving the cost effective approach just described is using chemical, physical, and biological indicators in their most appropriate roles as stressor, exposure, or response indictors. The accurate portrayal of the condition of aquatic resources depends on wider development and use of response indicators and adequate spatial monitoring designs conducted at the same scale of water quality management. Part of the solution to these challenges is to use indicators within their most appropriate roles. The EPA environmental Monitoring and Assessment Program (EMAP; U.S. EPA 1991) classified indicators as stressor, exposure, and response. Yoder and Rankin (1998) further organized the concept defining the most appropriate roles of parameters and measures when used in an adequate monitoring and assessment program.

Stressor indicators generally include activities and phenomena that impact, but which may or may not degrade or appreciably alter key environmental processes and attributes. These include point

*Table 1. Summary matrix of recommended environmental indicators for meeting management objectives for status and trends of surface waters (a boldface "**X" indicates** a recommended primary indicator after ITFM 1995; other recommended indicators are designated by a "√"). The corresponding EPA indicator hierarchy level (see Figure 6) is also listed for each suite of indicator groups.*

	Categories of Management Objectives					
	Human Health			Ecological Health	Economic Concerns	
Indicator Group	Consump-tion of fish/ shellfish	Public Water Supply	Recreation (swimming, fishing, boating)	Aquatic/ Semi-aquatic Life	Energy/ Transportation	Agriculture/ Forestry/ Mining
	Biological Response Indicators (Level 6)					
Macroinvertebrates		X	X	**X**		**X**
Fish	**X**	X	X	**X**		**X**
Semi-aquatic animals	X		X	**X**		X
Pathogens	X	**X**	**X**			X
Phytoplankton	X	X	X	X	X	
Periphyton				X		
Aquatic Plants		X	X	X	X	X
Zooplankton		X	X	X		X
	Chemical Exposure Indicators (Levels 4&5)					
Water chemistry	**X**	**X**	**X**	**X**	**X**	**X**
Odor/Taste	X	X	X			X
Sediment Chemistry	**X**	X	X	**X**	**X**	**X**
Tissue Chemistry	**X**	**X**		X	X	
Biochemical Markers	√	√	√	√		
	Physical Habitat/Hydrological Indicators (Levels 3&4)					
Hydrological Measures	X	X	X	**X**	**X**	**X**
Temperature	X	X	X	X	X	**X**
Geomorphology	X	X	**X**	**X**	**X**	**X**
Riparian/Shoreline	X	X		X	X	X
Habitat Quality			√	√	√	√
	Watershed Scale Stressor Indicators (Levels 3,4,&5)					
Land Use Patterns	X	X	X	X	X	X
Human Alterations	X	X	**X**	**X**	X	
Watershed Impervious-ness (% of watershed)			√	√		√
	Pollutant Loadings Indicators (Level 3)					
Point Source Loads	√	√	√	√		√
Nonpoint Loadings	√	√	√	√	√	√
Spills/Other Releases	√	√	√	√	√	√

and nonpoint source pollutant loadings, land use changes, and other broad-scale influences that most commonly result from anthropogenic activities. Stressor indicators provide the most direct measure of the activities that water quality management attempts to regulate. **Exposure** indicators include chemical-specific, whole effluent toxicity, tissue residues, and biomarkers, each of which suggest or provide evidence of biological exposure to stressor agents. Fecal bacteria also serve as exposure indicators and are used as surrogates for response where direct human response indicators are either lacking or their use would pose an unacceptable risk. These indicators are based on specific measurements that are taken either in the ambient environment or in discharges and effluents, either point or nonpoint source in origin are measures and parameters that reveal the level or degree of an exposure to a potentially deleterious substance or effect that was produced by a stressor event or activity. Chemical water quality parameters and the concentrations at which they occur in the water column fulfill this role. Water quality criteria for toxic substances are developed to indicate chronic, acute, and lethal exposures. Exceedences of these thresholds, either predicted or measured, provide design targets for planning and permitting and assessment thresholds for monitoring and assessment. Fecal bacteria fulfill this role as well, indicating the level of risk posed to humans and other animals by exposure to various levels and durations of potentially harmful pathogens. **Response** indicators are measures that most directly relate to an endpoint of concern, i.e., ecological and human health. They are most commonly biological indicators, e.g., aquatic assemblage measures for aquatic life uses and human health for recreational uses and are the most direct measures of the status of designated uses. For aquatic life uses the assemblage and population response parameters that are represented by the biological indices that comprise biological criteria are examples of response indicators. For other designated uses such as recreation and drinking water, symptoms of deleterious effects exhibited by humans would serve as a response indicator, albeit these might prove more difficult to develop and manage. Response indicators represent the synthesis of stress and exposure (re: Figure 4) and are commonly used to represent overall condition or status. The key to implementing a successful indicators and watershed approach that serves as a basis for developing a synthesized report card is to ensure that indicators are used within the roles that are the most appropriate for each. The inappropriate substitution of stressor and exposure indicators in the absence of response indicators is at the root of the national problem of widely divergent 305(b) and 303(d) statistics reported between the states (NRC 2001).

Historically, states have used surrogate approaches to measuring and determining the status of designates uses. For aquatic life uses, chemical criteria have been cast in that role. For recreational uses, fecal bacteria continue to fulfill that role. Yoder and Rankin (1998) define the former practice as an inappropriate substitution of stress or exposure indicators for response. Comparisons of biological and chemical assessments show that the latter leads to listing of water bodies as impaired when they are not (type I error) or not listing when they are impaired (type II error). Rankin and Yoder (1990) using data over a 10 year period in Ohio and the Oregon Department of Environmental Quality (D. Drake, personal communication) using data from the 1990s, both showed that type II errors are the most prevalent, leaving up to 50% of the impairments detected by biological assessments undetected and undiagnosed. In the case of recreational uses, the reality of fecal bacteria exceedences and human health risks needs to be better reconciled.

A process for assembling information from cost-effective indicators comprised of biological, chemical, and physical measures used in their most appropriate roles can ensure that pollution sources are judged objectively and on the basis of quantifiable environmental results. Such an approach simultaneously assures that indicators will be representative of the elements and processes of the five factors that determine water resource integrity (Figure 1; Karr et al. 1986). An indicators hierarchy developed by U.S. EPA (1995a,b) provides a sequential process within which indicators can be linked to support assessment and management responses (Figure 6). It offers a structured approach to assure that management programs are, if necessary, adjusted based on environmental feedback (see also Figure 2). A comprehensive ambient monitoring effort that includes indicators representative of key variables within the five factors which determine the integrity of the water resource is essential to successfully implementing a true environmental indicators approach. For this approach to be successful, ambient monitoring must take place at the same scale at which management actions are being applied.

This integrated framework relies on the hierarchical continuum of administrative and true environmental indicators. This framework was initially developed by U.S. EPA (1995a). The original framework included six "levels" of indicators as follows:

Level 1 - actions taken by regulatory agencies (*e.g.*, permitting, enforcement, grants);
Level 2 - responses by the regulated community (*e.g.*, construction of treatment works, pollution prevention);
Level 3 - changes in discharged quantities (*e.g.*, pollutant loadings);
Level 4 - changes in ambient conditions (*e.g.*, water quality, habitat);
Level 5 - changes in uptake and/or assimilation (*e.g.*, tissue contamination, biomarkers, assimilative capacity); and,
Level 6 - changes in health, ecology, or other effects (*e.g.*, ecological condition, pathogenicity).

In this process the results of administrative activities (levels 1 and 2) are followed by changes in pollutant loadings and ambient water quality (levels 3, 4, and 5), all of which leads to measurable environmental "results" (level 6). The process is multi-directional with the level 6 indicators providing overall feedback about the completeness and accuracy of the process through the preceding levels. While the U.S. EPA (1995a) hierarchy employs point source terms, it is adaptable to nonpoint sources and media other than surface waters. Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators (Figure 6) similar to that developed by the U.S. EPA Environmental Monitoring and Assessment Program (EMAP; U.S. EPA 1991). Stressor indicators include activities that have the potential to degrade the aquatic environment such as pollutant discharges, land use changes, and habitat modifications (level 3). Exposure indicators are those which measure the apparent effects of stressors and include chemical water quality criteria, whole effluent toxicity tests, tissue residues, bacterial levels, and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent (levels 4 and 5). Response indicators include composite measures of the cumulative effects of stress and exposure and include the more direct measures of biological community and population response that are represented here by the biological indices which comprise the Ohio EPA

Measuring and Managing Environmental Progress: Hierarchy of Indicators

Indicator Levels

1: Management actions

2: Response to management

__Administrative Indicators__ [permits, plans, grants, enforcement, abatements]

3: Stressor abatement

__Stressor Indicators__ [pollutant loads, land use practices]

4: Ambient conditions

5: Assimilation and uptake

__Exposure Indicators__ [pollutant levels, habitat quality, ecosystem process, fate & transport]

6: Biological response

__Response Indicators__ [biological assemblage indices, other attributes]

The "Health" Endpoint

Figure 6. Hierarchy of indicators for determining the effectiveness of water quality management and maintaining appropriate relationships and feedback loops between different classes of indicators (modified from U.S. EPA 1995a).

biological criteria (level 6). Other response indicators could include target assemblages (*e.g.*, rare, threatened, endangered, special status, and declining species). All of these indicators represent the essential technical elements for watershed-based management approaches. The key is to use the different indicators within the roles that are most appropriate for each.

The processes for sequencing and synthesizing environmental data and indicators serves as a foundation for reporting on status and trends at all levels (national, regional, statewide, or local). The disciplinary process just described should minimize both type I and type II assessment errors. Such errors are a concern in the integrated 305b/303d reporting and listing process, in which both type I and II errors have been extensively propagated (Yoder and Rankin 1998; National Resource Council 2001). The results of these errors are waters that are not impaired are identified as needing corrective actions (type I error) or waters that are truly impaired are overlooked altogether (type II error). While this may be the most "visible" issue at present, the impact of such assessment errors can adversely affect other water quality management program areas. The process by which the basic data and information on which indicators are developed and used must be integrated at the outset, not as a "tack-on" at the end of the process. Bringing a more consistent and scientifically robust approach to indicators development and usage should lead to the correction of such errors and foster better policy and management outcomes as a result.

Key Indicators Are Tied to WQS - Designated Uses and Criteria
Water quality standards (WQS) establish the essential framework for developing measurable endpoints and criteria for deriving restoration and protection benchmarks. They consist of two parts – a designated use and criteria intended to protect and measure attainment of the designated use. They are used as targets for developing management strategies to achieve restoration and protection (e.g., wasteload allocations, TMDLs, BMPs, etc.) and for measuring the relative quality of water and aquatic ecosystems. Obviously, the more that WQS account for regional variability and characteristics inherent to the aquatic ecosystems of a region, the more relevant and accurate are assessments of quality and management strategies designed to achieve restoration and protection goals. WQS are an absolutely fundamental issue of adequate monitoring and assessment and the linkages between the two must be recognized (NRC 2001). States widely employ non-specific, general uses, which essentially represents a one-size-fits-all approach to designating and assessing surface waters. For example, states designate waters for the "protection and propagation of fish and aquatic life" of other general descriptions such as "cold water fishery". Such uses are not specific enough to foster the development of the more detailed criteria and indicators that are needed to address many of the deficiencies identified by the General Accounting Office (GAO 2000, 2003b) and NRC (2001). Furthermore, the use of direct biological measures and criteria is viewed as essential to making refined uses work. A few states (e.g., Maine, Ohio, Vermont) have developed refined use designation frameworks that are supported by numeric biological criteria and these have been extensively described elsewhere (Courtemanch 1995; Yoder and Rankin 1995a; Yoder 1995). This has given rise to the biological condition gradient framework, which has been under development and testing by U.S. EPA (Figure 7) in support of the development of a national process for tiered aquatic life uses.

Water quality criteria are largely expressed as chemical pollutant concentrations and sometimes as narrative descriptors. As such, they function as indirect surrogates for the endpoint described by a designated use. The designated use is a description of a desired state or set of attributes for a waterbody and the criterion is a measurable indicator that is a surrogate of use attainment. A criterion occupies a position at any point along the sequence of stress, exposure, and response (Figure 8). The NRC (2001) described this as the "position of the standard" and concluded that a criterion that is positioned closer to the designated use is a more accurate indicator of that use. In addition, the more precisely the designated use is stated, the more accurate the criterion will be as a result. Karr and Yoder (2004) modified the original figure to show its consistency with the previously described stress, exposure, and response roles of indicators. It provides a way to relate different types of criteria (chemical, physical, biological) and how to sequence each along a causal chain of events such as that portrayed by the hierarchy of indicators. Both the appropriate roles of indicators and the hierarchy for sequencing them along a causal chain of events are embedded in Figure 8. Including adequate representatives of each indicator role and their development and calibration in a state's WQS institutionalizes their usefulness to water quality management.

Data and Measurement Quality Objectives

Data (DQO) and measurement quality objectives (MQO) determine the level of detail and analysis that is required in support of an indicator or parameter. Frequently, these are defined by the state's WQS, either directly or implicitly and these comprise an important determinant of the

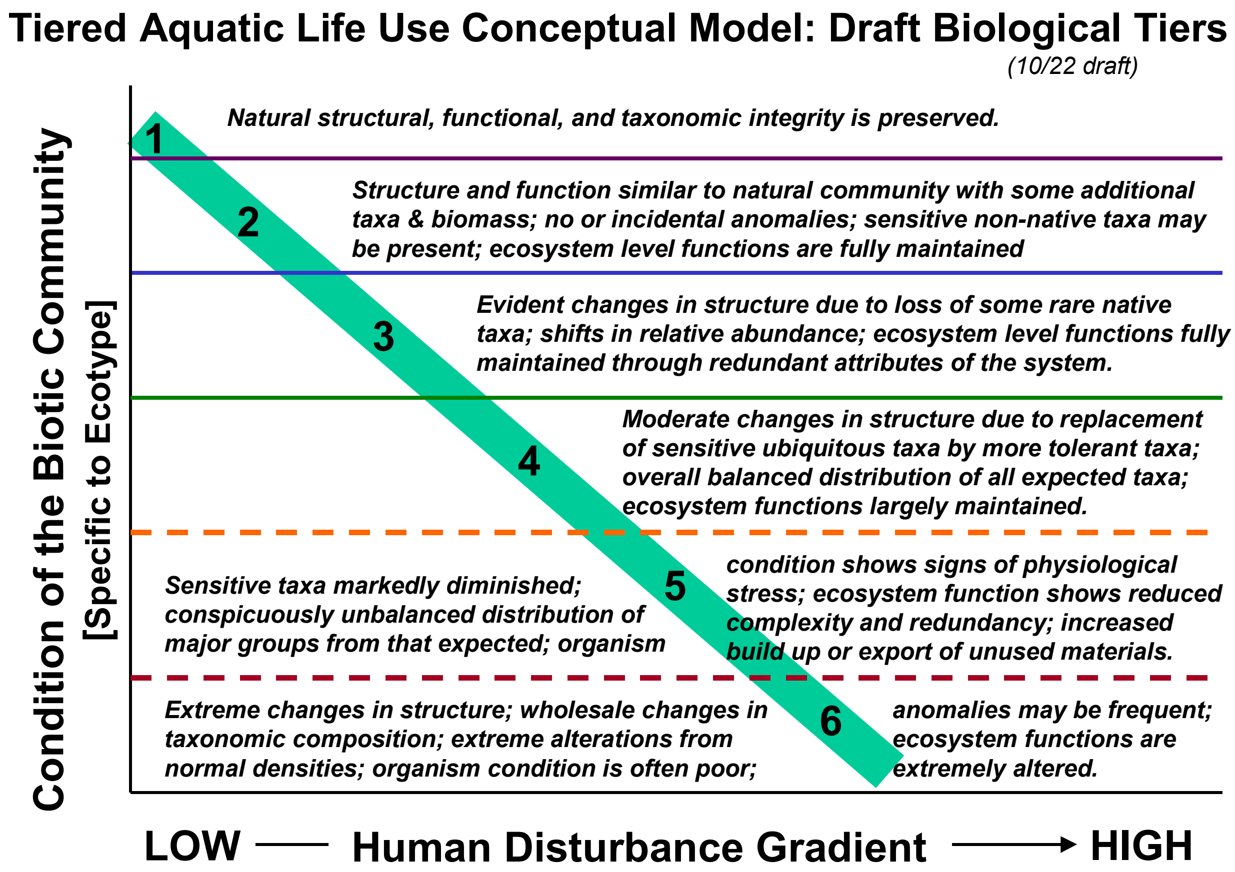


Figure 7. Refined aquatic life use conceptual model showing a biological condition axis and descriptive attributes of tiers along a gradient of quality and disturbance (U.S. EPA, Refined Aquatic Life Uses Working Group, 2001).

accuracy of assessments produced by a monitoring and assessment effort. For example, if a pollutant criterion is set at a concentration of 10 ug/l, then sampling and analytical methods that ensure detection to at least that concentration will be required. As such, the 10 ug/l criterion serves as the data and measurement quality objective. Furthermore, for many parameters it will be necessary to measure below the criterion threshold as there will be management issues of interest at lower levels. An example is defining reference condition for individual pollutants, which will require knowledge of the range of occurrence from minimum detection limit up to the criterion. For biological assessments, the issue includes how samples are obtained (effort, gear selectivity), how they are processed (subsampling, handling, preservation), how they are enumerated and identified (level of taxonomy), and the attributes that are recorded (species, numbers, biomass, anomalies). This illustrates both the qualitative and quantitative aspects of this issue. In biological assessment, taxonomic resolution is a key quality objective, as this not only determines the power of the assessment tool, but the diagnostic capabilities as well (Yoder and Rankin 1995b; Yoder and DeShon 2003). DQO/MQO can be governed by methods and protocol documents, but are much less ambiguous and debatable when they are codified in the state's WQS. Data and measurement

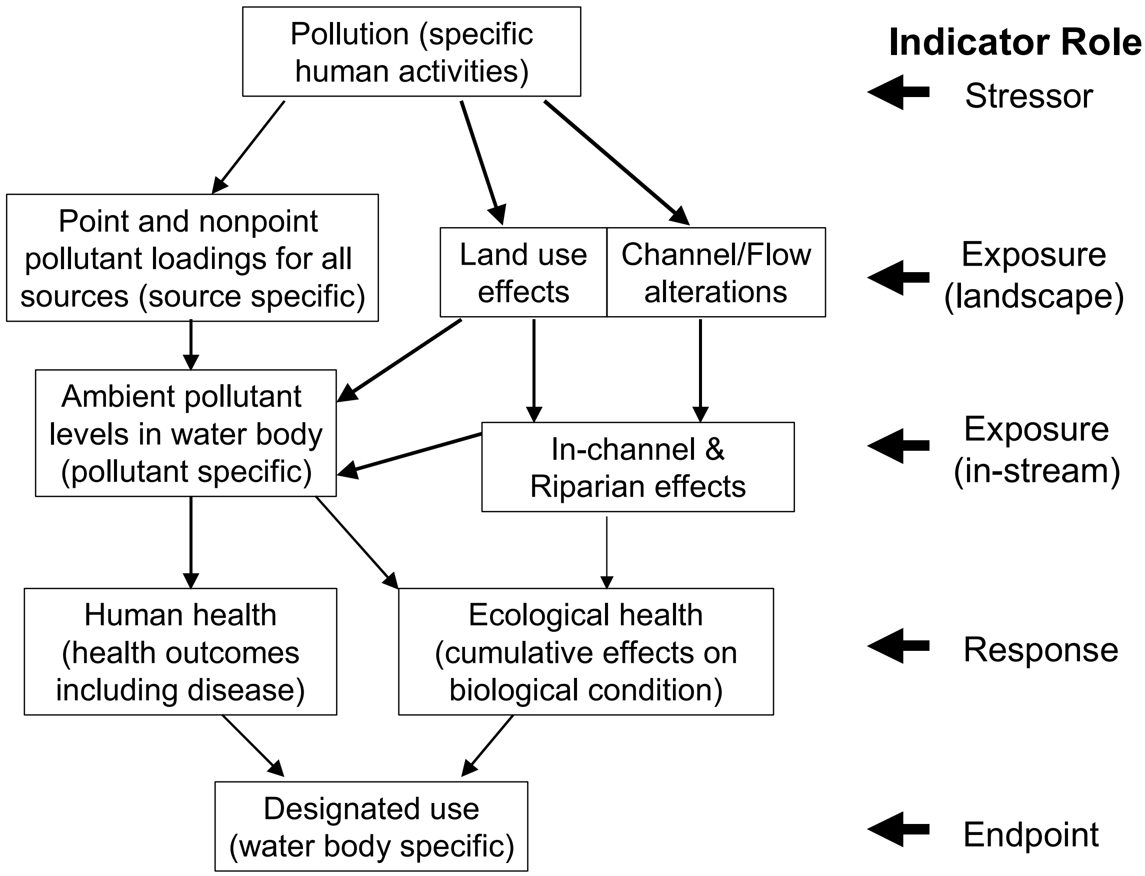


Figure 8. Position of the criterion (stressor, exposure, or response) illustrating the relationships between human activities, specific types of criteria, and designated uses that define the endpoint of interest to society (modified from NRC 2001). Their parallel roles as environmental indicators for each category is listed on the right. Arrows indicate directions and interrelationships along the causal sequence of stress, exposure, and response.

quality objectives inherently determine the overall capabilities of a monitoring and assessment program to accurately detect, quantify, and diagnose environmental status.

Strategic Issues

Adequate monitoring and assessment is an inherently strategic process. To fully realize the benefits of such requires an understanding of the multiple uses of the information in the management of water resources. A fundamental tenet of adequate monitoring and assessment is that the same set of core resources, methods, standards, data, and information should support multiple program management needs (Figure 9). It also requires a commitment to program maintenance and upkeep (i.e., maintenance of adequate resources, facilities, and professionalism) over the long term. Professionalism includes the qualifications of the monitoring and assessment personnel and their ability to carry out all tasks, including data analysis and the sequencing and interpretation of multiple indicators. Several of the indicators require specialized expertise in terms of data collection, field observations, laboratory methods, taxonomic practice, and data analysis and interpretation skills. Thus the professional qualifications of the personnel who execute and manage a statewide program is a pivotal issue.

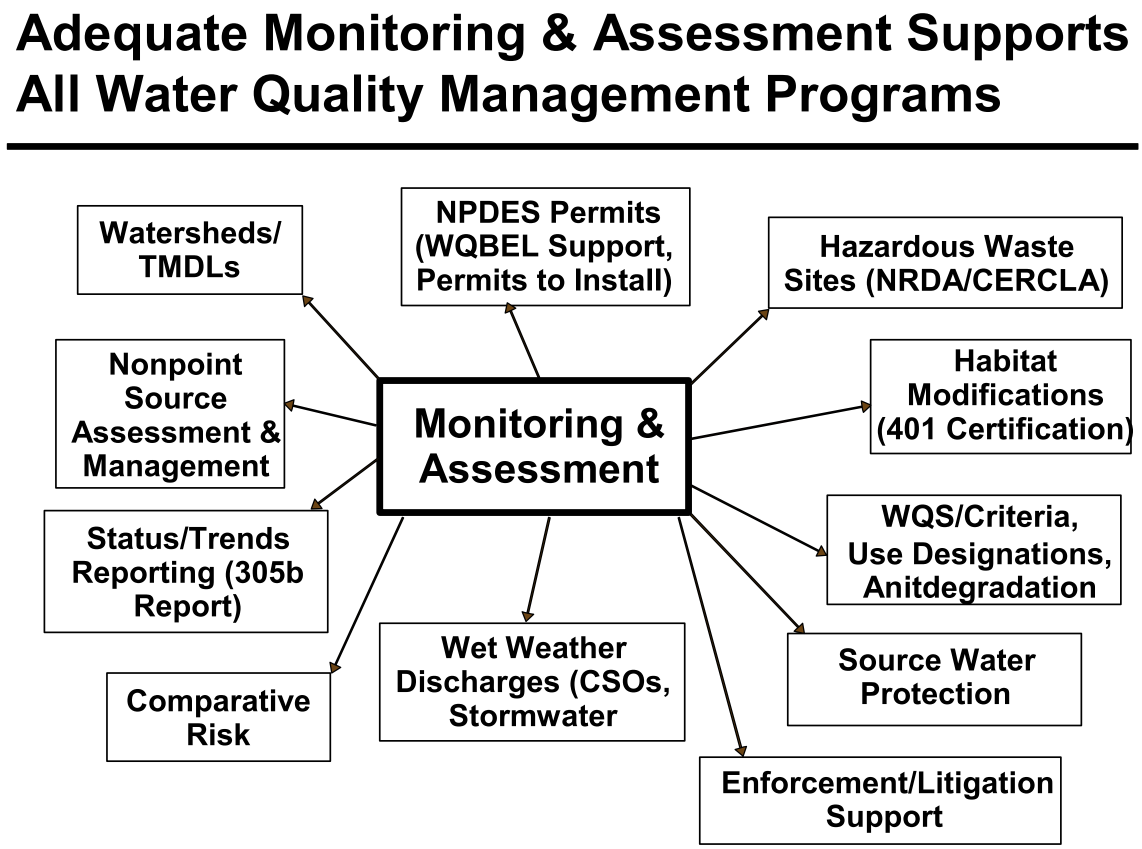


Figure 9. Adequate monitoring and assessment should be capable of supporting multiple program support needs with the same core base of indicators, parameters, and designs.

Two important functions of adequate monitoring and assessment include the functional support provided to individual management programs. The first includes tasks such as determinations of status at multiple scales, use attainability analyses, supporting the management of specific sources, and providing information to guide watershed planning and restoration processes (Figure 10; upper tier). The second is that of providing "strategic support" via the systematic accumulation of data, information, knowledge, and experience across various temporal and spatial scales (Figure 10; lower tier). This includes resources devoted to such tasks as sampling and maintenance of reference sites for determining regional reference condition and developing reference condition and benchmarks for key biological, physical, and chemical indicators and parameters. Many contemporary management needs are not well supported by conventional approaches to water

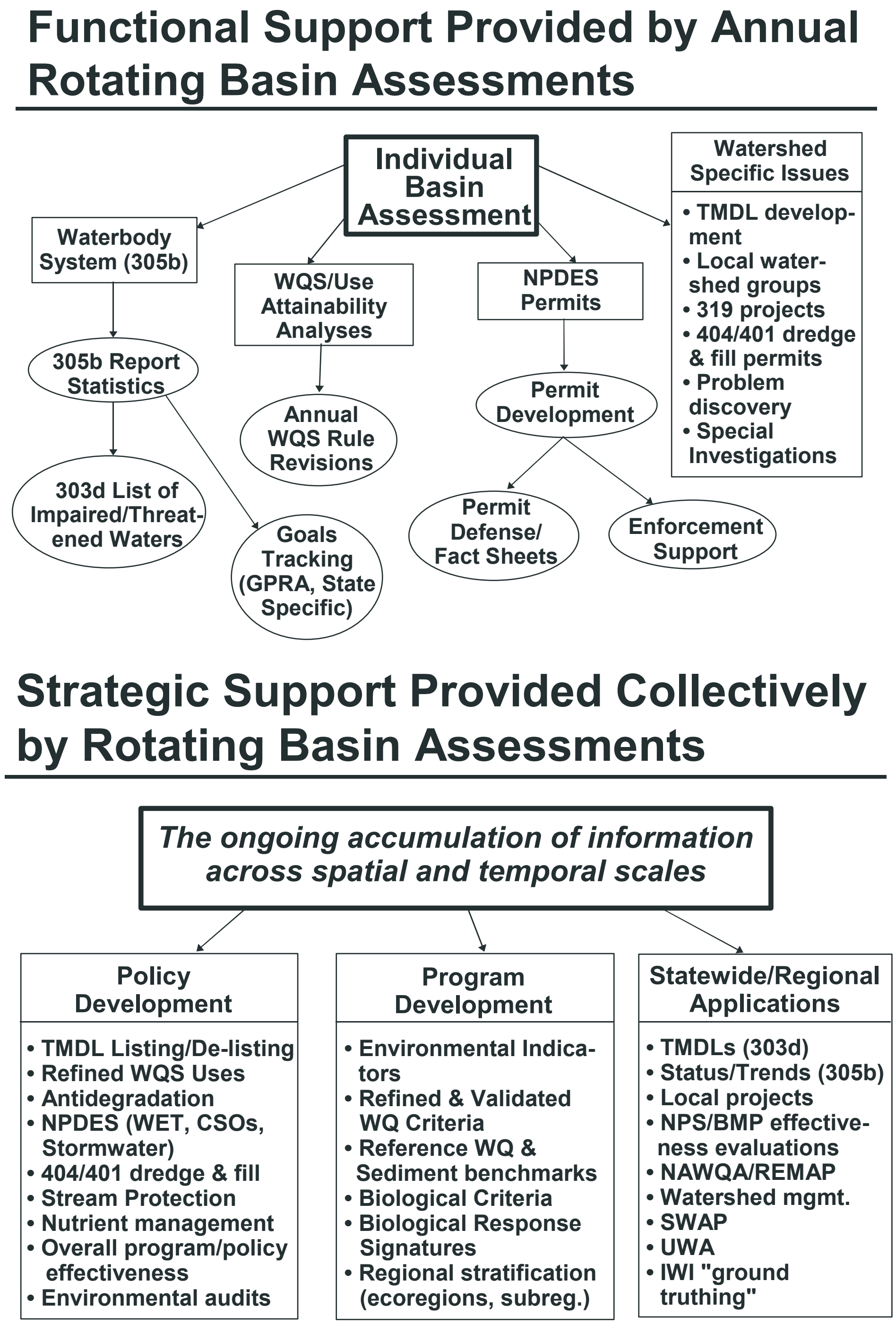


Figure 10. Examples of water quality management program support routinely provided by adequate monitoring and assessment at the watershed level (upper panel) and as a baseline support function delivered by routine monitoring over time (lower panel).

quality criteria and modeling, thus new ways of developing and applying benchmarks and criteria are needed. Developing criteria for nutrients and clean and contaminated sediments are examples. Other issues such as urbanization and habitat concerns will require landscape and riparian level indicators and objectives. All require robust spatial and temporal datasets. Coupled with this is the need to conduct ongoing applied research and exploratory data analysis with the monitoring program datasets, including the aggregate experience of the program. The ongoing accumulation of data, information, and assessment across different spatial scales provides both the datasets and the assessment experiences. This comprises the strategy for delivering the criteria and benchmarks that will not be delivered by the conventional approach to developing national water quality criteria.

Finally, the recognition that the most important product of adequate monitoring and assessment is the assessment, not just the data, is critical to achieving success. Data by itself has limited usefulness to environmental decision-making unless it is converted to useful information. This means having decision criteria and benchmarks fully integrated into the monitoring and assessment program. It also means adhering to the indicator sequencing and linkage processes that were previously described and most importantly, using indicators within their most appropriate roles. An integrated assessment should serve the needs of multiple programs by the same set of assessments, without the need to generate new or different datasets for each and every management issue.

MONITORING DESIGN OPTIONS

The design of monitoring and assessment incorporates the mosaic of chemical, physical, and biological indicators, their development, calibration, and measurement, and the spatial and temporal scales over which each is measured. In terms of how this has changed during the past four decades, Table 2 shows the important attributes and descriptors of these key elements that comprise an adequate approach to monitoring and assessment. The types of designs emphasized in the 1960s and 1970s include a primary reliance on fixed stations, upstream/downstream comparisons, a reliance on single control sites or paired watersheds, pass/fail assessments, and general designated uses that acted as goals for abatement programs. That approach is now being replaced by whole watershed assessments, performance expectations based on regional reference condition, stratified survey designs, proportional assessments, and tiered or refined uses that incorporate both regional and ecological realities and expectations. The latter approach is much more able to demonstrate results and phenomena at ecologically meaningful scales and which incorporate the broad spectrum of human disturbances. As such, this type of monitoring is not only better able to produce more refined goals and criteria, but foster a better integration of important chemical, physical, and biological factors into decision and policy-making.

Table 2. Comparison of key attributes and characteristics of monitoring and assessment issues and trends in indicator development and use, condition assessment, and spatial design over the past four decades.

Attribute/Characteristic	"Old" Technology	"New" Technology
Spatial Design	Fixed stations, paired watersheds	Whole watersheds (11-14 digit HUC scale)
Assessment Design	Upstream/downstream, Single control sites; Pass/fail	Regional Reference Sites/Condition; Proportional assessments
Primary Indicators	Chemical parameters "Pollutant focused"	Biological Criteria "Resource focused"
Assessment Criteria	General goals	Refined/Tiered goals
Integration	Little or none	Multiple indicators, Sequential process
Data/Design Standards	Few or none Low/no standardization	Well defined, systematic, standardized

The "new" technology emphasizes a reliance on integrated assessments casting chemical, physical, and biological indicators in their most appropriate roles as stressor, exposure, or response indicators. It also is governed by standards of data and design quality where the demands of decision-making and the need for accuracy in the resulting assessments are supported by producing data of a sufficient quality so as to minimize assessment errors.

An important and fundamental premise of adequate monitoring and assessment is that it be conducted at the same spatial scale at which management is being applied. This simple premise allows management policies, approaches, and activities to be linked more closely to their environmental consequences as revealed by monitoring and assessment. For example, management of point sources includes concerns for impacts to the immediate receiving waters, the severity and extent of any extended impacts, and the collective impacts of multiple and overlapping sources. In the immediate receiving waters, a common concern is acute toxicity in the mixing zone that results in lethality or avoidance. Thus sampling in the receiving waters should not only include the appropriate mix of indicators, but sampling targeted to the mixing zone itself. The determination of impacts beyond the mixing zone is determined by sampling at intervals downstream so as to allow the measurement of the severity and extent of any adverse impacts, i.e., how extensive are departures from indicator goals or thresholds and how far do these extend downstream? The collective impact of different types of point sources can then be accomplished by aggregating these types of data over larger regional and even statewide scales, serving the need to determine if there are patterns and phenomena associated with specific types of sources. In this case example, an intensive survey design served as the spatial design.

Several spatial designs are available to support the multiple needs of water quality management programs. The key is to develop and use a design that satisfies *all* program needs in the most cost-effective manner. Cost-effectiveness in this case means paying attention to the timeliness needs of the program in addition to the spatial comprehensiveness of the monitoring and assessment. Five general sampling designs are described and include examples in which they have been applied for biological assessment, as follows:

Option 1 – Fixed station design;
Option 2 – "Synoptic" design;
Option 3 – Intensive survey;
Option 4 – Geometric design; or
Option 5 – Probabilistic design.

In the following discussion of the attributes, advantages, and disadvantages of each design, the focus is on lotic surface waters and the watershed. While some of these designs have been used to support lake and reservoir, wetland, and estuarine monitoring programs, the emphasis has been on watershed units, specifically rivers and streams. It has been suggested that all waterbody types within a watershed unit should be addressed and would seem workable for lakes/reservoirs and wetlands. This would foster a more integrated and complete assessment of each watershed unit. A different approach for larger water bodies may well be needed, but obvious linkages should be made to watershed based efforts whenever possible. Given these diverse needs and issues, it is certain that more than one design will be needed to support a comprehensive and adequate monitoring and assessment program, a fact recognized by EPA's CALM guidance (U.S. EPA 2003).

Option 1 – Fixed Station Sampling Design

Fixed station monitoring networks have been employed by state and federal agencies for decades, some dating back for more than 60 years. The most notable of these networks are the National Ambient Water Quality Monitoring Network (NAWQMN), principally operated by the states in compliance with the program requirements of U.S. EPA under the Clean Water Act (CWA). The U.S. Geological Survey operates the National Stream Quality Accounting Network (NASQAN) which serves much the same function and purpose of NAWQMN and coincides with USGS flow gauging stations. Other fixed station networks exist and include state monthly and quarterly water quality stations, Great Lakes tributary stations, and a few select programs operated by industries and municipalities. What all of these networks have in common is that the stations are established at reasonable access points where water samples can be quickly obtained and fixed sampling equipment can be established. They are sampled at regular intervals (monthly, quarterly, or with continuous monitoring equipment) and their spatial density is comparatively sparse. In addition, the measures are predominately chemical/physical with a prescribed list of parameters to be analyzed. For example, most monthly sites are sampled for basic field parameters such as temperature, dissolved oxygen (D.O.), pH, and conductivity, and a suite of conventional and demand parameters such as BOD, suspended solids, primary nutrients, and ionic strength parameters. Toxicants such as heavy metals and pesticides are sampled either less frequently (i.e., quarterly) or at specific sites where these pollutants are an issue of concern.

In the early 1970s, EPA initiated a pilot biological program in which biological samples were collected from a subset of the NAWOMN stations. This program included macroinvertebrates and periphyton, with some states adding fish tissue analyses. The goal of this program was to provide real world water quality data to determine status and trends in relation to the water pollution control programs of the day. The monthly sampling design was implemented to account for seasonal variations both natural and human induced. The quarterly sampling of toxic parameters was the result of cost limitations. Biological sampling was added later as the interest in biological assessment was just beginning. In real operational terms, this program fell short in delivering the type or quantity of information that was needed to not only determine status and trends, but to support day-to-day water quality management. In many states, fixed station networks have been reduced in terms of the number of locations sampled, but they have not been completely abandoned. Many states have maintained a skeletal network primarily for the purpose of maintaining the long period of record and because of a continuing program requirement by U.S. EPA. An example of an ongoing network in Indiana appears in Figure 11.

In terms of status and trends and how this relates to determining water quality management program effectiveness, there are some good examples of the value of fixed station data. Figure 12 shows results for chlorides and pH from a long term chemical monitoring station in the Salamonie River (Indiana) and the results of a seasonal Kendall test for any trends. IDEM performed

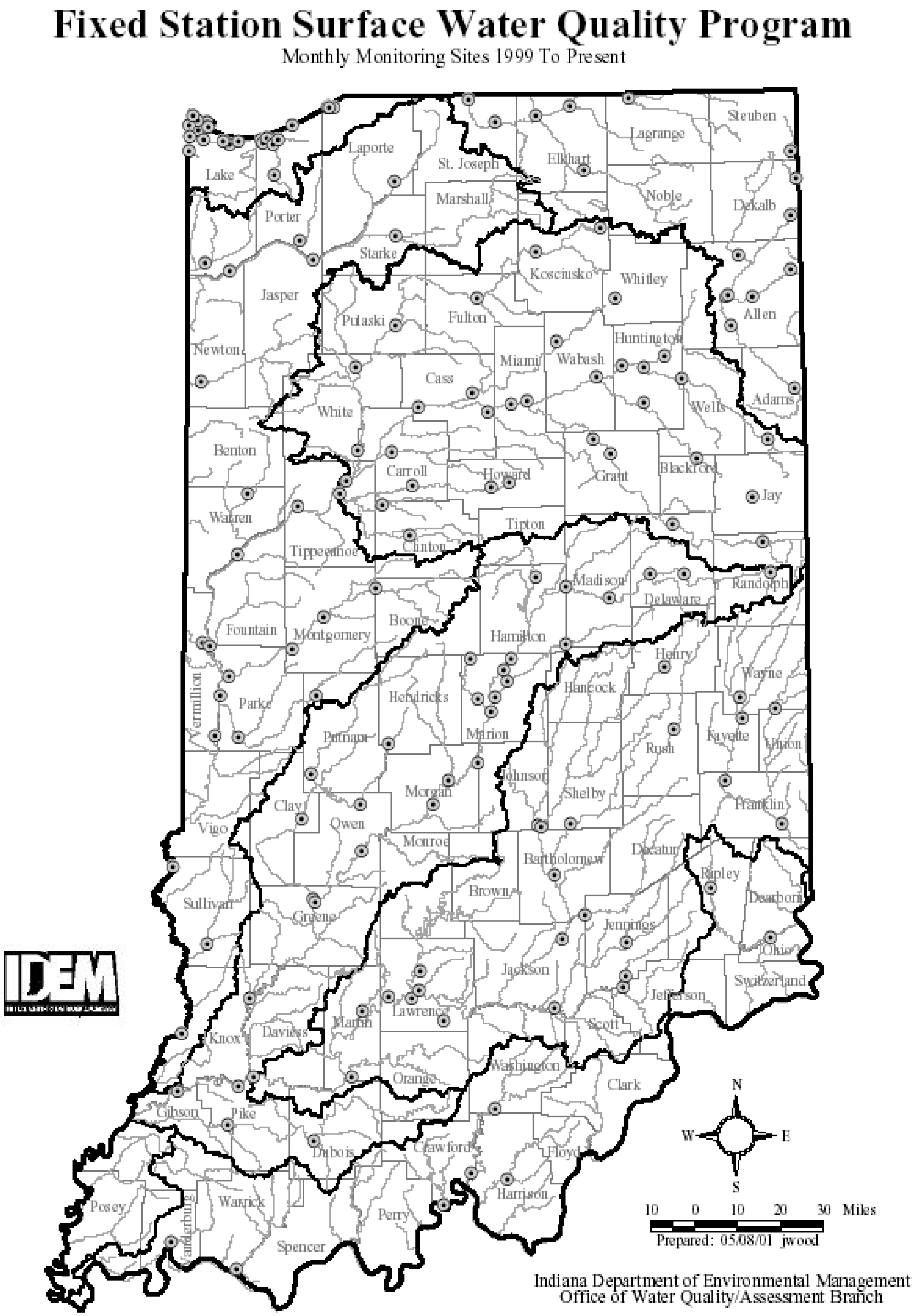
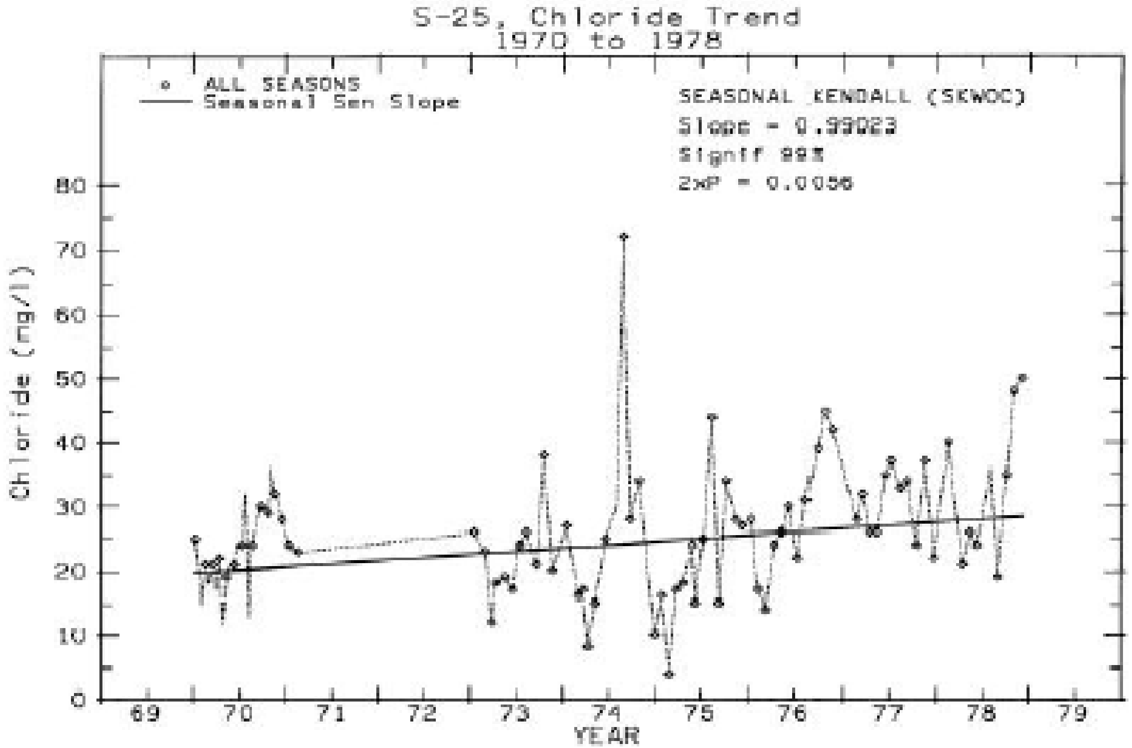


Figure 11. An extensive network of fixed station monitoring sites operated by the Indiana DEM.



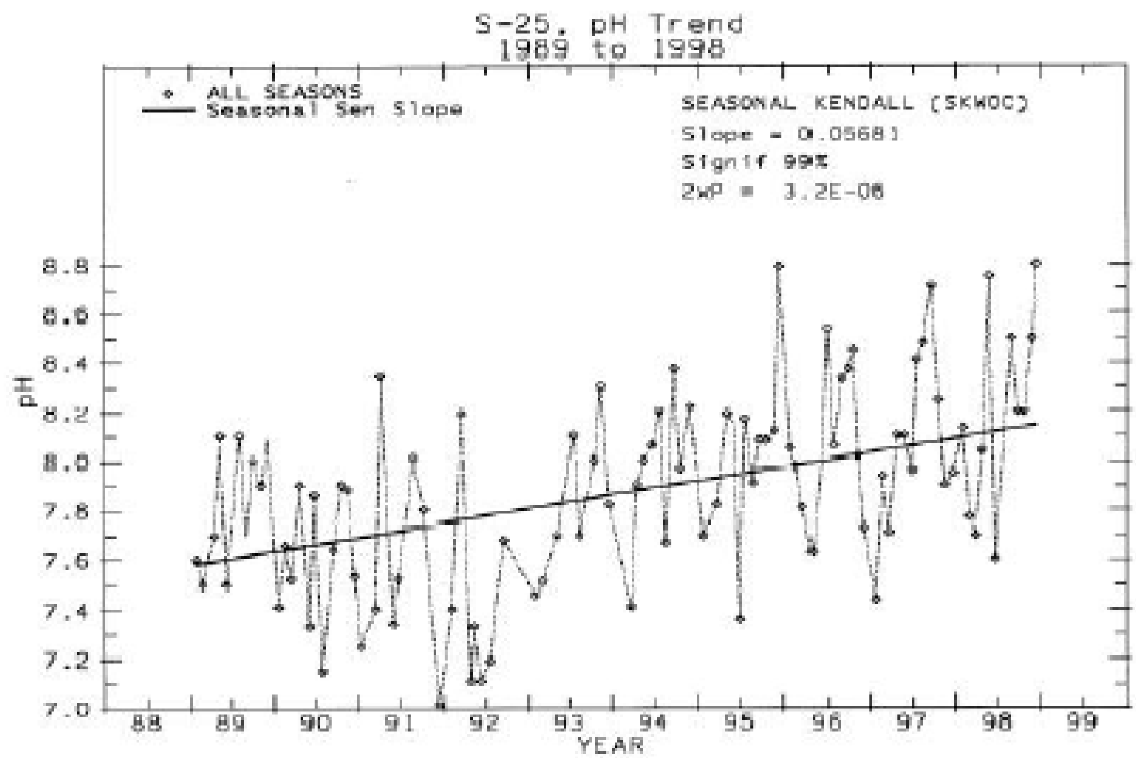


Figure 12. Example of fixed station data analysis showing results of a seasonal Kendall test of chlorides (1970-1978) and pH(1989-1998) trends in the Salamonie River at Lancaster.

approximately 1500 of these tests on their fixed station database (IDEM 1998) and they are used to assess trends in key parameters and spur management action when necessary. Their value thus far has been to demonstrate improvements in formerly grossly polluted waterbodies, but they fulfill an important baseline need of water quality management by maintaining awareness of changes in baseline variables through time.

Biological data can also be used to portray similar changes through time and completes the stress-exposure-response sequence. Figure 13 shows the changes over a nearly 25-year period in the lower Cuyahoga River downstream from Akron, Ohio for the fish and macroinvertebrate assemblages as represented by the Ohio IBI and ICI (Ohio EPA 1987). Again, the improvements documented in a grossly polluted water body at a fixed location some 18 miles downstream from the Akron municipal wastewater treatment facility corresponded to reductions in loadings of ammonia-N, BOD, and the later abatement of acute and chronic toxicity, in the effluent. Biological data used in this manner yields the advantage of synthesizing the cumulative effects of multiple stressors and pollutants through time. However, the fixed station being located 18 miles downstream from the discharge leaves the condition of the river in that distance unanswered.

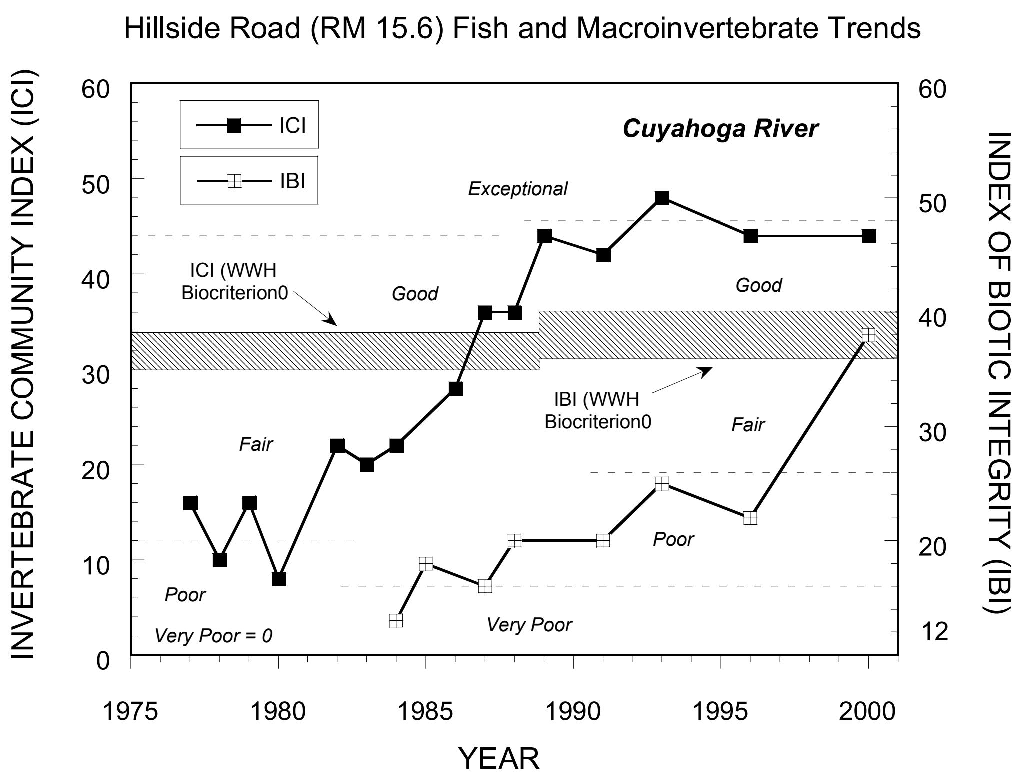


Figure 13. Temporal changes exhibited by the fish and macroinvertebrate assemblages at a single location in the Cuyahoga River, 1977-2000, in terms of the IBI and ICI.

The preceding examples illustrate a principal strength of the fixed station design - the production of long-term datasets. Once such networks are established they represent a unique resource in terms of the period of record and there is an understandable desire to continue sampling such sites. A fixed station sampling network also simplifies site selection and streamlines the process of sampling as site locations become familiar over time. A depth of understanding may also develop for these sites regarding the relationships between biological processes, natural variability, and human activities. Major weaknesses associated with this approach, when used alone, include a lack of spatial continuity, fixed distances from specific sources of pollution and other forms of degradation, and a comparative inability to extrapolate the results at a single site to unsampled areas. Sites are often selected for ease of access, proximity to road crossings, or proximity to a gauging station. Selection on the basis of convenience can lead to biased results, that is, assessments that are relevant only to the sites sampled, and not representative of watershed or regional conditions.

Option 2 –"Synoptic" Sampling Design

States are required by EPA to report the condition of their waters in terms of the proportion of stream and river miles, lake acres, etc. attaining or failing to attain their designated uses. EPA also strongly encourages states to assess 100% of all water bodies within a five-year time frame. To meet both of these objectives, some states have opted for a spatial design that is often referred to as "synoptic." Synoptic is not a strict statistical term, but rather is a descriptive one suggesting a broad view of the whole or an overview. This approach differs from a fixed station approach in that sites are sampled periodically (i.e., once every five years). It can be applied within discrete watershed areas such as major river basins or it can be applied to an entire jurisdictional region such as a state. In the latter, synoptic designs may include sampling in every watershed unit, which can result in a wide dispersal of a limited number of sites to cover the entire area in a fixed time frame (e.g., five years). The five-year basin approach (Figure 14) employed by many states is easily adapted within this design and it provides a way to allocate limited monitoring resources. The intent of some synoptic networks is a "snapshot" of water quality during the time of sampling and can be conducted on a river basin scale as opposed to statewide. The Indiana DEM provides one such example (Figure 15).

The goal of statewide efforts are usually to sample in every watershed with the design inherently assuming a census. When this design is used to assess statewide status, targeted monitoring sites are frequently allocated within large watershed units (e.g., 8 digit HUC[2]). Major river mainstems and their tributaries are frequently emphasized and sites are widely dispersed resulting in extensive extrapolation of the results. Locations for these sites may be positioned to reflect the accumulated impacts of upstream influences (i.e., located near the mouth of major drainages). This design is used to achieve statewide or region-wide coverage in a specified time frame (e.g., five years) with limited or fixed resources. The desire to achieve complete coverage in a fixed time period is primarily driven by previous EPA monitoring guidance, which espoused a goal of "100% coverage" of a state's waters within a five-year time frame. This was further driven by the inherent desire to

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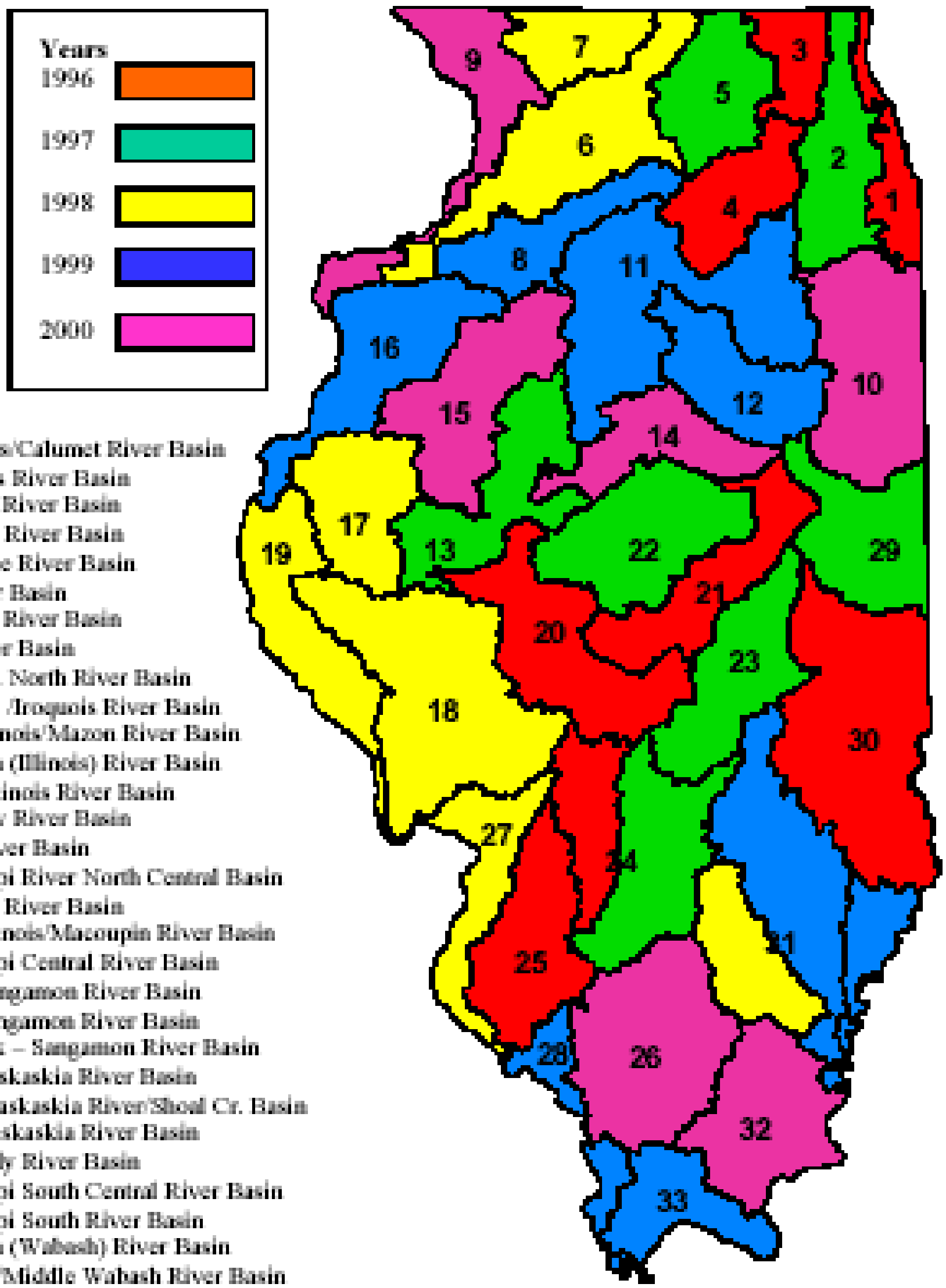
[2] HUC – hydrologic unit code; HUCs range in size from regional (21 units nationwide) to cataloguing (2150 units nationwide) and can be used to indicate an area contained within.

Figure 3-2. IEPA/IDNR Intensive Basin Survey Schedule, 1996-2000.



1. Great Lakes/Calumet River Basin
2. Des Plaines River Basin
3. Upper Fox River Basin
4. Lower Fox River Basin
5. Kishwaukee River Basin
6. Rock River Basin
7. Pecatonica River Basin
8. Green River Basin
9. Mississippi North River Basin
10. Kankakee /Iroquois River Basin
11. Upper Illinois/Mazon River Basin
12. Vermilion (Illinois) River Basin
13. Middle Illinois River Basin
14. Mackinaw River Basin
15. Spoon River Basin
16. Mississippi River North Central Basin
17. La Moine River Basin
18. Lower Illinois/Macoupin River Basin
19. Mississippi Central River Basin
20. Lower Sangamon River Basin
21. Upper Sangamon River Basin
22. Salt Creek – Sangamon River Basin
23. Upper Kaskaskia River Basin
24. Middle Kaskaskia River/Shoal Cr. Basin
25. Lower Kaskaskia River Basin
26. Big Muddy River Basin
27. Mississippi South Central River Basin
28. Mississippi South River Basin
29. Vermilion (Wabash) River Basin
30. Embarras/Middle Wabash River Basin
31. Little Wabash/Skillet Fork Basin
32. Saline River/Bay Creek Basin
33. Cache River Basin

- 24 -

Figure 14. Rotating basin approach used by Illinois EPA. Monitoring is conducted in each subbasin rotating through the state in five years.

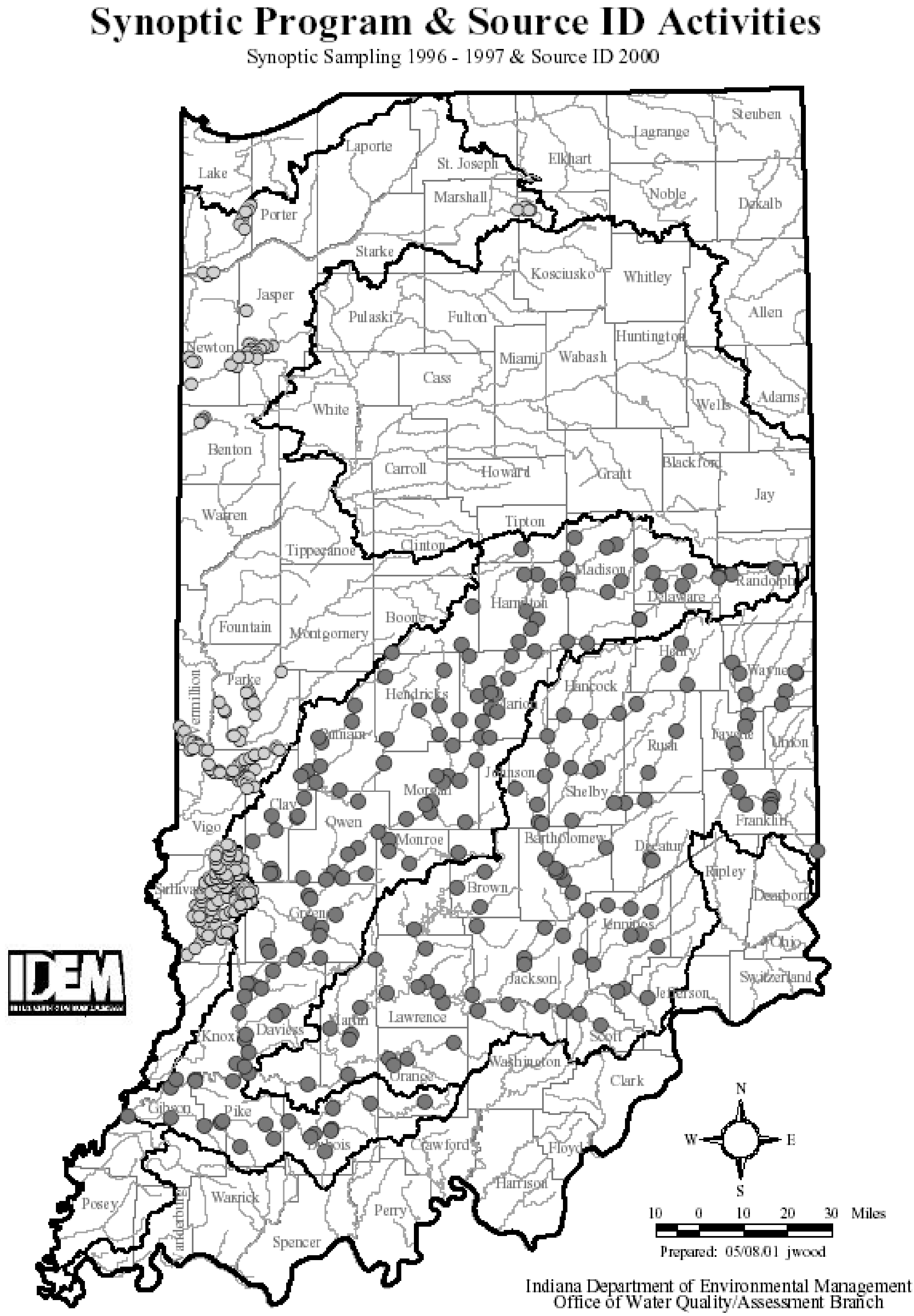


Figure 15. Synoptic and source identification sampling networks operated by Indiana DEM.

have an assessment of status for 100% of jurisdictional water bodies. Because of fixed resources, spatial intensity is functionally diluted to achieve statewide coverage. This often results in the need to further stratify the aquatic resource, i.e., sampling only wadeable streams. This approach also necessitates the extrapolation of sampling results at a single site to many miles of river and stream. For example, EPA guidance recommends extrapolating sampling results 10 miles in wadeable streams and 25 miles in non-wadeable rivers as a default criterion and in the absence of information to the contrary. This is done in order to accumulate assessed miles for the purpose of 305b reporting and is the purported strength of this design.

In regionally focused approaches like that employed by Indiana DEM (Figure 13), the goal is to provide screening data for determining if and what types of problems might exist in relation to different types of land use, stream sizes, confluences, etc. It is presumed here that the discovery of any problems would be followed up by more spatially intensive sampling given the multiple designs that are used by IDEM (IDEM 2001). The utility of this approach was demonstrated in the development of a fish assemblage assessment of the non-wadeable rivers of Wisconsin by Lyons et al. (2001), which employed a version of a synoptic design to all the large rivers of the state. The results were used to assess the relative contributions of major types of impacts and their comparative severity (Figure 16).

The weaknesses of this approach can be significant and mostly involves the non-random approach in sampling site selection. It results in a biased database, which can make aggregate estimates of status over large areas questionable. The extent of data extrapolation can be quite large and is a source of error in terms of representing aggregate resource condition and status. The design can also lack of site-specific relevance making direct program comparisons and assessments difficult and only generally relevant at best. Sampling sites located several miles downstream from a source of concern may or may not provide a relevant assessment of impact or about upstream reaches. Sites can be compared from one year to the next, but comparatively large changes may need to occur to be statistically significant.

Option 3 – Intensive Surveys

An intensive survey is defined here as spatially intensive sampling of localized stream or river segments or a distinct subwatershed area. The fundamental goal of this design is to comprehensively assess all possible sources of stress and influence within a localized river reach or discrete subwatershed area. It is critically dependent on the ability to identify and locate potential sources of human influence and natural variation prior to and during sampling. A comprehensive planning process is generally conducted for the purpose of developing a detailed plan of study, which then guides site selection. It is easily amenable to serving as the principal design of a rotating basin approach. The design is spatially intensive and requires multiple and closely spaced sampling sites within a defined reach of a stream, river, or subwatershed. This may include a few sites in a relatively simple setting (small wadeable stream, one or two sources) or tens of sites over many miles in larger rivers and complex watershed areas. An important objective is the longitudinal portrayal and interpretation of monitoring results in spatial relation to sources of potential change and stress. The early concepts of Bartsch (1948) and Doudoroff and Warren (1951), which demonstrated how the influence of pollution changes along the length of a flowing

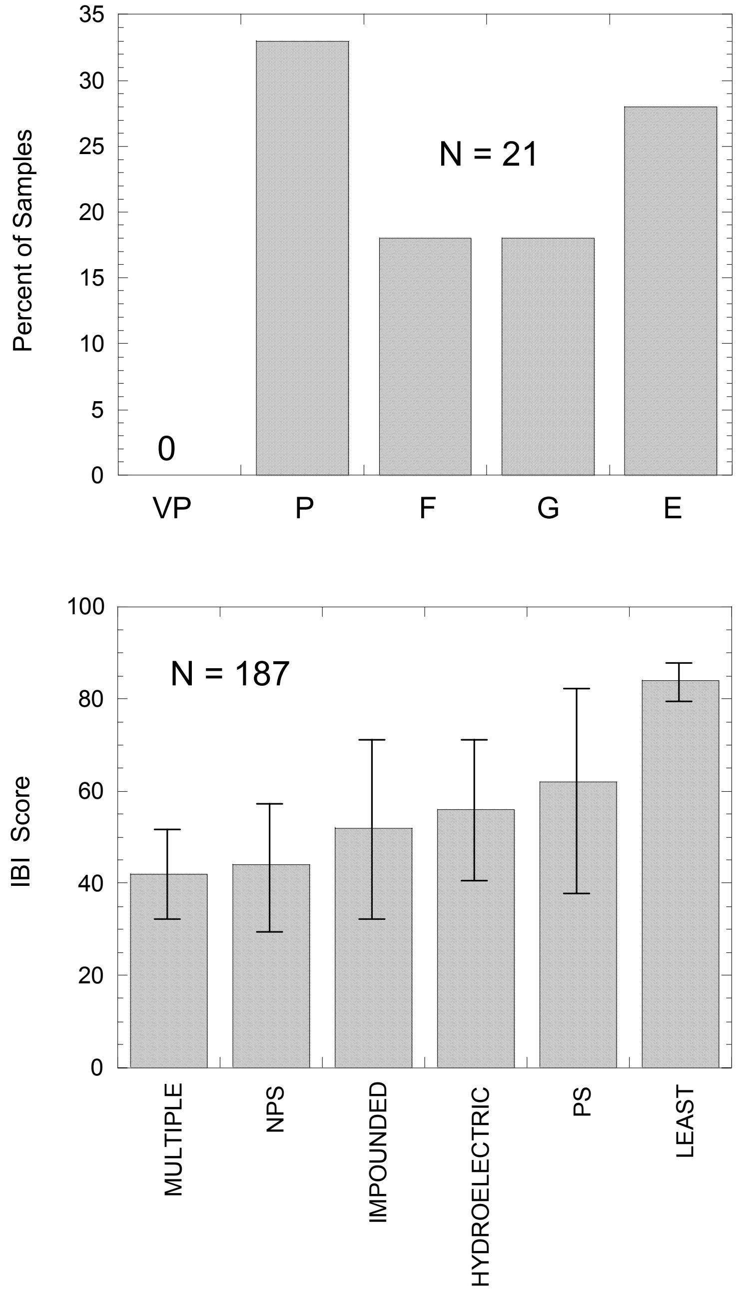


Figure 16. Mean IBI scores and 95% confidence intervals (lower panel) and the distribution of IBI scores among five condition ratings (upper panel; VP = very poor; P = poor; F = fair; G = good; E = excellent) for the hydroelectric impact type. Data is from 187 large river sampling sites in Wisconsin (after Lyons et al. 2001).

water body (i.e., pollution zones) likely gave rise to this type of monitoring design. This includes sampling in reaches that are upstream from the upstream most sources of potential impact, in areas of immediate impact and potentially acute effects, through zones of increasing and lessening degradation, and zones of eventual recovery.

This design is commonly used to support water quality management at the local, reach, and subwatershed scales. It also includes elements of "upstream/downstream" and paired watershed designs. Also inherent in this design is the goal of developing an understanding of how different parameters and indicators change in an upstream to downstream direction, in proximity to specific sources of stress and changes from immediate effects through the various stages of longitudinal recovery, and correspondence to changes in land use. This includes attempting to determine the role of specific sources as well as the accumulation of effects by multiple sources. This design must adequately define the condition of the water resource first and the influences of the sources based on the feedback from the indicators. For example, large mainstem rivers must frequently be treated as a single study unit in order to understand how changes take place along a longitudinal continuum with respect to both natural and anthropogenic influences. Important in the delineation of these study units are natural features and transitional boundaries (e.g., cold to warmwater, geologic phenomena), clusters of anthropogenic sources (e.g., major urban/industrial area, dams and impoundments, etc.), and transitions in land use. Some study areas may include up to 100-mile long river reaches in order to capture these types of influences and provide important geographic context for interpreting results at any given location. Ohio EPA has operated such a design for nearly 25 years (Figure 17).

An example of river specific results from this design shows the longitudinal results of the fish IBI in the Scioto River during three years over an 18-year time frame (Figure 18). Not only does this design yield a detailed assessment of status for a particular stream or river reach, it can also demonstrate changes through time. In addition, it illustrates the extent and severity of indicator responses along the longitudinal continuum. When this information is sequenced with stressor and exposure indicators using the hierarchy of indicators process described previously in figure 6, the results and effectiveness of water quality management programs through time clearly emerges. To continue the example from Columbus, Ohio the sequencing of monitoring results through the hierarchy of indicators illustrates the effects of water quality based permitting and financial assistance via the former construction grants program and current revolving loan programs. The intensive survey design in conjunction with a fixed station design demonstrate the effectiveness of water quality management in achieving not only chemical and biological improvements in the Scioto River, but restoration of the designated aquatic life use. The sequential positioning of the various chemical and biological indicators (Figure 19) follows the hierarchy of indicators process of U.S. EPA (1995a). This design is also amenable to using tools such as the Area of Degradation Value (ADV) and biological response signatures (Yoder and Rankin 1995b; Yoder and DeShon 2003) to further quantify resource response and trends through time (Figure 20). The ADV example quantifies the changes observed in the biological condition of the Scioto River and to demonstrate the biological impact and recovery before and after various technological changes made at the Columbus southerly WWTP. In this example, all of the data years can be viewed sequentially using an expression that communicates incremental severity and extent in addition to the bivariate impaired/unimpaired condition. Such tools allow water quality management programs to see their results in incremental rather than pass/fail terms.

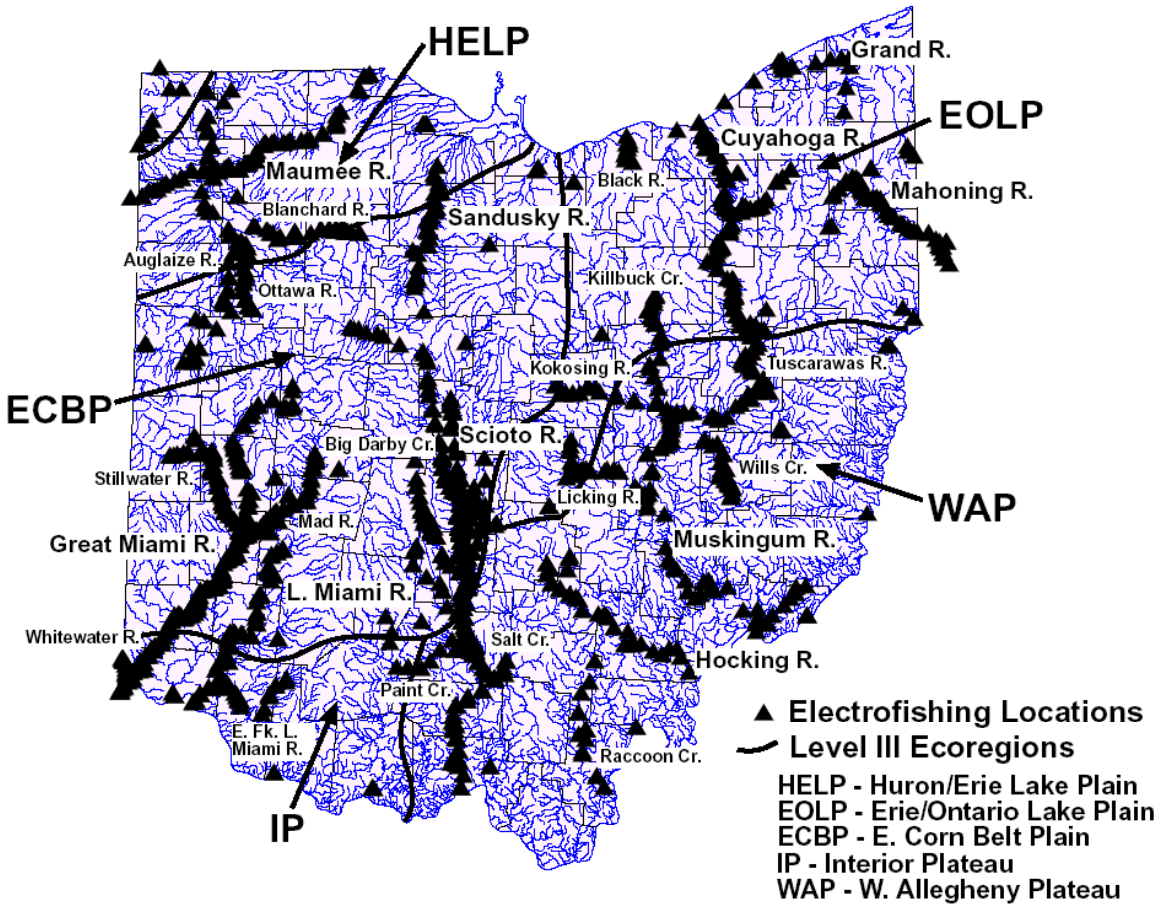


Figure 17. Ohio EPA non-wadeable fish assemblage locations sampled between 1979-2001 based on an intensive survey design.

The biological response signatures from the Scioto and Ottawa Rivers[3] (northwestern Ohio) demonstrate differential responses, non-toxic in the Scioto River and toxic in the Ottawa River, but also varying degrees of response through time (Figure 21). The Scioto River represents a situation with an absence of significant toxic impacts whereas the Ottawa River is substantially impacted by a variety of toxic stressors including legacy pollution from both abandoned and active sources. This is an example of how the component metrics and data from biological assemblage assessments can be used to accurately characterize and diagnose impacts. However, monitoring design is a critical element of building the database needed to make these types of data interpretations.

[3] The Ottawa River has a similar municipal/urban and land use setting as the Scioto River, but has two large industrial sources with a variety of legacy toxic pollutants discharged over many decades.

The intensive survey design provides a spatially intense and robust assessment of status and trends in a specific river or stream reach. Such a design is critical in making causal linkages with water quality management programs such as NPDES permitting and site-specific water quality standards issues such as designated uses and use attainability analyses. It also supports more refined 303d listings. Its value to the TMDL process additionally includes causal associations and local scale concerns such as the appropriate designation of individual waterbodies via the UAA process. There are important questions about how well this design can support broader assessment needs such as regional and statewide 305b reporting. It frequently is a matter of aggregating such data to a statewide or regional scale, but also ensuring that the design essentially represents a census of the resource. This design most effectively satisfies a critical need in water quality management, i.e., conducting monitoring and assessment at the same scale at which water quality management decisions are made.

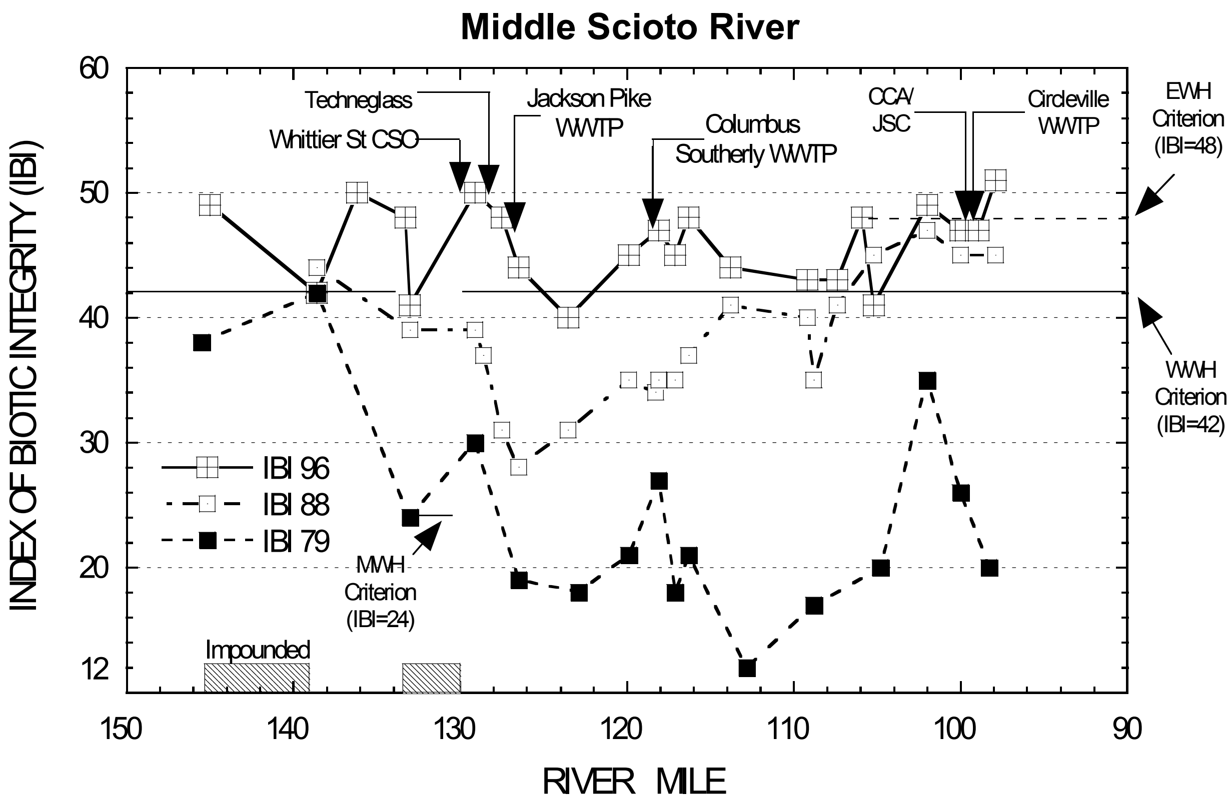


Figure 18. Longitudinal results of fish (IBI) assemblage assessments in the Scioto River based on sampling conducted in 1979, 1988, and 1996.

Option 4 – Geometric Sampling Design

The geometric sampling design was first developed by Ohio EPA (1999) and is applied to small watersheds at the 11 to 14-digit HUC size. Sampling sites are located by geometrically working "downwards" from the drainage size of the entire watershed to a resolution of 1-2 square miles of drainage area. For example, for a watershed with a drainage area of 152 square miles, one site is located at the mouth of the mainstem stream or river (152 mi^2 location), one site is located at the 76 mi^2 location, and sites are located at the 36 mi^2 locations, the 18 mi^2, 9 mi^2, 4.5 mi^2, 2 mi^2, and 1 mi^2 locations, respectively (Figure 22). Sampling sites are located at reasonable access points and

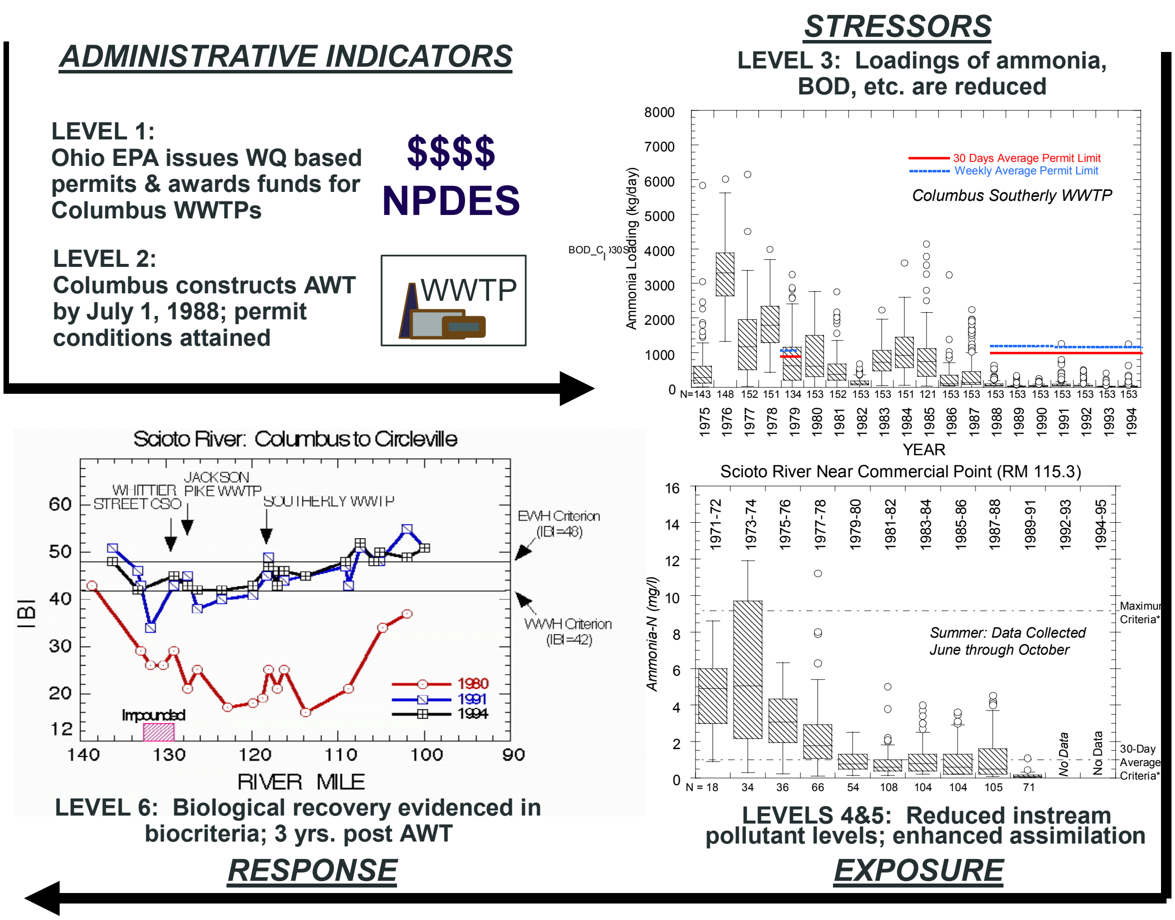


Figure 19. Using indicators based on different monitoring designs to demonstrate water quality management effectiveness by making linkages between administrative (upper left), stressor (upper right), exposure (lower right), and response indicators (lower left). This example uses the middle Scioto River mainstem and the Columbus Southerly WWTP based on data collected during 1975-1996.

with respect to tributary confluences and other factors. Gaps in coverage for specific sources or sections of interest are addressed by blending aspects of the intensive survey design as needed to ensure the adequate capture of all local scale issues.

The purpose of this design is to provide a stratified sampling of *all* streams within a watershed at a local scale of resolution. This resolution satisfies water quality management needs such as TMDL listing and development, identification of individual stream management issues, site-specific WQS issues such as designated uses and use attainability analyses, and the ranking and prioritization of management issues within a specific watershed area. While Ohio EPA has used the results to

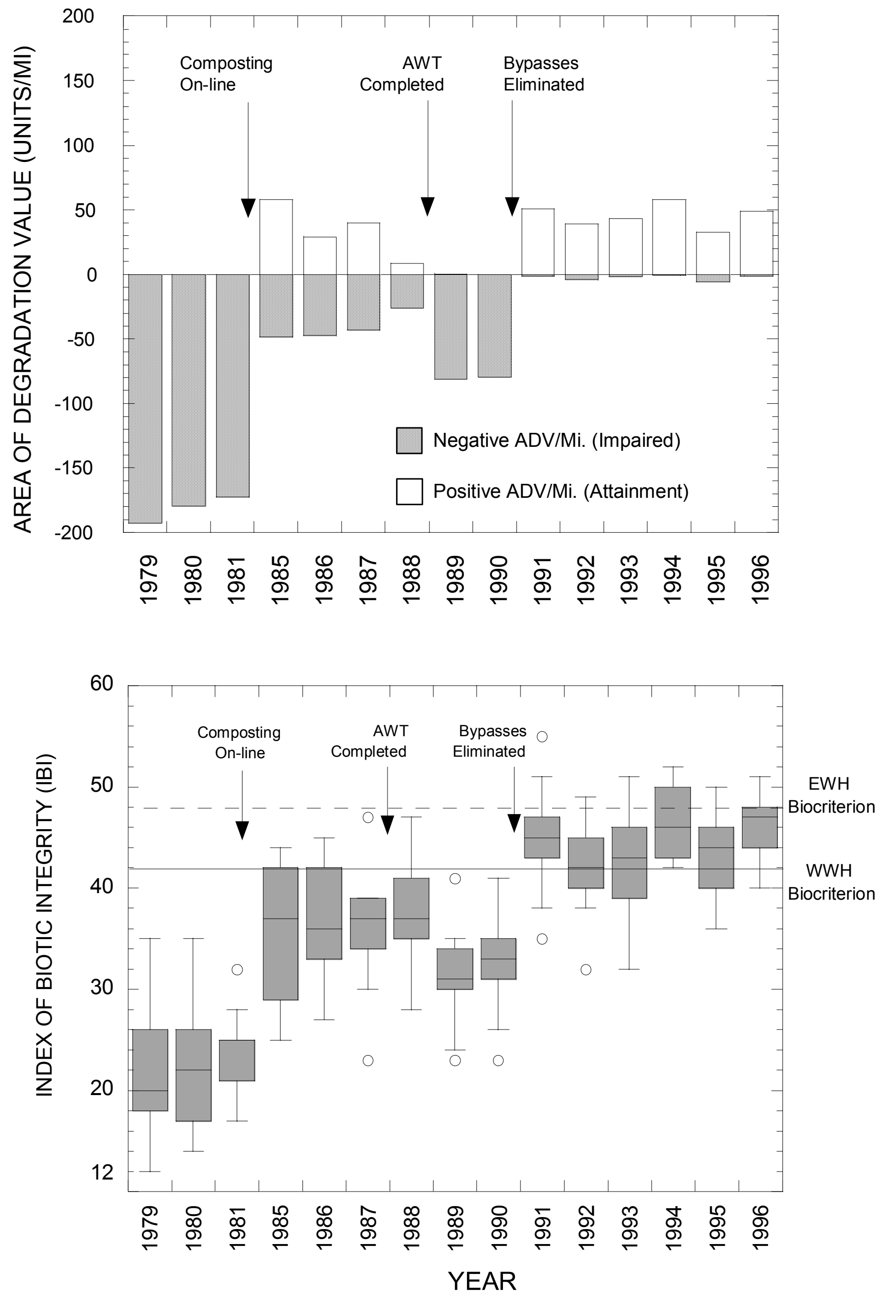
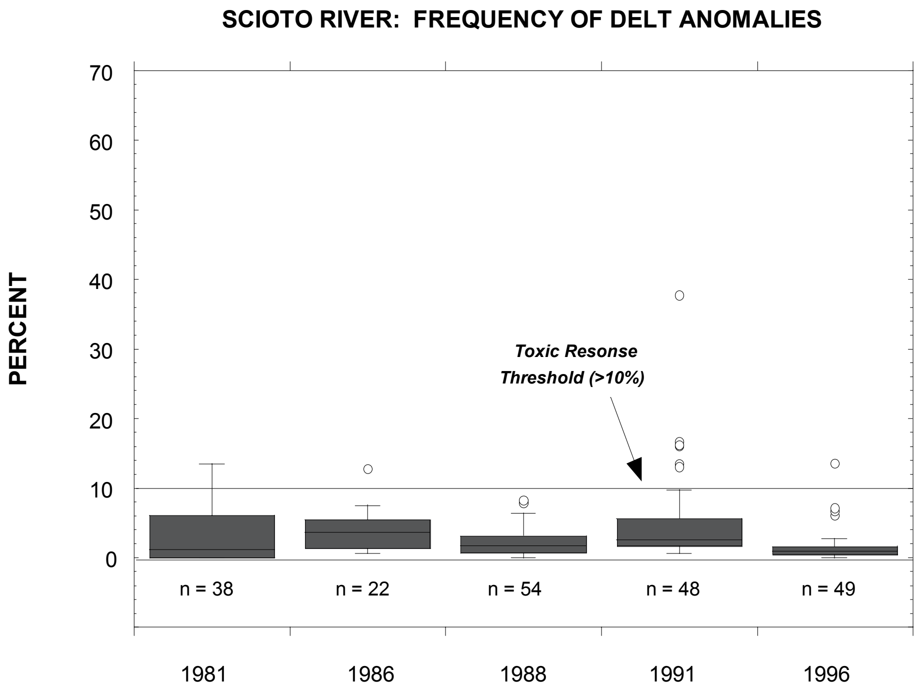


Figure 20. Annual Index of Biotic Integrity (IBI) results from the mainstem Scioto River directly impacted by municipal sewage discharges and urban runoff from Columbus, Ohio between 1979 and 1996 (lower panel; WWH = Warmwater Habitat; EWH = Exceptional Warmwater Habitat) and Area of Degradation Value (ADV) based on IBI results from the same segment and time period (upper panel). Significant changes in the operation of the sewage system are noted on each panel.



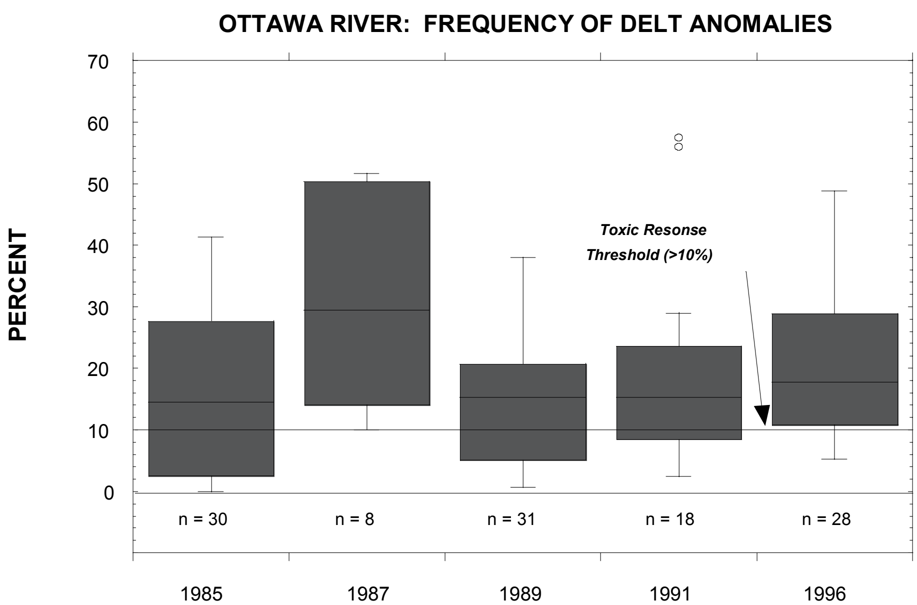


Figure 21. Examples of aggregate changes in a key fish assemblage response signature (%DELT anomalies) in the middle Scioto and Ottawa Rivers, Ohio, based on intensive survey data collected from multiple years (after Yoder and DeShon 2003).

conduct routine water quality management support activities such as stream use designations, use attainability analyses, permitting, planning, and other regulatory issues, the strength of this design is clearly with TMDL development and watershed planning support. The resulting assessment provides an initial clarification and refinement of WQS issues along with impaired waters listings that include an assessment of associated causes and sources (Figure 23). In this example, the geometric design provides a robust coverage of the watersheds that reveals patterns in stressors that correspond to clusters of streams either by size class, geographic position, or biological quality. This promotes the improved targeting of restoration, protection, and allied management efforts that are needed to implement TMDLs. This design also permits the broader comparison of whole watersheds across ecoregions and larger areas.

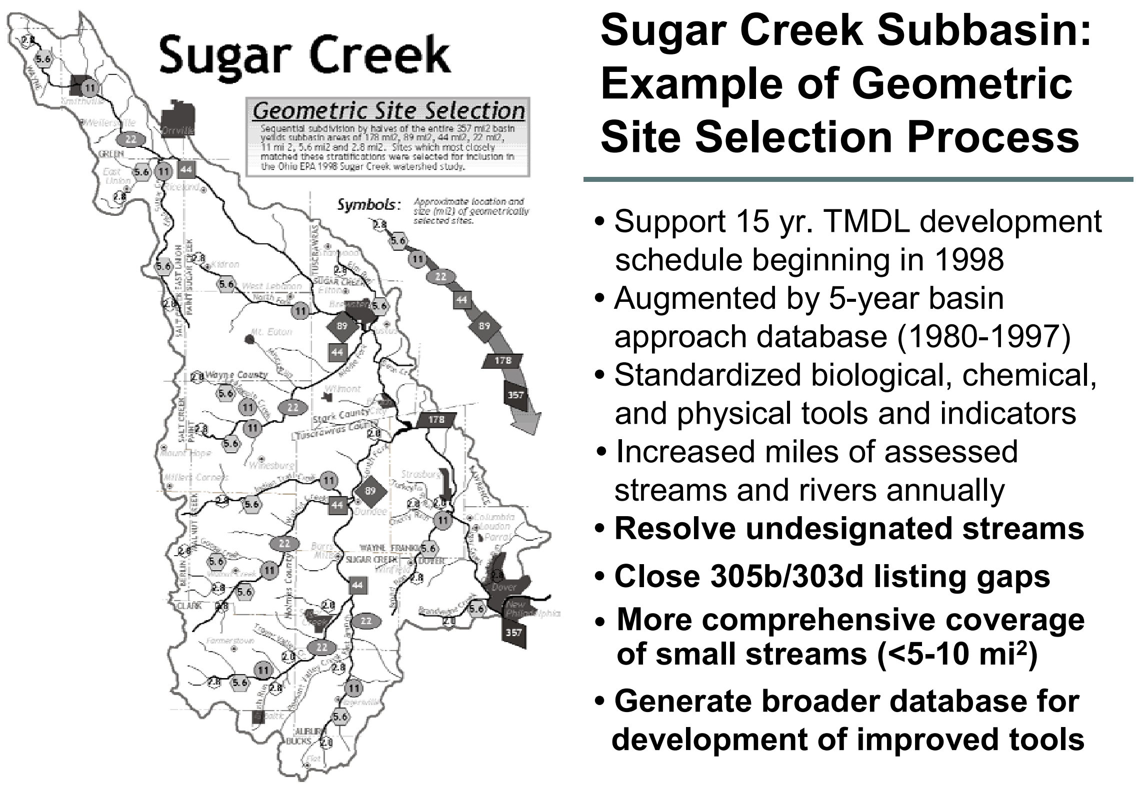


Figure 22. Geometric site selection design developed by Ohio EPA for the intensive assessment of watersheds in support of TMDL development and allied water quality management needs.

The results of selected geometric watersheds was compared to the 1995 Regional EMAP results and showed that some watersheds exhibited better or worse quality than the overall ecoregion condition revealed by the REMAP design (Figure 24). Knowing where these watersheds "fit" within the region and state coupled with the more detailed knowledge of associated stressors is of value not only to the TMDL process, but to water quality management in general. These are critical prerequisites to accurate and comprehensive TMDL development at a sufficiently detailed scale of management needed to be relevant to watershed issues and stakeholders. This design also provides a template for conducting progress and follow-up assessments to determine water quality management program effectiveness resulting from TMDL implementation activities. It also contributes to the better understanding of issues across different watersheds and supports the building of databases sufficient to address broader conceptual and technical issues.

Another advantage of the geometric sampling design is its flexibility. In homogeneous watersheds with little human influence or, at the opposite end of the spectrum, pervasive human influence, sampling intensity can be lessened if sites throughout the watershed yield similar biological assessments and have similar patterns of land use. In contrast, very homogenous reaches or segments can be sampled more intensively to evaluate the influence of specific sources. Whatever level of intensity is applied within a watershed, the consistency of the sampling pattern means that watersheds can be compared to each other by matching the sampling area associated with each sampling point from different basins, e.g., comparing biological index values for sites that integrate sites representing similar drainage areas (Figure 21). It can also provide initial information at a broad spatial scale. In this way, sampling functions as a screening tool for identifying subwatersheds that need additional or more intensive sampling in support of management applications.

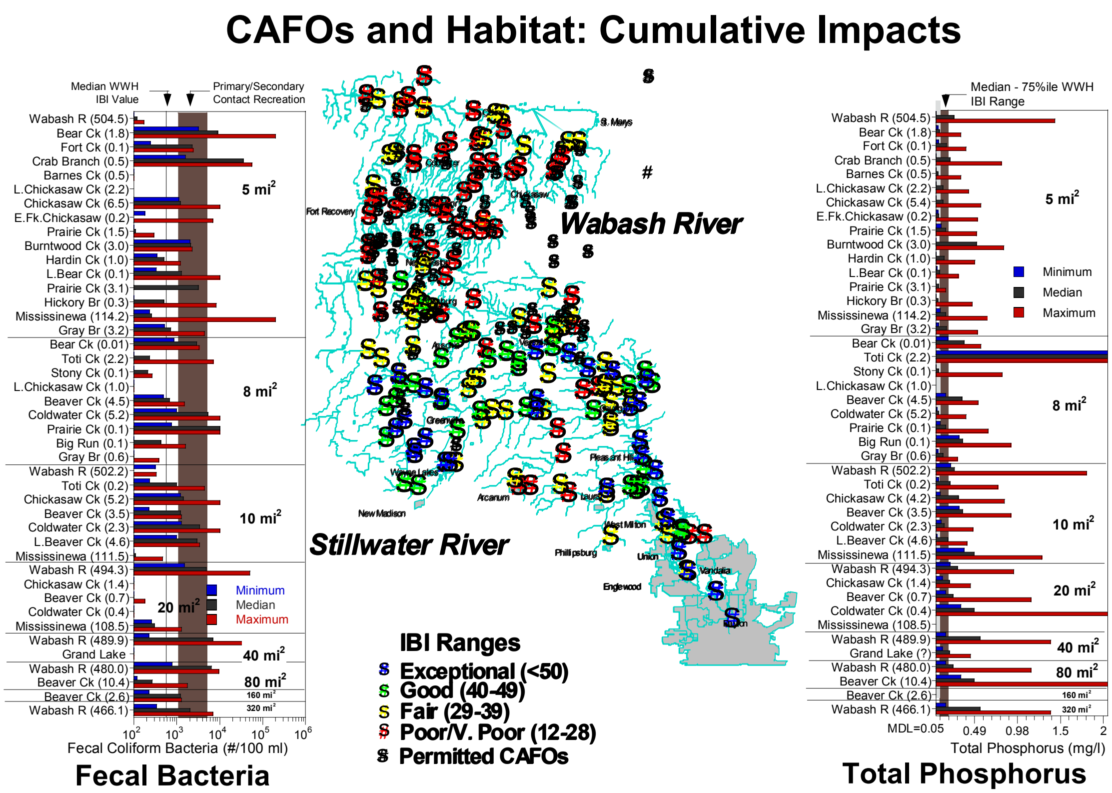


Figure 23. Fish assemblage quality by narrative range based on IBI values in the Stillwater and Wabash River watersheds based on a geometric site selection design. Corresponding stressor indicators for fecal bacteria and total phosphorus reveal spatial patterns associated with exceedences of biologically-based and water quality thresholds.

A perceived disadvantage of this design is that it requires a commitment to sampling tens or perhaps more than one hundred sites per year. If this level of sampling is not maintained, the design breaks down to an intensive sampling design from which it is difficult to extract data for broader status and trend monitoring. A major strength is that it is applied similarly to each and every watershed. If implemented in an ongoing and consistent manner (i.e., via a five year rotating basin approach) this design represents a census of all rivers and streams within the rotation time frame. Because a similar level of intensity is applied to each watershed, conditions can be summarized and compared across watersheds. Because all sites within all watersheds are

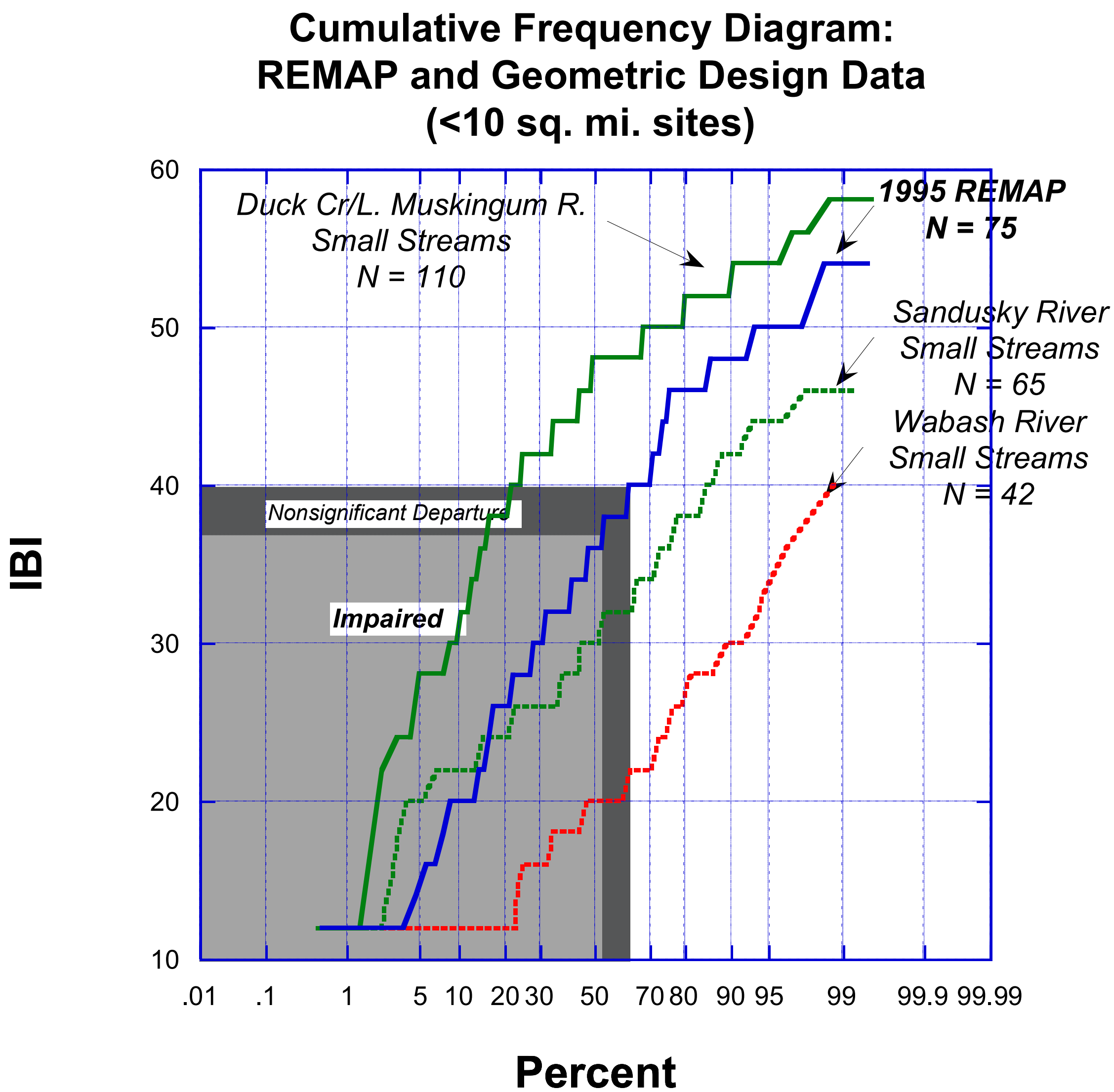


Figure 24. Cumulative frequency diagram (CFD) of fish assemblage IBI values at REMAP probabilistic sites sampled in 1995 compared to geometric sites from the Duck Creek and L. Muskingum watersheds (1999), the upper Sandusky River watershed (2000), and the Wabash River watershed (1999) in Ohio.

sampled, this approach represents a type of census design. Consequently, generalizing (or inferring) the results to the unsampled population is not an issue because a census is obtained. The implicit assumption is that the spatial coverage truly represents biological condition upstream of sampling points and that site selection within the watersheds is unbiased. Within a watershed, sites that represent specific classes of watershed size are sampled for each rotation, therefore, the results can be compared as a group through time using regression analysis to test for change (trend) in watersheds or aggregations of multiple watersheds (regions). Local scale sampling can also be accomplished to compare specific locations or evaluate changes through time. Because representative sites are sampled every five years, this design includes some of the preferred aspects of a fixed sampling design. Although sites are not sampled randomly, the geometric sample selection process is an unbiased approach to selecting sites because the same mathematical algorithm is applied to each watershed. Therefore, this approach represents an unbiased method of delineating a continuous resource and then censusing the entire population of all sampling units.

Option 5 – Probabilistic Sampling Design

Probabilistic designs include those commonly employed by the U.S. EPA Environmental Monitoring and Assessment Program (EMAP). All the potential sampling areas within a region of interest are identified, segmented and enumerated; segments are randomly selected and sites are sampled within the selected segments (Stevens and Olsen 1999). This design assumes that the resource is simply too large to visit every site (i.e., accomplish a census); therefore, a set of samples are randomly selected to represent the entire population. Results from the random sampling can be used to infer the condition of the entire resource, including segments and sites that were not sampled. This sampling design was developed to answer questions related to the status and trends of water resources at regional and national scales of resolution.

To date, three EMAP pilot projects have been implemented for surface waters across the U.S. These projects sampled large regional areas that included sites from several states in the Northeastern, Mid-Atlantic, and intermountain West. In addition, numerous Regional EMAP (REMAP) programs have been conducted at regional scales, typically involving parts of one or two states. Other efforts have been conducted with individual states and the IDEM probabilistic design serves as an example (Figure 25). An advantage of a probabilistic design is that comparatively large-scale changes can be recognized more quickly than with other types of designs. The results of the regional assessment are also unbiased due to random sampling. This means that the results obtained by sampling a subset of sites will truly be representative of regional conditions.

There are two principal disadvantages to this approach for states that are interested or obligated to assess beyond status. First, to obtain a random sample, every aquatic resource of concern must be delineated. Second, specific sites of management interest cannot be included in probabilistic sampling designs unless they are randomly chosen. Thus, information about individual sites is potentially excluded because the conclusions made at the regional scale cannot necessarily be attributed to specific sites or individual water bodies. This is one of the principal trade-offs between probabilistic sampling and intensive scale sampling.

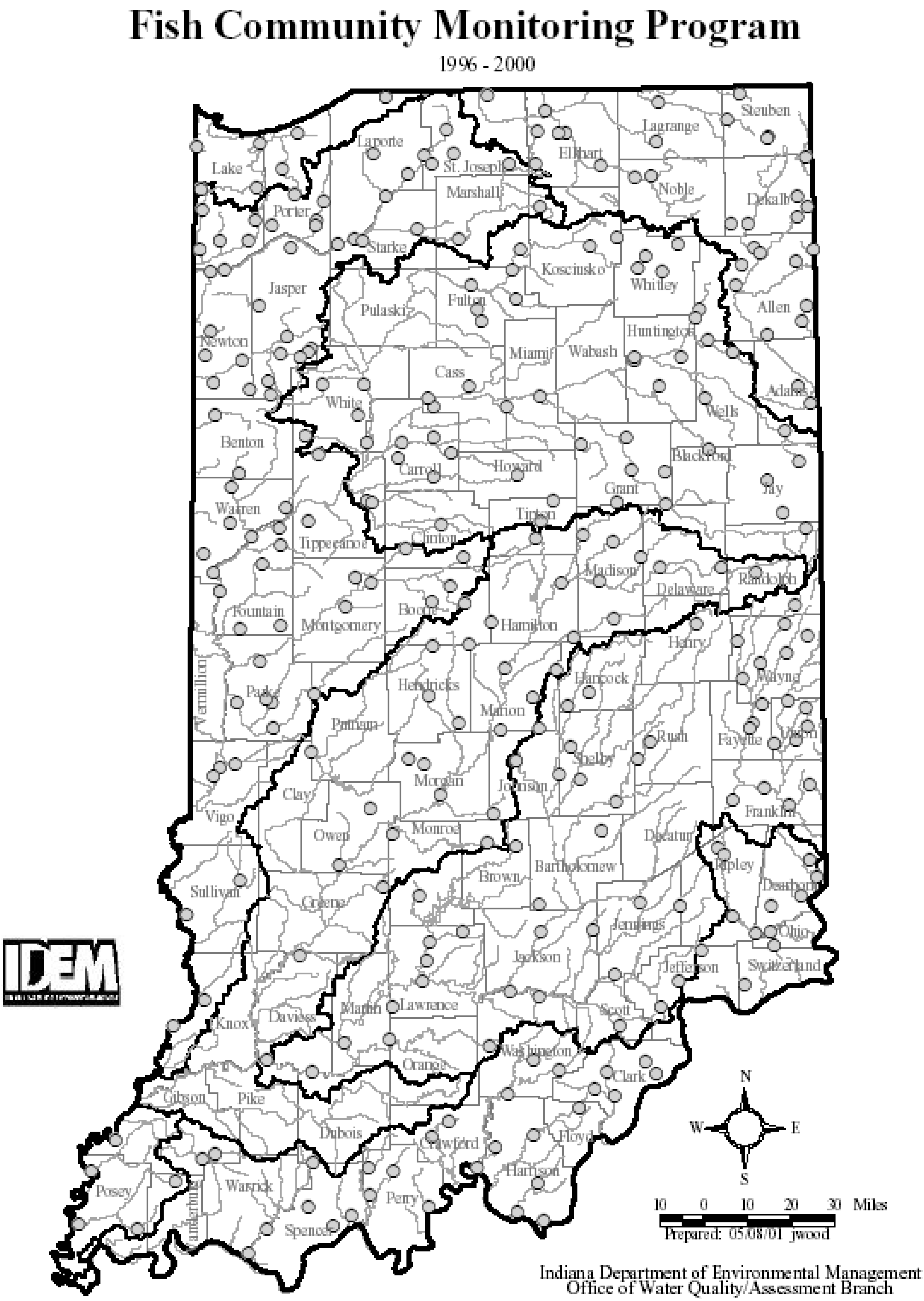


Figure 23. Probabilistic design employed by Indiana DEM to assess fish assemblage condition.

Some states have dealt with this trade-off and by using probabilistic sampling for primary site selection, but reserving a certain percentage of the annual sampling budget for more intensive, targeted sampling. Broad-scale probabilistic sampling is used to identify “hot spots”, or areas of specific interest due to high or poor biological condition or other unusual conditions. In terms of state-specific uses of this approach, the recently completed REMAP project in the E. Corn Belt Plains (ECBP) ecoregion of Indiana, Ohio, and Michigan provides some insights. The fish assemblage data obtained from one year of probabilistic sampling was compared to three years of intensive watershed sampling using a targeted, census design in the same ecoregion (Figure 24). IBI results were compared using a cumulative frequency diagram analysis, which showed some differences between the REMAP results and single years of the intensive, census based sampling. However, when the three years of intensive survey design were aggregated, the median IBI was

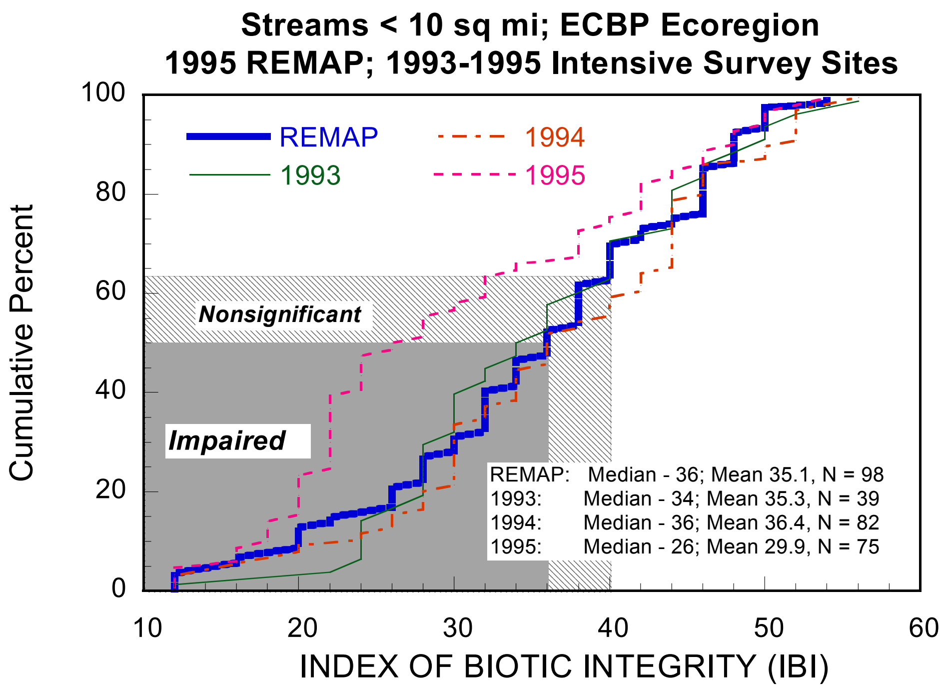


Figure 24. Cumulative frequency diagram (CFD) showing results of fish assemblage IBI based on the 1995 E. Corn Belt Plains REMAP project and three years (1993-1995) of intensive survey results from the same ecoregion and similar size streams. Shaded areas represent impaired and nonsignificant departure from the ecoregion IBI biocriterion.

nearly identical to the REMAP results. While this brief comparison does not address all of the issues between the different designs, it illustrates the ability to demonstrate important scale differences while achieving a similar assessment of overall status between different designs. The strength of the probabilistic approach is that broad, regional assessments of status and trend can be achieved in a comparatively brief time period and with fewer sampling locations than with intensive surveys. Intensive surveys, however, deliver essential local and stream specific information that is of direct interest to water quality management programs and which is not delivered by the common probability designs.

Implications to Water Quality Management Support

The choice of which spatial design(s) to employ in a multifaceted and comprehensive monitoring and assessment program should include considerations of all activities and programmatic objectives that must be satisfied by the same datasets. If the need is to report on trends through time irrespective of other programs and activities, then a probabilistic design seems to satisfy that need in the most timely and statistically robust manner. However, given the reality that states have other equally important water quality management objectives and programs to support, all of which would benefit from improved monitoring outputs and outcomes, consideration of more than one spatial design is appropriate. This was conceptually recognized by the EPA CALM process (U.S. EPA 2003) and we prepared Table 3 to aid in this process. Thus selecting a particular design or set of designs entails knowing how each can be used in a complementary manner to satisfy all water quality program needs.

The relative capability of each of the five designs to support various aspects of water quality management is described in Table 3. No single design supports all water quality management program areas equally well. Some designs are inherently better for supporting status and trends at regional or statewide scales, while other designs are better suited to support site and stream/river specific water quality management. Table 3 attempts to compare how effectively each of the designs considered by this report support the water quality management program areas that are in common to state water quality management agencies. The goal should be to select a sampling design or set of designs that support *all* state water quality management needs *with the same datasets and in the most cost-effective manner.* Another important consideration is ensuring that monitoring and assessment is conducted at the same scale at which water quality management takes place. For this consideration, an intensive sampling design such as the geometric design is probably more appropriate than the probabilistic design, although probabilistic sampling could be conceivably applied at a subwatershed scale. The attributes and capabilities of the different sampling designs can be compared and screened for their relevance for different monitoring goals using Table 3.

Table 3 is based on the collective experiences gained by selected states and some EPA Regions in using ambient monitoring data to support different water quality management programs. Some of this is based on the preceding discussion and description of the five major spatial monitoring designs. In terms of satisfying the objective of assessing spatial and temporal trends a probabilistic design would satisfy the overall assessment needs posed by 305b and similar programs in the shortest length of time. However, given the realities of overlapping and simultaneous water quality and natural resource management programs, a geometric and/or intensive survey design will be needed. If a probabilistic sampling design is selected for trends, a certain percentage of sites must be sampled each year outside of this framework to support other programs. While it takes longer for these designs to accumulate sufficient data and information to develop adequate trend information, the payoff is in the other management support functions, some of which are pressing needs accentuated by the recent emphasis on TMDLs. Resources will also dictate how quickly this information is accumulated; in the best situations this may well involve a 10 year process before sufficient trend information becomes available. The goal should be to have a monitoring and assessment design that satisfies multiple and diverse water quality management programs in the

Table 3. Relative degrees to which major water quality management program areas are supported by different spatial and temporal monitoring designs.

Design	Basic Reporting		WQS Program					Watersheds/ NPS		TMDL/303d		NPDES/Other Permitting							
Type of Design[1]	Status[2]	Trend[3]	Tiered Uses[4]	UAA[5]	Refined WQC[6]	Anti-deg.	Site-Specific Crit.Mod.[7]	NPS/BMP Effective-ness	Hab-itat[8]	List/ Delist	TMDL Dev.[9]	WQ BELs[10]	Priority Setting [11]	CSOs/ SSOs	Storm-water Ph. I&II	WET Limits/ Cond.[12]	Sever-ity/ Extent[13]	Enforce ment[14]	404/401 Dredge & Fill[15]
Fixed Station	○	○	–	–	–	–	–	○	○	–	○	○	–	○	–	–	–	–	–
Synoptic Watershed	◐	◐	○	○	○	○	○	○	○	○	○	○	○	–	–	–	–	–	–
Intensive Survey	◐	◐	●	●	●	●	●	●	●	●	●	●	◐	●	●	●	●	●	●
Probaba-listic: Regional	◐	◐	–	–	◐	–	–	◐	◐	○	–	–	–	–	–	–	◐	○	–
Probaba-listic: Watershed	●	●	◐	○	◐	◐	○	●	◐	◐	◐	○	◐	◐	◐	–	◐	○	–
Geometric Watershed	●	●	●	●	●	●	◐	●	●	●	●	◐	●	●	●	◐	●	●	●

● - Comprehensively fulfills program support role by providing robust and complete assessment of program needs and issues including scientific certainty and accuracy of condition assessment.
◐ - Generally fulfills program support, but may not provide sufficiently robust or accurate assessment information at all scales or for overall assessment of magnitude and severity.
○ - Supports only partial or indirect assessment of program area, e.g., may be useful only for pollutant-specific assessment at a single scale.
– Cannot support program needs due to incomplete spatial coverage, connectivity, or inadequate resolution at the equivalent scale of management.

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[1] Design types are inherently generic; modified and hybrid approaches are possible and will encumber the attributes and characteristics of each generic design.
[2] Basic attainment/non-attainment assessment for aquatic life use status including delineation of causes and sources of threat and impairment.
[3] Sufficient information to report aggregate status within specific ecotypes over at least a 10 year period including all sources and causes of impairment at all relevant scales of management.
[4] Tiered uses that are developed based on assemblage assessments and which correspond to EPA's biological condition axis; does not include generic fishery based or general uses.
[5] Includes any use of ambient monitoring data to change designated uses on a site-specific or waterbody specific scale.
[6] Design results in the aggregate accumulation of data that is used to influence the application or implementation of WQC (exclusive of pH, hardness, and other single parameter modifiers).
[7] Yields sufficiently detailed ambient data that is used to ground truth EPA's site specific criteria process (water effects ratio).
[8] Monitoring design is sufficient to assess habitat at both local, reach, and watershed scales and develop habitat relationships with biological condition to support tiered use implementation.
[9] Includes using ambient data to support TMDL development and determine success of TMDL implementation beyond basic calibration data.
[10] Water quality based effluent limits – reach-specific monitoring data is used to develop an assessment of the overall effect of the subject discharge on the receiving waters.
[11] Ambient monitoring data is used to influence priority setting for various water quality management program needs (e.g., NPDES permitting and/or SRF funding priorities) at all relevant scales..
[12] Ambient monitoring data is sufficiently detailed to influence WET testing requirements and/or effluent limits in NPDES permits.
[13] Monitoring design and assessment framework allows for determination of incremental departures and changes beyond pass/fail and communicates severity of problem over space & time.
[14] Monitoring design supports site-specific and/or case specific enforcement in terms of demonstrating that the action is both legal and reasonable.
[15] Direct support of site-specific decisions for the 401 certification of 404 dredge and fill permits.

most accurate, comprehensive, and cost-effective manner possible. This means adhering to the principal concepts and guidance of adequate monitoring and assessment, as described in this report. The desired outcome will be two fold; 1) watershed level monitoring that routinely deliver data, information, and assessments that support baseline water quality management program needs (i.e., reporting, WQS, permitting, and planning), and 2) the development and custody of a long term database comprised of an adequate array of chemical, physical, and biological indicators. This means that at the individual watershed study unit level, monitoring and assessment supports developing an integrated assessment of status and limiting factors, WQS (use attainability analyses, improved criteria and thresholds), permitting, watershed planning, and restoration activities. While this information satisfies what may be termed "day-to-day" management needs, the ongoing execution of the monitoring and assessment program also produces a database that has unique value for making ongoing improvements to all water quality management support functions such as regional reference condition, criteria development, indicator development, and the assessment and modification of policies, practices, and legislation. In other words monitoring and assessment, if it is conducted as a routine cost of doing business, will deliver more of value than the determination of status and individual watershed assessments. However, it must be maintained as an ongoing and baseline activity that is an integral part of the overall water quality management strategy if it is to accomplish these important functions.

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Appendix B

Important Concepts and Elements of an Adequate State Watershed Monitoring and Assessment Program

Important Concepts and Elements of an Adequate State Watershed Monitoring and Assessment Program

August 8, 1997

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and

ASIWPCA Standards and Monitoring Task Force

Important Concepts and Elements of an Adequate State Watershed Monitoring and Assessment Program

I. INTRODUCTION

Watershed-based approaches are gaining widespread acceptance as a conceptual framework from within which water quality management programs should function. However, overall reductions and inequities in State ambient monitoring and assessment programs jeopardize the scientific integrity of watershed-based approaches. This also has had the undesirable effect of failing to properly equip the States and EPA to adequately meet the challenges posed by recently emerging issues such as cumulative effects, nonpoint sources, habitat degradation, and interdisciplinary issues (*e.g.,* TMDLs) in general. Unfortunately, the chronic shortfall in ambient monitoring and assessment resources is not new - the ITFM (1995) reported that of the funding allocated by state and federal agencies to water quality management activities, only 0.2% was devoted to ambient monitoring. As the need for adequate supplies of clean water increases, concerns about public health and the environment escalate, and geographically targeted watershed-based approaches increase, the demands on the water quality monitoring "infrastructure" will likewise increase. These demands cannot be met effectively nor economically without fundamentally changing our attitudes towards ambient monitoring (ITFM 1995). An adequate ambient monitoring and assessment framework is needed to ensure not only a good science-based foundation for watershed-based approaches, but water quality management in general. This paper attempts to describe the important elements, processes, and frameworks which need to be included as part of an adequate State monitoring and assessment program and how this should be used to support the overall water quality management process. Furthermore, it is a goal of this effort to highlight the need to revitalize monitoring, assessment, and environmental indicators as an integral part of the overall water quality management process.

Monitoring and assessment information, when based on a sufficiently comprehensive and rigorous system of environmental indicators, is integral to protecting human health, preserving and restoring ecosystem integrity, and sustaining a viable economy. Such a strategy is intended to achieve a better return on public and private investments in environmental protection and natural resources management. In short, more and better monitoring and assessment information is needed to answer the fundamental questions that have been repeatedly asked about the condition of our water resources and shape the strategies needed to deal with both existing and emerging problems within the context of watershed-based management.

The long-term vision is to develop a process for the comprehensive assessment of the waters of each State by producing and implementing a multi-year monitoring and assessment framework at relevant geographic scales to support all water quality management objectives (including risk-based decision making). Some of the key elements of this approach are:

- development and implementation of a statewide monitoring strategy.
- publishing existing monitoring and assessment results from all relevant sources (*e.g.,* Watershed specific reports, State 305[b] reports).
- performance of data storage, retrieval, and management.
- taking appropriate regulatory and management actions based on those results.

These efforts would fall short if a linkage between program management and monitoring and assessment were not made part of the overall water quality management process (Figure 1). This, too, is part of the long range vision for revitalizing the role of water quality monitoring nationwide.

II. GOALS OF AN ADEQUATE STATE MONITORING AND ASSESSMENT PROGRAM

The following is a compilation of the major program goals that should shape the design of an adequate State monitoring and assessment program and thus become the identifiable characteristics. While much of this is patterned after the major monitoring and assessment compendia and program guidance that has recently been developed (ITFM 1995; U.S. EPA 106 Program Guidance), the specifics of implementation lie within the custodial responsibilities of State water quality management programs.

1. The **18 national water indicators** and the goals each measures (U.S. EPA 1995a; see inset p. 3) are employed as the core indicators with additional area and/or resource specific goals and indicators as needed to fulfill the following purposes:

   - conserve and enhance public health.
   - conserve and enhance ecosystems.
   - support uses designated by States/Tribes in Water Quality Standards (WQS).
   - conserve and improve ambient conditions.
   - reduce or prevent loadings and other stressors (*e.g.*, habitat degradation).

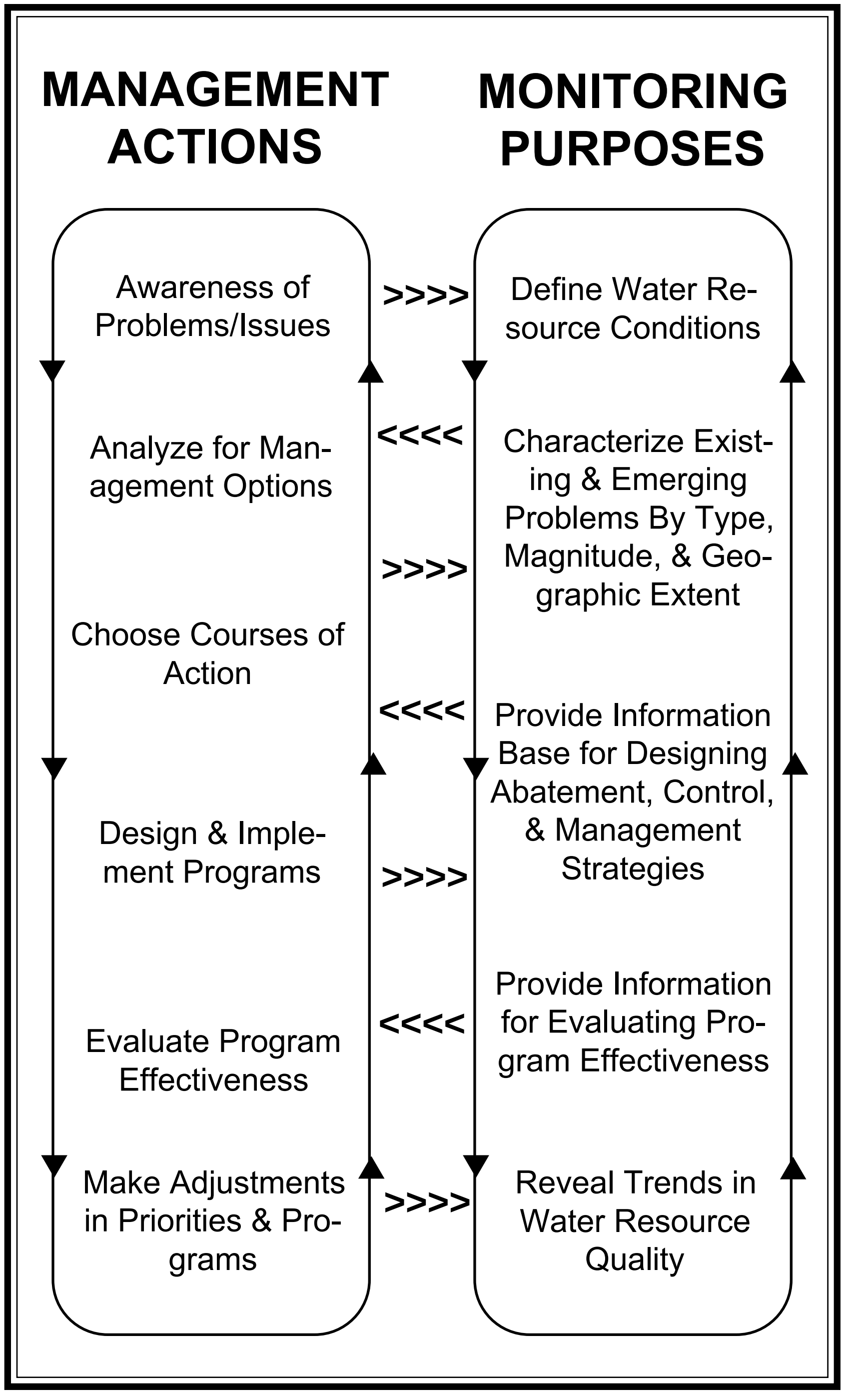

Figure 1. The relationship between management actions and the purposes monitoring and assessment (after ITFM 1995).

Taken together, all of the above should lead to achieving healthy watersheds.

2. **Assess all water resource types** within an organized time frame (*e.g.*, rotating basin approach) by employing the following approaches:

The U.S. EPA National Indicators for Water and the Goals Each Supports

Conserve & Enhance Public Health:

1. Population served by drinking water systems in compliance with health-based standards.
2. Population served by drinking water systems at risk from microbial contamination.
3. Population served by drinking water systems exceeding lead action levels.
4. Number of drinking water systems with source water protection.
5. Percentage of waters with fish consumption advisories.
6. Percentage of estuarine and shellfish waters approved for harvest for human consumption.

Conserve & Enhance Ecosystems:

7. Percentage of waters with healthy aquatic communities (*i.e.*, biological integrity).
8. Percentage of imperiled aquatic species.
9. Rate of wetland acreage loss.

Support Designated Uses:

10. Percentage of waters meeting designated uses:
    a. Drinking water supply
    b. Fish and shellfish consumption
    c. Recreational
    d. Aquatic life

Conserve & Improve Ambient Conditions:

11. Population exposed to chemical pollutants in ground water.
12. Trends in surface water pollutants.
13. Concentrations of selected pollutants in shellfish.
14. Trends in estuarine eutrophication.
15. Percentage of waters with chemically contaminated sediments.

Reduce Loadings & Prevent Other Stressors:

16. Point source loadings to surface and ground water.
17. Nonpoint source loadings to surface and ground water.
18. Marine debris.

- achieve virtually 100% coverage through a mix of different spatial schemes, *i.e.*, targeted sites, rotating basin cycles, and/or probabilistic design.
- utilize appropriate and robust techniques for extrapolation and stratification of monitoring and assessment results (*i.e.*, every mile of every stream need not be monitored to achieve the 100% coverage goal).
- maximize interagency and inter-organizational cooperation and collaboration.
- when appropriate, make use of volunteer organization results.

3. Produce a **“better” 305b report:**

- national statistics are currently biased by wide differences between State approaches to monitoring & assessment including indicators usage and calibration - one result is widely divergent state estimates of impaired waters (generally overly optimistic estimates of the full attainment of aquatic life uses).
- assignment of impairment (or lack thereof) to associated causes and sources also reveals the inconsistent usage of indicators and indicator frameworks - *e.g.*, habitat has been under reported by most states (almost one-half of states reported *zero* impaired miles for rivers & streams in 1992).

4. Support the emerging **watershed approaches**:

- reductions in State monitoring & assessment programs jeopardize the science basis for successfully implementing watershed-based approaches which are ostensibly based (in part) on addressing previously overlooked or under-emphasized problems.
- management applications most commonly take place at the watershed level thus monitoring & assessment must be relevant to this level of management and be capable of detecting impairments and characterizing aquatic resources at this scale.

5. **Satisfy basic questions** that are frequently encountered by water quality program managers:
   - what is the condition of surface, ground, estuarine, and coastal waters?
   - how and why are conditions changing over time?
   - what are the associated causes and sources of impairment?
   - are water quality management programs producing the desired results?
   - are state and national water quality goals being attained?

Each of the above can be subdivided into issue specific questions that are commonly encountered by water quality managers (see inset at right).

6. **Integrate the water resource integrity concepts** that have been developed during the past 10-15 years into monitoring and assessment approaches, environmental indicators, and watershed-based programs:

   - the five factors that determine the integrity of water resources (Figure 2; Karr *et al.* 1986) should be used to guide the development of environmental indicators - indicators which both represent or extend to each major factor *and* which reflect the integrity of the water resource as a whole (*e.g.,* composite measures, indices) are needed.
   - follow the stressor, exposure, response paradigm for determining the most appropriate roles for individual indicators - *avoid the inappropriate substitution of stressor and exposure indicators for response indicators.*
   - utilize appropriate regionalization schemes (*e.g.,* ecoregions, subregions) to stratify and partition natural variability for ambient indicators.
   - incorporate tiered and refined use designations in the State WQS as appropriate.
   - use the water indicators hierarchy (Figure 3) as an operational framework for State water quality management programs - make linkages between administrative activities and indicators of stress, exposure, and response.

Water Quality-Based Decisions Which Would Benefit From Better Monitoring & Assessment Information

Water Quality Standards:
- Refined and stratified designated uses and criteria
- Biological criteria
- Site-specific applications (*e.g.,* dissolved metals translators, design temperature & pH, hardness)
- Water effect ratios
- Anitdegradation
- Ground truthing revisions to water quality criteria

TMDLs:
- Delineating impaired segments and associated causes & sources
- Wasteload allocation (model calibration & verification

NPDES Permits:
- Impact assessment
- Toxicity assessment (*i.e.,* WET testing)
- Overall permit program effectiveness

Nonpoint Sources:
- Delineating impaired segments and prioritization of watersheds
- Database for State Nonpoint Source Assessments

404/401 Dredge & Fill:
- Improved site-specific review and approval criteria
- Minimize exemptions via nationwide permits

Ground Water:
- Development of ambient background characteristics

Wetlands:
- Improved wetlands classification and delineation criteria

III. STATE MONITORING & ASSESSMENT PROGRAM OBJECTIVES

The following are some of the major objectives that State monitoring & assessment programs should have as priorities. Fully meeting some of these objectives will require time to acquire and develop the necessary database, indicators, and staff expertise. However, this will be partly dependent on the status of existing and past State monitoring and assessment efforts. Nevertheless, using the following objectives provides a basis for determining the adequacy of a given State program. A well rounded approach to indicators and monitoring design utilizing a core set of chemical, physical, and biological indicators should provide the information needed to simultaneously meet these objectives without the need to redesign the approach for each different objective.

1. Baseline characterizations of surface water resources:

   - status and trends information.
   - aquatic resource characterization.

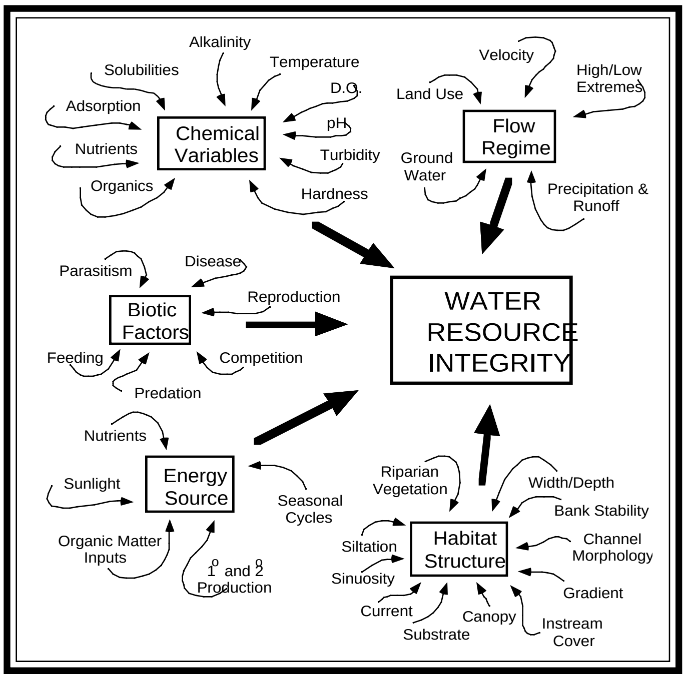

Figure 2. The five major factors which determine the integrity of the water resource (modified after Karr et al. 1986).

2. Identification and characterization of existing and emerging problems:

   - selection of indicators and the overall indicator framework will strongly influence the adequacy of problem identification and characterization (we cannot address problems that we do not know about or adequately understand).
   - the indicator framework and monitoring design must be prepared to provide information and insights to problems that may not yet be understood or even recognized.
   - there will be a need to go beyond point source paradigms.
   - make better linkages between designated uses and indicators.

3. Guide and evaluate the water quality management and regulatory process:

   - monitoring & assessment information should drive the regulatory and management processes from problem identification to assessing the effectiveness of these efforts.
   - the 305[b] process (*i.e.*, Water Body System) should be the central reporting mechanism for State programs - this will further benefit the national assessments compiled by EPA, other federal agencies, and private organizations.
   - support the development and refinement of aquatic life and other designated uses in State WQS.
   - examples of other regulatory and management programs that can be influenced include 303[d] listing, TMDLs, water quality-based permitting, compliance and enforcement, prioritizing grants and other financial assistance, the State nonpoint source assessment (319 program), etc.
   - monitoring and assessment information should provide the impetus for “new” regulatory or program management directions (*e.g.*, initiatives to restore and protect riparian habitat, nutrient criteria, sediment criteria, stream protection, antidegradation) and enhance existing efforts (CSOs, stormwater, 404/401 program, chemical criteria validation, biological criteria).

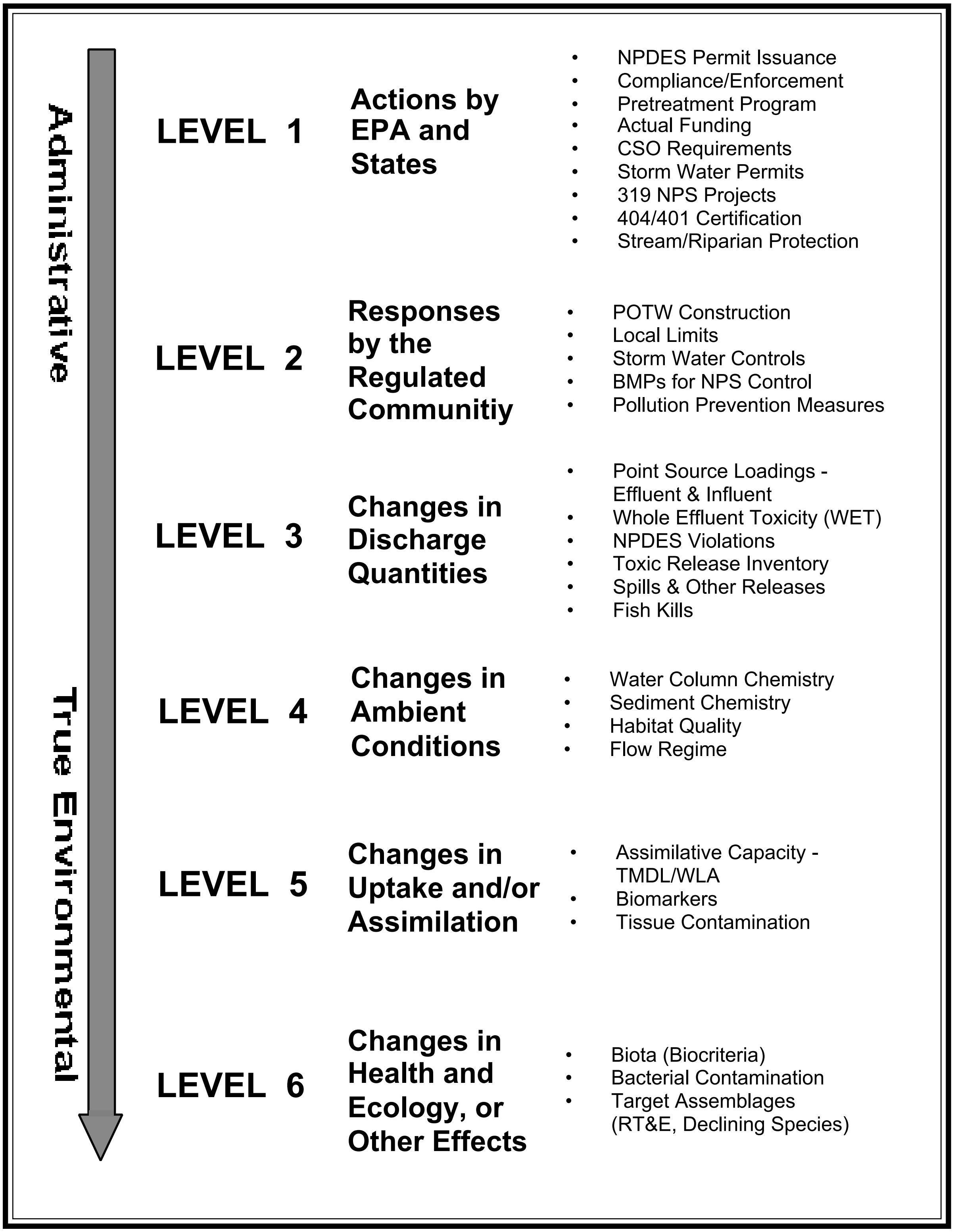

Figure 3. Hierarchy of administrative and environmental indicators which can be used by States for monitoring and assessment, reporting, and evaluating overall program effectiveness. This is patterned after a model developed by U.S. EPA (1995b).

4. Evaluation of overall water quality management program effectiveness:

   - demonstrate the effectiveness of 25+ years of CWA program implementation.
   - establish linkages between administrative activities (*i.e.,* “bean counts”) and environmental results (*i.e.,* ambient chemical, physical, and biological indicators).
   - which actions worked and which ones did not? - provide insights on why and suggest what specific program and/or resource adjustments might be needed.

5. Responding to emergencies, complaint investigations:

   - quantify environmental damages on a spatial and/or temporal basis.
   - characterize resources at risk.
   - define the magnitude of apparent problems.

6. Identify and characterize reference conditions:

   - baseline for development of indicator benchmarks for evaluating designated use attainment/ non-attainment (*e.g.,* biological criteria) and other management objectives.
   - this functions as a long term data source for characterizing ambient biological, chemical, and physical conditions through time.

IV. MONITORING & ASSESSMENT PROGRAM DESIGN ISSUES

Monitoring and assessment program design includes the different types of indicators and the frameworks within which each is developed and used. This in turn determines the different types of data that will need to be collected and synthesized into information in order to successfully realize the previously stated goals and objectives. Spatial considerations about the basic design of the monitoring program are also included and will be most influenced by the overall program goals and objectives of each State. State monitoring and assessment programs serve multiple needs and must function across multiple scales (*i.e.,* local watershed, basin/subbasin, statewide), thus consideration of more than one approach will likely be needed.

Environmental Indicators for Surface Waters

1. The most appropriate roles of indicators are defined as follows:

   - Stressor Indicator - measures of activities which have the potential to impact the environment (*e.g.,* pollutant loadings, land use characteristics, habitat changes).
   - Exposure Indicator - measures of change in environmental variables which suggest a degree (magnitude and duration) of exposure to a stressor (*e.g.,* chemical pollutant levels in water and sediment, toxicity response levels, habitat quality indices, biomarkers).
   - Response Indicator - usually a composite measure or other expression of an integrated or cumulative response to exposure and stress (*e.g.,* biological community indices, status of a target species, etc.).
   - The problem nationally with inconsistent 305[b] statistics (and by extension inconsistent 303[d] and 304[l] lists, etc.) is usually the result of the inappropriate substitution of stressor and/or exposure indicators in the place of response indicators - this is commonly due to the lack of

information about response indicators.

- The exclusion of response indicators and the inappropriate substitution with exposure and/or stressor indicators ultimately influences what States report in terms of waters meeting designated uses. An example of this is illustrated in Figure 4 where some State estimates of aquatic life use attainment based on surrogate approaches are much different than estimates based primarily on biological assessments (U.S. EPA 1996).

2. Use the EPA hierarchy of indicators (U.S. EPA 1995b; Figure 3) as a template to improve the integration of administrative actions and measures with environmental indicators within the State water quality management process:

   - The EPA hierarchy of surface water indicators links traditional administrative approaches (permitting, funding, compliance, enforcement) with environmental indicators which simultaneously sequences stressor, exposure and response indicators - six levels (Figure 3).
   - The six level hierarchy can become an operational template for implementing environmental indicators and monitoring information within a State water quality management process via a watershed approach. This will facilitate the development of case histories about what works and what does not, showing where information gaps exist, and providing opportunities for feedback throughout the process. An example from the Ohio pilot water indicators demonstration project is included in the selected examples (Part IX.).

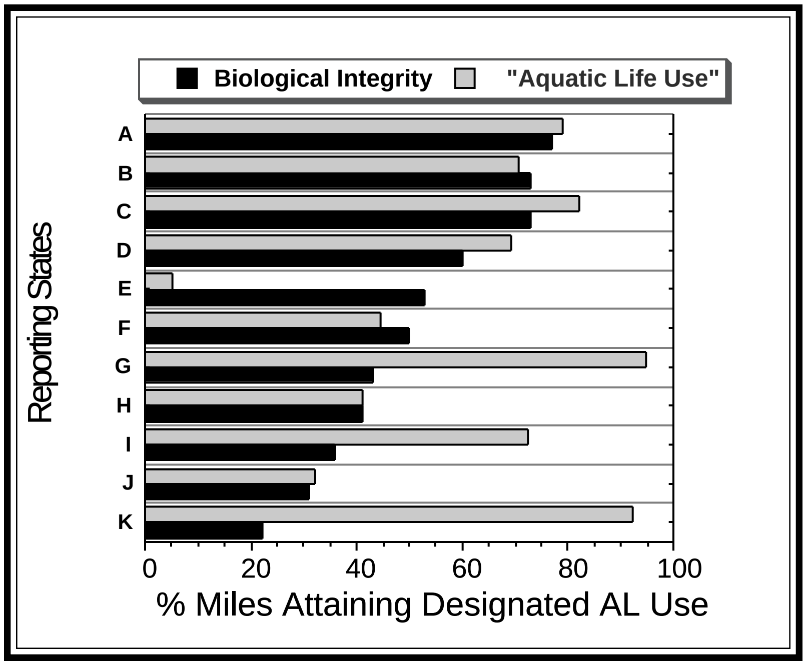

Figure 4. Miles of rivers and streams reported as fully supporting designated aquatic life uses based on varying methods used by 11 states in their 305[b] reports (light shading) compared to that based on biological assessments (after U.S. EPA 1996).

Monitoring Design Approaches

A key issue facing the States and EPA is selection of an appropriate monitoring design. It has been recognized for some time that the traditional fixed station design (*e.g.*, NAWQMN, NASQAN) common to many State monitoring networks is alone insufficient to meet the above stated objectives. However, State monitoring and assessment resources even under the best of circumstances have been limited and therefore must be prioritized. Thus, selection of the most cost and information effective spatial design is a critical step in the process. Two approaches, a synoptic, targeted design commonly referred to as a rotating basin approach and the probabilistic design developed by the U.S. EPA EMAP program are summarized here. The strengths and weaknesses of each are indicated with respect to the multiple issues that State monitoring and assessment programs must address. A case example from the Ohio portion of the E. Corn Belt Plains ecoregion Regional EMAP project is included in Part IX.

Rotating Basin Approach

1. Strengths:
   - organized, systematic approach based on accumulating assessment information at a local scale over a fixed period of time, usually 5 or 10 years.
   - coincides with various management programs which are supported by the monitoring & assessment information (*i.e.,* NPDES permit reissuance, basin-wide water quality planning, proposed 5-year 305b reporting cycle).
   - provides monitoring & assessment information at a local or reach specific scale so that the many issues which occur at this level can be addressed while providing the opportunity to aggregate upwards to a watershed, regional, statewide, or national scale once sufficient data exists.
   - there is more opportunity to define gradients of specific human disturbances with assessment information (*e.g.,* Karr's human activity "dose" - ecological response curve).
   - develop and maintain tabs on reference condition in a predictable and standardized time frame.

2. Weaknesses:
   - visiting a basin/segment/watershed only once in 5 or 10 years may not be sufficient to satisfy all needs.
   - larger scale assessment information (*i.e.,* in support of a valid statewide assessment) is generally not available for 5-10 years.

Probabilistic Design

1. Strengths:
   - statistically robust design.
   - "faster" route to a statewide assessment - aggregate to national scale.
   - transcends State boundary limitations - can facilitate collaborative monitoring between States.

2. Weaknesses:
   - lacks site-specific/issue-specific resolution.
   - logistics are potentially more difficult (*i.e.,* more difficult access to remote monitoring sites).
   - reference condition may be more difficult to define on probability basis alone.
   - local scale issues may be overlooked.

V. AQUATIC RESOURCE CHARACTERIZATION

Defining the different aquatic resource types that a State program must address is a critical step in the process. This includes the major aquatic ecosystem types such as flowing waters (*i.e.,* rivers and streams), lakes and reservoirs, coastal waters, great lakes, estuaries, or wetlands. Further stratification within each is possible (*e.g.,* headwater streams, wadable streams, large rivers, depressional wetlands, riparian wetlands, etc.) and may be accounted for *a priori* or as part of the indicator development and calibration process. Other stratification elements, which includes watershed driving factors (*e.g.,* ecoregions) and other physical vectors, are incorporated as well. Designated aquatic life uses provide an additional layer of stratification. Taken together all of these processes should result in more finely tuned indicator expectations or benchmarks against which management program success will ultimately be judged.

VI. STATE MONITORING & ASSESSMENT COMPONENTS AND RESOURCES

State monitoring and assessment programs need to include the appropriate ambient measurements in order to adequately meet the previously stated goals and objectives. The Intergovernmental Task Force on Monitoring Water Quality (ITFM 1995) recommended the minimum elements of an adequate monitoring and assessment program that will support meeting the previously stated goals and objectives (Table 1). This also represents the elements essential to implementing the hierarchy of water indicators framework (Figure 3) which, in turn, is needed to not only demonstrate program effectiveness, but provide opportunities for feedback resulting in future program improvements.

The ITFM (1995) concluded that the implementation of the ITFM recommendations and strategy would result in an adequate information base to achieve the environmental protection and natural resource management goals and objectives established for the nation's aquatic resources. However, it was also recognized that full implementation of the strategy could not be achieved "overnight" and that the necessary capacity and resources (*i.e.,* the monitoring and assessment "infrastructure") will need to be acquired over a reasonable period of time. Nevertheless, monitoring organizations, including States, will need to review, update, and/or revise their monitoring strategies in a series of deliberate steps. The demands that are increasingly being placed on our water resources at all scales require that past approaches to monitoring be significantly improved both in terms of quality and quantity. Some of the steps towards a more comprehensive and effective approach to ambient monitoring include the following which also summarizes the major points of this document:

1. Develop a goal oriented approach to monitoring, assessment, and indicators development where indicators are sufficiently specific so as to explicitly measure the identified national goals and those relevant to State WQS.

2. Evaluate information priorities and identify existing information gaps.

3. Develop a comprehensive and flexible approach that addresses all relevant scales and aquatic resource types.

4. Take advantage of inter-organizational collaboration whenever appropriate.

5. Link traditional compliance monitoring with watershed-based ambient monitoring.

6. Deal effectively with methods comparability to maximize the flexibility in monitoring and assessment approaches while producing data and information of known quality and power of assessment.

7. Automate and streamline data and information management including data entry, storage, and retrieval.

8. Develop better assessment and reporting at all relevant scales; publish results on a regular basis.

9. Promote the development of incentives and the elimination of disincentives to the development of better State ambient monitoring programs and indicators.

Table 1. Summary matrix of recommended environmental indicators for meeting management objectives for status and trends of surface waters (shaded boxes with **X** *are recommended as a primary indicator after ITFM 1995; other recommended indicators are indicated by* **✓).** *The corresponding EPA indicator hierarchy level is also listed between indicator groups.*

	Categories of Management Objectives					
	Human Health		Ecological Health		Economic Concerns	
Indicator Group	Consumption of Fish /Shellfish	Public Water Supply	Recreation (swimming, fishing, boating)	Aquatic/ Semi-aquatic Life	Industry/ Energy/ Transportation	Agriculture/ Forestry
Biological Response Indicator (Level 6)						
Macroinvertebrates		X	X	X		X
Fish	X		X	X		X
Semiaquatic Animals	X		X	X		X
Pathogens	X		X			X
Phytoplankton	X	X	X	X	X	
Periphyton				X		
Aquatic Plants		X	X	X	X	X
Zooplankton		X	X	X		X
Chemical Exposure Indicator (Level 4&5)						
Water chemistry	X	X	X	X	X	X
Odor/Taste	X	X	X			
Sediment Chemistry	X	X	X	X	X	X
Tissue Chemistry	X	X	✓	X	X	
Biochemical Markers	✓	✓	✓	✓		✓
Physical Habitat/Hydrologic Indicator (Levels 3&4)						
Hydrological Measures	X	X	X	X	X	X
Temperature	X	X	X	X	X	✓
Geomorphology	X	X	X	X	X	X
Riparian/shoreline	X	X	✓	X	X	X
Ambient Habitat Quality	✓	✓	✓	✓	✓	✓
Watershed Scale Stressor Indicators (Levels 3,4&5)						
Land Use Patterns	X	X	X	X	X	X
Human Alterations	X	X	X	X	X	✓
Watershed Impermeability	✓	✓	✓	✓	✓	✓
Pollutant Loadings Stressors (Level 3)						
Point Source Loadings	✓	✓	✓	✓	✓	✓
Nonpoint Source Loadings	✓	✓	✓	✓	✓	✓
Spills/Other Releases	✓	✓	✓	✓	✓	✓

Simply upgrading the monitoring program to include more and better measurements and the better conversion of data to information, while important, is alone insufficient. To achieve the overall goal of improving the use of monitoring and assessment information in the emerging watershed approach, water quality management must mature to focus primarily on the condition of the environment as the overall measure of program success (Figure 5). Whereas the performance of the "program" was

Two Approaches to Watershed-Based Water Quality Management

	PROGRAM FOCUSED APPROACH	RESOURCE FOCUSED APPROACH
Goal:	Program Performance	Environmental Performance
Measures:	Administrative Actions	Indicator End-points
Results:	Improve Programs	Programs are Tools to Improve the Environment

Figure 5. The goals, measures, and results of program based and resource based approaches to water quality management. State programs will evolve towards a resource based approach by developing and using a sufficiently comprehensive and rigorous system of environmental indicators.

once the principal measure of effectiveness, the program must be viewed as a tool to be used along-side monitoring and assessment and environmental indicators to improve the quality of the environ-ment.

VIII. REFERENCES

ITFM (Intergovernmental Task Force on Monitoring Water Quality). 1995. The strategy for improving water-quality monitoring in the United States. Final report of the Intergovernmental Task Force on Monitoring Water Quality. Interagency Advisory Committee on Water Data, Washington, D.C. + Appendices.

Karr, J. R., K. D. Fausch, P. L. Angermier, P. R. Yant, and I. J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Illinois Natural History Survey Special Publication 5: 28 pp.

U.S. Environmental Protection Agency. 1996. Summary of state biological assessment programs for streams and rivers. EPA 230-R-96-007. U. S. EPA, Office of Policy, Planning, & Evaluation, Washington, DC 20460.

U.S. Environmental Protection Agency. 1995a. Environmental indicators of water quality in the United States. EPA 841-R-96-002. Office of Water, Washington, DC 20460. 25 pp.

U.S. Environmental Protection Agency. 1995b. A conceptual framework to support development and use of environmental information in decision-making. EPA 239-R-95 012. Office of Policy, Planning, and Evaluation, Washington, DC 20460. 43 pp.

IX. INDICATORS & PARAMETERS FOR ADEQUATE STATE MONITORING & ASSESSMENT PROGRAMS

The following supplemental figure shows core and supplemental indicators and parameters that are used in an adequate State monitoring and assessment program. This is patterned after the recommendations of the Intergovermental Task Force on Monitoring Water Quality (ITFM 1995). The core indicators are measured everywhere and are supplemented by a variety of chemical and physical measurments depending on the applicable designated use(s) and watershed-specific needs.

CORE INDICATORS/PARAMETERS

• Fish Assemblage • Macroinvertebrates • Periphyton
(Use Community Level Data From At Least Two)

Physical Habitat Indicators
- Channel morphology • Flow
- Substrate Quality • Riparian

Chemical Quality Indicators
- pH • Temperature
- Conductivity • Dissolved O_2

For Specific Designated Uses Add the Following Parameters:

AQUATIC LIFE
Base List
- Ionic strength
- Nutrients, sediment

Supplemental List
- Metals (water/sediment)
- Organics (water/sediment)

RECREATIONAL
Base List
- Fecal bacteria
- Ionic strength

Supplemental List
- Other pathogens
- Organics (water/sediment)

WATER SUPPLY
Base List
- Fecal bacteria
- Ionic strength
- Nutrients, sediment

Supplemental List
- Metals (water/sediment)
- Organics (water/sediment)
- Other pathogens

HUMAN/WILDLIFE CONSUMPTION
Base List:
- Metals (in tissues)
- Organics (in tissues)

Supplemental Figure 1. Core indicators and parameters for an adequate State watershed monitoring and assessment program with supplemental chemical parameters according to the applicable designated use(s). Parameters are added based on site and watershed-specific needs and overall water quality management objectives.

X. CASE EXAMPLES
(ASIWPCA Meeting Version)

Case examples of how monitoring and assessment information based on an integrated water indicators framework can be used to address some of the key goals and objectives of this guidance document are appended. These examples provide tangible evidence of how good monitoring and assessment information can be used to not only support specific program areas, but the overall water quality management process in general.

A. Pennsylvania DEP
The Pennsylvania examples show how the DEP is responding to the settlement of a TMDL suit by committing to increased monitoring and assessment (biological monitoring in particular) statewide.

B. Tennessee Valley Authority (TVA)
The TVA has traditionally been a leader in using ambient monitoring information to meet their water quality management obligations. The examples appended here portray the types of monitoring and assessment, the spatial design, and how this has fostered a better approach to inter-organizational collaboration.

C. Wisconsin DNR
A published paper from the Wisconsin DNR shows how biological and habitat information was used to determine the effects of nonpoint sources and land use on the integrity of Wisconsin streams. This should begin to point out how this type of information can be used in the TMDL process.

D. Ohio EPA
A number of examples from the Ohio EPA surface water monitoring and assessment program are presented and include:

- fact sheets from the 1996 Ohio Water Resource Inventory (305b report);
- watershed profiles from two basin survey areas.
- preliminary results from the E. Corn Belt Plains Ecoregion REMAP project;
- a synopsis of figures from the pilot water indicators project; and,
- three examples of how ambient monitoring data can be used to validate and/or derive chemical water quality criteria.

E. U.S. EPA, Office of Water
The most recent version of the U.S. EPA Section 106 monitoring guidance attempts to foster helping States to achieve the many goals and objectives stated herein.

XI. OHIO EPA CASE EXAMPLES:

I. 1996 Ohio Water Resource Inventory (305[b] Report) Fact Sheets:

- Streams and Rivers Status
- Causes and Sources of Impairment
- Streams and Rivers: Siltation & Habitat Destruction
- Impaired Waters in Ohio: What Does This Mean?

II. An Evaluation of Spatial Monitoring & Assessment Design: Preliminary Results from the E. Corn Belt Plains REMAP Project

III. Ammonia Fact Sheets

- Associations Between the Index of Biotic Integrity and Unionized Ammonia in Ohio Rivers and Streams: A Preliminary Analysis
- Associations Between the Index of Biotic Integrity and Total Ammonia in Ohio Rivers and Streams: A Preliminary Analysis

IV. Ohio EPA Pilot Indicators Project figures

V. Watershed Profile Summaries

- Sandy Creek
- Little Miami River

Appendix C

Elements of a State Water Monitoring and Assessment Program

March 2003

Elements of a State Water Monitoring and Assessment Program

March 2003

Assessment and Watershed Protection Division
Office of Wetlands, Oceans and Watershed
U.S. Environmental Protection Agency

EPA 841-B-03-003

Available on the web at
http://www.epa.gov/owow/monitoring/repguid.html

Elements of a State Water Monitoring and Assessment Program

EPA and States need comprehensive water quality monitoring and assessment information on environmental conditions and changes over time to help set levels of protection in water quality standards and to identify problem areas that are emerging or that need additional regulatory and non-regulatory actions to support water quality management decisions such as TMDLs, NPDES permits, enforcement, and nonpoint source management. This information also informs EPA and State decisionmakers, the Congress, the public, and other stakeholders of the progress that the Agency and State partners are making in protecting human health and the environment. Without this information, it is difficult for EPA and the States to set priorities, evaluate the success of programs and activities, and report on accomplishments in a credible and informed way (U.S. GAO 2000).

Contents

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
WATER

MAR 14 2003

MEMORANDUM

SUBJECT: Transmittal of the *Elements of a State Water Monitoring and Assessment Program*

FROM: Diane C. Regas, Director
Office of Wetlands, Oceans and Watersheds

James A. Hanlon, Director
Office of Wastewater Management

TO: Water Management Division Directors, Regions 1-10
Regional Science and Technology Division Directors, Regions 1-10

The Clean Water Act [CWA] gives States and Territories the primary responsibility for implementing programs to protect and restore water quality, including monitoring and assessing the nation's waters and reporting on their quality. CWA Section 106(e)(1) requires the Environmental Protection Agency (EPA) to determine that a State is monitoring the quality of navigable waters, compiling, and analyzing data on water quality and including it in the State's Section 305(b) report prior to the award of Section 106 grant funds. The attached document, *Elements of a State Water Monitoring and Assessment Program,* recommends the basic elements of a State water monitoring program and serves as a tool to help EPA and the States determine whether a monitoring program meets the prerequisites of CWA Section 106(e)(1).

It is not EPA's intent to use the *Elements* document to withhold a State's Section 106 grant funds, but rather to encourage a long term process of incremental improvement in monitoring programs, as needed. The *Elements* document is intended to provide a framework for States to clearly articulate their programmatic and resource needs and a reasonable time line for meeting those needs. EPA expects this effort will identify efficiencies to be gained through a holistic approach to program implementation.

For the Fiscal Year (FY) 2004 grant award, a State should, in addition to continuing to submit reports under Section 305(b) and annual data updates, have a monitoring program strategy[1] in place or commit to complete development of such a strategy. This strategy will be State specific, building on the State's existing monitoring capabilities, but will describe how the monitoring program will serve all water quality management needs and address all State waters over time. The monitoring program strategy is a long-term implementation plan and should include a timeline, not to exceed ten years[2], for completing implementation of the strategy. It is important that the strategy be comprehensive in scope and identify the technical issues and resource needs that are currently impediments to an adequate monitoring program.

States should begin implementation of the strategies upon receipt of the subsequent award of a Section 106 grant or Performance Partnership Grant that includes Section 106 funds. Beginning with the FY2005 Section 106 grant cycle, activities from a State's strategy needed to upgrade its monitoring program should be incorporated into work plans for Section 106 grants and Performance Partnership Grants (PPGs) that include Section 106 funds, consistent with the regulations governing the negotiation of work plans at 40 CFR 35.107. The State must continue to submit reports under Section 305(b) and annual data updates.

The EPA Region, in conjunction with the State, will review the State's monitoring program to determine whether progress has been adequate and reflects commitments negotiated in work plans for Section 106 grants or Performance Partnership Grants (PPGs) that include Section 106 funds. This evaluation will take into consideration the effects of funding shortfalls on a State's implementation of its monitoring program strategy. EPA Headquarters will collaborate with the EPA Regional offices to assess overall State progress from a national perspective.

If you have any questions, please contact Charles Sutfin, Director, Assessment and Watershed Protection Division at 202-566-1155, or Margarete Heber, Chief, Monitoring Branch at 202-566-1189.

Attachment

cc: Regional Monitoring/305(b) coordinators
Regional TMDL coordinators
Regional 106 coordinators
Tracy Mehan-AA, Office of Water
Paul Gilman-AA, Office of Research and Development
Mike Shapiro-OW
Ben Grumbles-OW
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[1]see Section II, Part A, "Monitoring Program Strategy,"of this *Elements* document

[2]i.e., no later than the end of FY2014

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George Alapas-NCEA
Peter Preuss-NCER
Gary Foley-NERL
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Association of State and Interstate Water Pollution Control Administrators
Environmental Council of the States

Executive Summary

Clean Water Act §106(e)(1) and 40 CFR Part 35.168(a) provide that EPA award Section 106 funds to a State only if the State has provided for, or is carrying out as part of its program, the establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor and to compile and analyze data on the quality of navigable waters in the State[3], and provision for annually updating the data and including it in the Section 305(b) report.[4] This document recommends the basic elements of a State water monitoring program and serves as a tool to help EPA and the States determine whether a monitoring program meets the prerequisites of CWA Section 106(e)(1).

Because these elements have not been clearly defined in the past, there is a lot of variability in existing State programs. EPA expects that State water monitoring programs will evolve over the next 10 years so that ultimately all States will have a common foundation of water quality monitoring programs that support State decision needs. EPA expects that most States will employ an iterative process to fully implement a monitoring program that reflects the elements described in this document, and will work with States to identify annual monitoring milestones.

States should develop, over time, a monitoring program addressing the 10 elements summarized below and described in greater detail in the full text of this document. The first of these elements is a long-term state monitoring strategy. This strategy will be State specific, be designed from the monitoring capabilities each State already has, and should include a timeline not to exceed 10 years to complete implementation. EPA believes that state monitoring programs can be upgraded to include all of the elements described below within the next 10 years.

For the FY2004 grant award, a State, in addition to continuing to submit reports under Section 305(b) and annual data updates, should have a monitoring program strategy[5] in place or commit to complete development of such a strategy. Beginning with the FY2005 Section 106 grant cycle, activities from a State's strategy needed to upgrade its monitoring program should be incorporated into work plans for Section 106 grants and Performance Partnership Grants (PPGs) that include Section 106 funds, consistent with the regulations governing the negotiation of work plans at 40 CFR 35.107. The State must continue to submit reports under Section 305(b) and annual data. EPA expects that the State will have fully implemented its strategy by 2014.

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[3] The term "State waters" is used in this document to refer to navigable waters as defined under Section 502 of the Clean Water Act.

[4] This document uses the term "State" to refer to States, the District of Columbia and Territories, as defined under Section 502 of the Clean Water Act. Under the CWA and EPA's implementing regulations this requirement applies only to States and not to Interstate Agencies or Tribes (40 CFR §§ 35.168(b), 35.588). However, non-State recipients of 106 funds may be required to submit monitoring reports pursuant to the grant. EPA encourages these recipients to follow the recommendations of this guidance to the extent practicable.

[5] see Section II, Part A, "Monitoring Program Strategy," of this *Elements* document

The recommended 10 elements of a state water monitoring and assessment program are:

A. Monitoring Program Strategy
The State has a comprehensive monitoring program strategy that serves its water quality management needs and addresses all State waters, including streams, rivers, lakes, the Great Lakes, reservoirs, estuaries, coastal areas, wetlands, and groundwater. The strategy should contain or reference a description of how the State plans to address each of the remaining nine elements. The monitoring program strategy is a long-term implementation plan and should include a timeline, not to exceed ten years[6], for completing implementation of the strategy. EPA believes that state monitoring programs can be upgraded to include all of the elements described below within the next 10 years. It is important that the strategy be comprehensive in scope and identify the technical issues and resource needs that are currently impediments to an adequate monitoring program.

B. Monitoring Objectives
The State has identified monitoring objectives critical to the design of a monitoring program that is efficient and effective in generating data that serve management decision needs. EPA expects the State to develop a strategy and implement a monitoring program that reflects a full range of State water quality management objectives including, but not limited to, Clean Water Act goals. For example, monitoring objectives could include helping establish water quality standards, determining water quality status and trends, identifying impaired waters, identifying causes and sources of water quality problems, implementing water quality management programs, and evaluating program effectiveness. Consistent with the Clean Water Act, monitoring objectives should reflect the decision needs relevant to all types of State waters.

C. Monitoring Design
The State has an approach and rationale for selection of monitoring designs and sample sites that best serve its monitoring objectives. The State monitoring program will likely integrate several monitoring designs (e.g., fixed station, intensive and screening-level monitoring, rotating basin, judgmental and probability design) to meet the full range of decision needs. The State monitoring design should include a probability-based network for making statistically valid inferences about the condition of all State water types, over time. EPA expects the State to use the most efficient combination of monitoring designs to meet its objectives.

[6] i.e., no later than the end of FY2014

D. Core and Supplemental Water Quality Indicators

The State uses a tiered approach to monitoring that includes core indicators selected to represent each applicable designated use, plus supplemental indicators selected according to site-specific or project-specific decision criteria. Core indicators for each water resource type include physical/habitat, chemical/toxicological, and biological/ecological endpoints as appropriate, and can be used routinely to assess attainment with applicable water quality standards throughout the State. Supplemental indicators are used when there is a reasonable expectation that a specific pollutant may be present in a watershed, when core indicators indicate impairment, or to support a special study such as screening for potential pollutants of concern.

E. Quality Assurance

Quality management plans and quality assurance program/project plans are established, maintained, and peer reviewed in accordance with EPA policy to ensure the scientific validity of monitoring and laboratory activities, and to ensure that State reporting requirements are met.

F. Data Management

The State uses an accessible electronic data system for water quality, fish tissue, toxicity, sediment chemistry, habitat, biological data, with timely data entry (following appropriate metadata and State/Federal geo-locational standards) and public access. In the future, EPA will require all States to directly or indirectly make their monitoring data available through the new STORET system. For States that do not currently operate STORET, their monitoring strategies should provide for use of STORET as soon as is practicable. For the 2004 305(b) reports and 303(d) lists, EPA strongly recommends that all States store assessment information using the EPA Assessment Database or an equivalent relational database and define the geographic location of assessment units using the National Hydrography Dataset (NHD).

G. Data Analysis/Assessment

The State has a methodology for assessing attainment of water quality standards based on analysis of various types of data (chemical, physical, biological, land use) from various sources, for all waterbody types and all State waters. The methodology includes criteria for compiling, analyzing, and integrating all readily available and existing information (e.g., volunteer monitoring data, discharge monitoring reports).

H. Reporting

The State produces timely and complete water quality reports and lists called for under Sections 305(b), 303(d), 314, and 319 of the Clean Water Act and Section 406 of the Beaches Act. EPA issued *"2002 Integrated Water Quality Monitoring and Assessment Report Guidance"* on November 19, 2001, to encourage integration and consistency in the development and submission of Section 305(b) water quality reports and Section 303(d) impaired waters lists. EPA will continue to support the use of this integrated reporting framework for future reporting cycles.

Under current regulations, Section 303(d) lists and Section 305(b) reports are due no later than

April 1 of even-numbered years. To remain eligible for Section 106 grants, the State also must submit annual updates of water quality information. This requirement may be satisfied by annually updating 305(b) assessment information or by annually uploading monitoring data to the national STORET warehouse.

I. Programmatic Evaluation

The State, in consultation with its EPA Region, conducts periodic reviews of each aspect of its monitoring program to determine how well the program serves its water quality decision needs for all State waters, including all waterbody types. This should involve evaluating the monitoring program to determine how well each of the elements is addressed and determining how needed changes and additions are incorporated into future monitoring cycles.

J. General Support and Infrastructure Planning

The State identifies current and future resource needs it requires to fully implement its monitoring program strategy. This needs assessment should describe funding, staff, training, laboratory resources, and upcoming improvements.

I. Introduction

A. Background

Clean Water Act §106(e)(1) requires EPA, prior to awarding a Section 106 grant to a State, to determine that the State is monitoring the quality of navigable waters, compiling and analyzing data on the water quality, and including those data in the State's section 305(b) report.[7] Historically, EPA has relied on submission of the 305(b) report to determine that States have satisfied the Section 106(e) eligibility requirement for the award of Section 106 grant funds. As explained in the FY2001 Clean Water Act Section 106 Grant Guidance, Regions have begun conducting reviews of State monitoring programs and are working with States to strengthen these programs over time [1].

States have taken very different approaches, within their resource limitations, to implement their monitoring programs. They have applied a range of monitoring and assessment approaches (e.g., water chemistry, sediment chemistry, biological monitoring) to varying degrees, both spatially and temporally, and at varying levels of sampling effort. It is not uncommon for the reported quality of a waterbody (i.e., attainment or nonattainment) to differ on either side of a State boundary. Although some differences can be attributed to differences in water quality standards, variations in data collection, assessment methods, and relative representativeness of the available data contribute more to differences in assessment findings. These differences adversely affect the credibility of environmental management programs.

EPA has issued national guidance to promote and structure consistency in State monitoring programs and to ensure that the Section 305(b) process provides nationally comparable data with known accuracy [2, 3]. However, experts charge that EPA remains unable to make credible statements about differences in environmental quality over time and across the Nation [4, 5]. Also, in 1998, the Federal Advisory Committee on the Total Maximum Daily Load (TMDL) Program recommended that EPA assure needed improvements in State efforts to monitor water, characterize the general health of aquatic systems, and determine (non)attainment of any component of water quality standards, including narrative criteria and designated uses [6]. A 2001 National Research Council report, *Assessing the TMDL Approach to Water Quality Management*, recommends, among other things, the development of a uniform, consistent approach to ambient monitoring and data collection; increased resources for water monitoring; the coordination of monitoring with program needs; endorsement of statistical approaches and explicit acknowledgment of uncertainty; and the combining of monitoring and modeling [7].

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[7] See footnote 5 infra. §106(e) of the Clean Water Act provides that ... "the Administrator shall not make any grant under this section to any State which has not provided or is not carrying out as part of its program - the establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor, and to compile and analyze data on (including classification according to eutrophic condition), the quality of navigable waters and to the extent practicable, ground waters including biological monitoring; and provision for annually updating such data and including it in the report required under [section 305 of this Act]..."

And most recently, a 2002 National Academy of Public Administration report, *Understanding What States Need to Protect Water Quality,* notes that improved information on water quality conditions, pollution sources, and program results will help states make more effective use of limited resources [8].

B. Purpose

The purpose of this document is to recommend the elements of a State water monitoring program, to provide a framework for the State to articulate its programmatic and resource needs, and to serve as a tool to help EPA and the State determine whether a monitoring program meets the prerequisites of CWA Section 106(e)(1). EPA recognizes that full implementation of these elements will take time and resources and that currently many states do not fully meet these elements for all their waterbody types. For a State lacking many of the elements, this implementation process may extend over a period of up to 10 years. EPA expects the State to define annual milestones for incremental progress toward implementation of the ten elements and to include these in its work plans for Section 106 grants and Performance Partnership Grants (PPGs) that include Section 106 funds, consistent with the regulations governing the negotiation of work plans at 40 CFR 35.107.

C. References

1. U.S. Environmental Protection Agency (U.S. EPA). 2001. Memorandum on *FY 2001 Clean Water Act Section 106 Grant Guidance* signed February 16, 2001 by Michael B. Cook, Director, Office of Wastewater Management.

2. U.S. EPA. 1977. *Basic Water Monitoring Program*. U.S. Environmental Protection Agency Standing Work Group on Water Monitoring. EPA 440/9-76-0252.

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4. National Academy of Sciences. 1977. *A Report to the U.S. Environmental Protection Agency from the Study Group on Environmental Monitoring, Committee on National Statistics, National Research Council*. National Academy of Sciences, Washington, DC.

5. General Accounting Office. March 2000. *Water Quality–Key EPA and State Decisions Limited by Inconsistent and Incomplete Data.* GAO/RCED-00-54.

6. National Advisory Council for Environmental Policy and Technology (NACEPT). 1998. *Final Report of the Federal Advisory Committee on the Total Maximum Daily Load (TMDL) Program*. http://www.epa.gov/owow/tmdl/faca/tofc.htm.

7. National Research Council. 2001. *Assessing the TMDL Approach to Water Quality Management, Committee to Assess the Scientific Basis of the Total Maximum Daily Load Approach to Water Pollution Reduction.* National Academy Press, Washington, D.C.

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II. The Recommended Elements of a State Monitoring Program

A. Monitoring Program Strategy

The State has a comprehensive monitoring program strategy that serves all water quality management needs and addresses all State water, including all waterbody types (e.g., streams, rivers, lakes, Great Lakes, reservoirs, estuaries, coastal areas, wetlands, and groundwater). The monitoring program strategy is a long-term implementation plan and should include a timeline, not to exceed ten years[8], for completing implementation of the strategy. It is important that the strategy be comprehensive in scope and identify the technical issues and resource needs that are currently impediments to an adequate monitoring program.

The State's monitoring strategy should contain or reference a description of how the monitoring program elements described in the remainder of this document will be achieved.

EPA recommends that State monitoring program managers work with other State environmental managers and interested stakeholders (including EPA Regions, other Federal water quality and land management agencies, volunteer monitoring organizations, and academic institutions) as they develop their strategy. This collaboration provides the State water quality program an opportunity to maximize its use of other parties' data and effectively expand its monitoring resources. Many States have formed monitoring councils that help facilitate coordination of monitoring activities among various organizations.

B. Monitoring Objectives

The State has identified monitoring objectives critical to the design of a monitoring program that is efficient and effective in generating data that serve its management decision needs. EPA expects the State to develop a strategy and implement a monitoring program that reflects a full range of State water quality management objectives including, but not limited to, Clean Water Act goals. Consistent with the Clean Water Act, monitoring objectives should reflect the decision needs relevant to all types of waters of the United States, including streams, rivers, lakes, the Great Lakes, reservoirs, estuaries, coastal areas, wetlands and, to the extent possible, groundwater.

Clean Water Act objectives include:

- Establishing, reviewing, and revising water quality standards (Section 303(c)).
- Determining water quality standards attainment (Section 305(b)).
- Identifying impaired waters (Section 303(d)).
- Identifying causes and sources of water quality impairments (Sections 303(d), 305(b)).

[8] i.e., no later than the end of FY2014

- Supporting the implementation of water management programs (Sections 303, 314, 319, 402, etc.).
- Supporting the evaluation of program effectiveness (Sections 303, 305, 402, 314, 319, etc.).

The State may have additional objectives for its own purposes.

In general, a monitoring program that meets the Clean Water Act objectives should be able to answer the following five questions:

1. **What is the overall quality of waters in the State?** Under Section 305(b) of the Act, the State determines the extent to which its waters meet the objectives of the Clean Water Act, attain applicable water quality standards, and provide for the protection and propagation of balanced populations of fish, shellfish, and wildlife (40 CFR 130.8).

2. **To what extent is water quality changing over time?** The State assesses and reports on the extent to which control programs have improved water quality or will improve water quality for the purposes of "... the protection and propagation of a balanced population of shellfish, fish, and wildlife and ... recreational activities in and on the water" (40 CFR 130.8(b)(2) and 130.8(b)(1)). Under Section 319(h)(11) of the Act, a State with Section 319 grants reports on reductions in nonpoint-source loadings and related improvements in water quality. Under Section 314(a)(1)(F), a State reports on the status and trends of water quality in lakes. The State may address these requirements through the use of models (for load estimations) and by tracking trends in use assessments. The State also should be able to identify emerging environmental issues related to new pollutants or changes in activities within watersheds.

3. **What are the problem areas and areas needing protection?** Under Section 303(d), the State must identify impaired waters. The State should also identify waters that are currently of high quality and should be protected from degradation. In order to protect and restore waters, State monitoring and assessment programs should identify the causes and sources of impairment.

4. **What level of protection is needed?** The State establishes the level of protection that is being monitored against. For example, the State uses data from monitoring programs to conduct triennial reviews of state water quality standards, conduct use attainability analyses, develop and adopt revised designated uses and water quality criteria, establish water quality-based effluent limits in NPDES permits, establish total maximum daily loads, and assess which levels of best management practices for nonpoint sources are most appropriate.

5. **How effective are clean water projects and programs?** The State monitors to evaluate the effectiveness of specific projects and overall programs, including but not limited to Section 319 (nonpoint source control), Section 314 (Clean Lakes), Section 303(d) Total

Maximum Daily Loads (TMDLs), Section 402 NPDES permits, water quality standards modifications, compliance programs (Discharge Monitoring Report information), and generally to determine the success of management measures.

C. Monitoring Design

The State has an approach and rationale for selection of monitoring designs and sample sites that best serve its monitoring objectives. The State monitoring program will likely integrate several monitoring designs (e.g., fixed station, intensive and screening-level monitoring, rotating basin, judgmental and probability design) to meet the full range of decision needs. The State monitoring design should include probability-based networks (at the watershed or state-level) that support statistically valid inferences about the condition of all State water types, over time. EPA expects the State to use the most efficient combination of monitoring designs to meet its objectives.

When developing designs to meet specific objectives, the EPA encourages States to consider those designs used by EPA's Environmental Monitoring and Assessment Program (EMAP) (probabilistic site selection using simple random, stratified, or nested designs) and the U.S. Geological Survey's National Water Quality Assessment program (targeted, judgmental design based on land use, geological setting, and other natural and human influences). An integrated design for assessing water quality incorporates multiple tools in a tiered approach to address management decisions at multiple scales. These tools include probabilistic designs, landscape and water quality modeling, and targeted site-specific monitoring. This tiered approach enables States to make statistically valid inferences of the extent that waters meet water quality standards, to predict which waters are most likely degraded or at risk for degradation, and to target site-specific monitoring needed to address local water quality concerns. The efficiencies of an integrated design should extend beyond monitoring costs to program costs because it can help States prioritize which waterbodies need more immediate attention.

The monitoring design should address the objectives outlined in Section B, above. The design should include a comprehensive approach to assessment using multiple indicators [1,2], for all State waters on a continuing basis. The elements of the monitoring design should support the State's estimation of the amount or percentage of waters that are impaired Statewide, for each waterbody type, with a high degree of confidence. The State is encouraged to use a design that allows for estimations to within ±10% at a 90% confidence level for Statewide designs. EPA encourages the application of integrated monitoring designs that allow more intensive monitoring in specific areas of concern or interest for individual States.

To meet its monitoring objectives, States should ensure that the selected monitoring design yields scientifically valid results and meets the needs of the decision maker. The monitoring design should incorporate appropriate methods to control decision errors and balance the possibility of making incorrect decisions. The levels of precision and confidence should be appropriate to the monitoring objective and the type of data collected.

D. Core and Supplemental Water Quality Indicators

Because limited resources affect the design of water quality monitoring programs, the State should use a tiered approach to monitoring that includes a core set of baseline indicators selected to represent each applicable designated use, plus supplemental indicators selected according to site-specific or project-specific decision criteria [1, 2]**.** Using this tiered approach, the State should be able to make the best use of its resources to meet water quality decision needs, including assessing water quality standards attainment and designated use support, identifying needed changes to water quality standards, describing causes and sources of impairments, developing water quality-based source controls, and assessing whether physical, chemical, and biological integrity are supported.

The monitoring strategy should define a **core** set of indicators (e.g., water quality parameters) for each water resource type that include physical/habitat, chemical/toxicological, and biological/ecological endpoints as appropriate, that reflect designated uses, and that can be used routinely to assess attainment with applicable water quality standards throughout the State. This core set of indicators is monitored to provide Statewide or basin/watershed level information on the fundamental attributes of the aquatic environment and to assess water quality standards attainment/impairment status. Previously, chemical and physical indicators were emphasized; however, biological monitoring and assessment should assume a more prominent role in State monitoring. [2, 3].

The strategy should also describe a process for identifying **supplemental** indicators to monitor when there is a reasonable expectation that a specific pollutant may be present in a watershed, when core indicators indicate impairment, or to support a special study such as screening for potential pollutants of concern. Supplemental indicators are often key to identifying causes and sources of impairments and targeting appropriate source controls. These supplemental indicators may include each water quality criteria in the State's water quality standards, any pollutants controlled by the National Pollutant Discharge Elimination System (NPDES), and any other constituents or indicators of concern.

Table 1 presents examples of recommended core and supplemental water quality indicators. The *Consolidated Assessment and Listing Methodology* [4] provides additional information on considerations for selection of supplemental indicators (see http://www.epa.gov/owow/monitoring/calm.html, Chapter 11).

E. Quality Assurance

Quality Management Plans and Quality Assurance Project Plans are developed, maintained, and peer reviewed in accordance with EPA policy to ensure the scientific validity of monitoring and laboratory activities. The Quality Management Plan (QMP)

Table 1. Recommended water quality indicators for general designated use categories

Recommended Core and Supplemental Indicators				
	Aquatic Life & Wildlife	**Recreation**	**Drinking Water**	**Fish/Shellfish Consumption**
Recommended Core Indicators	*Condition of biological communities (EPA recommends the use of at least two assemblages) *Dissolved oxygen *Temperature *Conductivity *pH *Habitat assessment *Flow *Nutrients *Landscape conditions (e.g., % cover of land uses) Additional indicators for lakes: *Eutrophic condition Additional indicators for wetlands: *Wetland hydrogeomorphic settings and functions	*Pathogen indicators (*E. coli*, enterococci) *Nuisance plant Growth *Flow *Nutrients *Chlorophyll *Landscape conditions (e.g., % cover of land uses) Additional indicators for lakes: *Secchi depth Additional indicators for wetlands: *Wetland hydrogeomorphic settings and functions	*Trace metals *Pathogens *Nitrates *Salinity *Sediments/TDS *Flow *Landscape conditions (e.g., % cover of land uses)	*Pathogens *Mercury *Chlordane *DDT *PCBs *Landscape conditions (e.g., % cover of land uses)
Supplemental Indicators	*Ambient toxicity *Sediment toxicity *Other chemicals of concern in water column or sediment *Health of organisms	*Other chemicals of concern in water column or sediment *Hazardous chemicals *Aesthetics	*VOCs (in reservoirs) *Hydrophyllic pesticides *Nutrients *Other chemicals of concern in water column or sediment *Algae	*Other chemicals of concern in water column or sediment

documents how the State monitoring program will plan, implement, and assess the effectiveness of its quality assurance and quality control operations. Quality Assurance Project Plans (QAPPs) document the planning, implementation, and assessment procedures for a particular project, as well as any specific quality assurance and quality control activities. EPA guidance on developing QMPs and QAPPs is available at www.epa.gov/quality.

These plans should reflect the level of data quality that is appropriate for the specific uses of the data, such as comprehensive assessment and listing of impaired waters, TMDL development, NPDES permit issuance, and NPS effectiveness. Data quality and quantity needs are expected to vary according to the consequences of the resulting water quality decisions.

Under 40 CFR 130.4(b), State monitoring programs are to include collection and analysis of physical, chemical, and biological data, and quality assurance and control programs to ensure the data are scientifically valid. Under 40 CFR 31.45, if a grantee's project involves environmentally related measurements or data generation, the grantee must develop and implement quality assurance practices consisting of policies, procedures, specifications, standards, and documentation sufficient to produce data of adequate quality to meet project objectives and minimize loss of data due to out-of-control conditions or malfunctions.

A grantee that uses Section 106 funds for monitoring activities should include, in its Quality Assurance Program Plan (QAPP) or equivalent document, a description of how:

- Each study or monitoring program objective is defined in specific qualitative and quantitative terms and linked to an environmental management decision or reporting requirement associated with the goals of the Clean Water Act.

- Selected indicators offer the most direct means of assessing the environmental attribute under study, based upon the associated requirement and goals of the Clean Water Act.

- The uncertainty associated with estimates and conclusions drawn from each component of the monitoring program are understood, quantified, and limited to a reasonable extent, commensurate with the potential costs (both monetary and environmental) of decision errors.

- The proposed sampling scheme will yield data that are representative of the environmental attribute under study, with consideration of statistical probabilities associated with sampling.

- The quality of the data is assessed and validated to ensure that the data quality objectives of the programs were met.

F. Data Management

The State uses an accessible electronic data system for water quality, fish tissue, toxicity, sediment chemistry, habitat, and biological data (following appropriate metadata and State/Federal geo-locational standards) with timely data entry and public access.

EPA's new STORET (STOrage and RETrieval) system provides an accessible, nationwide central repository of water information of known quality. In the future, EPA will require that all States use STORET either directly or indirectly (e.g., via the Central Data Exchange (CDX) which will include the Monitoring Data Standard). For States that do not currently operate STORET, their monitoring strategies should provide for the use of STORET as soon as is practicable. EPA is committed to providing updates and improvements to STORET to meet user needs and to providing the State with training and other technical support. See www.epa.gov/storet for further information on STORET, including system updates for users and instructions on how to download data via the Web.

In addition, the State should store its assessment information in an accessible electronic database. For the 2004 305(b) reports and 303(d) lists, EPA strongly recommends that all States use either the Assessment Database (ADB) or an equivalent relational database for storing WQS attainment status for each assessment unit. See Appendix B of the 2002 *Integrated Water Quality Monitoring and Assessment Report Guidance* [5] for further information on the electronic reporting format. This guidance is available at: www.epa.gov/owow/tmdl/2002wqma.html

The State also provides appropriate geospatial data to enable the use of current Geographic Information System (GIS) tools. The 2002 *Integrated Water Quality Monitoring and Assessment Report Guidance*, Appendix B, asks states to define the geographic location of assessment units using the National Hydrography Dataset (NHD). The use of NHD is strongly recommended for the 2004 305(b) reports and 303(d) lists. The 1998 Content Standard for Digital Geospatial Metadata [6] to label geospatial datasets applies to States and EPA. It provides for characterizing geospatial data so that users can determine the data's fitness for their purpose. For more information, visit http://www.fgdc.gov/metadata/metadata.html.

G. Data Analysis/Assessment

The State has a methodology for assessing attainment of water quality standards based on analysis of various types of data (chemical, physical, biological, land use) from various sources, for all waterbody types and all State waters. The methodology should describe how existing and available data and information relevant to applicable water quality standards, including both core and supplemental indicators, will be compiled and analyzed to make attainment decisions about State waters. The methodology describes how the state integrates its primary data – collected specifically for making attainment decisions according to a State QAPP – with data from secondary sources, collected for a variety of purposes under a variety of quality control practices. (Secondary data could include, for example, volunteer monitoring data or discharge monitoring reports.) The methodology should:

- Identify the required or likely sources of existing and available data and information and procedures for collecting or assembling it;

- Describe or reference requirements relating to data quality and representativeness, such as analytical precision, temporal and geographical representation, and metadata documentation needs;

- Include or reference procedures for evaluating the quality of datasets; and

- Explain data reduction procedures (e.g., statistical analyses) appropriate for comparing data to applicable water quality standards.

For more information on developing assessment methodologies, see 40 CFR 130.7(b)(6)(iv) and www.epa.gov/owow/monitoring/calm.html.

H. Reporting

The State produces timely and complete water quality reports and lists. The Clean Water Act requires the State to provide certain reports and lists, including those listed below. EPA encourages consolidation of reports wherever possible.

- The Section 305(b) water quality inventory report, which includes Section 314 Lakes Assessments, characterizes the condition and quality trends of monitored waters within the State and is due on April 1 of even-numbered years. This is the primary State monitoring program report to EPA and draws upon information from the Clean Lakes program, nonpoint source program, TMDLs, and other national, State, and local assessments.

- The Section 303(d) list identifies all impaired waters based on existing and readily available information. The list is also due on April 1 of even-numbered years.

- Section 406 of the Clean Water Act, as amended by the Beaches Environmental Assessment and Coastal Health Act of 2000, requires States with Section 406 grants to submit information on monitoring and notification programs for coastal recreation waters.

Other reports and products resulting from water monitoring program activities include, for example, reports or analyses to support triennial reviews, use attainability analyses (UAAs), standards revisions, water quality based effluent limits (WQBELs) in permits, total maximum daily loads (TMDLs), nonpoint source programs, and watershed plans.

The *2002 Integrated Water Quality Monitoring and Assessment Report Guidance* (November 19, 2001) provides States, Territories, and authorized Tribes with guidance for integrating the development and submission of 2002 305(b) water quality reports and Section 303(d) lists of impaired waters. The Integrated Report will satisfy CWA reporting requirements for both Section 305(b) water quality reports and Section 303(d) lists.

As explained in the FY 2001 Clean Water Act Section 106 Grant Guidance and the March 1, 2002 memorandum, "2002 Integrated Section 305(b) Reports and 303(d) Lists and the impact of the 305(b) Reports on Annual S106 Grant Funding Targets", EPA will not award any Section 106 funding under a Section 106 grant or performance partnership grant (PPG) unless a State has annually updated its monitoring data in accordance with Section 106(e), and submitted the most recently required Section 305(b) report [7, 8]. The annual update requirement may be satisfied by uploading monitoring data to the national STORET warehouse or updating the 305(b) assessment information in the National Assessment Database.

The State is encouraged to report to the public on water quality, taking into account the needs of interested audiences. Many States use various formats and media such as technical reports, brochures, posters and other visual aids, oral presentations, newspaper articles, and the Internet.

I. Programmatic Evaluation

The State, in consultation with its EPA Region, conducts periodic reviews of each aspect of its monitoring program to determine how well the program serves its water quality decision needs for all State waters, including all waterbody types. This should involve evaluating the monitoring program to determine how well each of the 10 elements is addressed, and determining how needed changes and additions are incorporated into future monitoring cycles. This evaluation will take into consideration the effects of funding shortfalls on a State's implementation of its monitoring program strategy. EPA and States recognize the importance of a nationally consistent approach for evaluating state monitoring programs.

Since water quality monitoring programs are effective only when they meet the information needs of water quality resource managers, the State should have a feedback mechanism for reporting useful information to water quality managers and incorporating their input on future data needs. Information needs may include site-specific criteria modification studies, support for enforcement actions, validation of the success of control measures, modeling for TMDLs, monitoring unassessed waters, and other activities. Decision-makers at the national, regional, State, and local levels should be considered in this process.

The State should evaluate its overall monitoring program as part of a continuous improvement feedback loop. This may include, for example, undertaking audits of the monitoring program, quality assurance protocols, laboratory procedures, and data assessment procedures. See 40 CFR 130.5 and 130.6.

J. General Support and Infrastructure Planning

The State identifies current and future monitoring resources it needs to fully implement its monitoring program strategy.

As part of an ongoing integrated planning process, the following needs (staff and training, laboratory resources, and funding) should be assessed, considering current conditions and planned improvements, and discussed with the Regions during negotiation for Section 106 grants and PPGs that include Section 106 funds (Note: States may rely on workload models to assess needs).

Staff and Training: The State should identify the required number of staff needed for a State monitoring program, as well as needed training for field, laboratory, data management, and data assessment staff, and should document adequacies and shortfalls. States should also address staff and staff training needs for unassessed waterbody types.

Laboratory Resources: The State should identify needed laboratory support (and should document adequacies and shortfalls) to satisfy scientifically appropriate documented methods, such as methods listed in 40 CFR Part 136, published in *Standard Methods for the Examination of Water and Wastewater,* or published by the U.S. Geological Survey. U.S. EPA also encourages the use of performance-based methods (i.e., scientifically appropriate methods that meet established criteria for accuracy, sensitivity, bias, and precision and comply with specified data quality needs or requirements).

Funding: The State should identify required funding (e.g., for salaries, training, travel, equipment, laboratory analysis) for a State monitoring program, along with anticipated sources and amounts of funding and the effects of any shortfalls.

K. References

1. Intergovernmental Task Force on Monitoring Water Quality. February 1995. *The Strategy for Improving Water Quality Monitoring in the United States: Final Report of the Intergovernmental Task Force on Monitoring Water Quality.* http://water.usgs.gov/wicp/itfm.html

2. Yoder, C.O. 1997. *Important Concepts and Elements of an Adequate State Watershed Monitoring and Assessment Program.* ASIWPCA Standards and Monitoring Task Force. Prepared for U.S. EPA Office of Water Cooperative Agreement CX825484-01-0. Washington, DC.

3. National Research Council. 2001. *Assessing the TMDL Approach to Water Quality Management, Committee to Assess the Scientific Basis of the Total Maximum Daily Load Approach to Water Pollution Reduction.* National Academy Press, Washington, D.C.

4. U.S. EPA. 2002. *Consolidated Assessment and Listing Methodology - Toward a Compendium of Best Practices.* http://www.epa.gov/owow/monitoring/calm.html

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6. Federal Geographic Data Committee. June 1998. *Content Standard for Digital Geospatial Metadata* (FGDC-STD-001-1998). http://www.fgdc.gov/metadata/metadata.html

7. U.S. EPA. 2001. Memorandum on *FY 2001 Clean Water Act Section 106 Grant Guidance* signed February 16, 2001 by Michael B. Cook, Director, EPA Office of Wastewater Management.

8. U.S. EPA. 2002. Memorandum on *2002 Integrated Section 305(b) Reports and 303(d) Lists and the impact of the 305(b) Reports on Annual S106 Grant Funding Targets* signed March 1, 2002 by Michael B. Cook, Director, EPA Office of Wastewater Management.

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Yoder C. O. & M. T. Barbour. (2009) Critical technical elements of state bioassessment programs: a process to evaluate program rigor and comparability. Environmental Monitoring and Assessment 150: 31-42.

http://link.springer.com/article/10.1007/s10661-008-0671-1

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Yoder C. (1995) Policy issues and management applications of biological criteria. In: Biological assessment and criteria: Tools for water resource planning and decision making (eds W. S. Davis & T. Simon) pp. 327-344. Lewis Publishers, Boca Raton, FL.

Exhibit 50 is not publicly posted on the MPCA web page due to copyright protection laws. However, the following bibliographic citation is provided so that interested parties may acquire a copy of the document in accordance with the respective copyright restrictions. The document may also be available through your local library.

Yoder C. O. & E. T. Rankin (1995) Biological criteria program development and implementation in Ohio. In: Biological assessment and criteria: Tools for water resource planning and decision making (eds W. S. Davis & T. P. Simon) pp. 109-144. Lewis Publishers, Boca Raton, FL.