Pollution Control Agency

Adopted Permanent Rule Relating to Water Quality Standards and Tiered Aquatic Life Use

7050.0140 USE CLASSIFICATIONS FOR WATERS OF THE STATE.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Class 2 waters, aquatic life and recreation.** Aquatic life and recreation includes all waters of the state that support or may support aquatic biota, bathing, boating, or 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.

[For text of subps 4 to 8, see M.R.]

7050.0150 DETERMINATION OF WATER QUALITY, BIOLOGICAL AND PHYSICAL CONDITIONS, AND COMPLIANCE WITH STANDARDS.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Narrative standards.** 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, nor shall there be any significant increase in harmful pesticide or other residues in the waters, sediments, and aquatic flora and fauna; the normal aquatic biota and the use thereof shall not be seriously impaired or endangered, the species composition shall not be altered materially, and the propagation or migration of aquatic biota normally present shall not be prevented or hindered by the discharge of any sewage, industrial waste, or other wastes to the waters.

~~Subp. 3a. **Assessment criteria.** The criteria by which water bodies are assessed to determine if beneficial uses are supported, and definitions of the data and information required for that assessment, is in Guidance Manual for Assessing the Quality of Minnesota Surface Waters for Determination of Impairment: 305(b) Report and 303(d) List (2014 and~~

~~as subsequently amended), which is incorporated by reference. The guidance manual is not subject to frequent change and is available at http://www.pca.state.mn.us/lupg1125.~~

Subp. 4. **Definitions.** For the purposes of this chapter and chapter 7053, the following terms have the meanings given them.

A. "122-day ten-year low flow" or "$122Q_{10}$" means the lowest average 122-day flow with a once in ten-year recurrence interval. A $122Q_{10}$ is derived using the same methods used to derive a $7Q_{10}$, and the guidelines regarding period of record for flow data and estimating a $7Q_{10}$ apply equally to determining a $122Q_{10}$, as described in part 7050.0130, subpart 3.

B. "Altered materially," "material increase," "material manner," "seriously impaired," and "significant increase," as used in subparts 3, 5, and 6, mean that pollution of the waters of the state has resulted in degradation of the physical, chemical, or biological qualities of the water body to the extent that attainable or previously existing beneficial uses are actually or potentially lost.

C. "Aquatic biota" means the aquatic community composed of game and nongame fish, minnows and other small fish, mollusks, insects, crustaceans and other invertebrates, submerged or emergent rooted vegetation, suspended or floating algae, substrate-attached algae, microscopic organisms, and other aquatic-dependent organisms that require aquatic systems for food or to fulfill any part of their life cycle, such as amphibians and certain wildlife species.

D. "Assemblage" means a taxonomic subset of a biological community such as fish in a stream community.

E. "Biological condition gradient" means a concept describing how aquatic communities change in response to increasing levels of stressors. In application, the biological

condition gradient is an empirical, descriptive model that rates biological communities on a scale from natural to highly degraded.

F. "Biological criteria, narrative" or "biocriteria, narrative" means written statements describing the attributes of the structure and function of aquatic assemblages in a water body necessary to protect the designated aquatic life beneficial use. The singular form "biological criterion, narrative" or "biocriterion, narrative" may also be used.

G. "Biological criteria, numeric" or "biocriteria, numeric" means specific quantitative measures of the attributes of the structure and function of aquatic communities in a water body necessary to protect the designated aquatic life beneficial use. The singular form "biological criterion, numeric" or "biocriterion, numeric" may also be used.

H. "BOD_5" or "five-day biochemical oxygen demand" means the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a given water sample at a certain temperature over a five-day period.

I. "Chlorophyll-a" means a pigment in green plants including algae. The concentration of chlorophyll-a, expressed in weight per unit volume of water, is a measurement of the abundance of algae.

J. "Diel flux" means the daily change in a constituent, such as dissolved oxygen or pH, when there is a distinct daily cycle in the measurement. Diel dissolved oxygen flux means the difference between the maximum daily dissolved oxygen concentration and the minimum daily dissolved oxygen concentration.

K. "Ecoregion" means an area of relative homogeneity in ecological systems based on similar soils, land use, land surface form, and potential natural vegetation. Minnesota ecoregions are shown on the map in part 7050.0468.

L. "Eutrophication" means the increased productivity of the biological community in water bodies in response to increased nutrient loading. Eutrophication is characterized

by increased growth and abundance of algae and other aquatic plants, reduced water transparency, reduction or loss of dissolved oxygen, and other chemical and biological changes. The acceleration of eutrophication due to excess nutrient loading from human sources and activities, called cultural eutrophication, causes a degradation of water quality and possible loss of beneficial uses.

M. "Eutrophication standard" means the combination of indicators of enrichment and indicators of response as described in subpart 5. The indicators upon which the eutrophication standard for specific water bodies are based are as provided under subparts 5a to 5c.

N. "Hydraulic residence time" means the time water resides in a basin or, alternately, the time it would take to fill the basin if it were empty.

O. "Impaired water" or "impaired condition" means a water body that does not meet applicable water quality standards or fully support applicable beneficial uses, due in whole or in part to water pollution from point or nonpoint sources, or any combination thereof.

P. "Index of biotic integrity," "index of biological integrity, " or "IBI" means an index developed by measuring attributes of an aquatic community that change in quantifiable and predictable ways in response to human disturbance, representing the health of that community.

Q. "Lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth greater than 15 feet. Lakes may have no inlet or outlet, an inlet or outlet, or both an inlet and outlet.

R. "Lake morphometry" means the physical characteristics of the lake basin that are reasonably necessary to determine the shape of a lake, such as maximum length and width, maximum and mean depth, area, volume, and shoreline configuration.

S. "Lotic water" means a flowing or moving water body such as a stream, river, or ditch.

~~S.~~ T. "Mixing status" means the frequency of complete mixing of the lake water from surface to bottom, which is determined by whether temperature gradients are established and maintained in the water column during the summer season.

~~T.~~ U. "Measurable increase" or "measurable impact" means a change in trophic status that can be discerned above the normal variability in water quality data using a weight of evidence approach. The change in trophic status does not require a demonstration of statistical significance to be considered measurable. Mathematical models may be used as a tool in the data analysis to help predict changes in trophic status.

~~U.~~ V. "Natural causes" means the multiplicity of factors that determine the physical, chemical, or biological conditions that would exist in a water body in the absence of measurable impacts from human activity or influence.

~~V.~~ W. "Normal aquatic biota" and "normally present" mean a healthy aquatic community expected to be present in the water body in the absence of pollution of the water, consistent with any variability due to natural hydrological, substrate, habitat, or other physical and chemical characteristics. Expected presence is based on comparing the aquatic community in the water body of interest to the aquatic community in representative reference water bodies.

~~W.~~ X. "Nuisance algae bloom" means an excessive population of algae that is characterized by obvious green or blue-green pigmentation in the water, floating mats of algae, reduced light transparency, aesthetic degradation, loss of recreational use, possible harm to the aquatic community, or possible toxicity to animals and humans. Algae blooms are measured through tests for chlorophyll-a, observations of Secchi disk transparency, and observations of impaired recreational and aesthetic conditions by the users of the water

body, or any other reliable data that identifies the population of algae in an aquatic community.

~~X.~~ Y. "Periphyton" means algae on the bottom of a water body. In rivers or streams, these forms are typically found attached to logs, rocks, or other substrates, but when dislodged the algae will become part of the seston.

~~Y.~~ Z. "Readily available and reliable data and information" means chemical, biological, and physical data and information determined by the commissioner to meet the quality assurance and quality control requirements in subpart 8, that are not more than ten years old from the time they are used for the assessment. A subset of data in the ten-year period, or data more than ten years old can be used if credible scientific evidence shows that these data are representative of current conditions.

~~Z.~~ AA. "Reference water body" means a water body minimally or least impacted by point or nonpoint sources of pollution that is representative of water bodies of a similar surface water body type and within a geographic region such as an ecoregion or watershed. Reference water bodies are used as a base for comparing the quality of similar water bodies in the same geographic region.

~~AA.~~ BB. "Reservoir" means a body of water in a natural or artificial basin or watercourse where the outlet or flow is artificially controlled by a structure such as a dam. Reservoirs are distinguished from river systems by having a hydraulic residence time of at least 14 days. For purposes of this item, residence time is determined using a flow equal to the $122Q_{10}$ for the months of June through September.

~~BB.~~ CC. "River nutrient region" means the geographic basis for regionalizing the river eutrophication criteria as described in Heiskary, S. and K. Parson, Regionalization of Minnesota's Rivers for Application of River Nutrient Criteria, Minnesota Pollution Control Agency (2013), which is incorporated by reference. The document is not subject to frequent change and is available through the Minitex interlibrary loan system.

~~CC.~~ DD. "Secchi disk" means a tool that is used to measure the transparency of lake water. A Secchi disk is an eight-inch weighted disk on a calibrated rope, either white or with quadrants of black and white. To measure water transparency with a Secchi disk, the disk is viewed from the shaded side of a boat. The depth of the water at the point where the disk reappears upon raising it after it has been lowered beyond visibility is recorded.

~~DD.~~ EE. "Secchi disk transparency" means the transparency of water as measured by a Secchi disk, a Secchi tube, or a transparency tube.

~~EE.~~ FF. "Secchi tube" means a tool that is used to measure the transparency of stream or river water. A Secchi tube is a clear plastic tube, one meter in length and 1-3/4 inch in diameter, with a mini-Secchi disk on a string. To measure water transparency, the tube is filled with water collected from a stream or river and, looking into the tube from the top, the weighted Secchi disk is lowered into the tube by a string until it disappears and then raised until it reappears, allowing the user to raise and lower the disk within the same water sample numerous times. The depth of the water at the midpoint between disappearance and reappearance of the disk is recorded in centimeters, which are marked on the side of the tube. If the Secchi disk is visible when it is lowered to the bottom of the tube, the transparency reading is recorded as "greater than 100 centimeters."

~~FF.~~ GG. "Seston" means particulate matter suspended in water bodies and includes plankton and organic and inorganic matter.

~~GG.~~ HH. "Shallow lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the summer. The quality of shallow lakes will permit the propagation and maintenance of a healthy indigenous aquatic community and they will be suitable for boating and other forms of aquatic recreation for which they may be usable. Shallow lakes are differentiated from

wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186, subpart 1a.

~~HH.~~ II. "Summer-average" means a representative average of concentrations or measurements of nutrient enrichment factors, taken over one summer season.

~~II.~~ JJ. "Summer season" means a period annually from June 1 through September 30.

~~JJ.~~ KK. "Transparency tube" means a tool that is used to measure the transparency of stream or river water. A transparency tube is a graduated clear plastic tube, 24 inches or more in length by 1-1/2 inches in diameter, with a stopper at the bottom end. The inside surface of the stopper is painted black and white. To measure water transparency, the tube is filled with water from a surface water; the water is released through a valve at the bottom end until the painted surface of the stopper is just visible through the water column when viewed from the top of the tube. The depth, in centimeters, is noted. More water is released until the screw in the middle of the painted symbol on the stopper is clearly visible; this depth is noted. The two observed depths are averaged to obtain a transparency measurement.

~~KK.~~ LL. "Trophic status or condition" means the productivity of a lake as measured by the phosphorus content, algae abundance, and depth of light penetration.

~~LL.~~ MM. "Use attainability analysis" means a structured scientific assessment of the physical, chemical, biological, and economic factors affecting attainment of the uses of water bodies. A use attainability analysis is required to remove a designated use specified in section 101(a)(2) of the Clean Water Act that is not an existing use. The allowable reasons for removing a designated use are described in Code of Federal Regulations, title 40, section 131.10 (g).

~~MM.~~ NN. "Water body" means a lake, reservoir, wetland, or a geographically defined portion of a river or stream.

~~NN.~~ OO. "Water body type" means a group of water bodies with similar natural physical, chemical, and biological attributes, where the characteristics are similar among water bodies within each type and distinct from water bodies of other types.

[For text of subps 5 to 5c, see M.R.]

Subp. 6. **Impairment of biological community and aquatic habitat.** In evaluating whether the narrative standards in subpart 3, which prohibit serious impairment of the normal aquatic biota and the use thereof, material alteration of the species composition, material degradation of stream beds, and the prevention or hindrance of the propagation and migration of aquatic 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:

[For text of items A to D, see M.R.]

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 by the commissioner using a biological condition gradient model or a set of reference water bodies which best represents the most natural condition for that surface water body type within a geographic region.

[For text of subps 7 and 8, see M.R.]

7050.0155 PROTECTION OF DOWNSTREAM USES.

All waters must maintain a level of water quality that provides for the attainment and maintenance of the water quality standards of downstream waters, including the waters of another state.

7050.0217 OBJECTIVES FOR PROTECTION OF SURFACE WATERS FROM TOXIC POLLUTANTS.

Subpart 1. **Purpose and applicability.** The purpose of this part is to establish the objectives for developing numeric water quality standards listed in parts 7050.0220, 7050.0222, 7050.0227, and 7052.0100 and site-specific water quality criteria for toxic pollutants or chemicals developed in the absence of numeric standards. The listed numeric standards for toxics and site-specific numeric criteria established by methods in parts 7050.0218 and 7050.0219 protect Class 2 waters for the propagation and maintenance of aquatic biota, the consumption of fish and edible aquatic life by humans, the use of surface waters for public and private domestic consumption where applicable, and the consumption of aquatic organisms by wildlife. These criteria also protect the uses assigned to Class 7, limited resource value, waters as described in parts 7050.0140 and 7050.0227.

[For text of subp 2, see M.R.]

7050.0218 FOR TOXIC POLLUTANTS: DEFINITIONS AND METHODS FOR DETERMINATION OF HUMAN HEALTH-BASED NUMERIC STANDARDS AND SITE-SPECIFIC NUMERIC CRITERIA FOR AQUATIC LIFE, HUMAN HEALTH, AND FISH-EATING WILDLIFE.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Definitions.** For the purposes of parts 7050.0217 to 7050.0227, the following terms have the meanings given them.

[For text of items A to R, see M.R.]

S. "Criterion" means a number or numbers established for a pollutant derived under this part or part 7050.0219 or 7052.0110, or issued by the USEPA, to protect aquatic life, humans, or wildlife.

T. "Developmental health endpoint" or "developmental toxicity" means an adverse effect on the developing organism that may result from parental exposure prior to conception,

maternal exposure during prenatal development, or direct exposure postnatally until the time of sexual maturation. Developmental toxicity may be detected at any point in the lifespan of the organism. The major manifestations of developmental toxicity include:

(1) death of the developing organism;

(2) structural abnormality;

(3) altered growth; or

(4) functional deficiency.

U. "Duration" means the time over which the instream concentration of a pollutant is averaged for comparison with the standard or criterion.

V. "Durations for human health-based algorithms" or "D" means the length of the exposure period under consideration for noncancer and linear cancer algorithms.

(1) The four default D used in developing reference doses and corresponding intake rates are:

(a) acute: a period of 24 hours or less;

(b) short-term: a period of more than 24 hours, up to 30 days;

(c) subchronic: a period of more than 30 days, up to eight years based on application of the less than ten percent standard life expectancy of 70 years for humans; or

(d) chronic: a period of more than eight years.

(2) The default durations for use in the linear cancer algorithms with age dependent adjustment factors are:

(a) two years for the birth up to two-year age group;

(b) 14 years for the two- up to 16-year age group; and

(c) 54 years for the 16- up to 70-year age group.

For any algorithm, use of chemical-specific data to define durations for noncancer or linear cancer algorithms are preferred when acceptable data are available.

W. "Effect concentration" or "EC50" means the toxicant concentration that causes equilibrium loss, immobilization, mortality, or other debilitating effects in 50 percent of the exposed organisms during a specific time of observation.

X. "Endocrine" or "E" means a change in circulating hormone levels or interactions with hormone receptors, regardless of the organ or organ system affected. Health endpoints with or without the E designation are deemed equivalent, for example, thyroid (E) = thyroid, and must be included in the same health risk index equation.

Y. "Final acute value" or "FAV" means 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 is the acute toxicity limitation applied to mixing zones in part 7050.0210, subpart 5; and to dischargers in parts 7053.0215, subpart 1; 7053.0225, subpart 6; and 7053.0245, subpart 1.

Z. "Food chain multiplier" or "FCM" means the ratio of a bioaccumulation factor by trophic level to an appropriate bioconcentration factor. FCM refers to values developed using USEPA models or from available and reliable field studies.

AA. "Frequency" means the number of times a standard can be exceeded in a specified period of time without causing acute or chronic toxic effects on the aquatic community, human health, or fish-eating wildlife.

BB. "Genus mean acute value" or "GMAV" means the geometric mean of the SMAVs available for the genus.

CC. "Health risk index" means the sum of the quotients calculated by identifying all chemicals that share a common health endpoint or are based on linear carcinogenicity and dividing the water or fish tissue concentration for each chemical (measured or statistically derived) by its applicable chronic standard or chronic criterion. To meet the objectives in part 7050.0217, the health risk index must not exceed a value of one. The equations for the risk indices are found in part 7050.0222, subpart 7, items D and E.

DD. "Health risk index endpoint" or "health endpoint" means the general description of toxic effects used to group chemicals for the purpose of calculating a health risk index.

EE. "Intake rate" or "IR" means rate of ingestion, inhalation, or dermal contact, depending on the route of exposure, expressed as the amount of a media taken in, on a per body weight and daily basis, for a specified duration.

FF. "Lethal concentration" or "LC50" means the toxicant concentration killing 50 percent of the exposed organisms in a specific time of observation.

GG. "Lowest observable adverse effect level" or "LOAEL" means the lowest exposure level that caused a statistically or biologically significant increase in the frequency or severity of adverse effects observed between the exposed population and its appropriate control group.

HH. "Magnitude" means the acceptable amount of a toxic pollutant in water or fish tissue expressed as a concentration.

II. "Maximum criterion" or "MC" means 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 MC equals the FAV divided by two.

JJ. "Maximum standard" or "MS" means 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. Maximum standards are listed in part 7050.0222.

KK. "MDH" means the Minnesota Department of Health.

LL. "Mode of action" or "MOA" means the sequence of key events following pollutant or chemical exposure upon which the toxic outcome depends.

MM. "National methods" means the methods the USEPA uses to develop aquatic life criteria as described in Stephan, C.E., D.J. Mount, D.J. Hansen, J.H. Gentile, G.A. Chapman, and W.A. Brungs, 1985, "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses," USEPA, Office of Research and Development, Environmental Research Laboratories, Duluth MN; Narragansett, RI, Corvallis, OR. 98 p; available through the National Technical Information Service, Springfield, VA. (Publication PB85-227049)

NN. "No observable adverse effect level" or "NOAEL" means the highest exposure level at which there is no statistically or biologically significant increase in the frequency or severity of adverse effects between the exposed population and its appropriate control group.

OO. "Octanol to water partition coefficient" or "K_{ow}" means the ratio of the concentration of a chemical in the octanol phase to its concentration in the aqueous phase of a two-phase octanol to water system after equilibrium of the chemical between the two phases has been achieved. The base 10 logarithm of the K_{ow} or log K_{ow} is used in the calculation of bioaccumulation factors. The log K_{ow} has been shown to be proportional to the bioconcentration potential of lipophilic organic chemicals.

PP. "Percent effluent" means the representation of acute or chronic toxicity of an effluent as a percent of whole effluent mixed in dilution water, where acute toxicity is expressed by LC50s or EC50s and chronic toxicity is expressed by NOAEL.

QQ. "Reference dose" or "RfD" means an estimate of a dose for a given duration to the human population, including susceptible subgroups such as infants, that is likely to be without an appreciable risk of adverse effects during a lifetime. It is derived from a suitable dose level at which there are few or no statistically or biologically significant increases in the frequency or severity of an adverse effect between the dosed population and its associated control group. The RfD includes one or more divisors, applied to the suitable dose level, accounting for:

(1) uncertainty in extrapolating from mammalian laboratory animal data to humans;

(2) variation in toxicological sensitivity among individuals in the human population;

(3) uncertainty in extrapolating from effects observed in a short-term study to effects of long-term exposure;

(4) uncertainty in using a study in which health effects were found at all doses tested; and

(5) uncertainty associated with deficiencies in the available data.

The product of the divisors is not to exceed 3,000 in an RfD used for a chronic standard. The RfD is expressed in units of daily dose as milligrams of chemical per kilogram of body weight-day or mg/kg-day.

RR. "Relative source contribution factor" or "RSC" means the percentage or apportioned amount (subtraction method) of the reference dose for a pollutant allocated to surface water exposures from drinking or incidental water ingestion and fish consumption. In the absence of sufficient data to establish a pollutant- or chemical-specific RSC value, the default RSC is 0.2 or 0.5 as described in part 7050.0219, subpart 5.

SS. "Species mean acute value" or "SMAV" means the geometric mean of all the available and acceptable acute values for a species.

TT. "Standard" means a number or numbers established for a pollutant or water quality characteristic to protect a specified beneficial use as listed in parts 7050.0221 to 7050.0227. The standard for a toxic pollutant includes the CS, MS, and FAV. Some pollutants do not have an MS or an FAV due to insufficient data. For these pollutants, the CS alone is the standard.

UU. "Toxic effect" means an observable or measurable adverse biological event in an organ, tissue, or system. The designation of health endpoints does not exclude other possible observable or measurable biological events. For the purpose of grouping chemicals and creating a health risk index when multiple chemicals are present, toxic effects may be ascribed to more general health risk index endpoints or health endpoints.

VV. "Toxic pollutant" has the meaning given it in part 7050.0185, subpart 2, item F. Toxic pollutant is used interchangeably in this part and parts 7050.0217, 7050.0219, and 7050.0222, subpart 7, items B to G, with the terms "pollutant" and "chemical."

WW. "Toxic unit" means a measure of acute or chronic toxicity in an effluent. One acute toxic unit (TUa) is the reciprocal of the effluent concentration that causes 50 percent effect or mortality to organisms for acute exposures (100/LC50); one chronic toxic unit (TUc) is the reciprocal of the effluent concentration that causes no observable adverse effect level on test organisms for chronic exposures (100/NOAEL).

XX. "Trophic level" or "TL" means the food web level in an ecosystem that is occupied by an organism or group of organisms because of what they eat and how they are related to the rest of the food web. For example, trophic level 3 in an aquatic ecosystem consists of small fish such as bluegills, crappies, and smelt and trophic level 4 consists of larger carnivorous fish such as walleye, northern pike, and most trout species.

YY. "USEPA" means the United States Environmental Protection Agency.

ZZ. "Water quality characteristic" means a characteristic of natural waters, such as total hardness or pH. Some water quality characteristics can affect the toxicity of pollutants to aquatic organisms.

AAA. "Whole effluent toxicity test" means the aggregate toxic effect of an effluent measured directly by a 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.

Subp. 4. **Adoption of USEPA national criteria.** The USEPA establishes aquatic life and human health-based criteria under section 304(a)(1) of the Clean Water Act, United States Code, title 33, section 1314. The USEPA criteria, subject to modification as described in this subpart, are applicable to Class 2 waters of the state. The USEPA has described the national methods for developing aquatic life criteria in "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses."

USEPA criteria that vary with an ambient water quality characteristic such as total hardness or pH will be established for specific waters or reaches using data available to the commissioner. Central values such as the means or medians for the characteristic will be used unless there is evidence to support using different values. Values for water quality characteristics can be estimated for specific waters or reaches that have no data by using data from a nearby watershed with similar chemical properties.

A. The USEPA aquatic life criteria are adopted unchanged by the agency, unless modified under item C, as the criteria applicable to designated Class 2A waters in parts 7050.0420 and 7050.0470.

B. The USEPA criteria are adopted, subject to modification as described in this item or item C, for application to cool and warm water habitats and wetlands. Cool and warm water habitats (Class 2Bd and 2B) are defined in part 7050.0430 or listed in part

7050.0470. Wetlands (Class 2D) waters are defined in part 7050.0425 or listed in part 7050.0470.

(1) Acute data, in the form of the ranked genus mean acute values used by the USEPA to determine the national criteria, are the data used to determine the Class 2Bd, 2B, and 2D criteria.

[For text of subitems (2) to (4), see M.R.]

(5) If, as a result of the recalculation of the USEPA criterion for application to Class 2Bd, 2B, and 2D waters, the FAV for these water classes is lower than the FAV for Class 2A waters, the Class 2Bd, 2B, or 2D FAV will be changed to equal the Class 2A FAV, unless the lower Class 2Bd, 2B, or 2D FAV is justified based on the available toxicological data.

[For text of subitems (6) and (7), see M.R.]

[For text of item C, see M.R.]

[For text of subps 5 to 8, see M.R.]

Subp. 9. **Wildlife-based criteria.** The agency shall use the procedures in this subpart to establish wildlife-based criteria. Wildlife criteria shall protect wildlife consumers of freshwater aquatic organisms from adverse effects of toxic pollutants. Wildlife criteria are applicable to all surface waters, subject to the exceptions in subpart 10, item B, subitem (1).

[For text of items A to C, see M.R.]

D. A final BAF for calculating a wildlife chronic criterion (CC_w) is determined as in subpart 7, except that the BCFs and BAFs are adjusted to represent whole body BCFs and BAFs.

[For text of subitem (1), see M.R.]

(2) Normalized BCFs and BAFs are multiplied by five percent lipid for CC_w applicable to Class 2Bd and 2B waters.

[For text of subitem (3), see M.R.]

(4) BCFs estimated using the relationship between BCFs and the log K_{ow} are normalized by dividing the estimated BCF by 7.6 and then multiplying by 12 for Class 2A waters or by five for Class 2Bd and 2B waters.

[For text of subitem (5), see M.R.]

Subp. 10. **Applicable criteria or human health-based standard.** The final criteria or chronic standard for human health for toxic pollutants for surface waters must be the lowest of the applicable criteria or standards for human health derived under this part and part 7050.0219.

A. Applicable criteria or standards for human health by use for Class 2A, 2Bd, 2B, and 2D surface waters are listed for each applicable population protected (aquatic life, humans, and fish-eating wildlife). The applicable criteria or standards for human health must be the lowest of the CC or CS as described in subitems (1) to (3):

[For text of subitems (1) to (3), see M.R.]

[For text of items B to D, see M.R.]

7050.0219 HUMAN HEALTH-BASED CRITERIA AND STANDARDS.

[For text of subps 1 to 10, see M.R.]

Subp. 11. **Final baseline BAF by trophic level.** Determine the final baseline BAF by trophic level (TL):

A. Calculate geometric mean baseline BAF for TL_3 and TL_4 using available species-means for each baseline BAF method. For Class 2A water, preference is given for *Salmonidae* data and developed as a single representative TL_4 baseline BAF.

[For text of items B and C, see M.R.]

[For text of subps 12 to 15, see M.R.]

7050.0220 SPECIFIC WATER QUALITY STANDARDS BY ASSOCIATED USE CLASSES.

Subpart 1. **Purpose and scope.** The numeric and narrative water quality standards in this chapter prescribe the qualities or properties of the waters of the state that are necessary for the designated public uses and benefits. If the standards in this chapter are exceeded, it is considered indicative of a polluted condition which is actually or potentially deleterious, harmful, detrimental, or injurious with respect to designated uses or established classes of the waters of the state.

All surface waters are protected for multiple beneficial uses. Numeric water quality standards are tabulated in this part for all uses applicable to four common categories of surface waters, so that all applicable standards for each category are listed together in subparts 3a to 6a. The four categories are:

A. cold water aquatic life and habitat, also protected for drinking water: Classes 1B; 2A, 2Ae, or 2Ag; 3A or 3B; 4A and 4B; and 5 (subpart 3a);

B. cool and warm water aquatic life and habitat, also protected for drinking water: Classes 1B or 1C; 2Bd, 2Bde, 2Bdg, or 2Bdm; 3A or 3B; 4A and 4B; and 5 (subpart 4a);

C. cool and warm water aquatic life and habitat and wetlands: Classes 2B, 2Be, 2Bg, 2Bm, or 2D; 3A, 3B, 3C, or 3D; 4A and 4B or 4C; and 5 (subpart 5a); and

D. limited resource value waters: Classes 3C; 4A and 4B; 5; and 7 (subpart 6a).

Subp. 2. **Explanation of tables.**

[For text of items A to C, see M.R.]

D. The tables of standards in subparts 3a to 6a include the following abbreviations and acronyms:

AN	means aesthetic enjoyment and navigation, Class 5 waters
*	an asterisk following the FAV and MS values or double dashes (–) means part 7050.0222, subpart 7, item G, applies
(c)	means the chemical is assumed to be a human carcinogen
CS	means chronic standard, defined in part 7050.0218, subpart 3
DC	means domestic consumption (drinking water), Class 1 waters
–	double dashes means there is no standard
exp. ()	means the natural antilogarithm (base e) of the expression in parenthesis
FAV	means final acute value, defined in part 7050.0218, subpart 3
IC	means industrial consumption, Class 3 waters
IR	means agriculture irrigation use, Class 4A waters
LS	means agriculture livestock and wildlife use, Class 4B waters
MS	means maximum standard, defined in part 7050.0218, subpart 3
NA	means not applicable
(S)	means the associated value is a secondary drinking water standard
su	means standard unit. It is the reporting unit for pH
TH	means total hardness in mg/L, which is the sum of the calcium and magnesium concentrations expressed as $CaCO_3$
TON	means threshold odor number

[For text of items E and F, see M.R.]

Subp. 3. [Repealed, 24 SR 1105]

Subp. 3a. **Cold water aquatic life and habitat, drinking water, and associated use classes.** Water quality standards applicable to use Classes 1B; 2A, 2Ae, or 2Ag; 3A or 3b; 4A and 4B; and 5 surface waters. The water quality standards in part 7050.0222, subpart

2, that apply to Class 2A also apply to Classes 2Ae and 2Ag. In addition to the water quality standards in part 7050.0222, subpart 2, the biological criteria defined in part 7050.0222, subpart 2d, apply to Classes 2Ae and 2Ag.

[For text of items A to E, see M.R.]

Subp. 4. [Repealed, 24 SR 1105]

Subp. 4a. **Cool and warm water aquatic life and habitat, drinking water, and associated use classes.** Water quality standards applicable to use Classes 1B or 1C; 2Bd, 2Bde, 2Bdg, or 2Bdm; 3A or 3B; 4A and 4B; and 5 surface waters. The water quality standards in part 7050.0222, subpart 3, that apply to Class 2Bd also apply to Classes 2Bde, 2Bdg, and 2Bdm. In addition to the water quality standards in part 7050.0222, subpart 3, the biological criteria defined in part 7050.0222, subpart 3d, apply to Classes 2Bde, 2Bdg, and 2Bdm.

[For text of items A to F, see M.R.]

Subp. 5. [Repealed, 24 SR 1105]

Subp. 5a. **Cool and warm water aquatic life and habitat and associated use classes.** Water quality standards applicable to use Classes 2B, 2Be, 2Bg, 2Bm, or 2D; 3A, 3B, or 3C; 4A and 4B; and 5 surface waters. See parts 7050.0223, subpart 5; 7050.0224, subpart 4; and 7050.0225, subpart 2, for Class 3D, 4C, and 5 standards applicable to wetlands, respectively. The water quality standards in part 7050.0222, subpart 4, that apply to Class 2B also apply to Classes 2Be, 2Bg, and 2Bm. In addition to the water quality standards in part 7050.0222, subpart 4, the biological criteria defined in part 7050.0222, subpart 4d, apply to Classes 2Be, 2Bg, and 2Bm.

A. MISCELLANEOUS SUBSTANCE, CHARACTERISTIC, OR POLLUTANT

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (1) to (5), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitem (6), see M.R.]

(7) Eutrophication standards for lakes, shallow lakes, and reservoirs (phosphorus, total, µg/L; chlorophyll-a, µg/L; Secchi disk transparency, meters)

See part 7050.0222, subparts 4 and 4a	--	--	--	--	--	--

[For text of subitems (8) to (11), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

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(12) Oxygen, dissolved, mg/L

See part 7050.0222, subparts 4 and 6	--	--	--	--	--	--

[For text of subitems (13) to (16), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (17) to (22), see M.R.]

B. METALS AND ELEMENTS

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (1) to (4), see M.R.]

(5) Cadmium, total, µg/L

1.1	33	67	--	--	--	--

Class 2B and 2D cadmium standards are hardness dependent. Cadmium values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness values and equations to calculate cadmium standards for any hardness value not to exceed 400 mg/L.

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

(6) Chromium +3, total, µg/L

207	1,737	3,469	--	--	--	--

Class 2B and 2D trivalent chromium standards are hardness dependent. Chromium +3 values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness values and equations to calculate trivalent chromium standards for any hardness value not to exceed 400 mg/L.

[For text of subitems (7) and (8), see M.R.]

(9) Copper, total, µg/L

9.8	18	35	--	--	--	--

Class 2B and 2D copper standards are hardness dependent. Copper values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness values and equations to calculate copper standards for any hardness value not to exceed 400 mg/L.

(10) Lead, total, µg/L

3.2	82	164	--	--	--	--

Class 2B and 2D lead standards are hardness dependent. Lead values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness values and equations to calculate lead standards for any hardness value not to exceed 400 mg/L.

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (11) and (12), see M.R.]

(13) Nickel, total, µg/L

158	1,418	2,836	--	--	--	--

Class 2B and 2D nickel standards are hardness dependent. Nickel values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness values and equations to calculate nickel standards for any hardness value not to exceed 400 mg/L.

[For text of subitem (14), see M.R.]

(15) Silver, total, µg/L

1.0	2.0	4.1	--	--	--	--

Class 2B and 2D silver MS and FAV are hardness dependent. Silver values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness values and equations to calculate silver standards for any hardness value not to exceed 400 mg/L.

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitem (16), see M.R.]

(17) Zinc, total, µg/L

106	117	234	--	--	--	--

Class 2B and 2D zinc standards are hardness dependent. Zinc values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness values and equations to calculate zinc standards for any hardness value not to exceed 400 mg/L.

C. ORGANIC POLLUTANTS OR CHARACTERISTICS

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (1) to (5), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (6) to (10), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (11) to (15), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (16) to (20), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (21) to (25), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (26) to (30), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

(31) Pentachlorophenol, µg/L

5.5	15	30	--	--	--	--

Class 2B and 2D standards are pH dependent, except that the CS will not exceed 5.5 µg/L. Pentachlorophenol values shown are for a pH of 7.5 only. See part 7050.0222, subpart 4, for examples at other pH values and equations to calculate pentachlorophenol standards for any pH value.

[For text of subitems (32) to (35), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (36) to (40), see M.R.]

2B&D CS	**2B&D MS**	**2B&D FAV**	**3A/3B/3C IC**	**4A IR**	**4B LS**	**5 AN**

[For text of subitems (41) to (43), see M.R.]

[For text of items D to F, see M.R.]

G. Temperature must not exceed:

(1) Class 2B standard: five degrees Fahrenheit above natural in streams and three degrees Fahrenheit above natural in lakes, based on monthly average of maximum

daily temperature, except in no case shall it exceed the daily average temperature of 86 degrees Fahrenheit; and

(2) Class 2D standard: maintain background as defined in part 7050.0222, subpart 6.

Subp. 6. [Repealed, 24 SR 1105]

Subp. 6a. **Limited resource value waters and associated use classes.**

[For text of items A and B, see M.R.]

C. The level of dissolved oxygen must be maintained at concentrations:

(1) that will avoid odors or putrid conditions in the receiving water;

(2) at not less than one milligram per liter (daily average); and

(3) above zero milligrams per liter at all times.

[For text of items D and E, see M.R.]

[For text of subp 7, see M.R.]

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

[For text of subp 1, see M.R.]

Subp. 2. **Class 2A waters; aquatic life and recreation.** The quality of Class 2A surface waters shall be such as to permit the propagation and maintenance of a healthy community of cold water aquatic biota, and their habitats according to the definitions in subpart 2c. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. This class of surface waters is also protected as a source of drinking water. Abbreviations, acronyms, and symbols are explained in subpart 1.

Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
Acenaphthene	µg/L	20	HH	56	112	Tox
Acetochlor	µg/L	3.6	Tox	86	173	Tox
Acrylonitrile (c)	µg/L	0.38	HH	1,140*	2,281*	Tox
Alachlor (c)	µg/L	3.8	HH	800*	1,600*	Tox
Aluminum, total	µg/L	87	Tox	748	1,496	Tox
Ammonia un-ionized as N	µg/L	16	Tox	--	--	NA

The percent un-ionized ammonia can be calculated for any temperature and pH by using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V. Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature. Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

$$f = \frac{1}{10^{(pk_a - pH)} + 1} \times 100$$

where: f = the percent of total ammonia in the un-ionized state

$pk_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV

Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
Antimony, total	µg/L	5.5	HH	90	180	Tox
Arsenic, total	µg/L	2.0	HH	360	720	Tox
Atrazine (c)	µg/L	3.4	HH	323	645	Tox
Benzene (c)	µg/L	5.1	HH	4,487*	8,974*	Tox
Bromoform	µg/L	33	HH	2,900	5,800	Tox
Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.7852[ln(total hardness mg/L)]-3.490)

The MS in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-3.828)

The FAV in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-3.1349)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total cadmium standards for five hardness values:

TH in mg/L	50	100	200	300	400
Cadmium, total					
CS µg/L	0.66	1.1	2.0	2.7	3.4
MS µg/L	1.8	3.9	8.6	14	19
FAV µg/L	3.6	7.8	17	27	37

Substance, Characteristic, or Pollutant (Class 2A)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**

Carbon tetrachloride (c)	µg/L	1.9	HH	1750*	3500*	Tox
Chlordane (c)	ng/L	0.073	HH	1200*	2400*	Tox
Chloride	mg/L	230	Tox	860	1720	Tox
Chlorine, total residual	µg/L	11	Tox	19	38	Tox

Chlorine standard applies to conditions of continuous exposure, where continuous exposure refers to chlorinated effluents that are discharged for more than a total of two hours in any 24-hour period.

Chlorobenzene (Monochlorobenzene)	µg/L	20	HH	423	846	Tox
Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox
Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+1.561)

The MS in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+3.688)

The FAV in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+4.380)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total chromium +3 standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Chromium +3, total					
CS µg/L	117	207	365	509	644
MS µg/L	984	1,737	3,064	4,270	5,405
FAV µg/L	1,966	3,469	6,120	8,530	10,797

Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
Chromium +6, total	µg/L	11	Tox	16	32	Tox
Cobalt, total	µg/L	2.8	HH	436	872	Tox
Color value	Pt/Co	30	NA	--	--	NA
Copper, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.620[ln(total hardness mg/L)]-0.570)

The MS in µg/L shall not exceed: exp.(0.9422[ln(total hardness mg/L)]-1.464)

The FAV in µg/L shall not exceed: exp.(0.9422[ln(total hardness mg/L)]-0.7703)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total copper standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Copper, total					
CS µg/L	6.4	9.8	15	19	23
MS µg/L	9.2	18	34	50	65
FAV µg/L	18	35	68	100	131

Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV

Cyanide, free	µg/L	5.2	Tox	22	45	Tox
DDT (c)	ng/L	0.11	HH	550*	1100*	Tox
1,2-Dichloroethane (c)	µg/L	3.5	HH	45,050*	90,100*	Tox
Dieldrin (c)	ng/L	0.0065	HH	1,300*	2,500*	Tox
Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	--*	--*	NA
Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
Endosulfan	µg/L	0.0076	HH	0.084	0.17	Tox
Endrin	µg/L	0.0039	HH	0.090	0.18	Tox
Escherichia (E.) coli	See below	See below	HH	See below	See below	NA

Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between April 1 and October 31.

Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox

Substance, Characteristic, or Pollutant (Class 2A)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**

Eutrophication standards for Class 2A lakes and reservoirs.

Designated lake trout lakes in all ecoregions (lake trout lakes support natural populations of lake trout, *Salvelinus namaycush*):

Phosphorus, total	µg/L	12	NA	--	--	NA
Chlorophyll-a	µg/L	3	NA	--	--	NA
Secchi disk transparency	meters	No less than 4.8	NA	--	--	NA

Designated trout lakes in all ecoregions, except lake trout lakes:

Phosphorus, total	µg/L	20	NA	--	--	NA
Chlorophyll-a	µg/L	6	NA	--	--	NA
Secchi disk transparency	meters	No less than 2.5	NA	--	--	NA

Additional narrative eutrophication standards for Class 2A lakes and reservoirs are found under subpart 2a.

Eutrophication standards for Class 2A rivers and streams.

North River Nutrient Region:

Phosphorus, total	µg/L	less than or equal to 50
Chlorophyll-a (seston)	µg/L	less than or equal to 7
Diel dissolved oxygen flux	mg/L	less than or equal to 3.0
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 1.5

Central River Nutrient Region:

Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 18
Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 2.0

South River Nutrient Region:

Phosphorus, total	µg/L	less than or equal to 150
Chlorophyll-a (seston)	µg/L	less than or equal to 35
Diel dissolved oxygen flux	mg/L	less than or equal to 4.5
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 3.0

Additional narrative eutrophication standards for Class 2A rivers and streams are found under subpart 2b.

Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
Heptachlor (c)	ng/L	0.10	HH	260*	520*	Tox
Heptachlor epoxide (c)	ng/L	0.12	HH	270*	530*	Tox
Hexachlorobenzene (c)	ng/L	0.061	HH	--*	--*	Tox
Lead, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-4.705)

The MS in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-1.460)

The FAV in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-0.7643)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total lead standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Lead, total					
CS µg/L	1.3	3.2	7.7	13	19
MS µg/L	34	82	197	331	477
FAV µg/L	68	164	396	663	956

Substance, Characteristic,	Units	CS	Basis for CS	MS	FAV	Basis for

or Pollutant (Class 2A)						**MS, FAV**
Lindane (c) (Hexachlorocyclohexane, gamma-)	µg/L	0.0087	HH	1.0*	2.0*	Tox
Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
Mercury, total in edible fish	mg/kg ppm	0.2	HH	NA	NA	NA
Methylene chloride (c) Dichloromethane)	µg/L	45	HH	13,875*	27,749*	Tox
Metolachlor	µg/L	23	Tox	271	543	Tox
Naphthalene	µg/L	65	HH	409	818	Tox
Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS shall not exceed the human health-based standard of 297 µg/L. For waters with total hardness values less than 212 mg/L, the CS in µg/L is toxicity-based and shall not exceed: exp.(0.846[ln(total hardness mg/L)]+1.1645)

The MS in µg/L shall not exceed: exp.(0.846[ln(total hardness mg/L)]+3.3612)

The FAV in µg/L shall not exceed: exp.(0.846[ln(total hardness mg/L)]+4.0543)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total nickel standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Nickel, total					
CS µg/L	88	158	283	297	297

MS µg/L	789	1,418	2,549	3,592	4,582	
FAV µg/L	1,578	2,836	5,098	7,185	9,164	

Substance, Characteristic, or Pollutant (Class 2A)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Oil	µg/L	500	NA	5,000	10,000	NA
Oxygen, dissolved	mg/L	See below	NA	--	--	NA

7.0 mg/L as a daily minimum. This dissolved oxygen standard requires compliance with the standard 50 percent of the days at which the flow of the receiving water is equal to the $7Q_{10}$.

Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
Pentachlorophenol	µg/L	0.93	HH	equation	equation	Tox

The MS and FAV vary with pH and are calculated using the following equations:

The MS in µg/L shall not exceed: exp.(1.005[pH]-4.830)

The FAV in µg/L shall not exceed: exp.(1.005[pH]-4.1373)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH values greater than 9.0, 9.0 shall be used to calculate the standard.

Example of pentachlorophenol standards for five pH values:

pH su	6.5	7.0	7.5	8.0	8.5
Pentachlorophenol					
CS µg/L	0.93	0.93	0.93	0.93	0.93
MS µg/L	5.5	9.1	15	25	41
FAV µg/L	11	18	30	50	82

Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
pH, minimum	su	6.5	NA	--	--	NA
pH, maximum	su	8.5	NA	--	--	NA
Phenanthrene	µg/L	3.6	Tox	32	64	Tox
Phenol	µg/L	123	Tox	2,214	4,428	Tox
Polychlorinated biphenyls, total (c)	ng/L	0.014	HH	1,000*	2,000*	Tox
Radioactive materials	NA	See below	NA	See below	See below	NA

Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as permitted by the appropriate authority having control over their use.

Selenium, total	µg/L	5.0	Tox	20	40	Tox
Silver, total	µg/L	0.12	Tox	equation	equation	Tox

The MS and FAV vary with total hardness and are calculated using the following equations:

The MS in µg/L shall not exceed: exp.(1.720[ln(total hardness mg/L)]-7.2156)

The FAV in µg/L shall not exceed: exp.(1.720[ln(total hardness mg/L)]-6.520)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of silver standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Silver, total					
CS µg/L	0.12	0.12	0.12	0.12	0.12

MS µg/L	1.0	2.0	6.7	13	22	
FAV µg/L	1.2	4.1	13	27	44	

Substance, Characteristic, or Pollutant (Class 2A)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Temperature	°C or °F	No material increase	NA	--	--	NA
1,1,2,2-Tetrachloroethane (c)	µg/L	1.1	HH	1,127*	2,253*	Tox
Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
Thallium, total	µg/L	0.28	HH	64	128	Tox
Toluene	µg/L	253	Tox	1,352	2,703	Tox
Toxaphene (c)	ng/L	0.31	HH	730*	1,500*	Tox
1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
Total suspended solids (TSS)	mg/L	10	NA	--	--	NA
TSS standards for Class 2A may be exceeded for no more than ten percent of the time. This standard applies April 1 through September 30						
Vinyl chloride (c)	µg/L	0.17	HH	--*	--*	NA
Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
Zinc, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+0.7615)

The MS in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+0.8604)

The FAV in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+1.5536

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of zinc standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Zinc, total					
CS µg/L	59	106	191	269	343
MS µg/L	65	117	211	297	379
FAV µg/L	130	234	421	594	758

[For text of subps 2a and 2b, see M.R.]

Subp. 2c. **Beneficial use definitions for lotic cold water ~~stream and river~~ aquatic life and habitats (Class 2A).**

A. Subitems (1) to ~~(4)~~ (5) apply to the beneficial uses in items B and C:

(1) The designation and attainment of beneficial uses are based on the biological criteria in subpart 2d.

(2) The attributes of species composition, diversity, and functional organization are measured using:

(a) the ~~fish-based~~ fish IBI as defined in ~~Development of a Fish-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota (2017); or

(b) the macroinvertebrate IBI as defined in ~~Development of a Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota (2017).

(3) Water body types for streams and rivers are defined in the documents referenced in subitem (2).

(4) The following documents are incorporated by reference and are not subject to frequent change:

(a) Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking;

(b) ~~Development of a Fish-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency (2017). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking;

(c) ~~Development of a Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency (2017). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking; and

(d) Development of Biological Criteria for Tiered Aquatic Life Uses, Minnesota Pollution Control Agency (2016). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking.

(5) The beneficial use subclass designators "e" and "g" are added to the Class 2A designator as specific additional designators. The additional subclass designators do not replace the Class 2A designator. All requirements for Class 2A cold water stream and river habitats in parts 7050.0222 and 7052.0100 continue to apply in addition to requirements for Class 2Ae or Class 2Ag cold water stream and river habitats in part 7050.0222. These subclass designators are applied to lotic waters only.

B. "Exceptional cold water aquatic life and habitat" or "Class 2Ae" is a beneficial use that means waters capable of supporting and maintaining an exceptional and balanced, integrated, adaptive community of cold water aquatic organisms having a species composition, diversity, and functional organization comparable to the 75th percentile of biological condition gradient level 3 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

C. "General cold water aquatic life and habitat" or "Class 2Ag" is a beneficial use that means waters capable of supporting and maintaining a balanced, integrated, adaptive community of cold water aquatic organisms having a species composition, diversity, and functional organization comparable to the median of biological condition gradient level 4 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

Subp. 2d. **Biological criteria for lotic cold water ~~stream and river~~ aquatic life and habitats (Class 2A).**

Water Body Type	Tier	Class	Assemblage	Biocriterion
Southern cold water streams	Exceptional	2Ae	Fish	82
	General	2Ag	Fish	50
Northern cold water streams	Exceptional	2Ae	Fish	60
	General	2Ag	Fish	35

Northern cold water streams	Exceptional	2Ae	Macroinvertebrates	52
	General	2Ag	Macroinvertebrates	32
Southern cold water streams	Exceptional	2Ae	Macroinvertebrates	72
	General	2Ag	Macroinvertebrates	43

The biological criteria for lotic cold water aquatic life and habitats (Class 2A) are applicable to perennial and intermittent waters that allow for colonization of fish or macroinvertebrates.

Subp. 3. **Class 2Bd waters.** The quality of Class 2Bd surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water aquatic biota and their habitats according to the definitions in subpart 3c. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. This class of surface waters is also protected as a source of drinking water. The applicable standards are given below. Abbreviations, acronyms, and symbols are explained in subpart 1.

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Acenaphthene	µg/L	20	HH	56	112	Tox
Acetochlor	µg/L	3.6	Tox	86	173	Tox
Acrylonitrile (c)	µg/L	0.38	HH	1,140*	2,281*	Tox
Alachlor (c)	µg/L	4.2	HH	800*	1,600*	Tox
Aluminum, total	µg/L	125	Tox	1,072	2,145	Tox
Ammonia un-ionized as N	µg/L	40	Tox	--	--	NA

The percent un-ionized ammonia can be calculated for any temperature and pH by using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V. Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature. Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

$$f = 1/(10^{(pka-pH)} + 1) \times 100$$

where: f = the percent of total ammonia in the un-ionized state

$pk_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
Antimony, total	µg/L	5.5	HH	90	180	Tox
Arsenic, total	µg/L	2.0	HH	360	720	Tox
Atrazine (c)	µg/L	3.4	HH	323	645	Tox
Benzene (c)	µg/L	6.0	HH	4,487*	8,974*	Tox
Bromoform	µg/L	41	HH	2,900	5,800	Tox
Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.7852[ln(total hardness mg/L)]-3.490)

The MS in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-1.685)

The FAV in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-0.9919)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total cadmium standards for five hardness values:

TH in mg/L	50	100	200	300	400

Cadmium, total						
CS µg/L	0.66	1.1	2.0	2.7	3.4	
MS µg/L	15	33	73	116	160	
FAV µg/L	31	67	146	231	319	

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Carbon tetrachloride (c)	µg/L	1.9	HH	1,750*	3,500*	Tox
Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
Chloride	mg/L	230	Tox	860	1,720	Tox
Chlorine, total residual	µg/L	11	Tox	19	38	Tox

Chlorine standard applies to conditions of continuous exposure, where continuous exposure refers to chlorinated effluents that are discharged for more than a total of two hours in any 24-hour period.

Chlorobenzene (Monochlorobenzene)	µg/L	20	HH	423	846	Tox
Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox
Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+1.561)

The MS in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+3.688)

The FAV in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+4.380)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total chromium +3 standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Chromium +3, total					
CS µg/L	117	207	365	509	644
MS µg/L	984	1,737	3,064	4,270	5,405
FAV µg/L	1,966	3,469	6,120	8,530	10,797

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Chromium +6, total	µg/L	11	Tox	16	32	Tox
Cobalt, total	µg/L	2.8	HH	436	872	Tox
Copper, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.620[ln(total hardness mg/L)]-0.570)

The MS in µg/L shall not exceed: exp.(0.9422[ln(total hardness mg/L)]-1.464)

The FAV in µg/L shall not exceed: exp.(0.9422[ln(total hardness mg/L)]-0.7703)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total copper standards for five total hardness values:

TH in mg/L	50	100	200	300	400

Copper, total						
CS µg/L	6.4	9.8	15	19	23	
MS µg/L	9.2	18	34	50	65	
FAV µg/L	18	35	68	100	131	

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Cyanide, free	µg/L	5.2	Tox	22	45	Tox
DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
1,2-Dichloroethane (c)	µg/L	3.8	HH	45,050*	90,100*	Tox
Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	--*	--*	NA
Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
Endosulfan	µg/L	0.029	HH	0.28	0.56	Tox
Endrin	µg/L	0.016	HH	0.090	0.18	Tox
Escherichia (E.) coli	See below	See below	HH	See below	See below	NA

Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between April 1 and October 31.

Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for**

MS, FAV

Eutrophication standards for Class 2Bd lakes, shallow lakes, and reservoirs.

Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregion

Phosphorus, total	µg/L	30	NA	--	--	NA
Chlorophyll-a	µg/L	9	NA	--	--	NA
Secchi disk transparency	meters	Not less than 2.0	NA	--	--	NA

Lakes and Reservoirs in North Central Hardwood Forest Ecoregion

Phosphorus, total	µg/L	40	NA	--	--	NA
Chlorophyll-a	µg/L	14	NA	--	--	NA
Secchi disk transparency	meters	Not less than 1.4	NA	--	--	NA

Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions

Phosphorus, total	µg/L	65	NA	--	--	NA
Chlorophyll-a	µg/L	22	NA	--	--	NA
Secchi disk transparency	meters	Not less than 0.9	NA	--	--	NA

Shallow Lakes in North Central Hardwood Forest Ecoregion

Phosphorus, total	µg/L	60	NA	--	--	NA
Chlorophyll-a	µg/L	20	NA	--	--	NA
Secchi disk transparency	meters	Not less than 1.0	NA	--	--	NA

Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions

Phosphorus, total	µg/L	90	NA	--	--	NA
Chlorophyll-a	µg/L	30	NA	--	--	NA
Secchi disk transparency	meters	Not less than 0.7	NA	--	--	NA

Additional narrative eutrophication standards for Class 2Bd lakes, shallow lakes, and reservoirs are found under subpart 3a.

Eutrophication standards for Class 2Bd rivers and streams.

North River Nutrient Region

Phosphorus, total	µg/L	less than or equal to 50
Chlorophyll-a (seston)	µg/L	less than or equal to 7
Diel dissolved oxygen flux	mg/L	less than or equal to 3.0
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 1.5

Central River Nutrient Region

Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 18
Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 2.0

South River Nutrient Region

Phosphorus, total	µg/L	less than or equal to 150
Chlorophyll-a (seston)	µg/L	less than or equal to 35
Diel dissolved oxygen flux	mg/L	less than or equal to 4.5
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 3.0

Additional narrative eutrophication standards for Class 2Bd rivers and streams are found under subpart 3b.

Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
Hexachlorobenzene (c)	ng/L	0.24	HH	--*	--*	Tox
Lead, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-4.705)

The MS in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-1.460)

The FAV in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-0.7643)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total lead standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Lead, total					
CS µg/L	1.3	3.2	7.7	13	19
MS µg/L	34	82	197	331	477
FAV µg/L	68	164	396	663	956

Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for

						MS, FAV
Lindane (c) (Hexachlorocyclohexane, gamma-)	µg/L	0.032	HH	4.4*	8.8*	Tox
Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
Mercury, total in edible fish tissue	mg/kg ppm	0.2	HH	NA	NA	NA
Methylene chloride (c) (Dichloromethane)	µg/L	46	HH	13,875*	27,749*	Tox
Metolachlor	µg/L	23	Tox	271	543	Tox
Naphthalene	µg/L	81	Tox	409	818	Tox
Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS shall not exceed the human health-based standard of 297 µg/L. For waters with total hardness values less than 212 mg/L, the CS in µg/L is toxicity-based and shall not exceed: exp.(0.846[ln(total hardness mg/L)]+1.1645)

The MS in µg/L shall not exceed: exp.(0.846[ln(total hardness mg/L)]+3.3612)

The FAV in µg/L shall not exceed: exp.(0.846[ln(total hardness mg/L)]+4.0543)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total nickel standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Nickel, total					
CS µg/L	88	158	283	297	297

MS µg/L	789	1,418	2,549	3,592	4,582
FAV µg/L	1,578	2,836	5,098	7,185	9,164

Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
Oil	µg/L	500	NA	5,000	10,000	NA
Oxygen, dissolved	mg/L	See below	NA	--	--	NA

5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a site-specific basis according to part 7050.0220, subpart 7, except that no site-specific standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum. Compliance with this standard is required 50 percent of the days at which the flow of the receiving water is equal to the $7Q_{10}$.

Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
Pentachlorophenol	µg/L	1.9	HH	equation	equation	Tox

The MS and FAV vary with pH and are calculated using the following equations:

The MS in µg/L shall not exceed: exp.(1.005[pH]-4.830)

The FAV in µg/L shall not exceed: exp.(1.005[pH]-4.1373)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH values greater than 9.0, 9.0 shall be used to calculate the standard.

Example of pentachlorophenol standards for five pH values:

pH su	6.5	7.0	7.5	8.0	8.5
Pentachlorophenol					
CS µg/L	1.9	1.9	1.9	1.9	1.9

MS µg/L	5.5	9.1	15	25	41
FAV µg/L	11	18	30	50	82

Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
pH, minimum	su	6.5	NA	--	--	NA
pH, maximum	su	9.0	NA	--	--	NA
Phenanthrene	µg/L	3.6	Tox	32	64	Tox
Phenol	µg/L	123	Tox	2,214	4,428	Tox
Polychlorinated biphenyls, total (c)	ng/L	0.029	HH	1,000*	2,000*	Tox
Radioactive materials	NA	See below	NA	See below	See below	NA

Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as permitted by the appropriate authority having control over their use.

Selenium, total	µg/L	5.0	Tox	20	40	Tox
Silver, total	µg/L	1.0	Tox	equation	equation	Tox

The MS and FAV vary with total hardness and are calculated using the following equations:

The MS in µg/L shall not exceed: exp.(1.720[ln(total hardness mg/L)]-7.2156)

The FAV in µg/L shall not exceed: exp.(1.720[ln(total hardness mg/L)]-6.520)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total silver standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Silver, total					
CS µg/L	1.0	1.0	1.0	1.0	1.0
MS µg/L	1.0	2.0	6.7	13	22
FAV µg/L	1.2	4.1	13	27	44

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Temperature	°F	See below	NA	--	--	NA

5°F above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperatures, except in no case shall it exceed the daily average temperature of 86°F.

1,1,2,2-Tetrachloroethane (c)	µg/L	1.5	HH	1,127*	2,253*	Tox
Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
Thallium, total	µg/L	0.28	HH	64	128	Tox
Toluene	µg/L	253	Tox	1,352	2,703	Tox
Toxaphene (c)	ng/L	1.3	HH	730*	1,500*	Tox
1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
Total suspended solids (TSS)						
North River Nutrient Region	mg/L	15	NA	-	-	NA

Central River Nutrient Region	mg/L	30	NA	-	-	NA
South River Nutrient Region	mg/L	65	NA	-	-	NA
Red River mainstem - headwaters to border	mg/L	100	NA	-	-	NA
TSS standards for the Class 2Bd North, Central, and South River Nutrient Regions and the Red River mainstem may be exceeded for no more than ten percent of the time. This standard applies April 1 through September 30						
Total suspended solids (TSS), summer average						
Lower Mississippi River mainstem - Pools 2 through 4	mg/L	32	NA	-	-	NA
Lower Mississippi River mainstem below Lake Pepin	mg/L	30	NA	-	-	NA
TSS standards for the Class 2Bd Lower Mississippi River may be exceeded for no more than 50 percent of the time. This standard applies June 1 through September 30						

Substance, Characteristic, or Pollutant (Class 2Bd)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**

Vinyl chloride (c)	µg/L	0.18	HH	--*	--*	NA
Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
Zinc, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+0.7615)

The MS in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+0.8604)

The FAV in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+1.5536)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total zinc standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Zinc, total					
CS µg/L	59	106	191	269	343
MS µg/L	65	117	211	297	379
FAV µg/L	130	234	421	594	758

[For text of subps 3a and 3b, see M.R.]

Subp. 3c. **Beneficial use definitions for lotic warm or cool water ~~stream and river~~ aquatic life and habitats (Class 2Bd).**

A. Subitems (1) to ~~(4)~~ (5) apply to the beneficial uses in items B to D:

(1) The designation and attainment of beneficial uses are based on the biological criteria in subpart 3d.

(2) The attributes of species composition, diversity, and functional organization are measured using:

(a) the ~~fish-based~~ fish IBI as defined in ~~Development of a Fish-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota (2017); or

(b) the macroinvertebrate IBI as defined in ~~Development of a Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota (2017).

(3) Water body types for streams and rivers are defined in the documents referenced in subitem (2).

(4) The following documents are incorporated by reference and are not subject to frequent change:

(a) Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking;

(b) ~~Development of a Fish-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency (2017). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking;

(c) ~~Development of a Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency (2017). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking; and

(d) Development of Biological Criteria for Tiered Aquatic Life Uses, Minnesota Pollution Control Agency (2016). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking.

(5) The beneficial use subclass designators "e," "g," and "m" are added to the Class 2Bd designator as specific additional designators. The additional subclass designators do not replace the Class 2Bd designator. All requirements for Class 2Bd warm or cool water stream and river habitats in parts 7050.0222 and 7052.0100 continue to apply in addition to requirements for Class 2Bde, Class 2Bdg, or Class 2Bdm warm or cool water stream and river habitats in part 7050.0222. These subclass designators are applied to lotic waters only.

B. "Exceptional cool and warm water aquatic life and habitat, also protected as a source for drinking water" or "Class 2Bde" is a beneficial use that means waters capable of supporting and maintaining an exceptional and balanced, integrated, adaptive community of warm or cool water aquatic organisms having a species composition, diversity, and functional organization comparable to the 75th percentile of biological condition gradient level 3 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

C. "General cool and warm water aquatic life and habitat, also protected as a source for drinking water" or "Class 2Bdg" is a beneficial use that means waters capable of supporting and maintaining a balanced, integrated, adaptive community of warm or cool water aquatic organisms having a species composition, diversity, and functional organization comparable to the median of biological condition gradient level 4 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

D. "Modified cool and warm water aquatic life and habitat, also protected as a source for drinking water" or "Class 2Bdm" is a beneficial use that means waters capable of supporting and maintaining a balanced, integrated, adaptive community of warm or cool

water aquatic organisms having a species composition, diversity, and functional organization comparable to the median of biological condition gradient level 5 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

(1) To meet the definition in this item, waters must have been the subject of a use attainability analysis ~~and must have been found to be incapable of supporting and maintaining~~ where it is determined that attainment of the Class 2Bdg beneficial use is not feasible because of human-induced modifications of the physical habitat ~~that preclude the potential for recovery of the fauna~~. These modifications must be the result of direct alteration to the channel, such as drainageway maintenance, bank stabilization, and impoundments.

(2) Examples of Class 2Bdm waters are the stream channel modification activities regulated under:

(a) sections 401 and 404 of the Clean Water Act; or

(b) Minnesota Statutes, chapter 103E.

Subp. 3d. **Biological criteria for lotic warm or cool water ~~stream and river~~ aquatic life and habitats (Class 2Bd).**

Water Body Type	Tier	Class	Assemblage	Biocriterion
Southern rivers	Exceptional	2Bde	Fish	71
	General	2Bdg	Fish	49
Southern streams	Exceptional	2Bde	Fish	66
	General	2Bdg	Fish	50
	Modified	2Bdm	Fish	35
Southern headwaters	Exceptional	2Bde	Fish	74
	General	2Bdg	Fish	55
	Modified	2Bdm	Fish	33

Northern rivers	Exceptional	2Bde	Fish	67
	General	2Bdg	Fish	38
Northern streams	Exceptional	2Bde	Fish	61
	General	2Bdg	Fish	47
	Modified	2Bdm	Fish	35
Northern headwaters	Exceptional	2Bde	Fish	68
	General	2Bdg	Fish	42
	Modified	2Bdm	Fish	23
Low gradient	Exceptional	2Bde	Fish	70
	General	2Bdg	Fish	42
	Modified	2Bdm	Fish	15
Northern forest rivers	Exceptional	2Bde	Macroinvertebrates	77
	General	2Bdg	Macroinvertebrates	49
Prairie and southern forest rivers	Exceptional	2Bde	Macroinvertebrates	63
	General	2Bdg	Macroinvertebrates	31
High-gradient northern forest streams	Exceptional	2Bde	Macroinvertebrates	82
	General	2Bdg	Macroinvertebrates	53
Low-gradient northern forest streams	Exceptional	2Bde	Macroinvertebrates	76
	General	2Bdg	Macroinvertebrates	51
	Modified	2Bdm	Macroinvertebrates	37
High-gradient southern streams	Exceptional	2Bde	Macroinvertebrates	62
	General	2Bdg	Macroinvertebrates	37
	Modified	2Bdm	Macroinvertebrates	24
Low-gradient southern forest streams	Exceptional	2Bde	Macroinvertebrates	66

	General	2Bdg	Macroinvertebrates	43
	Modified	2Bdm	Macroinvertebrates	30
Low-gradient prairie streams	Exceptional	2Bde	Macroinvertebrates	69
	General	2Bdg	Macroinvertebrates	41
	Modified	2Bdm	Macroinvertebrates	22

The biological criteria for lotic warm or cool water aquatic life and habitats (Class 2Bd) are applicable to perennial and intermittent waters that allow for colonization of fish or macroinvertebrates.

Subp. 4. **Class 2B waters.** The quality of Class 2B surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water aquatic biota, and their habitats according to the definitions in subpart 4c. These waters shall 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. The applicable standards are given below. Abbreviations, acronyms, and symbols are explained in subpart 1.

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Acenaphthene	µg/l	20	HH	56	112	Tox
Acetochlor	µg/L	3.6	Tox	86	173	Tox
Acrylonitrile (c)	µg/l	0.89	HH	1,140*	2,281*	Tox
Alachlor (c)	µg/L	59	Tox	800	1,600	Tox
Aluminum, total	µg/L	125	Tox	1,072	2,145	Tox
Ammonia un-ionized as N	µg/L	40	Tox	--	--	NA

The percent un-ionized ammonia can be calculated for any temperature and pH by using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V. Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature. Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

$$f = 1/(10^{(pka-pH)} + 1) \times 100$$

where: f = the percent of total ammonia in the un-ionized state

$pk_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
Antimony, total	µg/L	31	Tox	90	180	Tox
Arsenic, total	µg/L	53	HH	360	720	Tox
Atrazine (c)	µg/L	10	Tox	323	645	Tox
Benzene (c)	µg/L	98	HH	4,487	8,974	Tox
Bromoform	µg/L	466	HH	2,900	5,800	Tox
Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.7852[ln(total hardness mg/L)]-3.490)

The MS in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-1.685)

The FAV in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-0.9919)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total cadmium standards for five hardness values:

TH in mg/L	50	100	200	300	400
Cadmium, total					
CS µg/L	0.66	1.1	2.0	2.7	3.4
MS µg/L	15	33	73	116	160
FAV µg/L	31	67	146	231	319

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Carbon tetrachloride (c)	µg/L	5.9	HH	1,750*	3,500*	Tox
Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
Chloride	mg/L	230	Tox	860	1,720	Tox
Chlorine, total residual	µg/L	11	Tox	19	38	Tox

Chlorine standard applies to conditions of continuous exposure, where continuous exposure refers to chlorinated effluents that are discharged for more than a total of two hours in any 24-hour period.

Chlorobenzene (Monochlorobenzene)	µg/L	20	HH	423	846	Tox
Chloroform (c)	µg/L	155	Tox	1,392	2,784	Tox
Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations

The CS in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+1.561)

The MS in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+3.688)

The FAV in µg/L shall not exceed: exp.(0.819[ln(total hardness mg/L)]+4.380)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total chromium +3 standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Chromium +3, total					
CS µg/L	117	207	365	509	644
MS µg/L	984	1,737	3,064	4,270	5,405
FAV µg/L	1,966	3,469	6,120	8,530	10,797

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Chromium +6, total	µg/L	11	Tox	16	32	Tox
Cobalt, total	µg/L	5.0	Tox	436	872	Tox
Copper, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.6200[ln(total hardness mg/L)]-0.570)

The MS in µg/L shall not exceed: exp.(0.9422[ln(total hardness mg/L)]-1.464)

The FAV in µg/L shall not exceed: exp.(0.9422[ln(total hardness mg/L)]-0.7703)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total copper standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Copper, total					
CS µg/L	6.4	9.8	15	19	23
MS µg/L	9.2	18	34	50	65
FAV µg/L	18	35	68	100	131

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Cyanide, free	µg/L	5.2	Tox	22	45	Tox
DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
1,2-Dichloroethane (c)	µg/L	190	HH	45,050*	90,100*	Tox
Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
Di-2-ethylhexyl phthalate (c)	µg/L	2.1	HH	--*	--*	NA
Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
Endosulfan	µg/L	0.031	HH	0.28	0.56	Tox
Endrin	µg/L	0.016	HH	0.090	0.18	Tox
Escherichia (E.) coli	See below	See below	HH	See below	See below	NA

Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between April 1 and October 31.

Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox

Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
Eutrophication standards for Class 2B lakes, shallow lakes, and reservoirs.						
Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregions						
Phosphorus, total	µg/L	30	NA	--	--	NA
Chlorophyll-a	µg/L	9	NA	--	--	NA
Secchi disk transparency	meters	Not less than 2.0	NA	--	--	NA
Lakes and Reservoirs in North Central Hardwood Forest Ecoregion						
Phosphorus, total	µg/L	40	NA	--	--	NA
Chlorophyll-a	µg/L	14	NA	--	--	NA
Secchi disk transparency	meters	Not less than 1.4	NA	--	--	NA
Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions						
Phosphorus, total	µg/L	65	NA	--	--	NA
Chlorophyll-a	µg/L	22	NA	--	--	NA
Secchi disk transparency	meters	Not less than 0.9	NA	--	--	NA
Shallow Lakes in North Central Hardwood Forest Ecoregion						
Phosphorus, total	µg/L	60	NA	--	--	NA
Chlorophyll-a	µg/L	20	NA	--	--	NA
Secchi disk transparency	meters	Not less than 1.0	NA	--	--	NA
Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions						

Phosphorus, total	µg/L	90	NA	--	--	NA
Chlorophyll-a	µg/L	30	NA	--	--	NA
Secchi disk transparency	meters	Not less than 0.7	NA	--	--	NA

Additional narrative eutrophication standards for Class 2B lakes, shallow lakes, and reservoirs are found in subpart 4a.

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**

Eutrophication standards for Class 2B rivers and streams.

North River Nutrient Region		
Phosphorus, total	µg/L	less than or equal to 50
Chlorophyll-a (seston)	µg/L	less than or equal to 7
Diel dissolved oxygen flux	mg/L	less than or equal to 3.0
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 1.5
Central River Nutrient Region		
Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 18
Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 2.0
South River Nutrient Region		
Phosphorus, total	µg/L	less than or equal to 150
Chlorophyll-a (seston)	µg/L	less than or equal to 40

Diel dissolved oxygen flux	mg/L	less than or equal to 5.0
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 3.5

Site-specific standards for specified river reaches or other waters are:

Mississippi River Navigational Pool 1 (river miles 854.1 to 847.7 reach from Fridley to Ford Dam in St. Paul)

Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 35

Mississippi River Navigational Pool 2 (river miles 847.7 to 815.2 reach from Ford Dam to Hastings Dam)

Phosphorus, total	µg/L	less than or equal to 125
Chlorophyll-a (seston)	µg/L	less than or equal to 35

Mississippi River Navigational Pool 3 (river miles 815.2 to 796.9 reach from Hastings Dam to Red Wing Dam)

Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 35

Mississippi River Navigational Pool 4 (river miles 796.9 to 752.8 reach from Red Wing Dam to Alma Dam). Lake Pepin occupies majority of Pool 4 and Lake Pepin site-specific standards are used for this pool.

Mississippi River Navigational Pools 5 to 8 (river miles 752.8 to 679.1 Alma Dam to Genoa Dam)

Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 35

Lake Pepin

Phosphorus, total	µg/L	less than or equal to 100
Chlorophyll-a (seston)	µg/L	less than or equal to 28

Crow Wing River from confluence of Long Prairie River to the mouth of the Crow Wing River at the Mississippi River

Phosphorus, total	µg/L	less than or equal to 75
Chlorophyll-a (seston)	µg/L	less than or equal to 13
Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 1.7

Crow River from the confluence of the North Fork of the Crow River and South Fork of the Crow River to the mouth of the Crow River at the Mississippi River

Phosphorus, total	µg/L	less than or equal to 125
Chlorophyll-a (seston)	µg/L	less than or equal to 27
Diel dissolved oxygen flux	mg/L	less than or equal to 4.0
Biochemical oxygen demand (BOD_5)	mg/L	less than or equal to 2.5

Additional narrative eutrophication standards for Class 2B rivers and streams are found in subpart 4b.

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
Hexachlorobenzene (c)	ng/L	0.24	HH	--*	--*	Tox
Lead, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-4.705)

The MS in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-1.460)

The FAV in µg/L shall not exceed: exp.(1.273[ln(total hardness mg/L)]-0.7643)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total lead standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Lead, total					
CS µg/L	1.3	3.2	7.7	13	19
MS µg/L	34	82	197	331	477
FAV µg/L	68	164	396	663	956

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Lindane (c) (Hexachlorocyclobenzene, gamma-)	µg/L	0.036	HH	4.4*	8.8*	Tox
Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
Mercury, total in edible fish tissue	mg/kg ppm	0.2	HH	NA	NA	NA
Methylene chloride (c) (Dichloromethane)	µg/L	1,940	HH	13,875	27,749	Tox
Metolachlor	µg/L	23	Tox	271	543	Tox
Naphthalene	µg/L	81	Tox	409	818	Tox
Nickel, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.846[ln(total hardness mg/L)]+1.1645)

The MS in µg/L shall not exceed: exp.(0.846[ln(total hardness mg/L)]+3.3612)

The FAV in µg/L shall not exceed: exp.(0.846[ln(total hardness mg/l)]+4.0543)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total nickel standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Nickel, total					
CS µg/L	88	158	283	399	509
MS µg/L	789	1,418	2,549	3,592	4,582
FAV µg/L	1,578	2,836	5,098	7,185	9,164

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Oil	µg/l	500	NA	5,000	10,000	NA
Oxygen, dissolved	mg/L	See below	NA	--	--	NA

5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a site-specific basis according to part 7050.0220, subpart 7, except that no site-specific standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum. Compliance with this standard is required 50 percent of the days at which the flow of the receiving water is equal to the $7Q_{10}$. This standard applies to all Class 2B waters except for:

(1) those portions of the Mississippi River from the outlet of the Metro Wastewater Treatment Works in Saint Paul (River Mile 835) to Lock and Dam No. 2 at Hastings (River Mile 815). For this reach of the Mississippi River, the standard is not less than 5 mg/L as a daily average from April 1 through November 30, and not less than 4 mg/L at other times; and

(2) the portion of the Minnesota River from the outlet of the Blue Lake wastewater treatment works (River Mile 21) to the mouth at Fort Snelling. For the specified reach of the Minnesota River, the standard is not less than 5 mg/L as a daily average year round.

Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
Pentachlorophenol	µg/L	equation	Tox/HH	equation	equation	Tox

The CS, MS, and FAV vary with pH and are calculated using the following equations:

For waters with pH values greater than 6.95, the CS shall not exceed the human health-based standard of 5.5 µg/L.

For waters with pH values less than 6.96, the CS in µg/L shall not exceed the toxicity-based standard of exp.(1.005[pH]-5.290)

The MS in µg/L shall not exceed: exp.(1.005[pH]-4.830)

The FAV in µg/L shall not exceed: exp.(1.005[pH]-4.1373)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH values greater than 9.0, 9.0 shall be used to calculate the standard.

Example of pentachlorophenol standards for five pH values:

pH su	6.5	7.0	7.5	8.0	8.5
Pentachlorophenol					
CS µg/L	3.5	5.5	5.5	5.5	5.5

MS µg/L	5.5	9.1	15	25	41
FAV µg/L	11	18	30	50	82

Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
pH, minimum	su	6.5	NA	--	--	NA
pH, maximum	su	9.0	NA	--	--	NA
Phenanthrene	µg/L	3.6	Tox	32	64	Tox
Phenol	µg/L	123	Tox	2,214	4,428	Tox
Polychlorinated biphenyls, total (c)	ng/L	0.029	HH	1,000*	2,000*	Tox
Radioactive materials	NA	See below	NA	See below	See below	NA

Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as permitted by the appropriate authority having control over their use.

Selenium, total	µg/L	5.0	Tox	20	40	Tox
Silver, total	µg/L	1.0	Tox	equation	equation	Tox

The MS and FAV vary with total hardness and are calculated using the following equations:

The MS in µg/L shall not exceed: exp.(1.720[ln(total hardness mg/L)]-7.2156)

The FAV in µg/L shall not exceed: exp.(1.720[ln(total hardness mg/L)]-6.520

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total silver standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Silver, total					
CS µg/L	1.0	1.0	1.0	1.0	1.0
MS µg/L	1.0	2.0	6.7	13	22
FAV µg/L	1.2	4.1	13	27	44

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Temperature	°F	See below	NA	--	--	NA

5°F above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperatures, except in no case shall it exceed the daily average temperature of 86°F.

1,1,2,2-Tetrachloroethane (c)	µg/L	13	HH	1,127	2,253	Tox
Tetrachloroethylene (c)	µg/L	8.9	HH	428	857	Tox
Thallium, total	µg/L	0.56	HH	64	128	Tox
Toluene	µg/L	253	Tox	1,352	2,703	Tox
Toxaphene (c)	ng/L	1.3	HH	730*	1,500*	Tox
1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
1,1,2-Trichloroethylene (c)	µg/L	120	HH	6,988	13,976	Tox
2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
Total suspended solids (TSS)						
North River Nutrient Region	mg/L	15	NA	--	--	NA
Central River Nutrient Region	mg/L	30	NA	--	--	NA
South River Nutrient Region	mg/L	65	NA	--	--	NA

Red River mainstem - headwaters to border	mg/L	100	NA	--	--	NA
TSS standards for the Class 2B North, Central, and South River Nutrient Regions and the Red River mainstem may be exceeded for no more than ten percent of the time. This standard applies April 1 through September 30						
Total suspended solids (TSS), summer average						
Lower Mississippi River mainstem - Pools 2 through 4	mg/L	32	NA	--	--	NA
Lower Mississippi River mainstem below Lake Pepin	mg/L	30	NA	--	--	NA
TSS standards for the Class 2B Lower Mississippi River may be exceeded for no more than 50 percent of the time. This standard applies June 1 through September 30						

Substance, Characteristic, or Pollutant (Class 2B)	**Units**	**CS**	**Basis for CS**	**MS**	**FAV**	**Basis for MS, FAV**
Vinyl chloride (c)	µg/L	9.2	HH	--*	--*	NA
Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
Zinc, total	µg/L	equation	Tox	equation	equation	Tox

The CS, MS, and FAV vary with total hardness and are calculated using the following equations:

The CS in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+0.7615)

The MS in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+0.8604)

The FAV in µg/L shall not exceed: exp.(0.8473[ln(total hardness mg/L)]+1.5536)

Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total zinc standards for five total hardness values:

TH in mg/L	50	100	200	300	400
Zinc, total					
CS µg/L	59	106	191	269	343
MS µg/L	65	117	211	297	379
FAV µg/L	130	234	421	594	758

[For text of subps 4a and 4b, see M.R.]

Subp. 4c. **Beneficial use definitions for lotic warm or cool water ~~stream and river~~ aquatic life and habitats (Class 2B).**

A. Subitems (1) to ~~(4)~~ (5) apply to the beneficial uses in items B to D:

(1) The designation and attainment of beneficial uses are based on the criteria in subpart 4d.

(2) The attributes of species composition, diversity, and functional organization are measured using:

(a) the ~~fish-based~~ fish IBI as defined in ~~Development of a Fish-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota (2017); or

(b) the macroinvertebrate IBI as defined in ~~Development of a Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota (2017).

(3) Water body types for streams and rivers are defined in the documents referenced in subitem (2).

(4) The following documents are incorporated by reference and are not subject to frequent change:

(a) Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking;

(b) ~~Development of a Fish-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency (2017). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking;

(c) ~~Development of a Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency (2017). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking; and

(d) Development of Biological Criteria for Tiered Aquatic Life Uses, Minnesota Pollution Control Agency (2016). The document is available on the agency's Web site at www.pca.state.mn.us/regulations/minnesota-rulemaking.

(5) The beneficial use subclass designators "e," "g," and "m" are added to the Class 2B designator as specific additional designators. The additional subclass designators do not replace the Class 2B designator. All requirements for Class 2B warm or cool water stream and river habitats in parts 7050.0222 and 7052.0100 continue to apply in addition to requirements for Class 2Be, Class 2Bg, or Class 2Bm warm or cool water stream and river habitats in part 7050.0222. These subclass designators are applied to lotic waters only.

B. "Exceptional cool and warm water aquatic life and habitat" or "Class 2Be" is a beneficial use that means waters capable of supporting and maintaining an exceptional and balanced, integrated, adaptive community of warm or cool water aquatic organisms having a species composition, diversity, and functional organization comparable to the 75th percentile of biological condition gradient level 3 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

C. "General cool and warm water aquatic life and habitat" or "Class 2Bg" is a beneficial use that means waters capable of supporting and maintaining a balanced, integrated, adaptive community of warm or cool water aquatic organisms having a species composition, diversity, and functional organization comparable to the median of biological condition gradient level 4 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

D. "Modified cool and warm water aquatic life and habitat" or "Class 2Bm" is a beneficial use that means waters capable of supporting and maintaining a balanced, integrated, adaptive community of warm or cool water aquatic organisms having a species composition, diversity, and functional organization comparable to the median of biological condition gradient level 5 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

(1) To meet the definition in this item, waters must have been the subject of a use attainability analysis ~~and must have been found to be incapable of supporting and~~

~~maintaining~~ where it is determined that attainment of the Class 2Bg beneficial use is not feasible because of human-induced modifications of the physical habitat ~~that preclude the potential for recovery of the fauna~~. These modifications must be the result of direct alteration to the channel, such as drainageway maintenance, bank stabilization, and impoundments.

(2) Examples of Class 2Bm waters are the stream channel modification activities regulated under:

(a) sections 401 and 404 of the Clean Water Act; or

(b) Minnesota Statutes, chapter 103E.

Subp. 4d. **Biological criteria for lotic warm or cool water ~~stream and river~~ aquatic life and habitats (Class 2B).**

Water Body Type	Tier	Class	Assemblage	Biocriterion
Southern rivers	Exceptional	2Be	Fish	71
	General	2Bg	Fish	49
Southern streams	Exceptional	2Be	Fish	66
	General	2Bg	Fish	50
	Modified	2Bm	Fish	35
Southern headwaters	Exceptional	2Be	Fish	74
	General	2Bg	Fish	55
	Modified	2Bm	Fish	33
Northern rivers	Exceptional	2Be	Fish	67
	General	2Bg	Fish	38
Northern streams	Exceptional	2Be	Fish	61
	General	2Bg	Fish	47
	Modified	2Bm	Fish	35
Northern headwaters	Exceptional	2Be	Fish	68

	General	2Bg	Fish	42
	Modified	2Bm	Fish	23
Low gradient	Exceptional	2Be	Fish	70
	General	2Bg	Fish	42
	Modified	2Bm	Fish	15
Northern forest rivers	Exceptional	2Be	Macroinvertebrates	77
	General	2Bg	Macroinvertebrates	49
Prairie and southern forest rivers	Exceptional	2Be	Macroinvertebrates	63
	General	2Bg	Macroinvertebrates	31
High-gradient northern forest streams	Exceptional	2Be	Macroinvertebrates	82
	General	2Bg	Macroinvertebrates	53
Low-gradient northern forest streams	Exceptional	2Be	Macroinvertebrates	76
	General	2Bg	Macroinvertebrates	51
	Modified	2Bm	Macroinvertebrates	37
High-gradient southern streams	Exceptional	2Be	Macroinvertebrates	62
	General	2Bg	Macroinvertebrates	37
	Modified	2Bm	Macroinvertebrates	24
Low-gradient southern forest streams	Exceptional	2Be	Macroinvertebrates	66
	General	2Bg	Macroinvertebrates	43
	Modified	2Bm	Macroinvertebrates	30
Low-gradient prairie streams	Exceptional	2Be	Macroinvertebrates	69
	General	2Bg	Macroinvertebrates	41
	Modified	2Bm	Macroinvertebrates	22

The biological criteria for lotic warm or cool water aquatic life and habitats (Class 2B) are applicable to perennial and intermittent waters that allow for colonization of fish or macroinvertebrates.

Subp. 5. [See repealer.]

[For text of subps 6 to 9, see M.R.]

7050.0227 SPECIFIC WATER QUALITY STANDARDS FOR CLASS 7 WATERS OF THE STATE; LIMITED RESOURCE VALUE WATERS.

[For text of subp 1, see M.R.]

Subp. 2. **Class 7 waters; limited resource value waters.** The quality of Class 7 waters of the state shall be such as to protect aesthetic qualities, secondary body contact use, and groundwater for use as a potable water supply. Standards for substances, characteristics, or pollutants given below shall not be exceeded in the waters:

Substance, Characteristic, or Pollutant	Class 7 Standard
Escherichia (E.) coli	Not to exceed 630 organisms per 100 milliliters as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between May 1 and October 31.
Oxygen, dissolved	The level of dissolved oxygen must be maintained at concentrations: i. that will avoid odors or putrid conditions in the receiving water; ii. at not less than 1 mg/L (daily average); and iii. above 0 mg/L at all times.
pH, minimum value	6.0

pH, maximum value	9.0
Toxic pollutants	Toxic pollutants shall not be allowed in such quantities or concentrations that will impair the specified uses.

7050.0430 UNLISTED WATERS.

Subpart 1. **Statewide surface waters.** Except as provided in subparts 2 and 3, all surface waters of the state that are not listed in part 7050.0470 and that are not wetlands as defined in part 7050.0186, subpart 1a, are hereby classified as Class ~~2Bg~~ 2B, 3C, 4A, 4B, 5, and 6 waters. Unlisted lotic waters are also assigned the beneficial use subclass designator "g" to the Class 2B designator.

Subp. 2. **Boundary Waters Canoe Area Wilderness.**

A. All streams in the Boundary Waters Canoe Area Wilderness [11/5/84P] not listed in part 7050.0470 are classified as Class 1B, 2Bdg, 3B.

B. All lakes in the Boundary Waters Canoe Area Wilderness [11/5/84P] not listed in part 7050.0470 are classified as Class 1B, 2Bd, 3B.

C. All wetlands in the Boundary Waters Canoe Area Wilderness [11/5/84P] are classified as Class 2D.

Subp. 3. **Voyageurs National Park.**

A. All streams in Voyageurs National Park [11/5/84P] not listed in part 7050.0470 are classified as Class 2Bg, 3B.

B. All lakes in Voyageurs National Park [11/5/84P] not listed in part 7050.0470 are classified as Class 2B, 3B.

C. All wetlands in Voyageurs National Park [11/5/84P] are classified as Class 2D.

7050.0460 WATERS SPECIFICALLY CLASSIFIED; EXPLANATION OF LISTINGS IN PART 7050.0470.

Subpart 1. **Explanation of listings.** The waters of the state listed in part 7050.0470 are classified as specified. The location of lakes, wetlands, calcareous fens, and scientific and natural areas are described by township, range, and section. Specific stream stretches are described by township, range, and section; stream confluence; geographic coordinates; road crossing; some other recognizable landmark; or a combination of these descriptors. Streams and rivers are listed by the eight-digit hydrologic unit code (HUC) of the major watersheds in part 7050.0469 in which the streams and rivers are located. The tables that specify the applicable beneficial uses for the stream and river reaches are incorporated by reference in part 7050.0470. Any community listed in part 7050.0470 is the community nearest the water classified, and is included solely to assist in identifying the water. Most waters of the state are not specifically listed in part 7050.0470. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed.

[For text of subps 2 and 3, see M.R.]

7050.0469 MAP: MINNESOTA'S MAJOR WATERSHEDS.

7050.0470 CLASSIFICATIONS FOR SURFACE WATERS IN MAJOR DRAINAGE BASINS.

Subpart 1. **Lake Superior Basin.** The water use classifications for the stream reaches within each of the major watersheds in the Lake Superior Basin listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at

www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Lake Superior Basin are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 04010101 Lake Superior - North (August 9, 2016);

(2) 04010102 Lake Superior - South (August 9, 2016);

(3) 04010201 St. Louis River (August 9, 2016);

(4) 04010202 Cloquet River (August 9, 2016); and

(5) 04010301 Nemadji River (August 9, 2016).

B. Lakes:

[For text of subitems (1) to (151), see M.R.]

(152) White Pine Lake, 16-0369-00, [WR] (T.61, R.3W, S.19, 20, 29, 30): 2B, 3B; and

(153) *Winchell Lake, 16-0354-00, [11/5/84P] (T.64, R.2, 3): 1B, 2A, 3B.

[For text of items C and D, see M.R.]

Subp. 2. **Lake of the Woods Basin.** The water use classifications for the stream reaches within each of the major watersheds in the Lake of the Woods Basin listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at

www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Lake of the Woods Basin are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 09030001 Rainy River - Headwaters (August 9, 2016);

(2) 09030002 Vermilion River (August 9, 2016);

(3) 09030003 Rainy River - Rainy Lake (August 9, 2016);

(4) 09030005 Little Fork River (August 9, 2016);

(5) 09030006 Big Fork River (August 9, 2016);

(6) 09030007 Rapid River (August 9, 2016);

(7) 09030008 Rainy River - Lower (August 9, 2016); and

(8) 09030009 Lake of the Woods (August 9, 2016).

B. Lakes:

[For text of subitems (1) to (182), see M.R.]

(183) *Wisini Lake, 38-0361-00, [11/5/84P] (T.64, R.7): 1B, 2A, 3B; and

(184) Woods, Lake of the, 39-0002-00, (see Lake of the Woods).

[For text of items C and D, see M.R.]

Subp. 3. **Red River of the North Basin.** The water use classifications for the stream reaches within each of the major watersheds in the Red River of the North Basin listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Red River of the North Basin are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 09020101 Bois de Sioux River (August 9, 2016);

(2) 09020102 Mustinka River (August 9, 2016);

(3) 09020103 Otter Tail River (August 9, 2016);

(4) 09020104 Upper Red River of the North (August 9, 2016);

(5) 09020106 Buffalo River (August 9, 2016);

(6) 09020107 Red River of the North - Marsh River (August 9, 2016);

(7) 09020108 Wild Rice River (August 9, 2016);

(8) 09020301 Red River of the North - Sandhill River (August 9, 2016);

(9) 09020302 Upper/Lower Red Lake (August 9, 2016);

(10) 09020303 Red Lake River (August 9, 2016);

(11) 09020304 Thief River (August 9, 2016);

(12) 09020305 Clearwater River (August 9, 2016);

(13) 09020306 Red River of the North - Grand Marais Creek (August 9, 2016);

(14) 09020309 Snake River (August 9, 2016);

(15) 09020311 Red River of the North - Tamarac River (August 9, 2016);

(16) 09020312 Two Rivers (August 9, 2016); and

(17) 09020314 Roseau River (August 9, 2016).

[For text of items B to D, see M.R.]

Subp. 4. **Upper Mississippi River Basin (headwaters to the confluence with the St. Croix River).** The water use classifications for the stream reaches within each of the major watersheds in the Upper Mississippi River Basin from the headwaters to the confluence with the St. Croix River listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Upper Mississippi River Basin from the headwaters to the confluence with the St. Croix River are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 07010101 Mississippi River - Headwaters (August 9, 2016);

(2) 07010102 Leech Lake River (August 9, 2016);

(3) 07010103 Mississippi River - Grand Rapids (August 9, 2016);

(4) 07010104 Mississippi River - Brainerd (August 9, 2016);

(5) 07010105 Pine River (August 9, 2016);

(6) 07010106 Crow Wing River (August 9, 2016);

(7) 07010107 Redeye River (August 9, 2016);

(8) 07010108 Long Prairie River (August 9, 2016);

(9) 07010201 Mississippi River - Sartell (August 9, 2016);

(10) 07010202 Sauk River (August 9, 2016);

(11) 07010203 Mississippi River - St. Cloud (August 9, 2016);

(12) 07010204 North Fork Crow River (August 9, 2016);

(13) 07010205 South Fork Crow River (August 9, 2016);

(14) 07010206 Mississippi River - Twin Cities (August 9, 2016); and

(15) 07010207 Rum River (August 9, 2016).

[For text of items B to D, see M.R.]

Subp. 5. **Minnesota River Basin.** The water use classifications for the stream reaches within each of the major watersheds in the Minnesota River Basin listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Minnesota River Basin are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use

information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 07020001 Minnesota River - Headwaters (August 9, 2016);

(2) 07020002 Pomme de Terre River (August 9, 2016);

(3) 07020003 Lac qui Parle River (August 9, 2016);

(4) 07020004 Minnesota River - Yellow Medicine River (August 9, 2016);

(5) 07020005 Chippewa River (August 9, 2016);

(6) 07020006 Redwood River (August 9, 2016);

(7) 07020007 Minnesota River - Mankato (August 9, 2016);

(8) 07020008 Cottonwood River (August 9, 2016);

(9) 07020009 Blue Earth River (August 9, 2016);

(10) 07020010 Watonwan River (August 9, 2016);

(11) 07020011 Le Sueur River (August 9, 2016); and

(12) 07020012 Lower Minnesota River (August 9, 2016).

[For text of items B to D, see M.R.]

Subp. 6. **Saint Croix River Basin.** The water use classifications for the stream reaches within each of the major watersheds in the Saint Croix River Basin listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in

item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Saint Croix River Basin are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 07030001 Upper St. Croix River (August 9, 2016);

(2) 07030003 Kettle River (August 9, 2016);

(3) 07030004 Snake River (August 9, 2016); and

(4) 07030005 Lower St. Croix River (August 9, 2016).

[For text of items B to D, see M.R.]

Subp. 7. **Lower Mississippi River Basin (from the confluence with the St. Croix River to the Iowa border).** The water use classifications for the stream reaches within each of the major watersheds in the Lower Mississippi River Basin from the confluence with the Saint Croix River to the Iowa border listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Lower Mississippi River Basin from the confluence with the St. Croix River to the Iowa border are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 07040001 Mississippi River - Lake Pepin (August 9, 2016);

(2) 07040002 Cannon River (August 9, 2016);

(3) 07040003 Mississippi River - Winona (August 9, 2016);

(4) 07040004 Zumbro River (August 9, 2016);

(5) 07040006 Mississippi River - La Crescent (August 9, 2016);

(6) 07040008 Root River (August 9, 2016);

(7) 07060001 Mississippi River - Reno (August 9, 2016); and

(8) 07060002 Upper Iowa River (August 9, 2016).

[For text of items B to D, see M.R.]

Subp. 8. **Cedar-Des Moines Rivers Basin.** The water use classifications for the stream reaches within each of the major watersheds in the Cedar-Des Moines Rivers Basin listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Cedar-Des Moines Rivers Basin are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 07080102 Upper Wapsipinicon River (August 9, 2016);

(2) 07080201 Cedar River (August 9, 2016);

(3) 07080202 Shell Rock River (August 9, 2016);

(4) 07080203 Winnebago River (August 9, 2016);

(5) 07100001 Des Moines River - Headwaters (August 9, 2016);

(6) 07100002 Lower Des Moines River (August 9, 2016); and

(7) 07100003 East Fork Des Moines River (August 9, 2016).

[For text of items B to D, see M.R.]

Subp. 9. **Missouri River Basin.** The water use classifications for the stream reaches within each of the major watersheds in the Missouri River Basin listed in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web site of the Minnesota Pollution Control Agency at www.pca.state.mn.us/regulations/minnesota-rulemaking. The tables are incorporated by reference and are not subject to frequent change. The date after each watershed listed in item A is the publication date of the applicable table. The water use classifications for the other listed waters in the Missouri River Basin are as identified in items B to D. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use information for water bodies can also be accessed through the agency's Environmental Data Access (http://www.pca.state.mn.us/quick-links/eda-surface-water-data).

A. Streams (by eight-digit hydrologic unit code):

(1) 10170202 Upper Big Sioux River (August 9, 2016);

(2) 10170203 Lower Big Sioux River (August 9, 2016);

(3) 10170204 Rock River (August 9, 2016); and

(4) 10230003 Little Sioux River (August 9, 2016).

[For text of items B to D, see M.R.]

7052.0100 WATER QUALITY STANDARDS.

[For text of subps 1 to 4, see M.R.]

Subp. 5. **Water quality standards applicable to Class 2B and 2D waters.**

Substance	Units	Aquatic Life Chronic Standard	Aquatic Life Maximum Standard	Aquatic Life Final Acute Value	Human Health Chronic Standard	Wildlife Chronic Standard	Applicable Chronic Standard
Arsenic, total	ug/l	148	340	680	53†		53
Benzene	ug/l	114†	4487†	8974†	237		114
Cadmium, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6
Chlordane	pg/l				225		225
Chlorobenzene	ug/l	10†	423†	846†	2916		10
Chromium III, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6
Chromium VI, total	ug/l	11	16	32			11
Copper, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6
Cyanide, free	ug/l	5.2	22	44	30240		5.2
DDT	pg/l				142	11	11
Dieldrin	pg/l	56000	240000	480000	6.5		6.5
2,4-Dimethylphenol	ug/l	21	137	274	7182		21

95.1	2,4-Dinitrophenol	ug/l	71	379	758	1982		71
95.2	Endrin	ug/l	0.036	0.086	0.17	0.016†		0.016
95.3	Hexachlorobenzene	pg/l				419		419
95.4	Hexachloroethane	ug/l				6.2		6.2
95.5	Lindane	ug/l		0.95	1.9	0.46		0.46
95.6	Mercury, total	ug/l	0.91	1.7	3.4	0.00153	0.0013	0.0013
95.7	Methylene Chloride	ug/l	1561†	9600†	19200†	1994		1561
95.8	Nickel, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6
95.9	Parathion	ug/l	0.013	0.065	0.13			.013
95.10	PCBs (class)	pg/l				25.2	122	25.2
95.11 95.12	Pentachlorophenol (pH)	ug/l	subp 6	subp 6	subp 6	5.5†		subp 6
95.13	Selenium, total	ug/l	5.0	20†	40†			5.0
95.14	2,3,7,8-TCDD	pg/l				0.0080	0.0031	0.0031
95.15	Toluene	ug/l	253†	1352†	2703†	45679		253
95.16	Toxaphene	pg/l				62		62
95.17	Trichloroethylene	ug/l				330		330
95.18	Zinc, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6

95.19 †this standard or FAV was derived under chapter 7050.

95.20 Subp. 6. **Water quality standards that vary with water quality characteristics.**

95.21 [For text of items A and B, see M.R.]

C. Standards that vary with pH applicable to Class 2B and 2D waters in the Lake Superior Basin are listed in this subpart. Exp. is the base e exponential function.

		Example standards at pH of:				
Pentachlorophenol	Formula, results in ug/l	6.5	7.0	7.5	8.0	8.5
Chronic standard	exp.(1.005[pH]-5.134) not to exceed 5.5 ug/l	4.0	5.5	5.5	5.5	5.5
Maximum standard	exp.(1.005[pH]-4.869)	5.3	8.7	14	24	39
Final acute value	exp.(1.005[pH]-4.175)	11	17	29	48	79

7052.0110 METHODOLOGIES FOR DEVELOPMENT OF STANDARDS AND CRITERIA, AND BIOACCUMULATION FACTORS.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Bioaccumulation factors.** Bioaccumulation factors (BAFs) for calculating human health and wildlife standards were developed and BAFs for calculating criteria must be developed using the methodology provided by Code of Federal Regulations, title 40, part 132, Appendix B, entitled "Great Lakes Water Quality Methodology for Deriving Bioaccumulation Factors," as amended through March 12, 1997, which is adopted and incorporated by reference in part 7052.0015, item B, except that for human health standards and criteria, the baseline BAF is multiplied by the following lipid fractions which apply to fish in both trophic levels 3 (TL_3) and 4 (TL_4), except as noted in item C:

[For text of items A and B, see M.R.]

C. 0.015 for TL_4 and 0.020 for TL_3 for Class 2B, 2Bd, and 2D waters.

[For text of subps 4 and 5, see M.R.]

REPEALER. Minnesota Rules, part 7050.0222, subpart 5, is repealed.