Methodology for Iowa's 2024 Water Quality Assessment, Listing, and Reporting Pursuant to Sections 305(b), 303(d), and 314 of the Federal Clean Water Act

Prepared by:

Water Quality Monitoring & Assessment Section
Water Quality Bureau
Environmental Services Division
Iowa Department of Natural Resources

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Table 1: List of acronyms, abbreviations, and terms used in this document.

Acronym, Abbreviation, or Term	Definition
303(d) List	Iowa's list of impaired waters: aka Impaired Waters List, Integrated Report Category 5
ADBNet	Iowa DNR's Assessment Database
ALU	Aquatic Life Use
AQuIA	Iowa DNR's online water quality database
BIT	Biological Impairment Threshold
BMIBI	Benthic Macroinvertebrate Index of Biotic Integrity
Calibrated	Stream/river segments with watershed drainage areas of ~25 mi^2 to $\leq$ 500 mi^2 or BCW1 stream segments.
CALM	EPA's Consolidated Assessment and Listing Methodology
CBI	Coldwater Benthic Index
CFR	Code of Federal Register
Comparable	Data having completeness and quality that is comparable to biocriteria project data used to develop reference biotic indices and biological impairment thresholds.
CW	Coldwater
CWA	Clean Water Act
CY	Calendar Year
DDE	Dichlorodiphenyldichloroethylene
DNR	Iowa Department of Natural Resources
DO	Dissolved Oxygen
E. coli	*Escherichia coli*
EMP	Environmental Management Program of the United States Army Corps of Engineers
EPA	United States Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, Trichoptera
FFG	Functional Feeding Group
FIBI	Fish Index of Biotic Integrity
FK	Fish kill
FKF	Fish kill Follow-up
FLMA	Filamentous Algae Coverage
FS	Fully Supported
FT	Fish Tissue
Geomean	Geometric Mean
HH	Human Health
HHS	Iowa Department of Health and Human Services (includes old Department of Public Health)
IAC	Iowa Administrative Code
IBI	Index of Biotic Integrity
IDPH	Iowa Department of Public Health
IFTMP	Iowa Fish Tissue Monitoring Program
IR	Integrated Report
ISU	Iowa State University
L&D	Lock and Dam
LTRMP	Long-Term Resource Monitoring Program
MCL	Maximum Contaminant Level

Acronym, Abbreviation, or Term	Definition
MDL	Method Detection Limit
mg/L	Milligrams per Liter
MPCA	Minnesota Pollution Control Agency
NA	Not Applicable
NASQAN	National Stream Quality Accounting Network
NAWQA	National Water Quality Assessment Program
ND	Non-detect
NIA	Nutrient Impact Assessment
NRSA	National River and Stream Assessment
NS	Not Supported
OIW	Outstanding Iowa Waters
ONRW	Outstanding National Resource Waters
PCB(s)	Polychlorinated Biphenyls
REMAP	Regional Environmental Monitoring Assessment Program
RL	Reporting limit (AKA Practical Quantitation Limit)
RTAG	Region 7 Technical Assistance Group
SAV	Submersed Aquatic Vegetation
SDWA	Safe Drinking Water Act
SHL	State Hygienic Laboratory of Iowa
SR	Species Richness
SSM	Single Sample Maximum
SWC	Iowa's Surface Water Classification Document
Tentative	Biological data having uncertain levels of completeness and quality documentation.
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSI	Trophic State Index (Carlson 1977)
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
UAV	Uncertainty Adjustment Value (8 pts. BMIBI, 8 pts. CBI, 7 pts. FIBI)
UMR	Upper Mississippi River
UMRBA	Upper Mississippi River Basin Association
UMRCC	Upper Mississippi River Conservation Committee
Uncalibrated	Warmwater stream and river segments with watershed drainage areas of ~< 25 mi^2 or > 500 mi^2 or Class BCW2 segments.
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
Vision	2024 303(d) Vision
WCBP	Western Corn Belt Plains
WINOFI	Waters In Need Of Further Investigation
WQ	Water Quality
WQB	Water Quality Bureau
WQC	Water Quality Criterion or Criteria
WQMA	Iowa DNR's Water Quality Monitoring and Assessment Section
WQS	Water Quality Standards
WW	Warmwater

Acronym, Abbreviation, or Term	Definition
µg/L	Micrograms per Liter

Introduction

Clean Water Act and the Integrated Report (IR)

Iowa's 2024 assessment and listing methodology incorporates recommendations from the United States Environmental Protection Agency's (EPA) historical [305(b)/303(d)/Integrated Reporting] guidance as well as the current guidance for the 2024 assessment, listing, and reporting requirements pursuant to Sections 303(d), 305(b), and 314 of the federal Clean Water Act (CWA) (EPA 2023). EPA guidance establishes the format for an "integrated report" (IR) that satisfies the listing requirements of Section 303(d) and the reporting requirements of Sections 305(b) and 314 of the CWA.

The Iowa Department of Natural Resources (DNR) updates and revises the IR methodology when concerns are raised or when program developments are released by the DNR. Additional modifications or clarifications to the assessment methods may also be made based on feedback provided by EPA or from the EPA's cycle-specific 303(d) guidance memorandum.

Due to the continued lack of details regarding the mechanics of CWA-related water quality assessment in more recent EPA guidance (e.g., EPA 2002), the DNR continues to use assessment methods described and recommended in previous EPA guidance for Section 305(b) reporting (EPA 1997). DNR uses the 1997 guidance only in cases where EPA's more recent guidance is inadequate. DNR's 2024 methodology generally meets the requirements of CWA Section 303(d)(1)(a) and 40 CFR Section 130.24 and incorporates requirements of Iowa's credible data law (2001 Iowa Code, Section 455B.194, subsection 1).

Iowa Water Quality Standards

According to EPA, a water quality standard is comprised of three components: (1) a description of designated use, (2) water quality criteria to protect this use, and (3) an antidegradation policy that ensures protection of water quality where water quality exceeds levels necessary to protect fish and wildlife propagation and recreation in and on the water. Thus, the basis for a state's IR assessments and Section 303(d) list of impaired waters is ultimately the state's water quality standards (WQS). That is, the state WQS contain the benchmarks (criteria) to which water quality data are compared to determine the degree to which designated uses are supported. The versions of the Iowa WQS (https://www.legis.iowa.gov/docs/iac/chapter/567.61.pdf), with the effective date of February 9, 2022, and the accompanying Iowa Surface Water Classification (SWC) (http://publications.iowa.gov/33245/1/SWC%20Final%207_24_19.pdf), with the effective date of July 24, 2019, were used as the basis for water quality assessments prepared for this 2024 assessment and listing cycle. These versions of the standards and surface water classification are available for download using the links above.

Total Maximum Daily Load (TMDL)

The Water Quality Monitoring and Assessment Section (WQMA) of the DNR's Water Quality Bureau (WQB) conducts water quality assessments as required by CWA Section 305(b). Based on these assessments, WQMA staff identifies waterbody segments in Iowa that may require a TMDL to address the causes and sources of pollutants contributing to impairment of a designated use. These segments are placed into Category 5 of Iowa's IR and this category constitutes Iowa's Section 303(d) list of impaired waters. Conceptually, a TMDL is the maximum pollutant load from point sources and nonpoint sources, plus a load allocated to a "margin of safety," that a waterbody can receive and continue to meet WQS.

Integrated Report

EPA guidance documents recommend that the IR contains five assessment categories and associated subcategories. In the descriptions below, the text in italics is taken from EPA's 2005 guidance for integrated reporting. The notes that follow these excerpts contain DNR's interpretations and modifications of EPA's guidance.

Category 1: *Segments belong in Category 1 if they are attaining all designated uses and no use is threatened. Segments should be listed in this category if there are data and information that are consistent with the State's methodology and this guidance, and support a determination that all applicable WQS are attained and no designated use is threatened.*

- DNR has made no modifications to the definition or intent of IR Category 1.

Category 2: *Segments should be placed in Category 2 if there are data and information that meet the requirements of the State's assessment and listing methodology that support a determination that some, but not all, designated uses are attained and none are threatened. Attainment status of the remaining designated uses is unknown because data are insufficient to categorize a segment consistent with the State's listing methodology.*

- DNR has made no modifications to the definition or intent of IR Category 2.

Category 3: *Segments belong in Category 3 if there are insufficient or no data and information to determine, consistent with the State's listing methodology, if any designated use is attained. To assess the attainment status of these segments, the State should schedule monitoring on a priority basis to obtain data and should also make efforts to obtain information necessary to move these waters into Categories 1, 2, 4, and 5.*

- DNR has made the following modifications to IR Category 3: the renaming of EPA Category 3 to Category 3a and the additions of Category 3b and Subcategories 3bc and 3bu.
    - **Category 3a:** Insufficient data exist to determine whether any uses are met; no uses are assessed [either "evaluated" or "monitored"]. This wording is consistent with the EPA's definition of IR Category 3.
    - **Category 3b:** At least one use is assessed as potentially impaired based on an "evaluated" assessment. This subcategory allows tracking of the potentially impaired waterbody segments. Waters placed into subcategory 3b are added to Iowa's list of "waters in need of further investigation" (WINOFI). As specified in Iowa's credible data law (2001 Iowa Code, Section 455B.194, subsection 1), segments where the assessment indicates a potential impairment, but where sufficient and credible data are lacking, will not be included on the state's 303(d) list (IR Category 5). However, waters in subcategory 3b are considered "not assessed" for purposes of EPA Integrated Reporting.
        - **Category 3bc** (calibrated): the aquatic life use of a stream segment within the calibrated range of the biological assessment protocol was assessed as potentially impaired;
        - **Category 3bu** (uncalibrated): the aquatic life use of a stream segment with a watershed size outside the calibrated range, or sampling requirements not meeting the requirements of the biological assessment protocol, was assessed as potentially impaired.

Category 4: *Segments belong in Category 4 if one or more designated uses are impaired or threatened but establishment of a TMDL is not required. States may place an impaired or threatened water segment that does not require a TMDL in one of the following three subcategories:*

Category 4a: *a TMDL has been completed for the water-pollutant combination. Segments should only be placed in Category 4a when all TMDLs needed to result in attainment of all applicable WQS have been approved or established by EPA. Current regulations do not require TMDLs for all segments.*

Category 4b: *other required control measures are expected to result in the attainment of WQSs in a reasonable period of time. Some segments may be excluded from Category 5, and placed into Category 4b. In order to meet the requirements to place these waters into Category 4b, the State must demonstrate that "other pollution control*

requirements (e.g., best management practices) required by local, State or Federal authority" (see 40 CFR 130.7(b)(1)(iii)) are expected to address all water-pollutant combinations and attain all WQS in a reasonable period of time. The EPA expects that states will provide adequate documentation that the required control mechanisms will address all major pollutant sources and establish a clear link between the control mechanisms and WQS.

***Category 4c:** the impairment or threat is not caused by a pollutant. Segments should be listed in Category 4c when an impairment is not caused by a pollutant. "Pollution," as defined by the CWA, is the "man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of water." In some cases, the pollution is caused by the presence of a pollutant and a TMDL is required. In other cases, pollution does not result from a pollutant and a TMDL is not required. An example of a pollutant stressor would be copper; an example of a non-pollutant stressor ("pollution") would be "low flow."*

- DNR made no modifications to the definitions or intents of IR Categories 4a, 4b, or 4c. DNR did, however, make the following modification to IR Category 4: the addition of Category 4d.

    - **Category 4d:** Segment is impaired due to a pollutant-caused fish kill and enforcement actions were taken against the party responsible for the kill: a TMDL is neither appropriate nor needed. Fish kill assessments where the pollutant cause was identified are placed into Category 4d when the responsible party is identified and restitution and/or fine has been paid.

Category 5: *This category constitutes the Section 303(d) list that EPA will approve or disapprove under the CWA. Segments should be placed in Category 5 when it is determined, in accordance with the State's assessment and listing methodology that a pollutant has caused, is suspected of causing, or is projected to cause an impairment or threat. If that impairment or threat is due to a pollutant, the water should be placed in Category 5 and the pollutant causing the impairment identified.*

- DNR made the following modifications to IR Category 5: the renaming of EPA's Category 5 to Category 5a and the addition of categories 5b (and subcategory 5bv) and 5p.

    - **Category 5a:** Segment is impaired or threatened by a pollutant stressor and a TMDL is needed. This wording is consistent with the EPA's definition of IR Category 5.

    - **Category 5b:** Impairment is based on results of biological sampling or a fish kill investigation where specific causes and/or sources of the impairment have not yet been identified. The biological assessment adequately demonstrates that an impairment exists, but either the cause or the source of the impairment is unknown. The primary use of this subcategory is for biologically-based impairments with the cause listed as "unknown" and for fish kill-based impairments where a pollutant cause was identified but no source was found. Historic aquatic life impairments based on evaluated assessments using tentative biological data were placed in a no longer used 5bt (tentative) subcategory.

        - **5bv (verified):** Aquatic life impairments based on monitored assessments using comparable biological data.

    - **Category 5p:** Impairment occurs on a segment presumptively designated for Class A1 primary contact recreational use and/or Class BWW1 aquatic life use. Due to changes in the Iowa WQS that became effective in March 2006, all perennially-flowing streams and intermittent streams with perennial pools are presumed to be capable of supporting the highest level of primary contact recreational use (Class A1) and the highest level of aquatic life use (Class BWW1). Until the time when a UAA has been conducted and the appropriate designated uses have been applied and approved by EPA, any impairments on presumptively-designated Iowa streams will be placed in IR Category 5p.

Deadlines

According to recent EPA memos, the Section 303(d) list of impaired waterbody segments must be submitted to EPA by April 1 of every even-numbered year. This methodology was designed to meet the deadline for submission of the list to EPA in April 2024.

Preparation of Iowa's IR includes the following steps:

- Review and update on methodology;
- Review and update on assessment database: designated uses, segments, links, language, etc.;
- Review and update violation auto calculator database;
- Assemble all existing and readily available water quality-related data;
- Identify water quality-related data and information of sufficient quality and quantity for purposes of developing scientifically defensible water quality assessments;
- Compare these water quality-related data and information to state water quality (WQ) criteria and internal thresholds to determine the degree to which assessed segments pass;
- Identify Section 303(d) impairments that are based on water quality-related data and information that meet the state's requirements for data quantity and data quality (Tables 8, 9, 10, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23)
- Place all segments into one of the five categories specified for water quality assessment and listing;
- Prepare the state list of segments in need of further investigation;
- Prioritize the waterbody segments on the draft Section 303(d) list (Category 5) for TMDL development;
- Provide the draft integrated report, including the draft Section 303(d) list (Category 5), to the public for review and comment;
- Revise and finalize the integrated report based on new information and public input;
- Submit the final integrated report, including the Section 303(d) list, to EPA for approval/disapproval;
- Develop a schedule for development of TMDLs for Section 303(d) listed (IR Category 5) waterbody segments;
- Upload integrated report into ATTAINS.

Changes in Methodology Since the 2022 Reporting and Listing Cycle

- The IR methodology document was redesigned for clarity and conciseness.
- The IR methodology integrated all of the assessment methodologies into designated use organized methodologies in the main body of the document.
- Table 5 (IR Category definitions/explanations) was eliminated and incorporated the information into "The Integrated Report" section of this methodology.
- DNR now uses a one cycle to impair and one cycle to delist methodology for all impairments.
- DNR now additionally uses a modified 10% rule, named the 7,8,9 rule, for all Binomial parameters, when the sample size is between 7 and 9 samples.
- When data is available, DNR now assesses all Class C and HH Toxic parameters using annual averages (4+ samples/year for each year), rather than overall averages (<4 samples/year for each year, 10 sample minimum). Overall averages are still used to assess these parameters when there is insufficient data to calculate an annual average.
- DNR now assesses Class B waters as impaired due to ammonia using the following method: when the data shows greater than one violation of the ammonia criteria during the three year sampling cycle..

Public Participation

A draft of this methodology is provided to the public for review and comment as part of the public comment period for the biennial IR. The draft methodology is available in hard copy by contacting the DNR. The draft is also available at the DNR assessment website ADBNet at https://programs.iowadnr.gov/adbnet. Comments on the draft methodology are received for a period of thirty days. A responsiveness summary based on the public comments received will be included with the IR upload to the EPA as well as published on the DNR's ADBNet website.

The methods used to assess water quality are always changing due both to recommendations from the EPA and changes at the state level (e.g., changes in the Iowa WQS). Thus, DNR will accept comments at any time regarding this methodology.

Data Sources, Quantity, and Quality

Primary Sources of Existing and Readily Available Water Quality-Related Data and Information

The DNR's WQMA section solicited, downloaded, and assembled all existing and readily available water quality-related data for the 2024 IR. The primary data sources and data types used for the 2024 IR can be found in Table 2. It is important to note that assessments based on old data and historic data sources not found in Table 2 may be included in the 2024 IR.

Table 2: 2024 Integrated Report data sources and data types for data collected in Iowa or from Iowa's border rivers (Big Sioux, Des Moines, Mississippi, and Missouri Rivers).

Organization	Data Type	Location
Iowa DNR	Stream/River, Beach, Lake, & Wetland WQ	https://programs.iowadnr.gov/aquia
Iowa DNR	Fish Tissue	https://programs.iowadnr.gov/aquia
Iowa DNR	Fish Kills	https://programs.iowadnr.gov/fishkill/
Iowa DNR	Biological	https://programs.iowadnr.gov/bionet/
Iowa DNR	Continuous Dissolved Oxygen	Contact DNR IR Team - IRcomment@dnr.iowa.gov
Iowa DNR	Drinking Water Supplies Source WQ	https://www.iowadnr.gov/Environmental-Protection/Water-Quality/Water-Supply-Engineering/Annual-Compliance-Report
Illinois EPA	Mississippi River WQ	https://epa.illinois.gov/topics/water-quality/monitoring/river-and-stream.html#sw1
Minnesota PCA	Stream and River WQ	https://webapp.pca.state.mn.us/wqd/surface-water
Missouri DNR	Des Moines River WQ	https://dnrservices.mo.gov/env/esp/lims/search https://apps5.mo.gov/mocwis_public/wqa/waterbodySearch.do
Nebraska DEE	Missouri River WQ	http://dee.ne.gov/NDEQProg.nsf/OnWeb/SWMA https://www.nwo.usace.army.mil/
South Dakota DENR	Big Sioux River WQ	https://apps.sd.gov/NR92WQMAP
Wisconsin DNR	Mississippi River WQ	https://dnr.wisconsin.gov/topic/SurfaceWater/Monitoring.html https://www.mvp.usace.army.mil/
Iowa Surface Water Supplies	Raw Water WQ	Contact DNR IR Team - IRcomment@dnr.iowa.gov
Long Term Resource Monitoring Program (UMESC)	Mississippi River and Tributaries WQ	https://www.umesc.usgs.gov/data_library/water_quality/water1_query.shtml
Meskwaki Nation	Stream and River WQ outside of Tribal Lands	https://www.waterqualitydata.us/
Region 7 EPA	Stream/River and Lake WQ	https://www.waterqualitydata.us/
United States Army Corps of Engineers (USACE)	Stream/River WQ, Reservoir WQ, and Fish Tissue	https://www.nwk.usace.army.mil/Contact/ https://www.mvr.usace.army.mil/Contact/ https://www.nwo.usace.army.mil/ https://www.mvp.usace.army.mil/
United States Geological Survey (USGS)	Stream and River WQ	https://nwis.waterdata.usgs.gov/ia/nwis/qwdata
Prairie Rivers of Iowa	Story County *E. coli*	https://www.prrcd.org/

Data from water quality monitoring conducted by adjacent states on border rivers are used with the guidelines described in this document to assess the degree to which the relevant Iowa WQS are being met. The lists of segments from border

states are summarized in Tables 28, 29, 30, and 31. Decisions on assessment and listing for border waters are coordinated to the extent possible with integrated report staff from the adjacent states. For example, assessments and listings for the Iowa portion of the Upper Mississippi River (UMR) are made in consultation with the states of Minnesota, Wisconsin, Illinois, and Missouri as part of ongoing interstate IR consultations through the Upper Mississippi River Basin Association's (UMRBA's) Water Quality Task Force (https://umrba.org/group/water-quality-task-force). UMRBA consultations and coordination or assessments and listings are based on a uniform set of assessment reaches for the UMR that was adopted by all five UMR states in 2004 (Table 28).

Additional Sources of Water Quality-Related Data and Information

Surface waters that originate outside of Iowa's borders but flow into Iowa but will be assessed using only monitoring locations within Iowa. DNR will work with neighboring states and tribes, as resources allow, on any impairments that fall close to jurisdictional boundaries by notifying the neighboring state of the impairments and available data relevant to the impairment.

Data from special studies of water quality and aquatic communities, best professional judgment of DNR staff, results of volunteer monitoring, and water-related information received from the public will also be reviewed for IR assessment. Data from these sources often do not meet the data quality and quantity requirements for Category 5 impairment. If the assessment of these data show a potential impairment they will be considered for addition to Iowa's WINOFI list.

Data Quantity Considerations ("Data Completeness" Guidelines)

The cutoff date for the data collection period for Iowa's current IR is the end of the previous even-numbered calendar year (Table 3). A considerable amount of staff time is needed to summarize monitoring data from the various monitoring agencies, to compare the summarized results to WQS, to develop the waterbody-specific assessments of the degree to which designated uses are supported, and to solicit and respond to public comments on the draft IR and IR methodology. Also, water quality data generated by the various agencies are not available immediately following sample collection: a lag time from a few months up to a year or more is associated with obtaining results of water quality monitoring networks. Given these time requirements, and given the other work responsibilities of DNR staff that prepare Iowa's IR, the allowance of a 15-month window for report preparation prior to the April deadline is not excessive.

For purposes of developing stream/river water quality assessments for integrated reporting, three years of water quality data are typically used for both Binomial parameters (e.g., indicator bacteria) and the less frequently monitored Toxic parameters (e.g., toxic metals). Since the 2004 IR cycle, DNR has used a three-year data gathering period for streams, rivers, and beaches (Table 3). For most assessments, the use of three years of data increases the number of samples upon which the decision on use support is based and helps address the problem of weather-related year-to-year fluctuations in water quality.

Due to the lower sampling frequency in Iowa's ambient lake, biological, fish kill, and fish tissue monitoring programs, five years of data are used for developing IR assessments and for identifying Section 303(d) listings (Table 3).

In order to improve the accuracy of water quality assessments, DNR has identified minimum data requirements for IR assessments (Tables 8, 9, 10, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23). These guidelines identify the numbers of samples needed for IR assessments that can support Section 303(d) listings (i.e., monitored assessments).

Table 3: The 2024 Integrated Report cycle's "new data" timeframe.

Data Type	Data Timeframe
Beach Sampling Data	CY 2020-2022
Stream/River Water Quality Data	CY 2020-2022
Lake Water Quality Data	CY 2018-2022
Biological Sampling Data	CY 2018-2022*
Fish Kill Data	CY 2018-2022
Fish Tissue Sampling Data	CY 2018-2022
Continuous Dissolved Oxygen Sampling Data	CY 2018-2022
*Biological sites with 2017 and 2021 sampling data were also assessed.	

Data Quality Considerations ("Credible Data" Requirements)

As defined by EPA, data quality objectives are qualitative and quantitative statements that clarify objectives, define appropriate types of data, and specify levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support assessment decisions. In this context, Iowa's credible data law defines "credible data" as scientifically valid chemical, physical, or biological monitoring data collected under a scientifically accepted sampling and analysis plan, including quality control and quality assurance procedures (2001 Iowa Code, Section 455B.171, subsection 11). Water quality data collected by the DNR are collected under a department Quality Management Plan and are considered "credible data". Water quality results collected from external sources that meet all requirements of Iowa's "credible data" law, including the availability of a quality assurance project plan (or equivalent plan or methodology for sampling and analysis), will be considered on a case-by-case basis. Data from external sources such as federal and surrounding state agencies are often considered credible. DNR will review all relevant quality assurance project plans for special studies prior to the decision to use study results for purposes of Section 303(d) listing. Any water quality results that meet "credible data" requirements will be compared to water quality criteria as specified in the Iowa WQS with the methods described in this document.

Additionally, as specified in Iowa's credible data law, and based on the inherent uncertainty in using old data to characterize current water quality conditions, data between five and ten years old are used for IR assessments but are not used for purposes of adding segments to Iowa's Section 303(d) list of impaired waters (i.e., Category 5 of the IR). Chemical/physical data older than five years are generally believed to be less reflective of current ambient water quality than are more recent data (EPA 1997, pages 1-5 and 1-9). However, nearly all recent water quality data from Iowa waters have already been used for IR assessments and thus have already been considered for Section 303(d) listings. Also, a listed waterbody will not be removed from the state's Section 303(d) list simply because the data upon which the impairment was based have aged beyond five or ten years. Thus, the restrictions placed on use of old water quality data by Iowa's credible data law have little effect on impaired waters listings or delistings in Iowa.

Waters in Need of Further Investigation (WINOFI) List

As provided for in Iowa's credible data law (2001 Iowa Code, Section 455B.194, subsection 1), the WINOFI list is not part of the Section 303(d) process in Iowa and includes waterbodies where limited information suggests, but does not credibly demonstrate, a water quality impairment. The state's WINOFI list is comprised of those waterbodies assessed (evaluated) as potentially "impaired." That is, the assessment of a designated use or uses in these segments as "potentially impaired" is based on less than complete information; thus, the assessment is of relatively low confidence and is not appropriate for addition to the list of Section 303(d) waterbodies. These potentially-impaired segments are placed in Subcategory 3b of the IR which comprises the WINOFI list. If the results of further investigative monitoring demonstrate with credible data that a water quality impairment exists, the affected segment can be added to Iowa's Section 303(d) list (IR Category 5).

Rationale for any Decision not to Use Existing and Readily Available Data for Section 303(d) Listings

DNR reviews all existing and readily available water quality-related data and information for purposes of water quality reporting and impaired waters listing as required by Sections 305(b) and 303(d) of the CWA (see Sources of Existing and Readily Available Water Quality Data in this methodology). Certain categories of water quality information, however, do not meet requirements of either Iowa's credible data law or DNR's data completeness guidelines for water quality assessments and impaired waters listings. The ultimate reasons for not using certain "existing and readily available data" are (1) the need for reasonably accurate assessments of water quality and (2) the desire to add only waterbody segments to the state's Section 303(d) list (Category 5) that are actually "impaired." Placing segments on the state's Section 303(d) list on the basis of inaccurate and/or incomplete data increases the risk that the DNR's limited resources, including staff time and monitoring dollars, will be used unwisely. Examples of water quality information that typically would not be considered appropriate as the basis for Section 303(d) listing include the following:

- **Best professional judgment of DNR staff:** DNR utilizes observations of professional staff of the DNR bureaus of Fisheries and Wildlife, as well as professional staff in other agencies for IR assessments. Best professional judgment is used to assess support of the aquatic life use for certain types of Iowa waterbodies that have historically lacked chemical, physical, and/or biological water quality data (primarily wetlands). Field biologists and other field staff are extremely knowledgeable regarding the water resources they manage but are much less knowledgeable regarding the intent and basis for Clean Water Act Section 303(d) listing. Segments assessed as "impaired" solely on the basis of best professional judgment will be added to Subcategory 3b of the Integrated Report; this subcategory comprises the WINOFI list as provided for in Iowa's credible data law.

- **Data or information older than five years from the end of the most recent IR cycle:** Data collected more than five years before the end of the current IR data consideration period (Table 3) are presumed under state law to be "not credible" unless DNR identifies compelling reasons as to why these older data are credible. This provision of Iowa's credible data law was based on, and is consistent with, the EPA's (1997) recommendation that data older than five years should not be used to make the type of water quality assessment (a "monitored" assessment) that is believed to accurately portray site-specific water quality conditions.

  The issue of "old data'' is seldom relevant to the IR in Iowa. Water quality data are used for developing the biennial IR assessments as they become available and are thus considered for Section 303(d) listing when the data most likely represent current water quality conditions. This process occurs long before the data age beyond their ability to accurately represent current water quality conditions. As the data age beyond five years, the IR assessment type is changed from "monitored" to "evaluated" to reflect the lowered level of confidence in assessments based on older data that may not represent current water quality conditions. Once placed in IR Category 5 (i.e., once placed on the state's Section 303(d) list), however, a waterbody will not be moved to a non-TMDL required category without "good cause" as defined by EPA regulations at 40 CFR 130.7 (e.g., a TMDL for the waterbody is approved by EPA or new monitoring data suggest that the impairment no longer exists). EPA regulations do not consider the age of the data used to impair a waterbody as a "good cause" for removing a Section 303(d) impairment. Any non-303(d) or WINOFI assessments based on data that have aged beyond ten years are not included in the current assessment cycle. The previous assessments based on these old data, however, remain in the DNR's assessment database (ADBNet).

- **Data that do not meet "completeness guidelines'' developed for the IR:** As stated in the Data Quantity Considerations ("Data Completeness" Guidelines) section, the DNR has identified timeframes and minimum data requirements for "monitored" IR assessments(Tables 3, 8, 9, 10, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23). These guidelines also identify assessments appropriate only for evaluated assessments. These guidelines were first developed for Iowa's 1990 Section 305(b) report and are designed to improve-within the constraints of (1) resources available for monitoring and (2) the designs of existing monitoring networks-the accuracy of IR water quality assessments. The improvement in assessment accuracy increases the confidence with which waterbodies are added to Iowa's Section 303(d) list. Although DNR's ambient water quality monitoring networks and

networks of other agencies are designed to produce sufficient data to meet Iowa's "completeness guidelines," not all monitoring networks are so-designed. Thus, the use of these guidelines will eliminate certain data from consideration for Section 303(d) listing. Any waterbodies assessed as "impaired" only on the basis of incomplete data, however, will be placed in IR Subcategory 3b and will be added to the WINOFI list as provided for in Iowa's credible data law.

- **Volunteer monitoring:** Results from volunteer monitoring can only be used for Section 303(d) listing if requirements of Iowa's credible data law are met or if overwhelming evidence of impairment is indicated. To be considered for Section 303(d) listing, DNR rules [567 IAC 61.10 through 61.13 (455B) in the Iowa WQS] require that volunteer monitoring must be supported by an DNR-approved sampling and analysis plan that includes quality control and quality assurance procedures. Waterbodies assessed as "impaired" only on the basis of volunteer data from non-qualified volunteers will not be added to the Iowa's Section 303(d) list but may be added to the WINOFI list. If, however, results of volunteer monitoring show the existence of gross pollution such that Iowa's narrative criteria are violated, such segments can be added to Iowa's Section 303(d) list due to overwhelming evidence of impairment.

- **Results of habitat assessment:** Although detailed information on the quality of aquatic habitats is collected as part of biological monitoring conducted for the DNR/SHL stream biocriteria, EPA's Regional Environmental Monitoring Assessment Program (REMAP), and National River and Stream Assessment (NRSA) projects, this information is not directly used to identify Section 303(d) impairments of aquatic life uses. Presently, all aquatic life use impairments, based on biological data, are assigned "unknown" cause and "unknown" source, with one exception: habitat. In 2015, the DNR developed the Fish Habitat Indicators for the Assessment of Wadeable, Warmwater Streams document (http://publications.iowa.gov/21408/). This document contains a new quantitative habitat index, and comparison approach, that is used to determine if the physical habitat in the sampling reach is suppressing the fish community (FIBI score) enough that the segment is unable to pass the standard ecoregion Biological Impairment Threshold (BIT).

- **Biological assessments of uncalibrated stream segments:** Due to the lack of a calibrated biological assessment protocol for headwater segments and large rivers, impairments based on biological sampling in these segments will be placed into IR Subcategory 3b and added to Iowa's WINOFI list and not placed on the Section 303(d) list.
    - **Assessments of headwater stream segments based on biological data:** Biological monitoring is conducted on Iowa's headwater stream segments (i.e., having watersheds draining less than ~25 square miles). The use of biological assessment methods developed and calibrated for the larger, more stable, and more diverse streams to assess headwater segments will likely overstate the existence of impairment. For this reason, headwater stream segments that show impairment based on a failure to meet regional expectations for aquatic biota (fish or aquatic macroinvertebrates) of presumptive Class BWW1 or Class BWW2/BWW3 streams will not be added to Iowa's Section 303(d) list of impaired waters. The assessment type for these segments will be considered "evaluated" (indicating an assessment with relatively lower confidence) as opposed to "monitored" (indicating an assessment with relatively higher confidence). Such segments will be placed in Subcategory 3bu (i.e., potentially impaired based on un-calibrated assessment) and will be added to the state's WINOFI list as provided for in Iowa's credible data law.
    - **Assessments of large river stream segments based on biological data:** Biological monitoring is conducted on Iowa's large river segments (i.e., having watersheds draining more than 500 square miles). The use of biological assessment methods developed and calibrated for the wadeable streams to assess large river segments will likely overstate the existence of impairment. For this reason, large river segments that show impairment based on a failure to meet regional expectations for aquatic biota (fish or aquatic macroinvertebrates) of the Class BWW1 streams will not be added to Iowa's Section 303(d) list of impaired waters. The assessment type for these segments will be considered "evaluated" (indicating an assessment with relatively lower confidence) as opposed to "monitored" (indicating an assessment

with relatively higher confidence). Such segments will be placed in Subcategory 3bu (i.e., potentially impaired based on un-calibrated assessment) and will be added to the state's WINOFI list as provided for in Iowa's credible data law.

Types of Assessments and Magnitudes of Impairments

Evaluated and Monitored Assessments

For purposes of developing IR assessments, the existing and readily available water quality data described above are used to make two types of water quality assessments: "evaluated" and "monitored." As described in guidelines for Section 305(b) reporting (EPA 1997, pages 1-5 and 1-9):

Evaluated assessments are:

those for which the use support decision is based on water quality information other than current site-specific data such as data on land use, location of sources, predictive modeling using estimated input values, and some questionnaire surveys of fish and game biologists. As a general rule, if an assessment is based on older ambient data (e.g., older than five years), the State should also consider it "evaluated." For example, water quality assessments based on results from only a few grab samples or on professional judgment of local biologists, in the absence of any supporting data, would be considered "evaluated" assessments.

Monitored assessments are:

those for which the use support decision is principally based on current, (five years old or less) site-specific ambient monitoring data believed to accurately portray water quality conditions. Segments with data from biosurveys should be included in this category along with segments monitored by fixed-station chemical/physical monitoring or toxicity testing. To be considered "monitored" based on fixed station chemical/physical monitoring, segments generally should be sampled quarterly or more frequently.

Although EPA's more recent guidelines for integrated reporting (EPA 2005) do not distinguish between "monitored" and "evaluated" assessments, DNR maintains that the distinction is important for determining the relative scientific strength and confidence of the water quality assessments developed. In addition, this distinction (monitored versus evaluated) allows DNR to better target assessed segments for additional monitoring, and is the basis for identifying segments in need of additional monitoring.

In terms of the ability of IR assessments to characterize current water quality conditions, DNR considers "evaluated" assessments as having relatively lower confidence while "monitored" assessments are of relatively higher confidence. This approach is consistent with guidance from EPA (EPA 1997). DNR considers "monitored" assessments as sufficiently accurate to be appropriate for both Section 305(b) assessment and Section 303(d) listing (i.e., for placing segments into Category 5). The lower confidence "evaluated" assessments, however, are viewed as appropriate only for Section 305(b) reporting. Thus, any segments "evaluated" as "impaired" are placed in IR Category 3b (i.e., potentially impaired waterbody segments with insufficient information for determining whether uses are met). Such segments are added to Iowa's WINOFI list as provided for in Iowa's credible data law and will be considered for follow-up monitoring to better determine current water quality conditions and the existence of any impairments.

Magnitude of Impairment

In addition to DNR's retention of the distinction between "evaluated" and "monitored" segments, DNR continues to estimate the magnitude of impairment for each cause of impairment. This information is useful for improved communication on the relative severity of water quality problems and for prioritization for TMDL development. Information on the degree of impairment and on the magnitude of the cause of impairment is available in DNR's ADBNet. DNR uses the following impairment levels:

Slight: A slight impairment suggested by occurrence in the lower impairment range. The following example would result in a "slight"impairment magnitude: a water quality criterion violation frequency between 10% and 25% or the mean or median of a parameter is slightly above the criterion.

Moderate: A moderate impairment suggested by occurrence in the middle to lower impairment range. The following examples would result in a "moderate" impairment magnitude: a water quality criterion violation frequency between 25% and 50%; the score for only one of the two indexes of biotic integrity is in the impairment range; the lower tier of fish consumption advisories (one meal/week) is in effect.

High: A severe impairment suggested by occurrence in the middle to upper impairment range. The following examples would result in a "high" impairment magnitude: a water quality criterion violation frequency greater than 50%; scores for both indexes of biotic integrity (fish and aquatic macroinvertebrates) in the impairment range; upper tier of fish consumption advisories ("do not eat") in effect.

Overwhelming Evidence of Impairment

Situations exist where reliable information can accurately indicate a Section 303(d) impairment of designated uses even though this information does not meet the DNR data quantity and quality requirements for Section 303(d) listing. Such waterbody segments would be considered for addition to the Section 303(d) list of Iowa's IR.

The Assessment, Listing, and Delisting Process

10% Rule: Binomial Parameters at or Above 10 Samples

Using EPA's 1997 Section 305(b) assessment guidelines and the methodology developed by the State of Nebraska which uses the paper on impairing water bodies by Lin et. al (2000), the DNR has historically assessed the use support of waters relative to the parameters in the Binomial list (see Table 6) using a statistical model which shows significant exceedance of a 10% positive sample rate in a data set. The Iowa Methodology refers to this model as the "10% Rule." This Rule requires a certain number of samples in violation of criteria in a data set to meet a 90% confidence level such that 10% of an infinite number of samples taken would be in violation of the water quality standards. The 10% Rule provides the method to assess the use support of Iowa's waters at more realistic numbers of samples. The number of samples in violation of criteria required for various data sets is described in Table 4.

The 10% rule draws on assessment approaches have been developed that (1) avoid the need to compare raw percentage values to state criteria to identify impairments and (2) incorporate estimates of the numbers of samples and the corresponding number of violations that represent a significant exceedance of at least 10% of samples in violation of criteria in a data set. Specifically, the state of Nebraska (NDEQ 2006), drawing on information from Lin et al. (2000), adopted an assessment approach which specifies the number of exceedance required at various sample sizes sample to identify a significant exceedance with greater than 90 percent confidence. This approach is based on the binomial method for estimating the probability of committing Type I and Type II errors and is detailed in Table 4. DNR first used this binomial-based approach for identifying impairments based on violations of the 10% Rule for the 2006 assessment/listing cycle. As noted, the DNR continues to use this approach for all Binomial parameters.

Except as detailed in the 7,8,9 Rule, the DNR does not use the 10% Rule to assess water quality with datasets of less than ten samples due to the large degree of uncertainty associated with basing impairment decisions on small datasets. The DNR requirement of at least ten samples was based on the resultant improvement in the ability of the EPA's recommended assessment approach to accurately identify an impairment based on a critical value of 10% violation.

Table 4: Sample size (n) and number of exceedances required to determine an impaired beneficial use to maintain a greater than 90% Confidence Level (CL) as reported by Lin et al. (2000) (10% Rule).

Sample Size (n)	Number of observations exceeding required to define an impaired use	Confidence Level	Sample Size (n)	Number of observations exceeding required to define an impaired use	Confidence Level
10	3	0.930	21	5	0.948
11	3	0.910	22	5	0.938
12	4	0.974	23	5	0.927
13	4	0.966	24	5	0.915
14	4	0.956	25	5	0.902
15	4	0.944	26	6	0.960
16	4	0.932	27	6	0.953
17	4	0.917	28	6	0.945
18	4	0.911	29	6	0.936
19	5	0.965	30	6	0.927
20	5	0.957	n	=BINOM.INV(n,0.1,0.9)+ 1 (MS Excel Formula)	=BINOM.DIST(BINOM.INV(n,0.1,0.9),n,0.1,TRUE) (MS Excel Formula)

7,8,9 Rule: Binomial Parameters Between Seven and Nine Samples

Starting with the 2022 assessment cycle, an alternative minimum sample size was applied to annual *E. coli* Single Sample Maximum (SSM) assessments where the sample size (n) was below the required 10 samples for the 10% Rule. This is a logical extension of the 10% Rule which presumes below-criteria results for all samples in the difference between samples taken and 10. For segments to be assessed as "fully supported", any of the recreational seasons with only eight samples, the count of SSM violations of the respective Class criterion must be zero and for segments with nine samples, the count must be zero or one. If seven to nine samples were collected during a recreational season, and a minimum of three samples exceed Iowa's SSM for the respective Class criterion, the assessed segment will be considered for Section 303(d) listing. This became known as the "**7,8,9 Rule**" for the 2024 assessment cycle and future assessment cycles the "**7,8,9 Rule**" will apply to all Binomial parameters.

Table 5: Determination of support level in segments with Binomial parameter data using the 7,8,9 Rule.

Sample Size (n)	Number of violations of Binomial parameter criteria			
	0	1	2	3
7	Not Applicable	Not Applicable	Not Applicable	Not Supported
8	Fully Supported	Not Applicable	Not Applicable	Not Supported
9	Fully Supported	Fully Supported	Not Applicable	Not Supported

Lists of Binomial and Toxic Parameters

Table 6 lists the parameters analyzed in the 2024 IR for Class A, Class B, Class C, and Class HH designated uses. The lists merely distinguish which assessment methodology applies to each parameter on the list. These lists mirror Iowa's approach to each parameter in prior methodologies, with the exception of ammonia, as noted. The lists' descriptors are not an indicator of the degree of risk or toxicity associated with any parameter. The specifics on the assessment of each use class relative to each parameter can be found in the appropriate sections of this Methodology.

Table 6: Lists of Binomial and Toxic parameters assessed for the Class A, Class B, Class C, and Class HH designated uses.

Binomial	Toxic			
Chloride	1,2,4-Trichlorobenzene	Barium	Dinoseb	o-Dichlorobenzene

Dissolved Oxygen	2,4-D	Benzo(a)Pyrene	Endosulfan sulfate	para-Dichlorobenzene
Fluoride	2,4,5-TP (Silvex)	Beryllium	Endrin	Parathion
Nitrate+Nitrite as N	4,4-DDD	beta-endosulfan	gamma-BHC (Lindane)	Pentachlorophenol (PCP)
Nitrate as N	4,4-DDE	Cadmium	Glyphosate	Phenols
Nitrite as N	4,4-DDT	Carbofuran	Heptachlor	Picloram
pH	Alachlor	Chlordane	Heptachlor epoxide	PCBs
Sulfate	Aldrin	Chloropyrifos	Hexachlorobenzene	Selenium
Temperature	alpha-endosulfan	Chromium (VI)	Hexachlorocyclopentadiene	Silver
E. coli	Aluminum	Copper	Lead	Simazine
	Ammonia-Nitrogen	Cyanide	Mercury (II)	Thallium
	Antimony	Dalapon	Methoxychlor	Toxaphene
	Arsenic (III)	Dieldrin	Nickel	Zinc
	Atrazine			

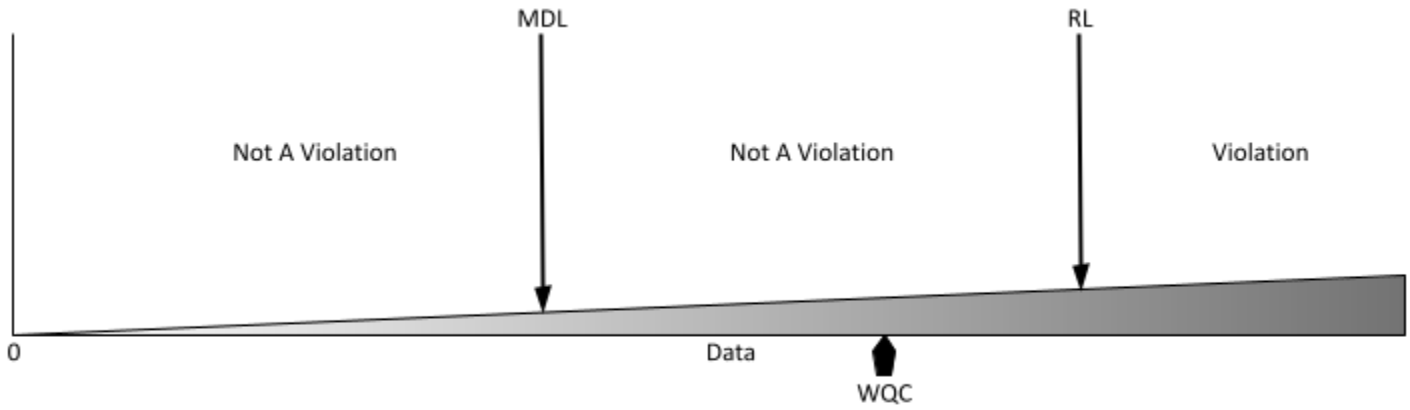
Using Less than the Reporting Limit Data for Integrated Report Assessments

A non-detect (ND) is typically reported by a laboratory when the values measured by the lab are considered to be not significantly different from a blank signal, at a specified level of probability (Helsel 2005). Historically the DNR handled non-detects values many different ways across programs ranging from omission from the data set, to simple substitution, to more advanced distributional and robust statistical methods. Omission is not a viable option for the purpose of determining medians, means, and counts of violations, since the resulting median would be positively skewed. Simple substitution methods substitute a single value for each ND. Using this method all NDs could be set as Reporting Level (RL), Method Detection Limit (MDL), zero, ½ or some other fraction of the MDL or RL, or other value.
The procedure for handling NDs for the purposes of determining medians, means, and counts of violations is to set the data value to half the RL if the RL or equivalent is known. If only the MDL is known, the data value is set to half the MDL.

Using Estimated Data for Integrated Report Assessments

Prior to the 2014 Integrated Reporting cycle, all estimated data values were considered as valid data and were compared to water quality criteria for the purpose of identifying Section 303(d) impairments. Estimated data are those data that fall between the MDL and the RL. Based on information from USGS (Oblinger et al. 1999) and on comments from DNR Wasteload Allocation staff that existing impairments for toxic metals had been incorrectly identified, DNR IR staff changed how estimated data values were used for IR assessments (see Figure 1).

The only scenario where estimated data values are used is if the water quality criterion (WQC) is below the MDL. Any data values reported between the MDL and the RL (or above the RL) will be considered as violations of the WQC.



If the WQC is between the MDL and the RL, only those data values above the RL will be considered violations. The data values between the MDL and the RL (estimated values) will not be considered violations of the WQC.

Figure 1. Two scenarios involving the use of estimated data for determining water quality criteria violations related to WQC, MDLs, and RLs.

Toxic Parameter Fractions and Portions

While toxic parameters are frequently collected in the correct fraction or portion that align with the criteria in the WQS, there are occasions where different fractions or portions are collected. Due to these discrepancies, the scenarios detailed in Table 7 were created for violation or attainment determination.

Table 7: Determining violations for metals data with criteria-specified fraction or portion.

Data **Fraction or Portion**	**Criteria** **Fraction or Portion Specified in** Iowa WQS	**Violation if a Sample Result is Greater than Criterion?**	**Violation if a Sample Result is Less than Criterion?**
Dissolved	Dissolved	Yes	No
Total	Total	Yes	No
Dissolved	Total	Yes	No Determination Possible
Total	Dissolved	No Determination Possible	No
Bioavailable Aluminum	Bioavailable Aluminum	Yes	No
Total Aluminum	Bioavailable Aluminum	No Determination Possible	No
Dissolved Aluminum	Bioavailable Aluminum	Yes	No Determination Possible

Class A (Recreational) Methodology

Assessments of the Class A (recreational) uses are completed using:

- data from indicator bacteria (*E. coli*) monitoring conducted in and around Iowa.
- data from pH monitoring conducted in and around Iowa.
- data from lake water quality monitoring conducted in Iowa.

Recreational use support using indicator bacteria (*E. coli*) data:

Table 8: Methods for determining support of the Class A uses in rivers/streams, lakes (primary sampling point), flood control reservoirs (primary sampling point), and beach areas using indicator bacteria (*E. coli*) data.

Parameter	Data Required*	Fully Supported	Not Supported (5a or 5p)
Indicator Bacteria *(E. coli)*	During the data collection timeframe (Table 3), data collected monthly or more frequently during recreational season**; ≥ 7 temporally independent samples per recreational season.	Each recreational season** geomean < Class geomean criterion AND each recreational season** violations of Class SSM criteria < maximum count of violations allowed by 10% or 7,8,9 Rules.	One or more recreational season** geomean ≥ Class geomean criteria OR violations of Class SSM criteria ≥ maximum violations allowed by 10% Rule or 7,8,9 Rule for one or more recreational season**.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.
**Class A2 criteria apply year-round for OIW or ONRW, and Class BCW1 waters that also have the Class A2 use; for all other segments, criteria apply from March 15 through November 15 (i.e., the "recreational season").

For Class A1, A2, and A3 segments, the *E. coli* criteria apply from March 15 through November 15 (i.e., the "recreational season"). For segments that are also Outstanding Iowa Waters (OIW) or Outstanding National Resource Waters (ONRW), and Class BCW1 and BCW2 waters that are also designated as Class A2 (secondary contact recreation) waters, the Class A2 criteria will also apply year-round (January 1 to December 31).

For Class A1, A2, or A3 segments to be assessed as "fully supported" using *E. coli* data, the following conditions must be met: (1) the recreational season geometric mean (geomean) of at least seven *E. coli* samples collected during any of the three recreational seasons shall not exceed the applicable Class A geomean criterion, and (2a) for any of the recreational seasons with at least 10 *E. coli* samples, the count of violations of the applicable Class A SSM criterion shall not exceed the maximum allowed violations based on the 10% Rule, or (2b) for any of the recreational seasons with 9 *E. coli* samples, the count of violations of the applicable Class A SSM criterion shall not exceed the one (1) violation based on the 7,8,9 Rule, or (2c) for any of the recreational seasons with 8 *E. coli* samples, the count of violations of the applicable Class A SSM criterion shall be zero (0) based on the 7,8,9 Rule. In addition, no swimming area closures due to accidental or illegal discharges of untreated water have been issued during the assessment period (Table 3). If a recreational season geomean exceeds the applicable Class criterion (minimum of 7 samples per recreational season required), or if significantly greater than 10% of the samples collected over a recreational season exceeds the applicable SSM Class A criterion (minimum of 10 samples per recreational season required), or if a minimum of 3 samples collected over a recreational season exceeds the applicable SSM Class A criterion from a sampling season where 7 to 9 samples were collected, the assessed segment will be considered for Section 303(d) listing.

For segments that are also OIW or ONRW, and Class BCW1 and BCW2 waters that are also designated as Class A2 waters, the Class A2 criteria apply year round criteria and will also be assessed. For "full support" of the year-round Class A2 recreational use, the following conditions must be met: (1) the annual geomean of at least 7 samples collected during any one of the three collection years of the current data gathering period (Table 3) shall not exceed the Class A2 geomean criterion, and (2a) for any of the recreational seasons with at least 10 *E. coli* samples, the count of violations of the Class A2 SSM criterion shall not exceed the maximum allowed violations based on the 10% Rule, (2b) for any of the recreational seasons with 9 *E. coli* samples, the count of violations of the applicable Class A SSM criterion shall not exceed the one (1) violation based on the 7,8,9 Rule, or (2c) for any of the recreational seasons with 8 *E. coli* samples, the

count of violations of the applicable Class A SSM criterion shall be zero (0) based on the 7,8,9 Rule. If an annual geomean exceeds the Class A2 geomean criterion (minimum of 7 samples per recreational season required), or if significantly greater than 10% of the samples collected over a collection year exceeds the Class A2 SSM criterion (minimum of 10 samples per recreational season required), or if a minimum of 3 samples collected over a collection year exceeds the Class A2 SSM criterion from sampling year where at least 7 to 9 samples were collected, the assessed segment will be considered for Section 303(d) listing.

Temporal correlation of *E. coli* samples: Several *E. coli* datasets used to determine attainment of the Class A uses contain *E. coli* data from multiple samples collected on the same day or from samples collected on consecutive days. A study of temporal variations in *E. coli* concentrations in the Raccoon River in central Iowa showed a temporal correlation of *E. coli* concentrations within a span of about four days (Schilling et al. 2009). Failure to account for this correlation could result in calculations of geomeans that are biased due to inclusion of temporally correlated repeated measures of either high levels or low levels of bacteria in samples collected within this four-day period. Average values may be calculated for multiple *E. coli* samples collected within a four-day period. This average value is considered an independent estimate of the bacterial concentration during that four-day period and is used to calculate the geomean for the dataset being reviewed, where applicable. This approach was incorporated into Iowa's 2010 IR methodology and DNR reserves the right to use this approach on high density *E. coli* samples in the future.

Recreational use support using pH monitoring data:

Table 9: Method for determining support of the Class A uses in rivers/streams, lakes, and flood control reservoirs using pH data.

Parameter	Data Required*	Fully Supported	Not Supported (5a)
pH	During the data collection timeframe (Table 3), ≥ 7 samples are needed for a "not supported" assessment and ≥ 8 samples are needed for a "fully supported" assessment.	Violations of Class A criteria < maximum count of violations allowed by 10% or 7,8,9 Rules.	Violations of Class A criteria ≥ maximum count of violations allowed by 10% or 7,8,9 Rules.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.

For A1, A2, or A3 segments to be assessed as "fully supported" using pH data, the following conditions must be met: (1) for datasets with 10 or more pH samples, the count of pH violations shall not exceed the maximum allowed violations based on the 10% Rule or (2) for any datasets with 9 pH samples, the count of violations shall not exceed the one (1) violation based on the 7,8,9 Rule, or (3) for any datasets with 8 pH samples, the count of violations shall be zero (0) based on the 7,8,9 Rule. If significantly greater than 10% of the pH samples violate the Class A pH criteria (minimum of 10 samples required) or if a minimum of 3 of the pH samples violate the Class A pH criteria from datasets of 7 to 9 samples, the assessed segment will be considered for Section 303(d) listing.

Recreational use support using lake water quality monitoring data:

Table 10: Methods for determining support of the Class A use in lakes (primary sampling point) and flood control reservoirs (primary sampling point) using Carlson Secchi and chlorophyll a trophic state index (TSI) data (excludes shallow lakes and wetlands).

Parameter	Data Required*	Fully Supported	Not Supported (5a)
Chlorophyll a TSI	During the data collection timeframe (Table 3), a minimum of 9 samples collected during at least 3 years with a minimum of 3 samples in each year.	Median TSI value of the parameter is < 65.**	Median TSI value of the parameter is ≥ 65.
Secchi TSI	During the data collection timeframe (Table 3), a minimum of 9 samples collected during at least 3 years with a minimum of 3 samples in each year.	Median TSI value of the parameter is < 65.**	Median TSI value of the parameter is ≥ 65.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.

**Delisting prior impairments require a lower TSI value. See the delisting section.

History of Class A use support assessment in lakes and flood control reservoirs using trophic state indices (TSI)s

Due to year-to-year variability in lake water quality, state limnologists participating in the EPA Region 7 Technical Assistance Group (RTAG) for nutrient criteria development recommended that the combined data from at least three years of monitoring results from this type of lake survey is needed to identify nutrient-related water quality impairments. Thus, DNR uses overall median water quality values from a three- to five-year period to calculate a trophic state index (TSI) (Carlson 1977). Median-based TSI values are used to determine the existence of an impairment. This framework is based on using the TSI as a numeric translator for Iowa's existing narrative water quality criteria protecting against aesthetically objectionable conditions and/or nuisance aquatic life. For the reporting/listing cycle, lake data for a five-year period were used to identify lake water quality impairments.

Lake and flood control reservoir Class A assessment rationale using TSIs

The concept of "trophic state" has long been used by limnologists to classify lakes and is based on the chemistry and biology of lakes. Although a number of approaches exist for classifying lakes according to trophic state, and although a number of variations exist regarding how "trophic state" is defined, the use of this framework has the advantages of historical usage, general acceptance of the trophic state concept (e.g., "eutrophic" indicates nutrient enrichment), and an improved ability to describe lake condition versus a description using a single variable or number (e.g., total phosphorus concentration). Table 11 describes the general framework of the lake trophic state concept. For a discussion on the development and variety of trophic state indices, see Chapter 2 (The Basis for Lake and Reservoir Nutrient Criteria) in EPA (2000) (see http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/lakes/index.cfm).

Carlson's (1977) TSI is a numeric indicator of the continuum of the biomass of suspended algae in lakes and thus reflects a lake's nutrient condition and water transparency. The level of plant biomass is estimated by calculating the TSI value for chlorophyll a. TSI values for total phosphorus and Secchi depth serve as surrogate measures of the TSI value for chlorophyll. The focus on turbidity in general, and chlorophyll in particular, seems appropriate for assessing the degree to which Iowa lakes support their designated Class A1 (primary contact recreational) use. Carlson's TSI provides a convenient and well-established method for identifying turbidity-related impacts to Iowa lakes. As described in a subsequent paper by Carlson (1991), turbidity, and especially turbidity related to large populations of suspended algae, is a key indicator of the degree to which a lake supports primary contact uses:

> [plant] biomass is a proximate measure of the problems that plague lakes. Probably few citizens complain about the productivity of their lake and fewer yet lodge complaints about phosphorus concentrations. A biomass-related trophic state definition places the emphasis of the classification on the problem rather than on any potential cause.

Because of this direct linkage between the perceived level of water quality and turbidity, TSI values for chlorophyll a and Secchi depth will be used as guidelines to identify Iowa lakes that do not meet Iowa's narrative WQS protecting against "aesthetically objectionable conditions." Both chlorophyll a and Secchi depth appear applicable to Iowa's narrative water quality criterion protecting against aesthetically objectionable conditions in Iowa surface waters (61.3(2) in the Iowa WQS). DNR Fisheries Bureau staff will be contacted to corroborate that the aesthetically objectionable conditions suggested by the TSI values do, in fact, exist. Because aesthetics are more closely associated with recreational uses than to aquatic life uses of Iowa lakes, impairments based on violations of these narrative criteria are typically applied to Class A1 (primary contact recreational) uses for purposes of IR assessments and listings.

For two reasons, TSI values for total phosphorus are not used as the primary basis for assessing support of either primary contact recreational uses or aquatic life uses:

- TSIs for total phosphorus are poor predictors of impairment due to either Secchi depth or chlorophyll a: The typical use of the TSI for total phosphorus to measure trophic state (and the level of water quality) presumes that the relationship between total phosphorus and chlorophyll a will remain stable for the lake being assessed. The

production of chlorophyll in Iowa's natural lakes and impoundments, however, is sometimes limited by nutrients other than phosphorus (e.g., nitrogen) and/or high levels of non-algal turbidity in the water column. Other information suggests that phosphorus is seldom a limiting nutrient in Iowa's nutrient-rich lakes. The result is that lakes with very high levels of total phosphorus that suggest hypereutrophic conditions sometimes have levels of chlorophyll a and Secchi depth that suggest relatively good water quality (i.e., in the middle to lower eutrophic range). Because of this lack of correlation between TSI values for total phosphorus and TSI values for the response variables that define the aesthetically objectionable conditions, TSI values for total phosphorus are not used as the primary basis for determining the level of use support or for identifying water quality impairments at Iowa lakes.

- The Iowa WQS lack water quality criteria-narrative or numeric-that are relevant to impacts of total phosphorus in surface waters. When developing this assessment procedure, careful consideration of Iowa's numeric and narrative criteria in the Iowa WQS showed that none of these criteria are directly relevant to levels of phosphorus in the water column of a lake. That is, phosphorus is not a toxic substance at ambient levels seen in Iowa waters. In addition, high levels of phosphorus in Iowa lakes do not necessarily lead to either nuisance aquatic life or aesthetically objectionable conditions. For example, lakes with growths of aquatic macrophytes in littoral zone areas can have high levels of phosphorus but have low levels of chlorophyll a and have good water transparency.

For lakes where assessment information from the DNR Fisheries Bureau is available, TSI values were also used to supplement assessments of the designated Class B aquatic life uses based on best professional judgment of DNR fisheries biologists. According to biologists in the DNR Fisheries Bureau, algal blooms can also cause impairments to aquatic life uses of Iowa lakes through interference with some spawning activities of nest building species, e.g., Bluegill, Bullhead spp., Crappie spp., and Largemouth Bass) and lowered levels (sags) of dissolved oxygen that, in extreme cases, can cause fish mortality.

Identifying Class A use impairments in Iowa lakes and flood control reservoirs using TSIs

For purposes of developing water quality assessments Carlson's (1977, 1984, 1991) TSI values were calculated using the lake water quality data collected at the primary sampling point or deepest point in each lake basin from the current assessment period (Table 3). Overall (five-year) median values were used to calculate TSI values for total phosphorus, chlorophyll a, and Secchi depth for each lake. The identification of an impairment of the primary contact uses was based on TSI values for chlorophyll a and/or Secchi depth. The TSI values for the indicator variable of total phosphorus are used primarily to interpret discrepancies between TSI values for chlorophyll a and Secchi depth.

Relevant state water quality criteria

The Iowa WQS (567 IAC Chapter 61) do not contain numeric criteria for nutrients (e.g., nitrogen or phosphorus), chlorophyll, or turbidity that apply to the Class A1 use. Thus, the assessments of the degree to which these parameters might impair the Class A1 use are based on a comparison of lake-specific TSI values to the following narrative criteria for general use waters as defined in Section 61.3(2) of the Iowa WQS:

> Such waters shall be free from materials attributable to wastewater discharges or agricultural practices producing objectionable color, odor, or other aesthetically objectionable conditions.
>
> Such waters shall be free from substances, attributable to wastewater discharges or agricultural practices, in quantities which would produce undesirable or nuisance aquatic life;

Examples of aesthetically objectionable conditions include poor water transparency caused by blooms of algae or high levels of non-algal turbidity that make the lake less desirable (aesthetically unpleasing) for primary contact recreation. Cyanobacteria blooms can also cause aesthetically objectionable conditions due to their ability to create unpleasant floating scums on the water surface or unpleasant odors, both of which can limit the

primary contact recreational uses at a lake. In addition, cyanobacteria can be considered a form of nuisance aquatic life due to their ability to produce toxins that can adversely affect aquatic life and the uses of the lake for watering by livestock and wildlife. In severe cases, levels of these toxins in lake water can affect human health.

DNR is aware that some of the aesthetically objectionable conditions and/or undesirable or nuisance aquatic life at the lakes assessed as "impaired" may not be attributable to either wastewater discharges or agricultural practices. For example, a number of lakes assessed as "impaired" based on TSI values are very shallow (mean depth less than 2 meters) natural lakes of glacial origin with very low watershed-to-surface area ratios. The turbidity-related water quality problems at these lakes, whether caused by algae or suspended inorganic sediments, are due primarily to lack of sufficient water depth to prevent internal nutrient recycling and sediment re-suspension due to either bottom-feeding fish (e.g., Common Carp (*Cyprinus carpio*)) and/or wind/wave action. Regardless, the levels of turbidity (whether of algal or non-algal origin) at these lakes constitute limitations to the use of these lakes for their designated beneficial uses. Thus, these lakes are appropriate for addition to the state list of impaired waters.

Threshold TSI values used for assessment

Similar to Iowa's previous IR cycles, a TSI value of greater than or equal to 65 for either chlorophyll a or Secchi depth will be used to identify candidate lakes for Category 5 of Iowa's current IR. This threshold is similar to that used by the Minnesota Pollution Control Agency (MPCA) for lakes in the Western Corn Belt Plains ecoregion of southern Minnesota (MPCA 2005). Nearly the entire state of Iowa lies in this same ecoregion, the exceptions being (1) the portion of south-central and southeastern Iowa in the Central Irregular Plains ecoregion and (2) the portion of northeastern Iowa in the Paleozoic Plateau (Driftless Area) ecoregion. Lakes with TSI values greater than or equal to 65 are likely to have nutrient or sediment-related water quality problems that contribute to excessive turbidity (algal or non-algal) that impair the Class A1 uses and are thus potential candidates for Section 303(d) listing.

Iowa lake and flood control reservoir recreational use support guidelines

The following are detailed descriptions of the use support categories used for IR lake assessments. This approach is the same as that used for previous IR cycles in Iowa.

Monitored or Evaluated "Fully Supported" Assessment:

- Lakes with overall median TSI values for chlorophyll a and Secchi depth less than 65 are assessed as "fully supported" their designated use for primary contact recreation. These lakes have moderately-good (TSI approaching 65) to sometimes exceptional (TSI < 55) water quality with only brief episodes of marginal water quality conditions. The TSI threshold values for both chlorophyll a and Secchi depth in this category range from the middle range between eutrophic and hyper-eutrophic lakes to the upper range of mesotrophic lakes. Thus, the range of lake quality in this assessment category is considerable.

Monitored "Not Supported" Assessment:

- If the overall median summer TSI value for either chlorophyll a or Secchi depth is greater than or equal to 65, then the lake should be assessed as "not supported" designated use, and the lake should be considered as a candidate for Section 303(d) listing. These lakes are likely to have severe turbidity-related impacts, of either algal or non-algal origin that (1) interfere with designated uses for primary contact recreation and (2) constitute an aesthetically objectionable condition that violates narrative criteria for general use waters as defined in Section 61.3(2) of the Iowa WQS. The TSI threshold value for chlorophyll a and/or Secchi depth is the lower limit that identifies "hypereutrophic" lakes (Table 11). Thus, this threshold value provides strong evidence of a water quality impairment.

Evaluated "WINOFI" Assessment:

- If the overall median summer TSI value for either chlorophyll a or Secchi depth is greater than or equal to 65, but the TSI value(s) is based on less than sufficient data (<9 samples), then the lake should be assessed as "WINOFI" designated use but should not be considered a candidate for Section 303(d) listing. These lakes may have turbidity-related impacts, of either algal or non-algal origin, that may interfere with designated uses for primary contact recreation and/or aquatic life. Thus, while the TSI values for Iowa lakes in this category may be impaired for Class A1 use, insufficient data are available for developing IR assessments having the high degree of confidence needed to justify Section 303(d) listing. These lakes will be placed into IR Category 3b and will thus be added to Iowa's list of WINOFI.

Note: due to the existence of sufficient data for chlorophyll a and Secchi depth from lakes in Iowa's ambient lake monitoring program, TSI-based "evaluated" (lower confidence) assessments are rare.

Table 11: Changes in temperate lake attributes according to trophic state (modified from EPA 2000, Carlson and Simpson 1996, and Oglesby et al. 1987).

TSI Value	Attributes	Primary Contact Recreation	Aquatic Life (Fisheries)
50-60	Eutrophy: anoxic hypolimnia; macrophyte problems possible	[none]	Warmwater fishery only; Percid fishery; Bass may be dominant
60-70	Cyanobacteria (blue-green algae) dominate; algal scums and macrophyte problems occur	Weeds, algal scums, and low transparency discourage swimming and boating	Centrarchid fishery
70-80	Hypereutrophy (light limited); dense algae and macrophytes	Weeds, algal scums, and low transparency discourage swimming and boating	Cyprinid fishery (e.g., Common Carp and other rough fish)
>80	Algal scums; few macrophytes	Algal scums, and low transparency discourage swimming and boating	Rough fish dominate; summer fish kills possible

Class B (Aquatic Life) Methodology

Assessments of the Class B (aquatic life) uses are completed using:

- Data from water quality monitoring conducted in and around Iowa.
- Data from continuous dissolved oxygen monitoring in and around Iowa.
- Data from the fish kill investigations conducted by the DNR in Iowa.
- Data from biological sampling conducted, or directed, by the DNR in Iowa.
- Data from freshwater mussel surveys conducted by qualified professionals in collaboration with the DNR.
- Data from phytoplankton surveys collected as a part of the DNR Ambient Lake monitoring program.

Aquatic life use support using water quality monitoring data:

Table 12: Methods for determining support of the Class B uses for rivers/streams, lakes, shallow lakes, wetlands, and flood control reservoirs using water quality monitoring data.

Parameter	Data Required*	Fully Supported	Not Supported (5a)
Binomial	During the data collection timeframe (Table 3), ≥ 7 samples are needed for a "not supported" assessment and ≥ 8 samples are needed for a "fully supported" assessment.	< maximum violations of the Class B criteria allowed by 10% or 7,8,9 Rules.	≥ maximum violations of the Class B criteria allowed by 10% or 7,8,9 Rules.
Toxic	During the data collection timeframe (Table 3), ≥ 10 samples are needed for a "fully supported" assessment and ≥ 2 samples are needed for a "not supported" assessment.	≤ 1 Class B acute or chronic toxicity criterion violation.	> 1 Class B acute or chronic toxicity criterion violation.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.

For BWW1, BWW2, BWW3, BCW1, BCW2, and BLW designated uses to be assessed as "fully supported" using Binomial parameter data (Table 6), the following conditions must be met: (1) for datasets with 10 or more Binomial parameter samples, the count of violations shall not exceed the maximum allowed violations based on the 10% Rule, or (2) for any datasets with 9 Binomial parameter samples, the count of violations shall not exceed the one (1) violation based on the 7,8,9 Rule, or (3) for any datasets with 8 Binomial parameter samples, the count of violations shall be zero (0) based on the 7,8,9 Rule. If significantly greater than 10% of the Binomial parameter samples violate the applicable Class B criteria (minimum of 10 samples required) or if a minimum of 3 of the Binomial parameter samples violate the applicable Class B criteria from datasets of 7 to 9 samples, the assessed segment will be considered for Section 303(d) listing.

For BWW1, BWW2, BWW3, BCW1, and BCW2 designated uses to be assessed as "fully supported" using toxic parameter data (Table 6), the segment must have one violation or less of an acute or chronic water quality criterion over a three-year period. For the BLW designated use to be assessed as "fully supported" using toxic parameter data (Table 6), the segment must have one violation or less of an acute or chronic water quality criterion over a five year period. DNR is using the U.S EPA 1997 guidelines for the use support assessment of the Class B uses. The 1997 guidelines state that, for toxic parameters (see https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act), more than one violation of an acute or chronic water quality criterion over a three-year period suggests impairment of the aquatic life use. Thus, for purposes of identifying candidates for Section 303(d) listing, Iowa will simply consider any violation of a criterion of a toxic parameter, whether chronic or acute, to be equivalent to violation of an acute criterion. If any Class B designated use has more than one acute or chronic violation in the IR assessment period, the assessed segment will be considered for Section 303(d) listing. An explanation on how DNR determines violations for metals data with criteria-specified fraction or portion can be found in Table 7.

Aquatic life use support using continuous dissolved oxygen (DO) monitoring data:

Table 13: Methods for determining support of the Class B uses for rivers/streams, lakes, and flood control reservoirs using continuous dissolved oxygen monitoring data*.

Parameter	Data Required**	Fully Supported	Not Supported (5a)
Continuous DO	A minimum of one 24-day period in mid to late summer in each of two different years during the data collection timeframe (Table 3).	< maximum violations (days violating) of the Class B criteria allowed by 10% Rule	≥ maximum violations (days violating) the Class B 16-hour criterion OR ≥ maximum violations (days violating) the Class B 24-hour minimum DO criterion.

*Methodology and DO criteria only apply to the upper layer of stratification in lakes.
**Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.

Continuous DO data quantity
The continuous DO methodology was developed in 2014 and uses continuous DO monitoring data for both IR assessments and Section 303(d) listings. This methodology is consistent with the Iowa WQS and with Iowa's existing assessment/listing methodology for DO based on results of grab sample monitoring and use of the 10% rule. In order to use results of continuous DO monitoring for purposes of identifying Section 303(d) impairments, monitoring needs to have been conducted over at least one 24-day period during mid to late summer (e.g., July and August) in each of two different years within the five-year data collection period (see Table 3). Historically, this methodology required a four week or 28 day deployment with a minimum of 14 days worth of data. This data requirement discrepancy caused confusion and primarily applied to old datasets that only contained 14 days of data. Beginning with the 2024 IR cycle, DNR adjusted the data requirement to 24 days to allow for less than four weeks/28 days due to potential instrument or weather-related issues.

Identifying violations of Iowa's DO criteria using continuous DO data
A violation of Iowa's DO criteria based on continuous monitoring data will be identified if results of continuous monitoring show that either of the following conditions has occurred:

- Levels of DO fail to meet the 16-hour criterion for more than 8 hours of a 24-hour period. In the context of continuous monitoring for DO, a violation would be a day where levels of DO failed to remain above the 16-hour criterion for at least 16 hours.
- Levels of DO fail to meet the 24-hour criterion. In the context of continuous monitoring for DO, a violation of this criterion would be a day (24-hour period) when the DO falls below the 24-hour criterion.

Identifying impairments of the Class B aquatic life uses based on continuous DO monitoring data
Based on a 24-day deployment of continuous DO monitoring equipment, a Section 303(d) impairment of designated aquatic life uses will be identified if any of the following conditions occurs during each of two 28-day monitoring periods during different years within a five-year period:

- Significantly greater than 10% (the 10% rule) of the days monitored have levels of DO that fail to meet the 16-hour criterion for more than 8 hours of the 24-hour period.
- Significantly greater than 10% of the days monitored have levels of DO that fail to meet the 24-hour minimum DO criterion.

Aquatic life use support using fish and benthic macroinvertebrate sampling data:

The DNR uses a WW Benthic Macroinvertebrate Index of Biotic Integrity (BMIBI), a WW Fish Index of Biotic Integrity (FIBI), and a Coldwater Benthic Index (CBI) to summarize biological sampling data. The BMIBI, FIBI and CBI combine several quantitative measurements, or "metrics", that provide a broad assessment of stream biological conditions. See Biological assessment of Iowa's wadeable streams (Wilton 2004) for history on biological assessment in Iowa. To assess support of the aquatic life uses, IBI scores are compared against BITs (Table 16), which more specifically reflect reference

conditions defined by ecoregion, thermal class, and habitat class. DNR also uses an annual natural trout reproduction summary compiled by the Fisheries Bureau to assess the Class BCW1 use.

Presently, all aquatic life use impairments, based on biological data, are assigned "unknown" cause and "unknown" source, with one exception: habitat. In 2015, the DNR developed the *Fish Habitat Indicators for the Assessment of Wadeable, Warmwater Streams* document (Iowa DNR 2015). This document contains a new quantitative habitat index, and comparison approach, that is used to determine if the physical habitat in the sampling reach is suppressing the fish community (FIBI score) enough that the segment is unable to pass the standard ecoregion BIT.

For a detailed flow chart on how the biological aquatic life use assessments are completed, see Figure 3.

Table 14: Methods for determining monitored support of the Class B uses for rivers/streams using biological sampling data.

Parameter	Data Required	Fully Supported	Not Supported (5b)
Warmwater Streams and River IBIs	At least two FIBI and/or BMIBI samples from calibrated WW segments during the most recent six calendar years (with two samples collected in a five year span).	Simple majority of FIBI and/or BMIBI scores equal or exceed the ecoregional biological impairment threshold(s) (BITs).	Simple majority of FIBI and/or BMIBI scores fail the ecoregional biological impairment threshold(s) (BITs).
Coldwater Stream CBIs	At least two valid CBI samples from CW segments during the most recent six calendar years (with two samples collected in a five year span).	Simple majority of CBI scores equal or exceed the coldwater BIT.	Simple majority of CBI scores fail the coldwater BIT.
Coldwater Streams Natural Reproduction Data	Annual natural trout reproduction data compiled by the Fisheries Bureau.	Evidence of Category 1 or Category 2 natural trout reproduction.	NA

Table 15: Methods for determining evaluated support of the Class B uses for rivers/streams using biological sampling data.

Parameter	Data Required	Fully Supported	**WINOFI**
Warmwater Streams and River IBIs	FIBI and/or BMIBI samples that don't meet the criteria in Table 14.	Simple majority of FIBI and/or BMIBI scores (or single score + UAV) equal or exceed the ecoregional BITs.	Simple majority of FIBI and/or BMIBI scores (or single score + UAV) fail the ecoregional BITs.
Coldwater Stream CBIs	CBI samples that don't meet the criteria in Table 14.	Simple majority of CBI scores (or single score + UAV) equal or exceed the coldwater BIT.	Simple majority of CBI scores (or single score + UAV) fail the coldwater BIT.

Table 16: Biological Impairment Thresholds (BITs) used for assessments of the Class B uses of rivers/streams in Iowa's IR.

Warmwater Streams and Rivers		
Ecoregion:	**FIBI**	**BMIBI**
40a - Central Irregular Plains	33	41
47a - Western Corn Belt Plains (WCBP) /Northwest Iowa Loess Prairies	43	54
47b - WCBP / Des Moines Lobe (Stable Riffle Habitat*/No Stable Riffle Habitat)	53/32	62
47c - WCBP / Iowan Surface (Stable Riffle Habitat - FIBI, Natural Substrate Sampling - BMIBI)	65	70
47c - WCBP / Iowan Surface (No Stable Riffle Habitat - FIBI, Artificial Substrate Sampling - BMIBI)	44	52
47d - WCBP / Missouri Alluvial Plain	-	-
47e - WCBP / Loess Hills and Rolling Loess Prairies	31	54
47f - WCBP / Southern Iowa Rolling Loess Prairies (Mississippi River Drainage System)	36	51
47f - WCBP / Southern Iowa Rolling Loess Prairies (Missouri River Drainage System)	31	54
52b - Paleozoic Plateau (Driftless Area)	52	61
72d - Central Interior Lowland	36	51
Coldwater Streams	**CBI**	
Statewide CW streams (primarily located in 52b and 47c ecoregions)	60	
*Stable riffle habitat = ≥10% riffle macrohabitat, ≥10% cobble substrate and ≥30% total coarse substrate.		

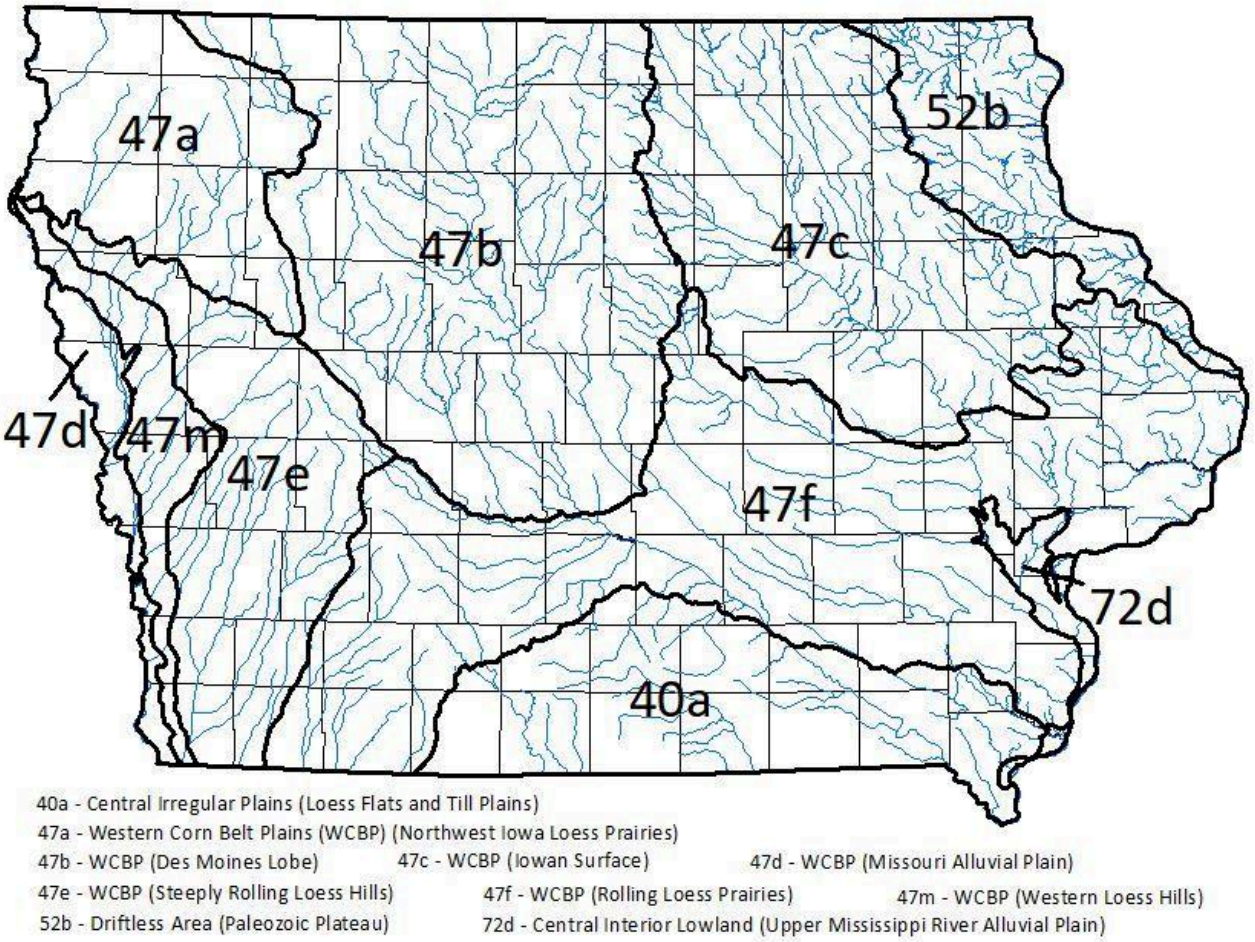


Figure 2. Level IV ecological regions (ecoregions) of Iowa (after Chapman *et al.* 2002).

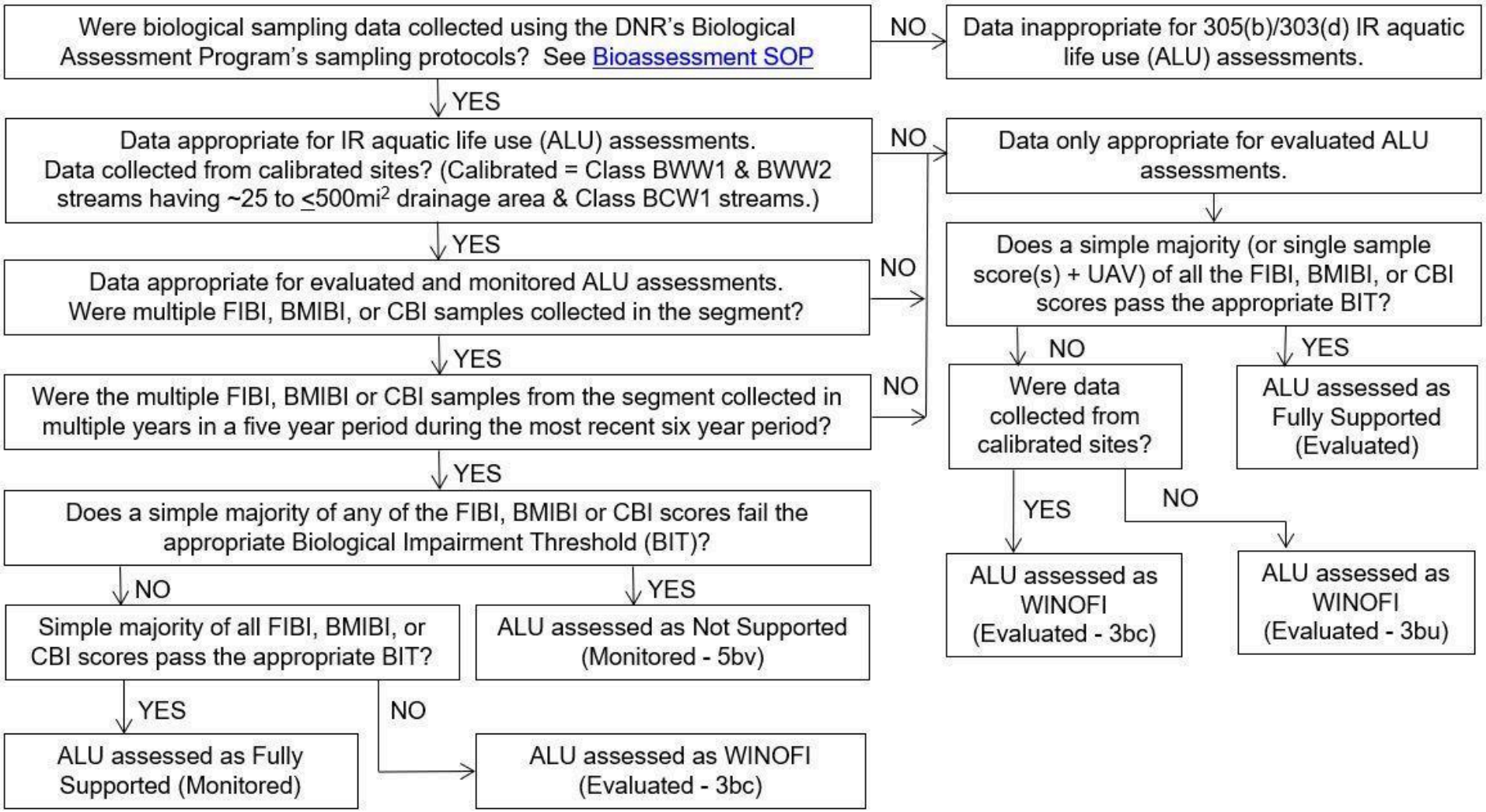


Figure 3. Biological assessment flowchart detailing how the DNR biological assessment methodology is used when completing IR aquatic life use assessments.

Aquatic life use support using lake sampling data:

Table 17: Methods for determining support of the Class BLW use for lakes (excluding wetlands and shallow lakes) and flood control reservoirs using phytoplankton biomass data.

Parameters	Data Required	Fully Supported	WINOFI (3b)
% Cyanobacteria composition	During the data collection timeframe (Table 3), A minimum of 9 samples collected during at least 3 years with a minimum of 3 samples in each year.	Average % cyanobacteria per lakes/reservoirs biomass < 75th percentile of all averaged phytoplankton samples per lakes/reservoirs	Average % cyanobacteria per lakes/reservoirs biomass ≥ 75th percentile of all averaged phytoplankton samples per lakes/reservoirs

Information on lake phytoplankton communities from the plankton surveys conducted as a part of the Ambient Lake monitoring Program is used to determine the amount and proportion of cyanobacteria in the water column. The proportions of cyanobacteria are then averaged and the top 25% lakes/reservoirs with the highest proportion of cyanobacteria are used to determine potential impairments due to nuisance aquatic life. The DNR considers these assessments to be evaluated and shall be considered potential impairments to be placed on the WINOFI list due a lack of state water quality criterion and certified analysis methods for identifying, enumerating and estimating plankton biomass.

Aquatic life use support using shallow lake data:

Table 18: Methods for determining support of the Class BLW use in shallow lakes using water quality sampling data that is protective of submerged aquatic vegetation (SAV).

Parameters	Data Required*	Fully Supported	Not Supported (5a)
Chlorophyll a TSI	During the data collection timeframe (Table 3), a minimum of 10 samples collected during at least 3 years with a minimum of 3 samples in each year.	Overall median TSI value of the parameter is < 65.**	Overall median TSI value of the parameter is ≥ 65.
Total Suspended Solids (TSS)	During the data collection timeframe (Table 3), a minimum of 10 samples collected during at least 3 years with a minimum of 3 samples in each year.	Overall median value of the parameter is < 30 mg/L.	Overall median value of the parameter is ≥ 30 mg/L.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.
**Delisting prior impairments require a lower TSI value. See the delisting section

Shallow lake aquatic life use support history

DNR has historically relied on the professional judgment of DNR biologists to assess Iowa's shallow lakes and wetlands due to the lack of (1) monitoring data, (2) appropriate water quality criteria, and (3) an assessment protocol. Although assessed for purposes of Section 305(b) reporting, Iowa's wetlands and shallow lakes have typically not been identified as candidates for Section 303(d) impaired waters listing. That is, without water quality monitoring data, and without an assessment protocol to objectively identify the degree to which a shallow lake or wetland supported its designated aquatic life use, DNR was unable to develop high-confidence assessments that would support a Section 303(d) listing.

In 2006, WQMA initiated routine water quality monitoring on several shallow lakes and wetlands in north-central and northwest Iowa. For the assessment period (Table 3), data generated for total suspended solids and chlorophyll a from Iowa's shallow natural lakes of glacial origin were used with guidelines for wetland assessment from the Upper Mississippi River Conservation Committee's (UMRCC) Water Quality Technical Section (UMRCC 2003) using total suspended solids (TSS) and Carlson's (1977) trophic state index (TSI) for chlorophyll a to identify the degree to which these shallow lakes support their designated Class BLW aquatic life uses. Information from DNR field staff on the status of aquatic macrophytes and aquatic macroinvertebrates at the shallow lakes monitored will be used to supplement the water quality assessments developed.

Shallow lake assessment rationale
High levels of TSS impact the ability of a shallow lake to support the growth of submersed aquatic vegetation (SAV). Submersed aquatic vegetation is critical to the health of shallow lake ecosystems, the elimination of SAV can degrade habitat quality such that undesirable aquatic species such as cyanobacteria, Common Carp (*Cyprinus carpio*), and Fathead Minnows (*Pimephales promelas*) dominate the ecosystem.

The concept of "trophic state" has long been used by limnologists to classify lakes and is based on the chemistry and biology of lakes. Although a number of approaches exist for classifying lakes according to trophic state, and although a number of controversies exist regarding how "trophic state" is defined, the use of this framework has the advantages of historical usage, general acceptance of the trophic state concept (e.g., "eutrophic" indicates nutrient enrichment), and an improved ability to describe lake condition versus a description using a single variable or number (e.g., total phosphorus concentration). Table 11 describes the general framework of the lake trophic state concept. For a discussion on the development and variety of trophic state indices, see Chapter 2 (The Basis for Lake and Reservoir Nutrient Criteria) in EPA (2000) (see https://www.epa.gov/nutrient-policy-data/criteria-development-guidance-lakes-and-reservoirs).

Carlson's (1977) TSI is a numeric indicator of the continuum of the biomass of suspended algae in lakes and thus reflects a lake's nutrient condition and water transparency. The level of plant biomass is estimated by calculating the TSI value for chlorophyll a. TSI values for Secchi depth serve as surrogate measures of the TSI values for chlorophyll. Carlson's trophic state index provides a convenient and well-established method for identifying turbidity-related impacts to Iowa lakes and thus seems appropriate for assessing the degree to which Iowa's shallow lakes support their designated Class BLW aquatic life uses.

Because of the direct linkage between turbidity and attainment of aquatic life use, a TSI value for chlorophyll a is used to identify shallow lakes in Iowa that do not fully support their designated Class BLW aquatic life use. For the following reason, the TSI value for Secchi depth will not be used to evaluate the attainment of aquatic life goals of shallow lakes. Due to the depth of these shallow lakes, TSI values for Secchi depth can be misleading. In some instances, the Secchi disk remains visible at the bottom of the lake and the depth of the lake is recorded as the Secchi depth. In these instances, the water clarity may be sufficient to support the Class BLW use, but the index value is limited by the depth of the lake. Thus, total suspended solids will be used as an indicator of water clarity to determine whether or not the Class BLW use is impaired in these shallow systems.

This methodology applies only to shallow lakes and not to wetlands. For purposes of this IR cycle, shallow lakes are defined as lakes with maximum depths typically greater than seven feet but less than 15 feet. Shallow lakes typically do not stratify thermally in summer. Abundant rooted aquatic vegetation (macrophytes), including submergent and emergent vegetation, may cover much of a shallow lake. Shallow lakes can support a variety of beneficial uses including boating, fishing, waterfowl production, hunting, aesthetics, and limited swimming. Wetlands have maximum depths typically less than seven feet, often have minimal open water in summer, and are typically not managed as sport fisheries but for waterfowl and wildlife production, hunting, and aesthetics. Wetlands are not managed for swimming uses and lack swimming beaches. Due to past limitations in DNR's assessment database (ADBNet), Iowa's shallow lakes were placed in the "wetland" category.

Identifying water quality impairments at Iowa shallow lakes based on TSI and Total Suspended Solids (TSS)
For purposes of developing water quality assessments for the IR cycle, the TSS concentration and Carlson's (1977) TSI were used with the three years of data generated for Iowa shallow lakes as part of DNR surveys from assessment period (Table 3). Overall (three-year) median value for TSS and the TSI value for chlorophyll a were used for each lake. The identification of impairment of the Class BLW aquatic life use was based on the resulting median total suspended solids concentration and median-based TSI value for chlorophyll a.

Relevant state water quality criteria
The Iowa WQS (567 IAC Chapter 61) do not contain numeric criteria for nutrients (e.g., nitrogen or phosphorus), chlorophyll, or turbidity that apply to the Class BLW aquatic life use. Thus, the assessment of the degree to which the Class BLW use is supported is based on a determination of whether this use is impaired by turbidity as

interpreted through the TSI (Carlson 1977) and the UMRCC (2003) benchmarks to protect growth of SAV. The assessments of the degree to which turbidity might impair the Class BLW uses of shallow lakes are based on a comparison of lake-specific TSI values to the following narrative criteria for general use waters as defined in Section 61.3(2) of the Iowa WQS:

> Such waters shall be free from substances, attributable to wastewater discharges or agricultural practices, in quantities which would produce undesirable or nuisance aquatic life;

Examples of undesirable or nuisance aquatic life include cyanobacteria blooms, blooms of sestonic algae, and dominance by populations of undesirable fish species (e.g., Common Carp). Cyanobacteria can be considered a form of nuisance aquatic life due to their ability to produce toxins that can adversely affect aquatic life and the uses of the lake for watering by livestock and wildlife. In severe cases, levels of these toxins in lake water can affect human health.

DNR is aware that the presence of undesirable or nuisance aquatic life at the shallow lakes assessed as "impaired" may not be attributable to either wastewater discharges or agricultural practices. The turbidity-related water quality problems at these shallow lakes, whether caused by algae or suspended inorganic sediments, are due primarily to a dominance of nuisance aquatic life (e.g., Common Carp) that prevents the growth of rooted aquatic vegetation that is needed to stabilize shoreline sediments and improve water clarity. Without rooted aquatic vegetation, nutrient-rich sediments are easily resuspended into the water column by either bottom-feeding fish and/or wind/wave action. Regardless, high levels of turbidity (whether of algal or non-algal origin) at these lakes can limit the ability of the lake to support their designated aquatic life uses. Thus, these lakes are appropriate for addition to the state list of impaired waters.

Shallow lake TSS threshold value

Based on guidelines proposed by the Upper Mississippi River Conservation Committee's Water Quality Technical Section (UMRCC 2003), an overall growing season median concentration of TSS equal to or greater than 30 mg/L will be used to identify candidate shallow lakes for Section 303(d) listing. The original recommended TSS threshold for SAV was 25 mg/L; this threshold was subsequently revised to 30 mg/L (John Sullivan, Wisconsin DNR, retired, personal communication). Shallow lakes with TSS concentrations greater than or equal to 30 mg/L are likely to have impeded growth of SAV. A lack of SAV can degrade habitat quality such that undesirable aquatic species such as cyanobacteria, Common Carp, and Fathead Minnows dominate. The presence of nuisance/undesirable aquatic species constitutes an impairment of the Class BLW aquatic life use and therefore makes lakes with a TSS concentration equal to or greater than 30 mg/L candidates for Section 303(d) listing. Shallow lakes with TSS concentrations approaching, but not exceeding, 30 mg/L will also be considered candidates for the WINOFI list if data suggest a worsening water quality trend that threatens full support.

Shallow lake chlorophyll a threshold value

Similar to the approach for assessing lake water quality that Iowa has used since the 2004 IR cycle, a TSI value of equal to or greater than 65 for chlorophyll a will be used to identify candidate shallow lakes for Section 303(d) listing. Lakes with TSI values greater than or equal to 65 are likely to have nutrient water quality problems that contribute to excessive turbidity (algal) that impair the Class BLW aquatic life use. Shallow lakes with TSI values approaching, but not exceeding, 65 will also be considered candidates for WINOFI listing if data suggest a worsening water quality trend that threatens full support. This methodology is similar to that used by the Minnesota Pollution Control Agency for lakes in the Western Corn Belt Plains ecoregion of southern Minnesota (MPCA 2005, Heiskary and Wilson 2005). All of Iowa's natural lakes of glacial origin lie within this ecoregion. As explained under Shallow lake assessment rationale, the TSI value for Secchi depth will not be used to evaluate the attainment of the aquatic life use.

Shallow Lake aquatic life use support guidelines

The following are detailed descriptions of the use support categories used for shallow lake IR assessments. The TSS concentrations and chlorophyll a TSI values associated with each of these support categories are summarized in Table 18.

Monitored or Evaluated "Fully Supported" Assessment:

- If the overall median TSS concentrations are less than 30 mg/L and TSI values for chlorophyll a are less than 65 in the absence of any adverse water quality trend, then the Class BLW use of the lake will be assessed as "fully supported". The TSI threshold values for chlorophyll a in this category range from the middle range between eutrophic and hypereutrophic lakes to the upper range of mesotrophic lakes.

Monitored "Not Supported" Assessment:

- If the overall median TSS concentration based on the data requirements (Table 18) is greater than or equal to 30 mg/L, or the overall median TSI value for chlorophyll a based on the data requirements (Table 18) is greater than or equal to 65, then the Class BLW use of the lake will be assessed as "not supported", and the lake will be considered as a candidate for Section 303(d) listing. These lakes are likely to have moderate to severe turbidity-related impacts, of either algal or non-algal origin that prevent the shallow lake from supporting its Class BLW aquatic life use. TSI values from 65 and above are in the middle to upper range between eutrophic and hypereutrophic lakes. The TSS concentration for this use support category is utilized by the UMRCC's Water Quality Technical Section as a threshold to sustain SAV in the Upper Mississippi River. The chlorophyll a threshold value for this use support category (65 and above) is used by the MPCA to identify Section 303(d)-impaired lakes in southern Minnesota (MPCA 2005). As such, these thresholds are appropriate for identifying impairments in Iowa shallow lakes.

Evaluated "WINOFI" Assessment:

- If the overall median TSS concentration is greater than or equal to 30 mg/L or the summer TSI value for chlorophyll a is greater than or equal to 65, but the TSS and TSI values are based on less than sufficient data (Table 18), then the shallow lake will be assessed as "WINOFI" and will not be considered a candidate for Section 303(d) listing. These shallow lakes possibly have turbidity-related impacts, of either algal or non-algal origin, that may interfere with support of the aquatic life designated use. Thus, while the TSS concentration and/or TSI value for Iowa lakes in this category may be impaired for the Class BLW use, insufficient data are available for developing IR assessments having the high degree of confidence needed to justify Section 303(d) listing. These shallow lakes will be placed into IR category 3b and will be added to Iowa's WINOFI list.

Aquatic life use support using DNR-verified fish kill reports:

Table 19: Method for determining support of the Class B uses for rivers/streams, lakes, shallow lakes, wetlands, and flood control reservoirs using DNR-verified reports of pollutant-caused fish kills.

Parameter	Data Required*	Fully Supported	Not Supported (5b)
DNR-verified fish kill reports	Two or more DNR-verified fish kills during the data collection timeframe (Table 3).	*See delisting	Two or more pollutant-caused fish kills on an individual segment reported within the last five years.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.

The occurrence of two or more fish kills on a lake or river segment during the current five-year assessment period (Table 3) could indicate an impairment of the aquatic life use. The bullet points below explain how DNR assesses segments that have multiple fish kills during the assessment period:

- Segments with multiple fish kills where one or more of the fish kills was attributed to a pollutant (or suspected pollutant), but where no DNR enforcement actions were taken, are placed into IR subcategory 5b. The intent of placing these waterbody segments into Category 5 is not necessarily to require a TMDL but to keep the impairment highlighted due to the potential for similar future kills from the unaddressed causes and/or sources.

- Segments with multiple fish kills where all of the fish kills were attributed to authorized discharges (e.g., a wastewater discharge meeting permit limits) are considered for Section 303(d) listing (subcategory 5a) as the existing, required pollution control measures are not adequate to address this impairment, and a TMDL is needed.

- Segments with multiple fish kills where all of the fish kills were caused by a one-time illegal or unauthorized release of manure or other toxic substances and where enforcement actions were taken will be placed into IR subcategory 4d. The rationale for this approach is as follows:
    - Consent orders were issued to the parties responsible for the fish kills and monetary restitution was sought and received for the fish killed. A consent order indicates that DNR has voluntarily entered into a legally enforceable agreement with the other party. DNR maintains that these enforcement actions are more appropriate and effective for addressing a spill-related impairment than the TMDL process. No daily load allocation process is possible with a pollutant that is discharged only once.
    - For IR Category 4d segments, if no additional fish kills have been reported for five years subsequent to the kill, any impact from the fish kill upon which the impairment was based likely has long-ago dissipated (see Wilton 2002). The IR category for the kill will be changed from 4d to 3a (water not assessed).

- Segments with multiple fish kills where all of the fish kills were non-pollutant caused fish kills (e.g., winterkill) and/or natural fish kills will be assessed as "WINOFI" and placed in IR subcategory 3b. If no additional kills are reported for a five year period, the IR category will be changed from IR 3b to 3a (water not assessed).

The occurrence of a single fish kill on a lake or river segment during the current 5-year assessment period (Table 3) indicates a potential impairment and suggests that the aquatic life use should be assessed as "WINOFI." Segments affected by single fish kills will be placed in IR Subcategory 3b and will be added to the WINOFI list. If no additional kills are reported for a five year period, the IR category will be changed from IR 3b to 3a (water not assessed). Any impact from the fish kill upon which the impairment was based likely has long-ago dissipated (see Wilton 2002).

Please refer to the Methodology for Iowa's 2020 Water Quality Assessment, Listing, and Reporting Pursuant to Sections 305(b) and 303(d) of the CWA for information on how fish kill assessments were completed prior to the 2022 IR cycle and for a full description of DNR's fish kill follow-up methodology.

Aquatic life use support using freshwater mussel sampling data:

Table 20: Methods for determining support of the Class B uses for rivers/streams using data from the statewide surveys of freshwater mussels.

Parameter	Data Required	Fully Supported	Not Supported (5b)
Mussel Data	Reports finalized during the data collection time (Table 3)	Species Richness (SR) decline from 1984-85 to 1998-99 (for 1984-85 sites with SR >4) < 50%	Species Richness (SR) decline from 1984-85 to 1998-99 (for 1984-85 sites with SR >4) > 50%

Information from Statewide Assessment of Freshwater Mussels (Bivalva: Unionidae) in Iowa Streams: Final Report (Arbuckle et al. 2000) were used for the current IR to assess support of aquatic life uses of Iowa streams and rivers. Until 2011, only a limited number of localized mussel surveys had been conducted since the statewide survey of Arbuckle et al. (2000). In 2011, however, DNR began a multi-year distributional study of Iowa's freshwater mussels. Results from this ongoing study were used to update existing assessments of aquatic life use support.

The methodology used to develop assessments of aquatic life use support based on freshwater mussel communities is as follows. The survey conducted by Arbuckle et al. (2000) involved re-sampling of sites visited in the mid-1980s by Frest (1987). For purposes of identifying candidates for Section 303(d) listing, the number of mussel species reported for a given waterbody by Frest was compared to the number of species reported for the same waterbody by Arbuckle et al. The degree to which aquatic life use was supported was based on the percent change in the number of mussel species from the 1984-85 period to the 1998-99 period. If the mean waterbody species richness (SR) was four or greater in the 1984-1985 survey period, then the following assessment approach using percent change from the 1984-85 to 1998-99 survey periods was used to identify candidates for Section 303(d) listing:

The decision to consider only those sites having four or more species reported in the 1984-85 survey is based on (1) a review of the historical distributions of freshwater mussels in Iowa as shown by Cummings and Mayer (1992) and (2) the framework (i.e., percent decline approach) described in the Table 4 above. For the Iowa ecoregions that show historical presence of a stream/river community of freshwater mussels (i.e., all ecoregions except 47e and the portions of ecoregions 47f and 40 in the Missouri River drainage), a SR of approximately four appears to characterize average SR from the 1984-85 survey by Frest. The decision to identify a waterbody as impaired due to a decline in SR between the 1984-85 and 1998-99 survey periods was originally based on quartiles. Current methodology only assesses "fully supported" and "not supported." Any decision to add a waterbody to the state list of impaired waters based on a percent decline of between 26 and 50 percent will be made on a case-by-case basis, with impairment and listing more likely as the percent decline approaches 50 percent. Using four species as a minimum for this assessment approach allows for some apparent decline between the survey periods without identifying the waterbody as "impaired." Such declines may be due to problems with sampling efficiency as opposed to the actual elimination of species.

As presented by Arbuckle et al. (2000), the potential causes of declines in SR of Iowa's freshwater mussels include siltation, destabilization of stream substrate, stream flow instability, and high in-stream levels of nutrients (phosphorus and nitrogen). Their study also suggested the importance of stream shading provided by riparian vegetation to mussel SR. For purposes of Section 305(b) reporting and Section 303(d) listing, the following causes and sources will be identified for all segments assessed as "impaired" due to declines in the mussel community: siltation from agricultural and natural sources; flow modification due to hydromodification of the watershed; and nutrients from agricultural and natural sources. Because site-specific causes and sources of these impairments were not identified by Arbuckle et al. (2000), any segments assessed as impaired due to declines in the freshwater mussel community will be placed into subcategory 5b. As is typical for IR assessments, the sources of impairment identified for Iowa's freshwater mussel community are only potential sources. The logistics of a statewide water quality assessment process does not often allow precise site-specific determinations of pollutant sources. More accurate information on sources would typically be gathered during the stressor identification phase of TMDL development.

Class C (Drinking Water) Use Assessment Methodology

Assessments of the Class C (drinking water) use are completed using:

- data from water quality monitoring conducted in and around Iowa.
- finished drinking water information from Iowa public water supplies using surface waters as their source water.

Drinking water use support using water quality monitoring data:

Table 21: Methods for determining support of the Class C use in surface water supplies using water quality sampling data.

Data Type	Data Required*	Fully Supported	Not Supported
Binomial Parameter	During the data collection timeframe (Table 3), a minimum of 7 samples is needed for a "Not Supported" assessment and a minimum of 8 samples is needed for a "Fully Supported" assessment.	Violations of all Class C criteria < maximum count of violations allowed by the 10% or 7,8,9 Rules.	Violations of one or more Class C criteria ≥ maximum count of violations allowed by the 10% or 7,8,9 Rules.
Toxic Parameter**	During the data collection timeframe (Table 3), a minimum of 4 annual samples (each year) is needed to calculate annual averages. A minimum of 10 overall samples (during data collection timeframe) is needed to calculate an overall average.	Each annual average, or overall average, of all toxic parameters is less than respective HH criteria or MCLs.	One or more annual averages, or one or more overall averages, of toxic parameters is greater than respective HH criteria or MCLs.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.
**See Figure 1: Using remarked (estimated) data for toxics for purposes of IR and Table 7 Determining violations for metals data with criteria-specified fraction or portion.

Data for the quality of raw (untreated) water from a surface water source will be used with the methodology for identifying impairments in Class C (drinking water use) segments described in Table 21. Two types parameters are considered as part of IR assessments to determine the support of the Class C use: Binomial and Toxic.

For Class C segments to be assessed as "fully supported" using Binomial parameter data, the following conditions must be met: (1) for any segment with least 10 Binomial parameter samples, the count of violations of the Class C criteria must not exceed the maximum allowable violations based on the 10% Rule, or (2) for any segment with 7 to 9 Binomial parameter samples the count of violations of the Class C criteria must be 0. If significantly greater than 10% of the Binomial parameter samples exceeds a Class C criteria (minimum of 10 samples required), or if a minimum of three (3) samples collected exceeds a Class C criteria where 7 to 9 samples were collected, the assessed segment will be considered for Section 303(d) listing.

For Class C segments to be assessed as "fully supported" using Toxic parameter data, the following conditions must be met: (1) for any segment with least four (4) Toxic parameter samples each year, each annual average must be less than all of the Class C criteria, or (2) for any segment with less than four (4) Toxic parameter samples each year, each overall average (minimum 10 samples required) must be less than the Class C criteria. If an annual average, or an overall average, of any Toxic parameter exceeds a Class C criteria, the assessed segment will be considered for Section 303(d) listing.

Drinking water use support using DNR public drinking water program compliance reports:

Table 22: Methods for determining support of the Class C use in surface water supplies using annual DNR public drinking water program compliance reports.

Data Type	Fully Supported	Not Supported
DNR public drinking water program compliance reports	No drinking water supply closures or advisories in effect; water not treated beyond reasonable levels during the data collection timeframe (Table 3).	Due to WQ issues: one (or more) drinking water supply advisory lasting >30 days per year, other problems not requiring closure but affecting treatment costs, or one or more drinking water supply closures per year.

Impairments related to the quality of finished (treated) water will be determined through review of current assessment cycle's annual DNR public drinking water program compliance reports available at: *http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Water-Supply-Engineering/Annual-Compliance-Report*. Information from these reports on violations of Class C water quality criteria and issuance of drinking water advisories will be used with methods described in Table 22 to determine the existence of impairment of drinking water uses.

Class HH (Human Health/Fish Consumption) Use Assessment Methodology

Assessments of the Class HH (human health/fish consumption) use are completed using:

- levels of toxic contaminants in fish or turtle tissue.
- data from water quality monitoring conducted in and around Iowa.

Human health/fish consumption use support using tissue sampling and water quality monitoring data:

Table 23: Methods for determining support of the Class HH use using tissue and water quality sampling data.

Data Type	Data Required*	Fully Supported	Not Supported
Tissue Sampling Data	During the data collection timeframe (Table 3), two tissue samples are needed for a "Not Supported" assessment and one is sample needed for a "Fully Supported" assessment.	One or more samples showing average** contaminant levels less than the HHS/DNR advisory level(s) (Table 24).	Two or more samples showing average** contaminant levels greater than the HHS/DNR advisory level(s) (Table 24).
Toxic Parameter Data***	During the data collection timeframe (Table 3), a minimum of 4 annual samples (each year) is needed to calculate annual averages. A minimum of 10 overall samples is needed to calculate an overall average.	Each annual average, or overall average, of all toxic parameters is less than respective HH criteria.	One or more of the annual averages, or one or more overall averages, of toxic parameters is greater than respective HH criteria.

*Data required for monitored assessments. Assessments not meeting this requirement may be added to the WINOFI list.
** Note: Samples refer to the *average contaminant level* in either the arithmetic sample average of tissue plug concentrations or to the contaminant concentration in a composite sample from three to five individual fish.
***See Figure 1: Using remarked (estimated) data for toxics for purposes of IR and Table 7 Determining violations for metals data with criteria-specified fraction or portion.

For Class HH segments to be assessed as "fully supported" using tissue data, the segment must have one or more tissue samples showing average contaminant levels less than the HHS/DNR advisory levels. If two or more samples indicate contaminant levels greater than the HHS/DNR advisory levels, the assessed segment will be considered for Section 303(d) listing.

For Class HH segments to be assessed as "fully supported" using Toxic parameter data, the following conditions must be met: (1) for any segment with least four Toxic parameter samples each year, each annual average must be less than all of the Class HH criteria, or (2) for any segment with less than four Toxic parameter samples each year, each overall average must be less than the Class HH criteria. If an annual average, or an overall average, of any Toxic parameter exceeds a Class HH criteria, the assessed segment will be considered for Section 303(d) listing.

Table 24: Summary of Iowa fish consumption advisory contaminants and their respective evaluation criteria.

Contaminant	Concentration in Fish	Consumption Advice	Support Level	IR Category
Mercury (total)	0 to <0.3 ppm	Unrestricted consumption	Full	1
	0.3 to <1.0 ppm	One meal per week	Not	5a
	1.0 ppm and over	Do not eat	Not	5a
PCBs (sum of Aroclors 1248, 1254 and 1260)	0 to <0.2 ppm	Unrestricted consumption	Full	1
	0.2 to <2.0 ppm	One meal per week	Not	5a
	2.0 ppm and over	Do not eat	Not	5a
Technical Chlordane	0 to <0.6 ppm	Unrestricted consumption	Full	1
	0.6 to <5.0 ppm	One meal per week	Not	5a
	5.0 ppm and over	Do not eat	Not	5a
See IDPH (2007) and http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Water-Monitoring/Fish-Tissue for more information on Iowa's fish consumption advisory protocol.				

Delisting (Removal) of Impairments from Iowa's Section 303(d) List

All impairments removed from Iowa's current Section 303(d) list will be summarized in a table posted at the DNR Assessment website ADBNet. For any waterbody listed on the final EPA-approved previous Section 303(d) list and not included on DNR's current list, a waterbody-specific rationale for the exclusion or delisting will be incorporated into DNR's on-line assessment database (ADBNet).

Age of data alone is not an adequate justification for omitting a previously-listed water on a new list of impaired waters. This provision is especially relevant to waterbody segments included on lists based on results of one-time surveys (e.g., results of biological assessments conducted as part of biocriteria development or faunal surveys (e.g., freshwater mussels)). For example, if a waterbody was added to Iowa's 2004 303(d) list based on a biological assessment conducted in 2002, this waterbody should remain on Iowa's subsequent 303(d) lists until (1) a TMDL is completed, (2) additional monitoring is conducted that shows "full support" of aquatic life uses, or (3) a flaw in the original data analysis or assessment is discovered.

In addition, lack of sufficient new data to develop a "monitored" assessment for a previously-listed waterbody is not adequate justification for excluding a waterbody from Section 303(d) listing. For example, if a routinely-monitored waterbody was added to Iowa's 2004 303(d) list based on a "monitored" assessment showing violations of the Iowa water quality criterion for indicator bacteria, this waterbody should remain on Iowa's impaired waters lists until (1) adequate data are available to develop a high-confidence ("monitored") assessment, (2) the newly developed assessment shows "full support" of the impaired use, or (3) there is some other "good cause" for delisting this impairment.

According to EPA regulations (40 CFR 130.7), a state must demonstrate "good cause" for exclusion of previously impaired waterbody segments. According to these regulations, "good cause" includes, but is not limited to, more recent or accurate data, more sophisticated water quality modeling, flaws in the original analysis that led to the water being listed, or changes in conditions (e.g., new control equipment or the elimination of discharges). Thus, the following can be used to demonstrate good cause for removing a previously-listed waterbody from the Section 303(d) list or to decrease the scope of impairment to a listed waterbody:

- **More recent or accurate data.** Additional monitoring data or information from a waterbody may demonstrate that it now meets applicable WQS. In general, removal of an existing impairment due to violation of Iowa's numeric water quality criteria requires that data show full support of the previously impaired beneficial use. These data must be generated from monitoring studies and programs consistent with Iowa's credible data law and must be in sufficient quantity to be used with IR assessment procedures (see Table 25).

Table 25: Explanation of requirements for delisting of most impairments on Iowa's Impaired Waters List.

Data Type (Parameter) / Designated Use	Waterbody Type	Data Required	Fully Supported / Delisting Requirement
Binomial Parameters / All Classes (Except Indicator Bacteria for Class A (*E. coli*))	All	During the data collection timeframe (Table 3), ≥ 7 samples are needed for a "not supported" assessment and ≥ 8 samples are needed for a "fully supported" assessment.	Violations of all Class appropriate criteria < maximum count of violations allowed by the 10% or 7,8,9 Rules.
Indicator Bacteria (*E. coli*) / Class A	All	During the data collection timeframe (Table 3), data collected monthly or more frequently during recreational season**; ≥ 7 temporally independent samples per recreational season.	Each recreational season geomean < Class geomean criterion AND each recreational season violations of Class SSM criteria < maximum count of violations allowed by 10% or 7,8,9 Rules.
Chlorophyll a TSI or Secchi TSI / Class A	Lakes and Reservoirs	During the data collection timeframe (Table 3), a minimum of 9 samples collected during at least 3 years with a minimum of 3 samples in each year.	Overall median-based TSI values for the chlorophyll a TSI or Secchi TSI must be <63. TSI values are 63 or less is designed to ensure that a long-term and relatively

			stable improvement in lake water quality has occurred before delisting the impairment.
Toxic Parameters / Class B	All	During the data collection timeframe (Table 3), ≥ 10 samples are needed for a "fully supported" assessment and ≥ 2 samples are needed for a "not supported" assessment.	≤ 1 Class appropriate acute or chronic toxicity criteria violation.
Continuous DO / Class B	Streams/ Rivers, Lakes, and Reservoirs	A minimum of one 24-day period in mid to late summer in each of two different years during the data collection timeframe (Table 3).	< maximum violations (days violating) of the Class appropriate 16 hour and 24 hour criteria allowed by 10% Rule.
Biological (IBI scores) / Class B	Streams and Rivers	At least two valid IBI samples from a calibrated segment during the most recent six calendar years (with two samples collected in a five year span).	Simple majority of FIBI and/or BMIBI or CBI scores equal or exceed the ecoregional or CW biological impairment threshold(s) (BITs).
Total Suspended Solids (TSS) / Class B	Shallow Lakes	During the data collection timeframe (Table 3), a minimum of 10 samples collected during at least 3 years with a minimum of 3 samples in each year.	Overall median value of TSS is < 30 mg/L. Water quality is sufficient to support growth of SAV (UMRCC 2003).
Chlorophyll a TSI / Class B	Shallow Lakes	During the data collection timeframe (Table 3), a minimum of 10 samples collected during at least 3 years with a minimum of 3 samples in each year.	Overall median TSI value of the parameter is ≤ 63. TSI values of 63 or less indicate water quality is sufficient to support growth of SAV (UMRCC 2003).
Fish Kill / Class B	Streams and Rivers	See explanation below	See explanation below.
Biological (Freshwater Mussel) / Class B	Streams and Rivers	See explanation below	See explanation below.
Toxic Parameters / Class C & HH	All	During the data collection timeframe (Table 3), a minimum of 4 annual samples (each year) is needed to calculate annual averages. A minimum of 10 overall samples (during data collection timeframe) is needed to calculate an overall average.	Each annual average, or overall average, of all Toxic parameters is less than respective HH criteria or MCLs.
Fish Tissue / Class HH	All	During the data collection timeframe (Table 3), two tissue samples are needed for delisting.	One (FS) or two (delisting) samples showing average contaminant levels less than the HHS/DNR advisory level(s).

- The following approach is used for delisting freshwater mussel impairments in Iowa:
    - If a follow-up mussel survey is conducted by DNR or other natural resource agency staff, and if the SR from the follow-up survey is greater than 50% of the SR from the Frest 1987 surveys of the mid-1980s, the impairment will be delisted. Similar to the process for listing a mussel impairment, only one follow-up sampling is needed to justify a delisting.
    - Because DNR lacks a protocol for identifying biological thresholds that indicate a "fully supported" mussel community, recovery of the SR of the mussel community from a previous decline does not necessarily indicate "full support" of the designated Class B aquatic life use. Rather, the results of such surveys indicate only that the mussel community has recovered to approximately the baseline condition found during the surveys in the mid-1980s (which is the basis for identifying mussel impairments). Thus, segments where mussel impairments have been delisted (removed from IR Categories 4 or 5) are most appropriate for placement in IR Subcategory 3a (insufficient information is available to determine whether the designated use is supported).

- The following approach is used for delisting fish kill impairments in Iowa. Fish kill impairments will remain in IR Category 5b until either DNR biological sampling or DNR "fish kill follow-up" sampling has been conducted.
    - If DNR biological sampling is conducted such that the simple majority of sampling events within a recent five-year period show "full support" of the aquatic life use, the fish kill impairment will be delisted due to existence of "new data" and the assessment will be moved to a non-impairment ("fully supported") category (IR 1).
    - If DNR fish kill follow-up sampling is conducted, and if the results of the sampling indicate recovery of the fish community from the fish kill event, the impairment will be moved from IR Category 5b to the non-assessed category of the IR (IR 3a). Recovery is defined as having ≥ 50% of the expected ecoregion fish taxa (Table 26) and ≥ 25th percentile of the expected ecoregion fish per mile (Table 27). Although capable of identifying recovery of the fish community, DNR's fish kill follow-up monitoring protocol lacks the assessment rigor to identify "full support" of the aquatic life use.

Table 26: 2024 IR FKF Fish Taxa Richness Metric List.

Ecoregion→ Fish Taxa ↓	40a	47a	47b	47c	47d/m	47e	47f-MO	47f-MS	52b	72-m*	72-l**
Blackstripe Topminnow										X	X
Brassy Minnow			X							X	
Campostoma spp.	X	X	X	X				X	X	X	
Catfish Species	X	X	X	X	X	X	X	X	X	X	X
Centrarchidae spp. (excluding lake species)	X	X	X	X	X	X	X	X	X	X	X
Common Shiner		X	X	X					X		
Creek Chub	X	X	X	X	X	X	X	X	X	X	
Red or Spotfin Shiner	X		X	X	X	X	X	X	X	X	X
Darter Species	X	X	X	X				X	X	X	X
Flathead Chub						X					
Golden Shiner											X
Hornyhead Chub				X					X		
Notropis spp.	X	X	X	X	X	X	X	X	X	X	
Pimephales spp.	X	X	X	X	X	X	X	X	X	X	X
Redfin Pickerel											X
Western Blacknose Dace or Longnose Dace		X	X	X					X		
Suckermouth Minnow	X					X	X	X		X	
Sucker Species	X	X	X	X	X	X	X	X	X	X	
Expected Number of Taxa:	10	10	12	12	7	9	8	10	12	12	8
72-m* = medium gradient											
72-l** = low gradient											

Table 27: 2024 IR Fish per mile found at REMAP (random) sites 2002-2006, 2017-2021.

Ecoregion	# Sites	Minimum	25th %	Median	Mean	75th %	Maximum
40a	29	209	1542	2400	2812	3912	8440
47a	27	239	496	1096	1775	1992	7560
47b	33	293	1362	2368	3175	4195	11088
47c	33	1766	2992	4418	5228	6707	16183
47d+47m	6	176	266	525	728	982	1826
47e	28	221	597	1400	1851	2110	7848
47f	28	404	2019	2805	3521	4508	9980
52b	16	838	1502	4436	4635	6560	9587
72d	4	615	1920	3311	3406	4796	6389

- Flaws in original analysis or errors in listing. Errors in the data or flaws in assessment procedures used to list the waterbody invalidate the basis for listing. Changes in assessment methodology can be considered as correcting flaws in analysis or errors in listing.

- New conditions. Examples of new conditions include revised WQS, the elimination of discharges, and new control equipment such that a listed waterbody no longer meets the criteria for Section 303(d) listing.

Addressing Interstate Inconsistencies in Section 303(d) Lists

Inconsistency in the Section 303(d) listings of border rivers and other interstate waters is a long-standing national problem (see GAO 2002). DNR faces potential listing consistency issues with the following states and rivers that border Iowa: South Dakota (Big Sioux River), Nebraska (Missouri River), Missouri (Des Moines River and interstate waters), Minnesota (interstate waters), and Illinois and Wisconsin (Upper Mississippi River).

Border Rivers:

The UMRBA's Water Quality Task Force has provided, and continues to provide, a forum for improving listing consistency for the UMR for the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin (see UMRBA-WQTF 2004). In addition to the face-to-face consultations provided in the UMRBA Water Quality Task Force, interstate consistency can also be addressed through viewing web-available integrated reports and Section 303(d) lists of adjacent states.

For the current listing cycle, IR staff and websites for Nebraska, South Dakota, Illinois, Wisconsin, and Missouri will be consulted to resolve interstate (border river) listing issues as much as possible. Iowa does not have a shared Mississippi River border with Minnesota. The lists of border segments reviewed for this IR cycle are summarized in Tables 28, 29, 30, 31.

Where the listing in a border river state is different from Iowa, the DNR will review the assessment data, supporting information, and assessment methodology that support the listing in the other state. These data will be reviewed and applied to Iowa's IR methodology outlined in this document. If a listing from another state for a border river is based on WQS that are consistent with the Iowa WQS, the Iowa listing could be changed to reflect that listing.

This process of reviewing Section 303(d) listings for waters that border adjacent states is designed to reduce interstate inconsistencies in Section 303(d) listings and to provide a basis for cooperation on future development of TMDLs for these interstate waters.

Minnesota and Missouri Interstate Waters:

DNR will also review the Section 303(d) listings from adjacent states for waters that either enter or leave Iowa from Minnesota or Missouri (e.g., the Cedar River in Mitchell County and the Chariton River in Appanoose County), or that are shared with Iowa by either state (e. g., Tuttle Lake in Emmet County).

Where the listing in an adjacent state is different than in Iowa, the DNR will review the assessment data, supporting information, and assessment methodology that support the listing in the other state. The data used for the IR assessment in the adjacent state may also be used to complete an IR assessment on the nearest segment in Iowa. However, because those data were collected outside of Iowa, the Iowa segment is not eligible for the Iowa impaired waters list.

Table 28: Comparison of Iowa assessment segments for the Upper Mississippi River to those agreed upon in 2004 by the Upper Mississippi River Basin Association (UMRBA) as part of the memorandum of understanding on interstate assessment reaches developed by the UMRBA Water Quality Task Force (UMRBA-WQTF 2004).

Iowa Segment ID	Segment Description	Length (miles)	UMRBA Assessment Reach	Reach Description	Length (miles)*	Hydrologic Unit Code (HUC)
IA 03-SKM-884	Iowa/Missouri state line (Des Moines River) to Sugar Creek. near Ft. Madison	17.3	Flint-Henderson	Des Moines River to Iowa River	74.8	07080104
IA 03-SKM-885	Sugar Creek to Skunk River	19.5				
IA 02-ICM-618	Skunk River to water supply intake at Burlington	8.75				
IA 02-ICM-619	Burlington water supply intake to Iowa River	29.2				
IA 01-NEM-61	Iowa River to Lock and Dam (L&D) 15 at Davenport	49.3	Copperas-Duck	Iowa River to Lock & Dam 13 at Clinton	89.3	07080101
IA 01-NEM-62	L&D 15 to L&D 14 at LeClaire	10.7				
IA 01-NEM-63	L&D 14 to Wapsipinicon River	13.1				
IA 01-NEM-64	Wapsipinicon River to L&D 13 at Clinton	16.2				
IA 01-NEM-70	L&D 13 to Catfish Creek at Dubuque	54.0	Apple- Plum	Lock & Dam 13 to Lock & Dam 11	59.7	07060005
IA 01-NEM-71	Catfish Creek to L&D 11 at Dubuque	5.68				
IA 01-NEM-75	L&D 11 to L&D 10 at Guttenberg	30.9	Grant-Maquoketa	Lock & Dam 11 to Wisconsin River	46.0	07060003
IA 01-NEM-76	L&D 10 to Wisconsin River	15.1				
IA 01-NEM-77	Wisconsin River to L&D 9 at Harpers Ferry	19.0	Coon-Yellow	Wisconsin River to Root River	42.9	07060001
IA 01-NEM-78	L&D 9 to IA/MN state line	23.9				

*The length of the UMRBA assessment reaches was adjusted to correspond to the total mileage in the respective DNR assessment reaches.

Table 29: Comparison of Iowa and Missouri Des Moines River assessment segments not addressed by the UMRBA memorandum.

Iowa Segment ID	Segment Description	Length (miles)	Missouri Segment ID	Segment Description	Length (miles)	Hydrologic Unit Code (HUC)
IA 04-LDM-1002	Des Moines River, from Mouth (Lee County) to Confluence With Sugar Creek (Lee County)	6.3	MO_36.00	Legal US: State Line; Legal DS: Mouth	29.6	07080104
IA 04-LDM-1003	Des Moines River, from Confluence With Sugar Creek (Lee County) to Confluence With Indian Creek (Van Buren County)	25.3				

Table 30: Comparison of Iowa and South Dakota Big Sioux River assessment segments not addressed by the UMRBA memorandum.

Iowa Segment ID	Segment Description	Length (miles)	South Dakota Segment ID	Segment Description	Length (miles)	Hydrologic Unit Code (HUC)
IA 06-BSR-1520	Big Sioux River, from mouth to Broken Kettle Creek, Plymouth County	16.9	SD-BS-R-BIG_SIOUX_17	Big Sioux River, mouth to Broken Indian Creek, Plymouth County	58.1	10230001
IA 06-BSR-1521	Big Sioux River, from Broken Kettle Creek to Brule Creek near Richland, SD	18.4				
IA 06-BSR-1522	Big Sioux River, from Brule Creek to Indian Creek, Plymouth County	22.8				
IA 06-BSR-1523	Big Sioux River, from Indian Creek to Rock River	23.7	SD-BS-R-BIG_SIOUX_16	Big Sioux River, from Indian Creek to near Alcester	23.7	10230001
IA 06-BSR-1524	Big Sioux River, from Rock River to Beaver Creek near Canton, SD	22.2	SD-BS-R-BIG_SIOUX_15	Big Sioux River, near Alcester to Fairview	22.2	10170203
IA 06-BSR-1525	Big Sioux River, from Beaver Creek to Ninemile Creek	22.5	SD-BS-R-BIG_SIOUX_14	Big Sioux River, near Fairview to Ninemile Creek	22.5	10170203
IA 06-BSR-1526	Big Sioux River, from Ninemile Creek to IA/MN line	9.3	SD-BS-R-BIG_SIOUX_13	Big Sioux River, Ninemile Creek to near Brandon	9.3	10170203

Table 31: Comparison of Iowa and Nebraska Missouri River assessment segments not addressed by the UMRBA memorandum.

Iowa Segment ID	Segment Description	Length (miles)	Nebraska Segment ID	Segment Description	Length (miles)	Hydrologic Unit Code (HUC)
IA 06-WEM-1707	Missouri River, IA/MO state line to confluence with Platte River West of Glenwood in Mills County	41.6	MT1-10000: Missouri River	Missouri River, downriver from confluence with Platte River	41.6	10240001
IA 06-WEM-1708	Missouri River, from Platte River to Council Bluffs WS intake	23.3	NE1-10000: Missouri River	Missouri River, upriver from Platte River to Big Sioux River	135.4	10230006
IA 06-WEM-1709	Missouri River, from Council Bluffs WS intake to Boyer River	15.4				
IA 06-WEM-1715	Missouri River, from Boyer River to Little Sioux River	33.3				
IA 06-WEM-1720	Missouri River, from Little Sioux River to Elm Creek	20.8				10230001
IA 06-WEM-1721	Missouri River, from Elm Creek to Omaha Creek Ditch	25.0				
IA 06-WEM-1722	Missouri River, from Omaha Creek Ditch to Big Sioux River	17.6				

Prioritization and Scheduling of Waters for TMDL Development

In response to EPA's efforts to develop a new long-term vision for the Clean Water Act Section 303(d) program in 2022, DNR developed a revised system of prioritization for water bodies included in IR Category 5. This new long term vision was developed for the 2024 IR cycle by the DNR (Iowa DNR 2024). DNR prioritizes TMDLs with a high potential for social impact, efficiency, and partnership activity in accordance with the framework from the 2024 303(d) Vision.

TMDL Prioritization Methodology:

With the focus on partnerships in planning and prioritization as part of the Iowa's TMDL Vision 2024, a prioritization structure has been developed to accommodate the priorities of TMDL Program partners. Partner communication is a continuous process with updates to priorities occurring at no greater intervals than the 2-year cycle of the IR. Priorities from the previous TMDL Vision, which included water bodies with high social impact (drinking water impairments and lakes with bacteria or nutrient related impairments) and low cost and complexity of modeling, are still a portion of the priority structure. To increase the efficiency of TMDL creation and reduce the number of water bodies on the impaired waters list, priority is also given to TMDLs where multiple impairments can be addressed in a single TMDL and addendums to past TMDLs where the need for new modeling efforts is limited. Deprioritization of potential TMDLs where the pollutant and waterbody combination already has a TMDL and significant modeling is needed will be limited to waterbodies with recent TMDLs. Wetland eutrophication is also deprioritized, as achieving the current standards for wetlands would negatively impact the ecological function that they provide. A points system was created to accommodate the priorities described (Table 32).

Table 32: Points system used to prioritize TMDLs based on partnership needs, social impact, and efficiency measures.

Priority Parameter		Points
High Social Impact		1
Low Complexity/Cost		1
Addendum to Existing TMDLs		1
Multiple Impairments in Proposed TMDL	2-5 Impairments	1
	6+ Impairments	2
Partner Priority*	Lake Restoration Program or Section 319 High Priority	2
	Any Partner Priority	1
TMDL for Pollutant/Waterbody Combination within Last 15 Years, Excluding Addendum Cases		-1
Wetland Eutrophication		-1

*Lake Restoration Program and Section 319 may assign up to 10 points each; other partners may assign up to 5 points.

A tier system was developed to group priorities into a simpler framework and fit existing infrastructure while ensuring that the highest priority could only be achieved with some amount of partner priority (Table 33).

Table 33: Tiered system for TMDL priority based on the number of points allocated.

Priority Tier	Points Required
Tier I	5+
Tier II	4
Tier III	3
Tier IV	0-2

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