

IOWA'S WATER

Ambient Monitoring Program

Water Quality Impairments in Iowa Understanding Section 303(d) of the Clean Water Act

Why states assess water quality and identify impaired waters

Since its passage in 1972, the federal Clean Water Act (CWA) has required states to monitor the water quality of their rivers, streams, and lakes and to use the data collected to measure progress in meeting water quality goals. Each state's water quality goals are defined by their respective "water quality standards." Water quality standards designate the beneficial uses that are to be supported in the state's lakes, streams, and rivers. Examples of beneficial uses include recreation (e.g., swimming), aquatic life (e.g., growth and reproduction of aquatic life such as fish), and drinking water (e.g., serving as a

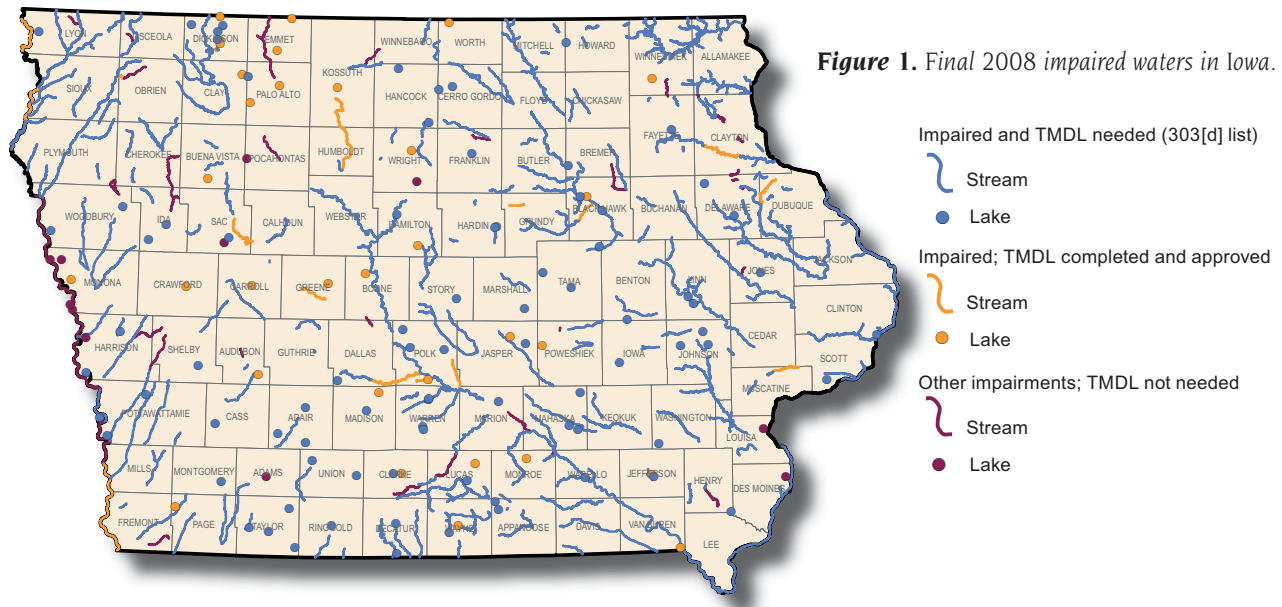
source for a public water supply). Water quality standards also specify the numeric levels of pollutants such as bacteria, ammonia, and nitrate that can be present in a lake, river, or stream without impairing these beneficial uses. As a basic floor of water quality protection, state standards also contain narrative descriptions of unacceptable levels of pollution that affect the more general uses that are to be protected in all waters of the state such as industrial, agricultural, and domestic uses. The Iowa Water Quality Standards are available at www.iowadnr.gov/water/standards/files/chapter61.pdf.



Although historically more common, impairments of Iowa rivers and streams due to wastewater discharges are now rare.

State requirements for reporting water quality conditions

The U.S. Environmental Protection Agency (EPA) is responsible for ensuring that states meet requirements of the CWA. Section 305(b) of the CWA requires that states, every two years, use the available water quality data to assess the degree to which the state's lakes, rivers, and streams meet state water quality goals. Section 303(d) of the CWA requires that each state, every two years, submits to EPA a list of the assessed waters that do not fully meet these goals and are thus considered "impaired."



After EPA approves a state’s list, the state is responsible for preparing a plan to correct each water quality problem identified on the Section 303(d) list. This plan is called a “total maximum daily load” or TMDL, which is an analysis of the amount of pollution a lake, stream, or river can receive and still meet state water quality standards. In practical terms, a TMDL is a plan to improve water quality by reducing pollutant levels. Federal regulations that apply to Section 303(d) do not, however, require states to implement all recommendations contained in TMDLs to improve water quality. Instead, TMDL implementation depends largely on the existence of formalized pollution control programs or on local stakeholder interest to support projects to improve water quality.

As part of their Clean Water Act responsibilities, U.S. EPA provides guidance to states on methods of water quality assessment and on formats for both Section 305(b) water quality status reporting and Section 303(d) impaired waters listing. States use EPA guidance to prepare state-specific assessment and listing methodologies. Since 2004, EPA has requested that states combine their Section 305(b) water quality status information and their Section 303(d) impaired waters information into an “Integrated Report.” More information on Iowa’s 2008 Integrated Report and impaired waters list can be found at the Iowa DNR web site at www.igsb.uiowa.edu/wqm/wqa/303d.html.

Sources of Water Quality Data

Federal regulations require states to use all existing and readily available data to assess water quality and to identify water quality impairments. All data used by the Iowa DNR to add or remove an impairment from the 303(d) list must also meet the requirements of Iowa’s credible data law. The credible data law requires that data be collected under an accepted sampling and analysis plan, which includes quality control and quality assurance procedures. This ensures that chemical, physical, and biological monitoring data are scientifically valid. The credible data law also states that data older than five years are presumed to be not credible for the purpose of assessing current water quality conditions.

In Iowa, the majority of water quality data used to identify impairments in rivers and streams comes from ambient chemical and biological monitoring networks sponsored by Iowa DNR and other governmental agencies. Impairments at Iowa's lakes are based on data from the Iowa DNR-sponsored statewide lake survey. Data on bacterial indicators from the statewide beach monitoring program are also used to assess the quality of Iowa's lakes. A variety of other data are used including results from fish tissue (contaminant) monitoring, fish kill investigations, monitoring of source waters used for public water supplies, information from IDNR field biologists, and results of volunteer monitoring that show significant pollution problems. Impairments on Iowa's border rivers are based primarily on water quality data and assessments from neighboring states.

Impairment summary of Iowa's 2008 Integrated Reporting cycle

As part of the 2008 Integrated Reporting cycle, Iowa DNR staff developed assessments for 162 lakes and 811 rivers/stream segments in Iowa (Figure 1). All of these assessments are available in Iowa DNR's water quality assessment database called ADBNet (available at <http://programs.iowadnr.gov/adbnnet/index.aspx>). Of the 162 assessed lakes, 109 (67%) were assessed as having at least one impaired use, and of the 811 river/stream segments assessed, 420 segments (52%) were assessed as having at least one impaired use (Figures 2 and 3).

Summarizing the assessment information as simple percentages of waterbody types with at least one use assessed as "impaired," however, does not tell the entire impairment story. The degree of impairment at a lake or stream can vary from slight to severe. And, due to their different physical properties and landscape settings, lakes and their beneficial uses are typically impaired to a different degree and by a different set of water quality problems than are the same beneficial uses designated for rivers and streams.

Impairment: a sliding scale from slight to severe

Figures 2 and 3 suggest that most Iowa waters are impaired. Although many Iowa waters do have at least one beneficial use impaired, or potentially impaired, not all of these impairments indicate severe pollution or poor water quality. The degree to which a beneficial use of a lake, river, or stream is impaired varies from slight to severe. Due to the methods used by states to identify impairments, the difference between "full support" and "impairment" of a beneficial use can be as little as one of 36

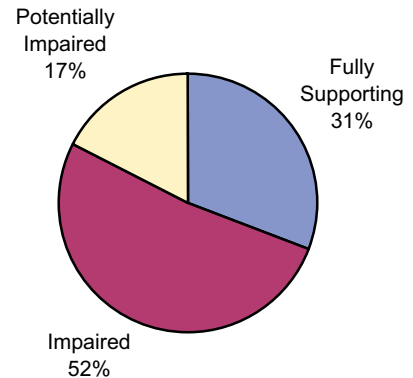


Figure 2. Percentages of Iowa lakes assessed as fully supported, potentially impaired, and impaired for the 2008 Integrated Reporting cycle (162 lakes assessed).

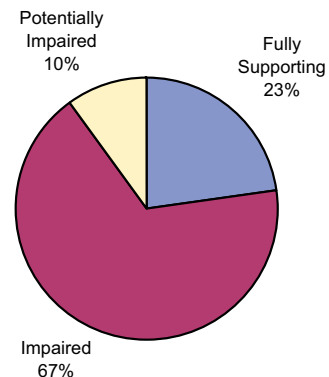


Figure 3. Percentages of Iowa river/stream segments assessed as fully supported, potentially impaired, and impaired for the 2008 Integrated Reporting cycle (811 segments assessed).

36 samples collected over a three-year period. On the other end of this spectrum, some waters have such poor water quality that nearly all samples show violations of state water quality criteria. Fortunately, most impairments identified for Iowa surface waters are in the "slight to moderate" range and do not indicate severe pollution. Of the 670 impairments identified for the 2008 Integrated Reporting cycle, 75% were in the "slight to moderate" range with 25% of the impairments considered "severe." Because state water quality criteria are designed to be fully protective, slight to moderate impairment of a beneficial use does not necessarily preclude that use from being at least partially supported.



Iowa's lakes, rivers, and streams provide many recreational opportunities, including fishing.

Conclusion

The water quality assessments developed by Iowa DNR to meet requirements of Section 305(b) of the federal Clean Water Act are used to create Iowa's Section 303(d) list of impaired waters. All impairments must be tied to a failure to fully support state water quality standards. While often interpreted in a simple and general way, water quality impairments reflect the levels of complexity and detail that exist in descriptions of beneficial uses and in the specific water quality criteria designed to protect beneficial uses. The degree of impairment can vary from slight to severe. And, due to their different physical properties and landscape settings, lakes and their beneficial uses are typically impaired to a different degree and by a different set of water quality problems than are rivers and streams.

Acknowledgements

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Iowa Watershed Monitoring and Assessment Program Web Site – www.igsb.uiowa.edu/wqm/



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Difference in Water Quality Impairments: Lakes vs. Rivers

Use support varies between lakes and rivers

As shown in Figures 4 and 5, not all of the beneficial uses designated for each waterbody in Iowa are equally likely to be identified as impaired. Although the primary contact recreation (swimming-type) uses of both lakes and rivers/streams are the most likely of all beneficial uses to be impaired, aquatic life uses of lakes are assessed as “fully supporting” most of the time, while this use in river/stream waterbodies has a higher probability of being assessed as impaired (~45% of river and stream segments assessed as “impaired” for aquatic life uses). The tendency of rivers and streams to be impaired for aquatic life uses reflects the greater potential impacts to river/stream aquatic life when compared to lakes (for example, higher turbidity, larger watersheds, greater susceptibility to fish kills from pollution inputs). It also reflects that a calibrated biotic index is available for streams, something that is being prepared for lakes, but is not currently available.

The degree to which drinking water use is supported also varies between lakes and rivers. This difference is related to the tendency for levels of nitrate and other contaminants (for example, arsenic) to be higher in rivers than in lakes. Fish consumption uses of both lakes and rivers/streams are seldom assessed as impaired. This reflects the generally low levels of toxic contaminants in Iowa fish.

Lakes and rivers/streams: impaired by different water quality problems

The types of water quality problems that impair lakes are different than those that impair rivers and streams. Lake water quality is most commonly impacted by reduced water clarity caused by either too much algae or suspended sediment and other material in the water column, high levels of pH caused by excessive algae, or high levels of indicator bacteria (*E. coli*) at lake beaches (Figure 6). The most commonly identified impairments of Iowa’s rivers and streams are (1) high levels of indicator bacteria, (2) biological condition less than the reference condition as measured by analysis of the fish and

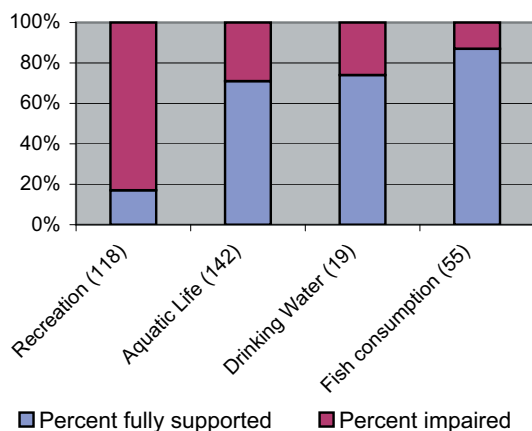


Figure 4. Percent of assessed lakes impaired versus fully supported by designated beneficial use. Number of lakes assessed for each use is in parentheses.

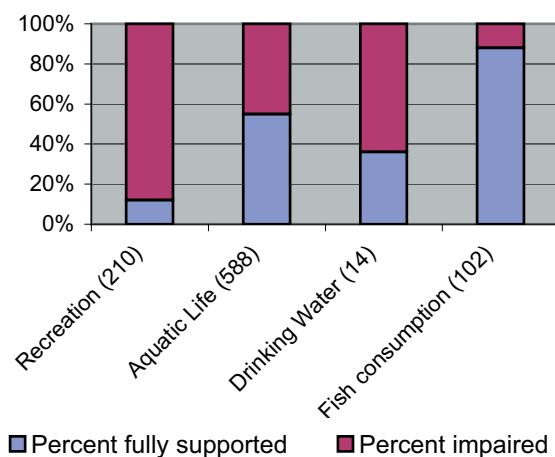


Figure 5. Percentage of assessed river/stream waterbodies impaired versus fully supported by designated beneficial use. Number of stream/river segments assessed for each use is in parentheses.

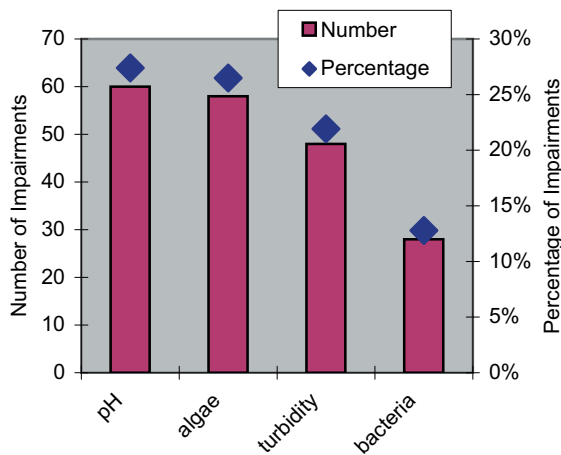


Figure 6. Most commonly identified causes of impairment at Iowa lakes, 2008.

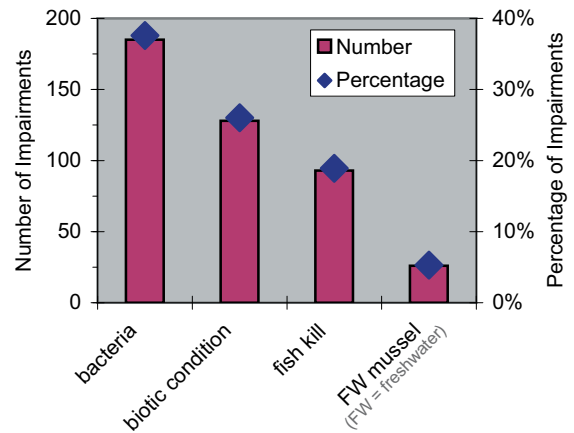


Figure 7. Most commonly identified causes of impairment in Iowa river/stream segments, 2008.

invertebrate populations, (3) fish kills caused primarily by unintended discharge of animal waste and fertilizer to streams and rivers, and (4) large declines in populations of freshwater mussels over the last 25 years (Figure 7).

Just as the types of impairments at lakes differ from those in rivers and streams, the most common causes of impairment of a given beneficial use in lakes can differ from those in rivers and streams. For example, swimming use in lakes is most likely to be impaired by poor water clarity caused either by too much algae or suspended material in the water column. In rivers, however, high levels of indicator bacteria are the most commonly – in fact, the only – reported cause of impairment of swimming use.

None of the leading causes of impairment of aquatic life use identified for Iowa’s lakes are the same as those impairing the aquatic life use of Iowa’s rivers and streams. Lake aquatic life use is most often impaired by levels of pH that exceed state water quality criteria. Turbidity (poor water clarity), especially as it affects the ability of fish and other aquatic life to grow and reproduce, is the second-leading cause of aquatic life use impairment at Iowa’s lakes.

The leading cause of impairment of aquatic life uses in Iowa’s rivers and streams, however, is a level of biotic condition that does not meet the regional reference condition of biotic integrity. See Water Fact Sheet 2001-3 Biological Assessment of Iowa’s Streams and Rivers (www.igsb.uiowa.edu/webapps/gsb-pubs/pdf/WFS-2001-03.pdf) for more information.

Pollutant-caused fish kills, often caused by animal waste or fertilizer spills, is the second leading cause of impairment of aquatic life use in streams. The third leading cause of impairment of aquatic life use of rivers and streams is the decline in populations of freshwater mussels based on comparisons of state-wide surveys conducted in 1985 to follow-ups conducted in 1998 and 1999. The relatively large number of mussel-related impairments reflects the drastic reductions in the state’s mussel populations.

