Iowa's 2012 List of Impaired Waters

Watershed Monitoring & Assessment Section, Iowa Geological & Water Survey,
Environmental Services Division, Iowa Department of Natural Resources

April 2013

Table of Contents	Page
Summary	1
Federal Requirements for water quality reporting and impaired waters listing	1
The Integrated Report Format	1
Iowa's List of Waters in Need of Further Investigation	2
Iowa's Water Quality Monitoring Programs	3
Qualifiers	4
Perspective on the meaning of "impairment"	4
Why does the number of impaired waters in Iowa continue to increase?	4
Why is the number of impaired waters on the 2012 list similar to that on the 2010 list?	4
What are the most common causes of impairment in Iowa waters?	4
Removal of impairments	7
The Status of Water Quality in Iowa	8
Web links	10

Summary: Iowa's 2012 Section 303(d) list of impaired waters contains 480 waterbodies with a total of 642 impairments. This list is Category 5 of Iowa's 2012 Integrated Report. The list includes 388 stream/river segments, 74 lakes, 7 segments of three federal flood control reservoirs, and 11 wetlands and is a subset of the 1,227 waterbodies assessed by IDNR staff for support of their designated beneficial uses as described in the *Iowa Water Quality Standards* as part of the Clean Water Act Section 305(b) reporting for the 2012 cycle. Impairments are identified for all classes of beneficial uses designated for Iowa surface waters: primary contact recreation, aquatic life, drinking water, fish consumption, and general uses. The total number of impaired waters in Iowa's 2012 Integrated Report is 630, with 480 Section 303(d) waters [Category 5: impaired and TMDL needed] and 150 waters in Category 4 [impaired but TMDL not required]. Similar to past listing cycles, the most frequently identified causes of impairment of streams and rivers are indicator bacteria (*E. coli*), biological impairments, and fish kills: these three causes account for 80% of the 606 stream/river impairments. For lakes, the most commonly identified impairments remain algal turbidity, pH (related to algae), non-algal turbidity (suspended sediment), and indicator bacteria (*E. coli*) with these four causes accounting for 78% of the 240 lake/reservoir impairments. All of Iowa's Section 305(b) water quality assessments developed since 1992 are available at Iowa DNR's on-line water quality assessment database, *ADBNet*.

Federal Requirements for water quality reporting and impaired waters listing: The 1972 amendments to the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act (CWA)) require each state to develop a program to monitor the quality of its surface waters (streams, lakes, and wetlands (=waterbodies)). Section 305(b) of the CWA requires states to prepare, every two years, a report that describes, based on the monitoring data available, the status of water quality and the extent to which state waters meet the goal of the Act (to restore and maintain the chemical, physical, and biological integrity of the Nation's waters). Section 303(d) of the CWA requires each state, "from time to time", to list its waters for which effluent limitations are not sufficient to meet state water quality standards. This is a state's list of impaired waters for which TMDLs must be developed. In federal regulations implementing Section 303(d), U.S. EPA has defined "from time to time" to mean April 1 of even-numbered years, which coincides with the deadline for Section 305(b) reporting.

The Integrated Report Format: Beginning with the 2004 water quality reporting cycle, U.S. EPA recommended that states provide a single water quality monitoring and assessment report—the Integrated Report—that combines the water quality reporting requirements of Section 305(b), the impaired waters listing requirements of Section

303(d), and the lakes reporting requirements of Section 314 of the Clean Water Act. This "Integrated Report" is composed of five categories that are designed to give the public and other stakeholders a comprehensive summary of the water quality status in the state (Table 1). According to U.S. EPA's guidelines, water quality problems identified in the Integrated Report should be emphasized and reflected in the state's water quality management plan and annual work programs under Sections 106 [pollution control programs], 205(j) [water quality planning], and 319 [nonpoint source management] of the Clean Water Act.

Table 1. The five categories of the U.S. EPA-recommended "Integrated Reporting" format.	
Category 1:	All designated uses are met
Category 2.	Some of the designated uses are met, but there are insufficient data to determine if the remaining designated uses are met.
Category 3:	Insufficient data to determine whether any designated uses are met.
Category 4:	Waterbody is impaired or threatened but a TMDL is not needed.
Category 5:	Waterbody is impaired or threatened and a TMDL is needed.

In their guidance to states, U.S. EPA has added the following Integrated Report subcategories:

- *4a: all TMDLs need to result in attainment of all applicable water quality standards that have been approved or established by EPA.*
- *4b. other required control measures are expected to result in the attainment of water quality standards in a reasonable period of time;*
- *4c: the impairment or threat is not caused by a pollutant.*

U.S. EPA guidelines allow states to create additional subcategories in order to refine the reporting process. In order to better track the attainment status of Iowa waterbodies, the following subcategories have been created by IDNR:

- Category 2b: At least one use is met with at least one other use potentially impaired.
- Category 3b: Insufficient data to determine whether any designated uses are met but at least one use is potentially impaired.
- Category 4d: Waterbody assessed as "impaired" due to a fish kill where enforcement action was taken to address the source of the kill: no TMDL required.
- Category 5b: Impairment is based on results of a fish kill investigation or biological monitoring where specific causes and/or sources of the impairment have not yet been identified.
- Category 5p: A presumptively-applied use is impaired (most often applied to bacterial impairments of the presumptively applied Class A1 [primary contact recreation] use).

Table 2 summarizes Iowa's 2012 Integrated Report and shows how the EPA-defined and state-define IR subcategories are utilized.

Iowa's List of Waters in Need of Further Investigation:

The list of waters in need of further investigation (WINOFI), as required by Iowa's "credible data law", is comprised of those waterbodies assessed as "potentially impaired" and placed in IR subcategories 2b or 3b. As stated in the rationales for subcategories 2b and 3b above, the assessments of any impairments in these waterbodies are based on less than complete information that suggests only a potential impairment. Thus, the assessments are of relatively low confidence and are not appropriate for addition to Iowa's impaired waters list. Iowa's 2012 list of waters in need of further investigation contains 340 waterbodies. Of the 253 waterbodies on the final 2010 WINOFI list, a total of 35 waterbodies were moved to other categories of the 2012 integrated report as follows:

- New data at sixteen waterbodies showed that an impairment did not exist; thus, these waterbodies were moved to IR Category 2a (at least one use assessed as fully supporting designated uses).

- Nine fish kill waterbodies where IDNR brought legal action and fines against responsible parties were moved to IR Category 3a (uses not assessed.)
- New data showed that six waterbodies identified as "potentially impaired" should, in fact, be assessed as "impaired", and these waters were placed in Category 5 (=Section 303(d) list).
- Three waterbodies were removed due to assessment errors that mistakenly suggested potential impairment.
- One waterbody was removed due to lack of recent data (within last 10 years) on indicator bacteria.

Table 2. Summary of the number of waterbodies in each category of Iowa's 2012 integrated Section 305(b) / Section 303(d) report. The 480 waterbodies in Categories 5a, 5b, and 5p comprise Iowa's 2012 Section 303(d) list; the 340 waterbodies in Categories 2b and 3b comprise Iowa's list of waters in need of further investigation.

Integrated Report Category	Category Description	Number of Waterbodies
1	All designated uses met.	6
2a	At least one designated use met; insufficient data to determine whether other uses are met.	591
2b	At least one designated use is met with at least one other use potentially impaired based on an "evaluated" assessment.	25
3a	Insufficient data to determine whether any designated uses are met.	1090
3b	Insufficient data to determine whether any designated uses are met but at least one use is potentially impaired based on an "evaluated" assessment.	315
4a	All TMDLs need to result in attainment of all applicable water quality standards that have been approved or established by EPA.	127
4b	Other required control measures are expected to result in the attainment of water quality standards in a reasonable period of time; TMDL not required.	0
4c	The impairment or threat is not caused by a pollutant; TMDL not required.	26
4d	Waterbody assessed as "impaired" due to a fish kill where enforcement action was taken to address the source of the kill: TMDL not required.	38
5a	Waterbody is impaired or threatened and a TMDL is needed.	211
5b	Impairment is based on results of biological monitoring or a fish kill investigation where specific causes and/or sources of the impairment have not yet been identified.	158
5p	A presumptively-applied use is impaired.	111

Iowa's Water Quality Monitoring Programs: To the extent possible, all of Iowa's Clean Water Act Section 305(b) water quality assessments and Section 303(d) impaired waters listing decisions are based on recent, site-specific results from water quality monitoring programs. Data from a variety of monitoring programs are used. The majority of monitoring data come from Iowa DNR's ambient surface water monitoring networks. IDNR's river/stream monitoring network consists of 84 stations mostly on the larger interior rivers. Sixty of these are ambient stations that are sampled monthly; 24 stations are monitored monthly as part of the upstream-downstream city monitoring. In addition, swimming beaches at 35 state-owned lakes are sampled for indicator bacteria (*E. coli*) weekly from April through October. During the period 2006-2010, IDNR's ambient lake monitoring program included 131 Iowa lakes that were sampled annually during summer seasons either by Iowa State University or by the State Hygienic Laboratory (SHL). Approximately 70 stations on smaller rivers and streams are sampled yearly by SHL for fish and macroinvertebrates as part of IDNR's ambient biological monitoring program. In cooperation with U.S. EPA (Region 7), IDNR conducts annual monitoring of toxic contaminants in fish from approximately 35 sites on Iowa's rivers and lakes. Iowa DNR also uses data from monitoring networks operated by the Corps of Engineers, U.S. Geological Survey, and municipal water utilities (e.g., Des Moines, Cedar Rapids, and the Rathbun Rural Water Association). Results of fish kill investigations are also used to develop water quality assessments and to identify impairments.

Qualifiers: The list of impaired waters is only as inclusive as the various water quality monitoring networks in Iowa. In general, the greater the amount of monitoring, the greater the number of impaired waters on the list. Also, the identification of impairments is strongly tied to the state's water quality standards. Because Iowa does not yet have numeric water quality criteria for nutrients or for sediment/siltation, identification of such impairments is relatively rare. Because Iowa's *Water Quality Standards* lack criteria for turbidity, lake or wetland impairments attributed to algae (chlorophyll) or non-algal turbidity (soil particles suspended in the water column) are based on violations of the state's narrative standards protecting against "aesthetically objectionable conditions." Eventual adoption of numeric criteria for nutrients, chlorophyll, and/or turbidity will likely result in a substantial increase in the number of waterbodies on Iowa's future lists of impaired waters.

Perspective on the meaning of "impairment": Much confusion exists regarding the meaning of "impairment" as used for Clean Water Act Section 303(d) listing. In terms of water quality condition, "impairment" is not a "one size fits all" concept. The degree of water quality impairment ranges from slight to severe. Severe water quality problems, although rare, do occur in Iowa. Most of the impairments on Iowa's draft list of impaired waters, however, do not indicate severely or grossly polluted conditions. Often, the difference between assessing a waterbody as "impaired" versus "fully supported" can come down to contaminant levels in only one of 36 monthly samples or the absence of a few key aquatic species in a stream. Iowa's numeric water quality criteria—which are the primary basis for identifying impairments—are designed to be protective of the beneficial uses designated for Iowa's streams, rivers, and lakes. These criteria are set to warn of potential water quality problems well before anything approaching "grossly polluted conditions" occurs. Many waters assessed as "impaired" for aquatic life uses often continue to support a moderately healthy and diverse aquatic community. Also, the designated recreational uses of many Iowa waters are impaired by high levels of indicator bacteria, but reports of waterborne illness related to these high levels of bacteria have historically been extremely rare. Impairments based on violations of Iowa's narrative water quality standards, however, tend to be more severe. These impairments result when objectionable water quality conditions are observed to exist (e.g., a lake with very poor water clarity due to algal growth).

Why does the number of impaired waters in Iowa continue to increase? A state's Section 303(d) list of impaired waters is, in part, an accumulation of impairments identified in past listing cycles. In general, impairments are identified faster than impairments are removed through the TMDL process or due to water quality improvement. Thus, the number of waters on state lists tends to increase over time. Also, as more state waters are monitored over time, the number of impairments continues to increase. While states can easily add new impairments, U.S. EPA carefully scrutinizes any state proposal to remove (de-list) an impairment from a Section 303(d) list and sometimes rejects state recommendations for de-listing. Also, many impairments (for example, those due to bacteria and many biological impairments) are related to nonpoint sources of pollution (NPS). Unless a state has authority to reduce levels of nonpoint source pollution, the NPS-related impairments will likely continue to reside on the state's list of impaired waters.

Why is the number of impaired waters on the 2012 list similar to that on the 2010 list? The number of impaired waters on Iowa's draft 2012 Section 303(d) list (480) is nearly identical to the number on Iowa's final/approved 2010 list (474). This similarity is due primarily to the lack of any significant changes to the *Iowa Water Quality Standards* or to monitoring networks over the last few years that would impact the Section 303(d) listing process. Also, a relatively large number of waters (95) were removed (de-listed) from the 2010 list (see Figure 4).

What are the most common causes of impairment in Iowa waters?

Rivers and Streams: Rivers and streams have different types of water quality impacts than do lakes and reservoirs. This difference is related primarily to the nature of flowing versus standing waters. The most commonly-identified impairment in streams and rivers—by far—is a level of indicator bacteria that exceeds Iowa's water quality standard to protect water contact recreational uses such as swimming. The indicator bacterium used by Iowa and many states to determine the suitability of waters for recreational use is *Escherichia coli (E. coli)*. This species of bacteria typically does not cause disease, is ubiquitous in the environment, and is easily measured in the laboratory, thus making an excellent environmental indicator. Despite the generally high levels of *E. coli* in Iowa's streams and rivers, reports of waterborne disease and illness are extremely rare. The second-most identified impairment is related

to biological impacts identified in streams and rivers. Iowa DNR has developed a detailed method for sampling and assessing the biological health of Iowa streams through monitoring fish and aquatic macroinvertebrate communities. Because Iowa's streams and rivers have naturally-occurring differences in biological communities across the state, the expectations for biological health, also called "biotic integrity", vary from one region of Iowa to the next. Other types of biological impacts include declines in diversity of Iowa's freshwater mussel communities and include impacts due to fish kills. The decline of our native freshwater mussels is a widespread problem but is especially severe in Iowa. Comparisons of recent mussel surveys to historic surveys have shown general and sometimes dramatic reductions in the diversity of Iowa's freshwater mussel communities. Pollutant-caused fish kills are also a commonly-identified cause of impairment in Iowa streams. As shown in Figure 2, most fish kill impairments are related to spills of animal waste that reach streams.

Figure 1. Number of river & stream impairments identified in Iowa's 2012 Integrated Report (Categories 4 & 5)

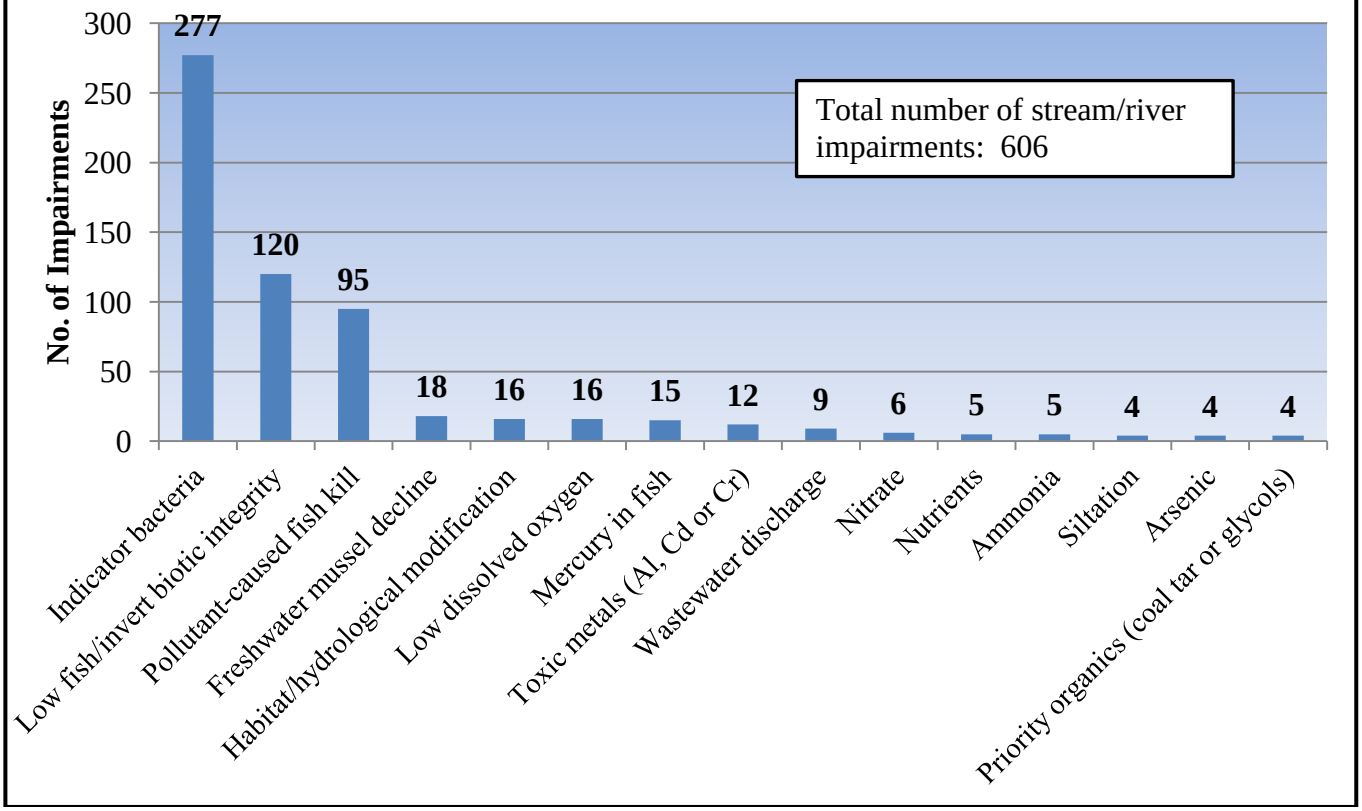
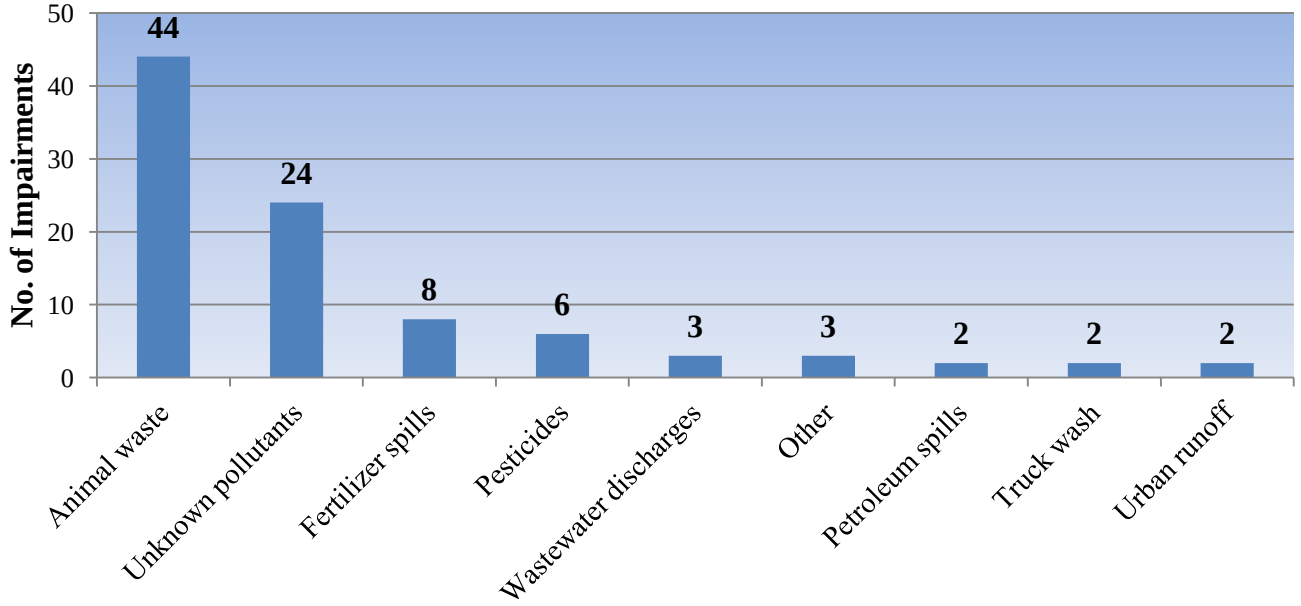
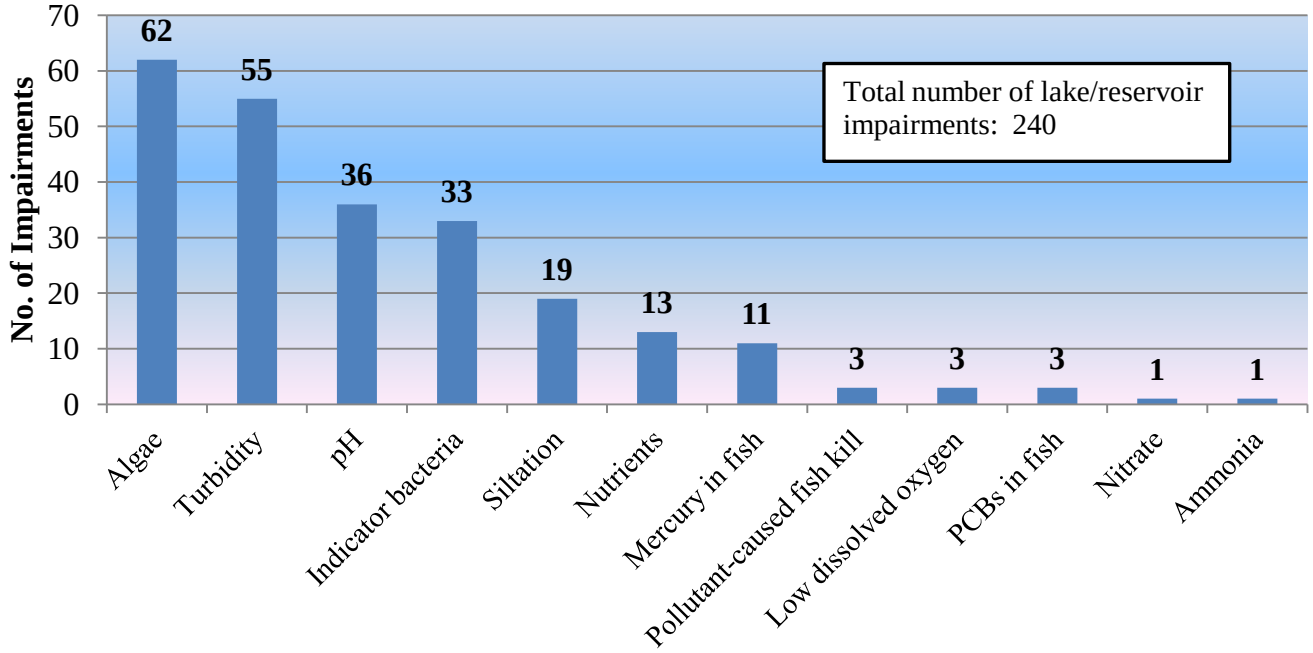


Figure 2. Causes of fish kills identified for Iowa's 2012 Integrated Report (Categories 4 & 5).



Lakes: Impairments identified at Iowa lakes are most often related to problems with water clarity. The closely-related impacts of algae suspended in the water column and turbidity caused by non-algal particles (such as lake sediments suspended in the water column) account for almost half of the 240 lake impairments identified (Figure 3). A high level of algae in the water column is a common problem for Iowa's nutrient-rich lakes. Shallower lakes tend to suffer more from this problem than do deeper lakes due to the tendency for plant nutrients to continually recycle from lake sediments to surface water during summer. The tendency for deeper temperate zone lakes to thermally stratify in summer helps isolate nutrient-rich water near the bottom of the lake and prevents these nutrients from circulating to the lakes surface and stimulating excessive growths of algae. Thus, water clarity of these deeper lakes is improved. High levels of algae in the water column are a direct cause of the third-most commonly identified cause of lake impairment: pH. As plants grow, they use carbon dioxide and water to produce energy (carbohydrates) and oxygen via photosynthesis. In a lake during midday, as algae photosynthesize and consume the available carbon dioxide in the water column, the pH tends to rise and sometimes rises above the Iowa water quality standard of 9.0 pH units. When this happens, a pH impairment can be identified. The fourth most commonly identified lake impairment is due to high levels of indicator bacteria at lake beaches. In general, however, levels of indicator bacteria in lakes tend to be much lower than in Iowa streams and rivers, thus the number of lake bacteria impairments is lower. And to reiterate: although levels of indicator bacteria often exceed state water quality criteria for protection of water contact recreation, indicator bacteria are typically non-pathogenic, and incidents of waterborne disease in Iowa are extremely rare. The number of impairments due to siltation and nutrients is relatively low due to the lack of water quality standards for these parameters. The existing nutrient/siltation impairments for Iowa lakes were identified in the late 1990s for Iowa's first list of impaired waters when best professional judgment was used to identify impairments. Today, identification of an impairment due to algae implies a nutrient impairment as well.

Figure 3. Number of lake & flood control reservoir impairments in Iowa's 2102 Integrated Report (Categories 4 & 5).



Removal of impairments: According to U.S. EPA regulations, impairments can only be removed from a state list for specific reasons, including (1) more recent data showing that the impairment no longer exists, (2) discovery of an error in the data or rationale for the original listing, and (3) preparation and approval of a total maximum daily load (TMDL) that identifies sources of pollutant loadings and reductions in loadings necessary to fully attain applicable water quality standards. Ninety-five impairments were removed from the 2010 list (de-listed) due to one of the following reasons: new data, preparation of TMDLs, receiving restitution for costs of fish kills, and changes in Iowa's assessment/listing methodology (Figure 4). A primary mechanism for removing waters from Iowa's list of impaired waters has been preparation of TMDLs. Category 4a of Iowa's 2012 Integrated Report consists of 127 impairments that were previously on Iowa's lists of impaired waters (IR Category 5) but that now have TMDLs approved for their impairments. While 34 impairments were removed from the 2010 list due to preparation and approval of a TMDL, a total of 45 impairments were removed due to new data showing improvement in either chemical or biological aspects of water quality. Twenty-nine chemical/bacterial impairments were removed with most removals due to lower levels of indicator bacteria and improved pH levels (Figure 5). The number of these impairments removed, however, typically represented a small percentage of the total number of such impairments. An exception, however, was the removal of the remaining two impairments for atrazine at Iowa water supply reservoirs. Sixteen biological impairments were removed due either to improved biotic integrity of fish/aquatic macroinvertebrate communities, recovery of freshwater mussel populations, or due to recovery from impacts of fish kills. Despite the improvements in chemical, bacterial, and biological water quality, and despite the ever-increasing number of impaired waters in Iowa, review of recent (2008-10) monitoring data for Iowa's surface waters suggests neither general improvement nor decline in the status of water quality statewide.

Figure 4. Rationales for removal (de-listing) of 95 waters that were on Iowa's previous (2010) list of impaired waters.

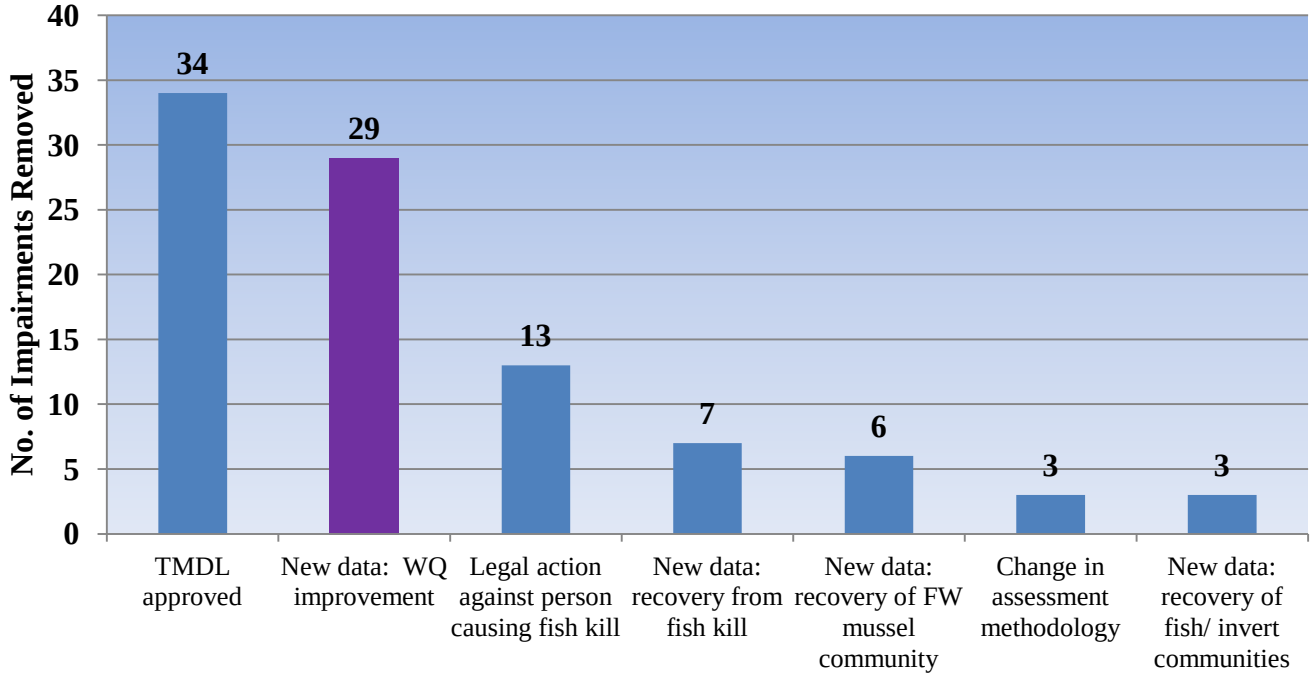
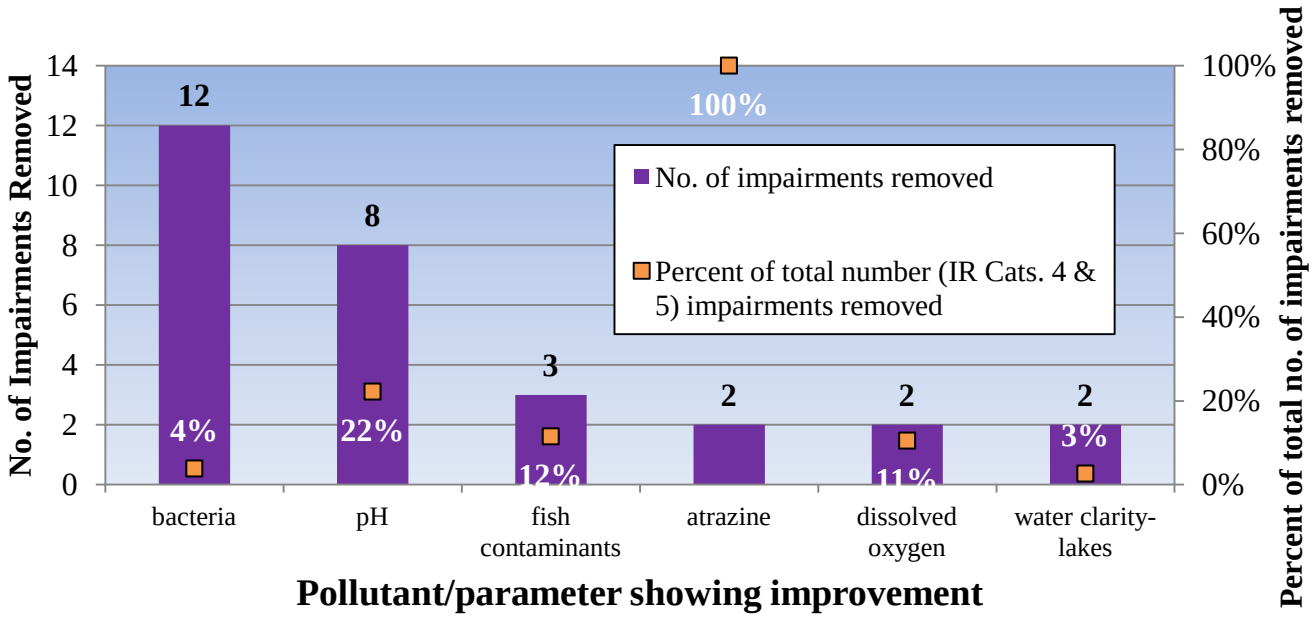


Figure 5. Details of the 29 impairments removed from Iowa's previous (2010) impaired waters list due to new data showing water quality improvement.



The Status of Water Quality in Iowa: Based on the 1,200-plus water quality assessments developed for the 2012 Integrated Reporting cycle, and based on the water quality goals identified in the Iowa Water Quality Standards, about 55% of the assessed stream/river waterbodies and about 60 % of the assessed lakes were placed in the impaired category. A little less than one-quarter of the stream/river waterbodies and just over one-third of the assessed lakes

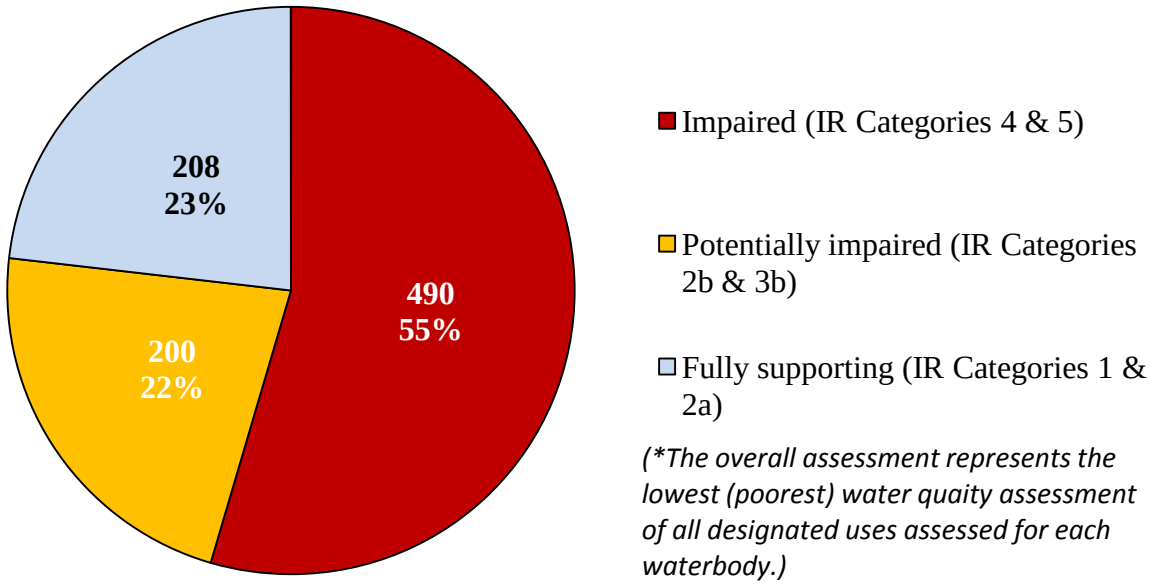
lack any impairments and show good water quality (Table 3; Figures 6 and 7). The remainder of the assessed streams, rivers, and lakes are in the potentially impaired category, thus indicating that more information is needed to determine whether the waterbody meets, or does not meet, the beneficial uses (such as water contact recreation and aquatic life uses) for which the waterbody is designated. These results are similar to those from previous Integrated Reporting cycles: there is no indication from the Clean Water Act Section 305(b) assessment process that water quality in Iowa is either improving or getting worse. Rather, this assessment process suggests general stability in water quality over the last decade.

Table 3. Summary of the assessed lake and stream/river waterbodies for Iowa's 2012 305(b)/303(d) cycle according to general water quality condition (good, potentially impaired, impaired). Note: each assessed waterbody may have more than one impairment.

Waterbody Type	Number assessed:	Good water quality: Categories 1 & 2a:	Potentially impaired: Categories 2b and 3b (WINOFI):	Impaired: Categories 4 & 5:
Streams and Rivers	901	208 (23%)	200 (23%)	490 (55%)
Lakes and Flood Control reservoirs	201	67 (34%)	16 (8%)	117 (58%)

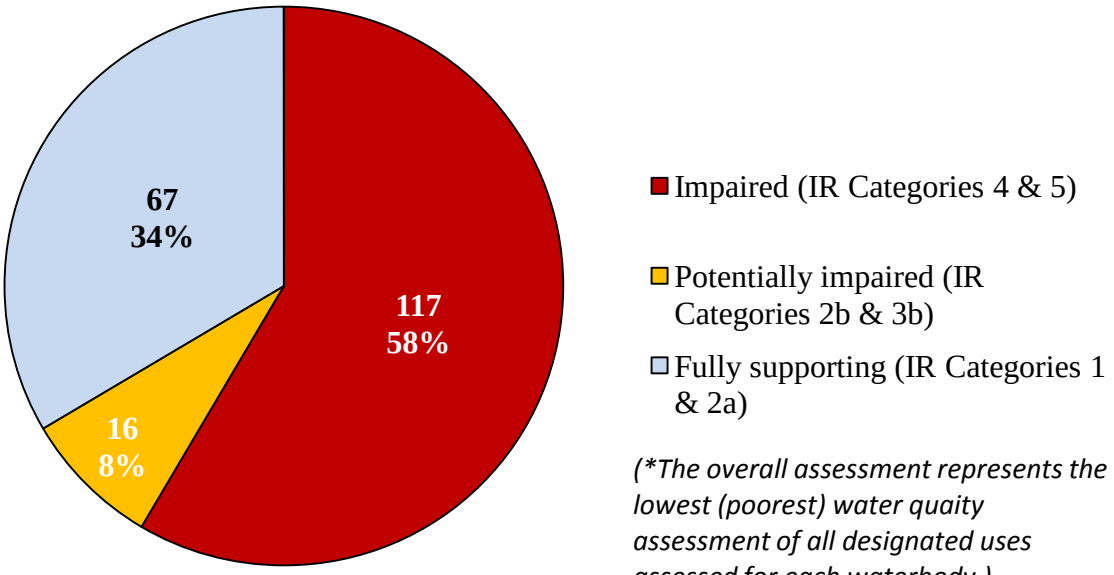
While the percentage of impaired waters appears unacceptably high (over 50%), these results must be interpreted in the context of what a Clean Water Act Section 303(d) impairment means. Although the existing water quality information has clearly indicated the existence of water quality impairment, the majority of Iowa's water quality impairments are in the slight to moderate categories. Streams, rivers, and lakes with slight to moderate impairments can, and do, continue to support their beneficial uses for water contact recreation, aquatic life support, and other uses, although at times at a reduced level. Severe impairments do, however continue to occur. For example, while levels of indicator bacteria just above the water quality standard are cause for concern, levels 10 times or 100 times the standard indicate a severe impact to the affected waterbody. Also, several of Iowa's lakes continue to have exceptionally high levels of algae during summer recreation seasons such that water contact recreational uses and fishing uses are often precluded. It is these waters with severe water quality impacts that Iowa DNR identifies as high priorities for preparation of a water quality improvement plan (a TMDL).

Figure 6. Summary of of water quality assessments* of <u>stream/river</u> waterbodies for Iowa's 2012 Integrated Report.



*(*The overall assessment represents the lowest (poorest) water quaity assessment of all designated uses assessed for each waterbody.)*

Figure 7. Summary of water quality assessments* of <u>lake/ flood control reservoir</u> waterbodies for Iowa's 2012 Integrated Report.



*(*The overall assessment represents the lowest (poorest) water quaity assessment of all designated uses assessed for each waterbody.)*

Web links:

- EPA guidelines for 2012 Integrated Reporting : http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/guidance.cfm#reporting.
- ADBNet: Iowa's Section 305(b) assessment database: http://programs.iowadnr.gov/adbnet/index.aspx.
- Iowa Water Quality Standards: https://www.legis.iowa.gov/DOCS/ACO/IAC/LINC/Chapter.567.61.pdf.
- The federal Clean Water Act: http://www.epw.senate.gov/water.pdf