# *1998 Volume I Addendum:*

## *Updated Aquatic Life Use Statistics*

*1998*


*Division of Surface Water*
*Monitoring & Assessment Section*

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# 1998 Ohio Water Resource Inventory:
## Addendum to 1996 Volume 1:
## Updated Statistics

Ohio EPA Technical Bulletin MAS/1998-6-2

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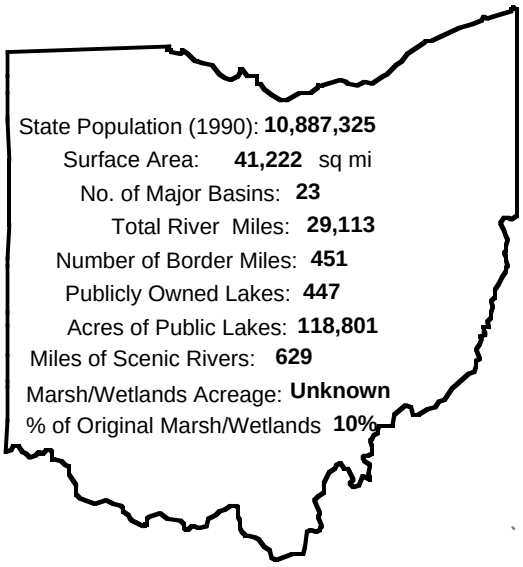
## *Introduction*

This document is a statistical addendum to the Ohio 1996 Water Resource Inventory, also know as the Ohio 305(b) report. The two years since the 1996 report do not warrant a full update to the 1996 report. This addendum provides statistical tables that have changed with the addition of the 1995 and 1996 water year data into our databases. In addition, much of the data collected in the 1980's is now too dated to be include as "monitored" level data (i.e., current) and has been eliminated from the statewide statistics (this data is still essential for trend analysis and is kept in our electronic databases, see trend section). The bulk of this addendum is the waterbody-specific summaries that contain the 1995-1996 data (Appendix A). An electronic copy of the Appendix A that includes all waterbodies where assessments are still considered current will be available in electronic (Adobe Acrobat pdf) form on Ohio EPA's web site (see cover).




This addendum also marks the beginning of a series of technical fact sheets that will report on many of the aspects of water resource integrity in Ohio that were previously covered in the large 305(b) report volumes. The advantage of these fact sheets is that they can focus on areas of specific concern in Ohio and can be prepared on a flexible schedule. These fact sheets will use the data generated for the 305(b) process and stored in the "Waterbody System" databases (WBS) and other baseline information in Ohio EPA ecological databases (OhioECOS). Three fact sheets are attached to this addendum and two more will be completed soon (recreation use support and tissue contamination) and more will be completed between now and the completion of another statewide summary in 2001.

The major conclusions of the 1996 report still stand. Several major differences include:

- Overall aquatic life use attainment, based on data for all years considered current, is now at 53.25% of streams and rivers; the most recent two years of data (collected in 1995 and 1996), termed the 1998 assessment cycle, is at 57.8% of streams and rivers.
- This is slightly greater than predicted (predicted = 57.0%) based on our forecast analyses from 1996.
- The predicted attainment status for the water year 2000 is 66.1%, slightly higher than the 65.6% prediction from the 1996 report.
- Habitat destruction is now the number one major cause of aquatic life impairment in Ohio streams and rivers, overtaking organic enrichment and dissolved oxygen impacts (which largely track point source impacts or severe nonpoint enrichment).
- Hydromodification is now the single major source of impairment to streams and rivers, overtaking point sources as reported in the 1996 report.

Although Ohio is making progress towards its goal of 75% attainment of aquatic life uses, our analyses (see trend fact sheet) identify habitat destruction and siltation, especially in smaller streams, as likely to preclude achievement of this goal.

***Plan to Achieve a Comprehensive Assessment***

Streams and Rivers

The magnitude of Ohio's stream and river monitoring program has been sufficient to provide a robust estimate of the aquatic life attainment status at a statewide scale for most streams and rivers. A preliminary comparison between a probabilistic sampling regime (from the Eastern Corn Belt Ecoregion EMAP study) and our intensive survey design indicated similar estimates of attainment and impairment. Random recombinations of 305(b) data based on our intensive survey data has shown that the variability of attainment estimates was linearly related to total miles sampled over the range of miles we have monitored, unlike probabilistic designs that commonly show a asymptotic relation with effort. Thus, the variability in estimates from intensive designs increases in a linear fashion as miles monitored declines. In other words the reliability of these estimates is dependent on a robust sample size. We have unfortunately had a loss of 2 FTEs in 1998, thus, the variability about our

estimate of attainment status may increase somewhat in future 305(b) cycles. The amount of variability can also be affected by deviations from our five year monitoring approach (see trend fact sheet).

Dr. Dale White of our GIS staff in the Division of Surface Water has a grant to develop a model of riparian vegetation, upland vegetation, and other landscape and environmental elements with the IBI and ICI as response variables. One potential use of a successful model would be a way to extrapolate our estimate of limiting stream stressors in waters and watersheds where we have little ambient data. Such models would also be useful in planning abatement strategies for watersheds.

The use of place-specific biosurvey and water quality data by a wide variety of programs at Ohio EPA (see Figure 1) precludes us from shifting to a purely probabilistic monitoring approach. Nevertheless, we may investigate the use of some probabilistic sampling in small streams in our five-year basin survey approach. Depending on the particular situation, this may include biosurvey data or may be limited to sampling of a particular stressor. For example, hydromodification is now the number one major source of impairment of aquatic life. Thus, we may use a probabilistic approach to measuring habitat quality (e.g., QHEI, CQHEI) in small streams in a watershed to identify, in a fairly comprehensive manner, sub-watersheds where habitat degradation is of most concern. Such an effort may be tested in two watersheds during the upcoming field season that are TMDL priority watersheds (the Sugar Creek watershed of the Tuscarawas River and the upper Little Miami River watershed).

Lake Erie and its Lacustuaries

Ongoing development of biocriteria for Lake Erie and its Lacustuaries will finally allow to complete a fairly intensive baseline estimate of the ecological condition of these areas. At this time however there is no ongoing funding to specifically monitor these areas. These waters will be monitored as the need arises through our five

year basin approach. A summary of the status of these waters is expected by the end of 1998.

Lakes, Ponds, and Reservoirs

A decline in Clean Lake funding has resulted in our small lake sampling program, about 20 lakes per year, declining to ten or fewer lakes per year.

Wetlands

Ohio is now in the process of developing biocriteria for wetlands in the State based on plants, amphibians, and macroinvertebrates. No source of funding has yet been identified, however, to establish and ongoing monitoring program.

Aquatic Life Use Attainment Statistics

The following pages summarize the aquatic life attainment statistics for Ohio.

# Aquatic Life Use Statistics

The following pages summarize aquatic life use statistics for Ohio's streams and rivers. Please refer to the fact sheets later in the document and the 1996 305(b) report for more detail on how these statistics were derived.

*Table 3-1. Aquatic life use attainment in Ohio streams and rivers based on our entire data base (1988 through 1998 assessment cycles), the post-1988 assessment cycles, and the individual 1988, 1990, 1992, 1994 , 1996 and 1998 assessment cycles. Data Represent monitored and evaluated level data , except for the combined 1988-1996 cycles and the post-1988 data (1990-1996 cycles) where only monitored level data was used to exclude older, less pertinent data from combined statistics.*

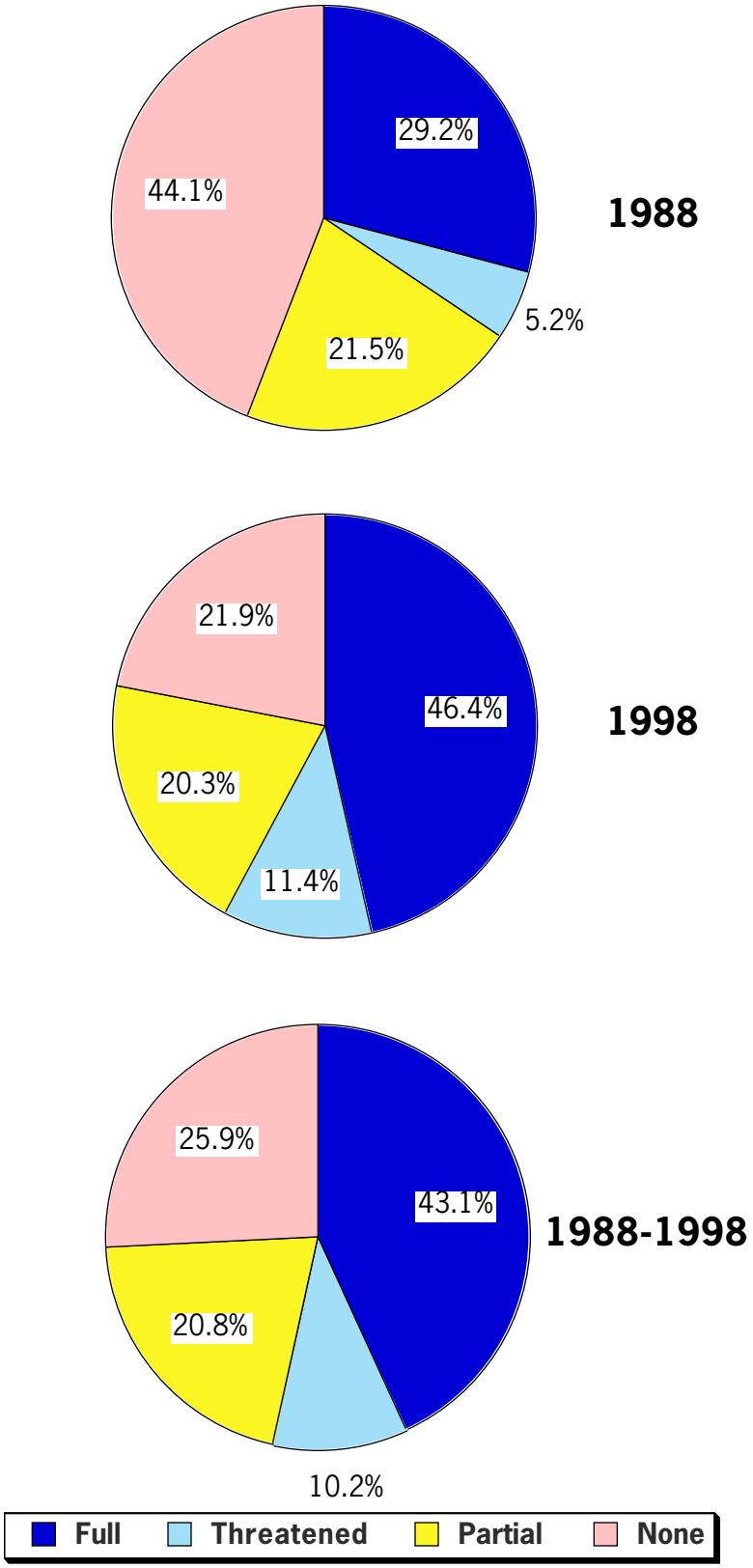
| Year(s) | Fully Supporting | Fully Threatened | Partially Supporting | Not Supporting | Total Miles Monitored |
|---|---|---|---|---|---|
| *1988-1998 Assessment Cycles - Monitored Level Data* | | | | | |
| Miles | 2,846.9 | 669.6 | 1375.2 | 1,711.4 | 6,603.2 |
| Percent | 43.11% | 10.14% | 20.8% | 25.9% | |
| | | Total Full Support 53.25% | | Total Impaired 46.75% | |
| *1990-1998 Assessment Cycles - Monitored Level Data* | | | | | |
| Miles | 2,760.1 | 669.6 | 1,369.3 | 1673.1 | 6,472.2 |
| Percent | 42.6% | 10.3% | 21.2% | 25.9% | |
| | | Total Full Support 52.9% | | Total Impaired 47.1% | |
| *1988 Assessment Cycle - Monitored and Evaluated Level Data* | | | | | |
| Miles | 2,051.3 | 361.4 | 1,506.5 | 3,099.4 | 7,018.7 |
| Percent | 29.2% | 5.2% | 21.5% | 44.1% | |
| | | Total Full Support 34.4% | | Total Impaired 65.6% | |
| *1990 Assessment Cycle - Monitored and Evaluated Level Data* | | | | | |
| Miles | 214.7 | 157.8 | 241.6 | 356.5 | 970.7 |
| Percent | 22.1% | 16.3% | 24.8% | 36.8% | |
| | | Total Full Support 38.4% | | Total Impaired 61.6% | |
| *1992 Assessment Cycle - Monitored and Evaluated Level Data* | | | | | |
| Miles | 646.3 | 191.5 | 446.9 | 426.4 | 1,711.2 |
| Percent | 37.8% | 11.2% | 26.1% | 24.9% | |
| | | Total Full Support 49.0% | | Total Impaired 51.0% | |
| *1994 Assessment Cycle - Monitored and Evaluated Level Data* | | | | | |
| Miles | 554.9 | 206.6 | 458.4 | 453.5 | 1,673.6 |
| Percent | 33.2% | 12.3% | 27.4% | 27.1% | |
| | | Total Full Support 45.5% | | Total Impaired 54.5% | |
| *1996 Assessment Cycle - Monitored and Evaluated Level Data* | | | | | |
| Miles | 1008.3 | 266.8 | 425.8 | 734.4 | 2,435.5 |
| Percent | 41.4% | 10.9% | 17.5% | 30.2% | |
| | | Total Full Support 52.5% | | Total Impaired 47.4% | |
| *1998 Assessment Cycle - Monitored and Evaluated Level Data* | | | | | |
| Miles | 1402.9 | 343.6 | 614.2 | 662.4 | 3,023.1 |
| Percent | 46.4% | 11.4% | 20.3% | 21.9% | |
| | | Total Full Support 57.8% | | Total Impaired 42.2% | |

**Monitored Data: ("Current" Data)**

Data from waterbody segments from the most recent five water years (1990-1994) OR from waterbody segments considered not likely to have changed since last assessed.

**Evaluated Data: ("Old" Data)**

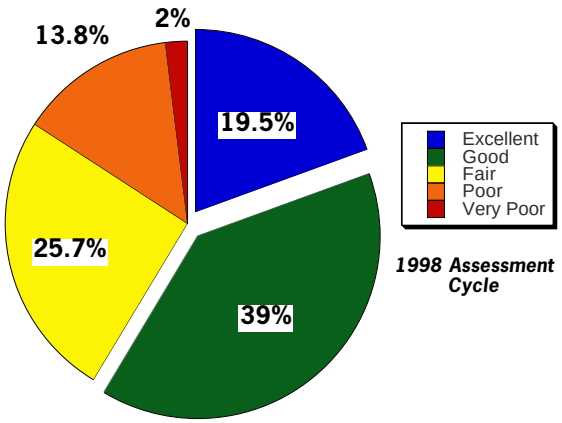
Data from waterbody segments from prior to the most recent five water years (pre-1990) OR from waterbody segments considered likely to have changed since last assessed.




Pie charts summarizing aquatic life use attainment from the 1988 cycle (top), from the 1998 cycle (middle), and from all current data (bottom).

Narrative Ranges of Ohio's Biocriteria

The 1998 cycle of the 305(b) marks the first cycle in which we report narrative ranges of biological integrity. Ohio has had narrative ratings that are matched to our aquatic life uses. ***Excellent*** scores indicate a high species richness and diversity of fish and macroinvertebrate assemblages and is associated with our EWH use designation. These streams typically harbor rare and endangered species and large populations of particular sport species such as smallmouth bass. ***Good*** scores indicate a well-balanced community of fish and macroinvertebrates comparable to reference sites for that stream size and ecoregion. ***Fair*** scores indicate that one or more organism group deviates moderately from reference conditions. Typically, this occurs through a loss of some sensitive species and/or shifts in trophic groups towards omnivorous species which are usually also more tolerant. ***Poor*** scores indicate situations where one or more organism groups deviates substantially from reference conditions. Such communities are characterized by few, tolerant species at low abundances. Where toxic impacts occur external anomalies (tumors, deformities, eroded fins, and lesions) may be high. ***Very Poor*** scores indicate a virtual absence of any semblance of a natural community. Fish, when they are present are typically tolerant and pioneering with few individuals.




*Narrative ranges describing aquatic life conditions (biological integrity) in Ohio streams during 1995 and 1996 (1998 assessment cycle). Where there were differences between organism groups or indices the most conservative category was used.*

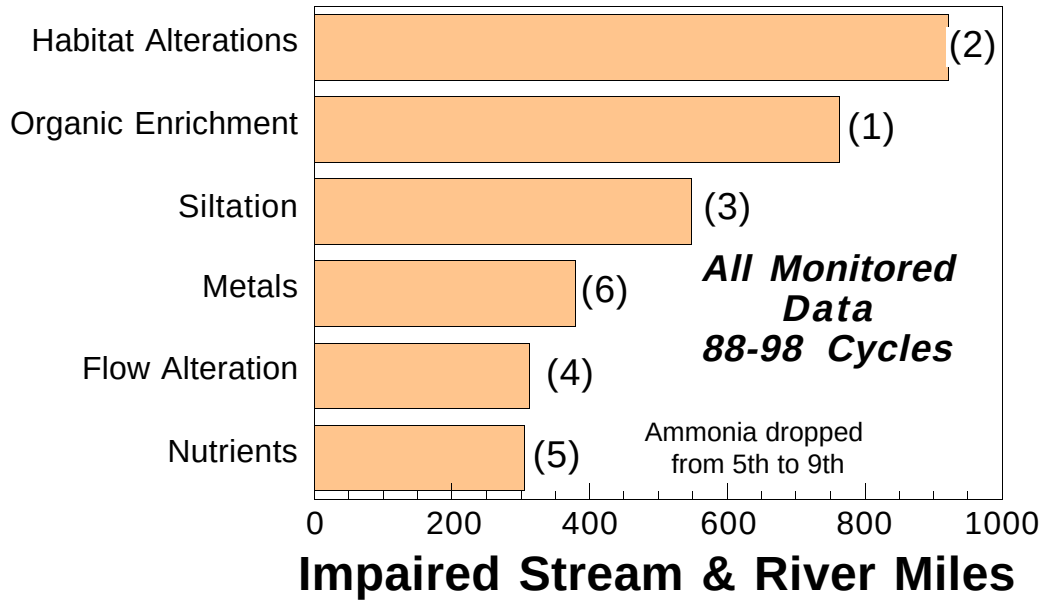
Only 2% of streams are classified as ***very poor***. Some have misinterpreted any impaired streams as being unable to support *any* aquatic life. The ***very poor*** category would be the only narrative category that might approximate such a condition.

Many streams with ***poor*** aquatic life, which describes about 13.8% of Ohio streams, are likely to be habitat degraded communities that may have high numbers of small, tolerant fish, but which by themselves do not reflect any significant human health risk. Some ***poor*** assemblages are found associated with more "toxic" conditions that may be associated with human health risks, however, these sources are diminishing across Ohio.

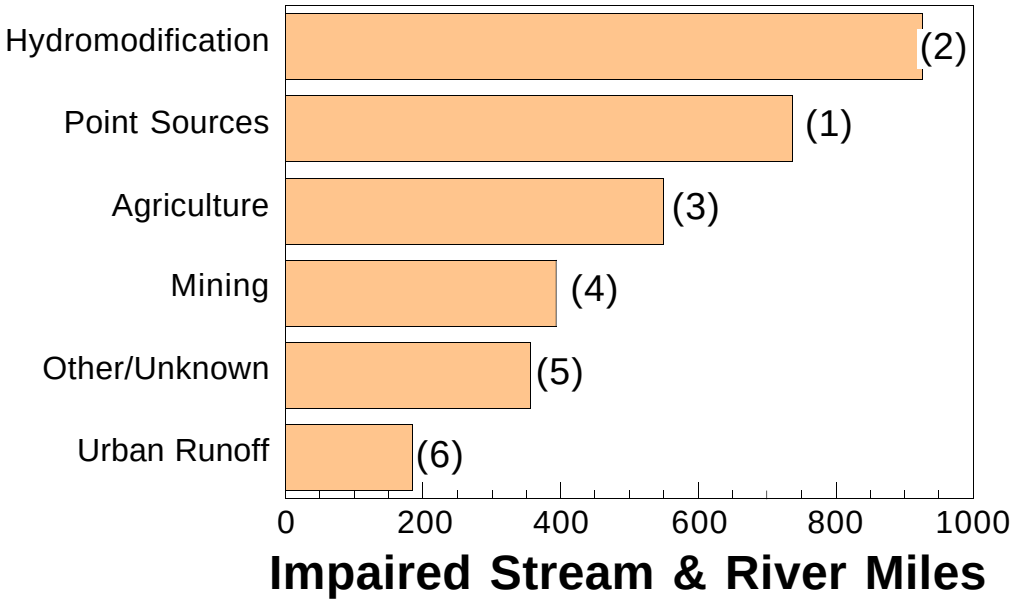
# Causes and Sources of Aquatic Life Impairment

The addition of the 1995 and 1996 water data into this report has resulted in the continuing shift from point source dominated impairments to impairments caused by nonpoint sources such as hydromodification, suburban/urban development and agriculture. Habitat related effects on aquatic life are now the number one cause and source of impairment. The six major causes and sources of impairment are illustrated on the next page, followed by tables of all causes and sources of impairment.

**Six Leading Causes of Aquatic Life Use Impairment**




**Six Leading Sources of Aquatic Life Use Impairment**




*Six leading causes (top) and sources (bottom) of aquatic life use impairment. Major causes or sources only, all data considered current 1988-1998 cycles.*

*Table 4-1. Relative assessment of major, moderate, and minor causes of impairment (i.e., miles[1]) that result in partial and non-attainment of aquatic life uses or threaten the current full attainment status of aquatic life uses in Ohio streams and rivers during the 1988 through 1998 305(b) report cycles. Data reflects monitored-level information only. Major, moderate, and minor impacts refer to the high, moderate, and slight magnitude codes specified by the U.S. EPA guidance for the 305(b) report.*

| | 1988-1998 305(b) Cycles | | | |
|---|---|---|---|---|
| Causes | Major Cause | Moderate Cause | Minor Cause | Threatened Use |
| Habitat Alterations | 922.1 | 280.2 | 73.9 | 235.0 |
| Org. Enrichment / D.O. | 762.7 | 192.6 | 101.1 | 99.4 |
| Siltation | 547.4 | 404.8 | 87.7 | 272.3 |
| Metals | 379.0 | 291.7 | 67.8 | 39.5 |
| Flow Alteration | 313.3 | 182.3 | 47.8 | 65.3 |
| Nutrients | 305.6 | 315.0 | 84.8 | 152.1 |
| Unknown | 260.1 | 83.8 | 52.4 | 17.9 |
| pH | 141.5 | 6.2 | 0.0 | 0.0 |
| Priority Organics | 125.8 | 100.3 | 56.4 | 11.9 |
| Ammonia | 115.8 | 25.4 | 15.4 | 2.1 |
| Pathogens | 63.4 | 55.3 | 17.9 | 39.9 |
| Suspended Solids | 49.5 | 41.3 | 25.4 | 5.6 |
| Oil & Grease | 36.5 | 37.0 | 5.7 | 2.0 |
| Salinity / TSD / Chlorides | 24.3 | 37.9 | 11.4 | 0.0 |
| Taste and Odor | 17.6 | 0.0 | 0.0 | 0.0 |
| Pesticides | 16.3 | 87.2 | 75.5 | 26.2 |
| Thermal Modifications | 16.6 | 0.1 | 0.0 | 19.5 |
| Total Toxics | 12.8 | 30.3 | 0.0 | 2.9 |
| Other Inorganics | 7.4 | 11.4 | 23.7 | 0.0 |
| Chlorine | 6.9 | 23.6 | 1.9 | 1.5 |
| Filling & Draining | 5.6 | 0.0 | 0.0 | 0.3 |
| Turbidity | 3.8 | 10.7 | 0.0 | 0.0 |
| Natural, Wetlands | 0.5 | 0.0 | 0.0 | 0.0 |
| Exotic Species | 0.0 | 11.5 | 0.0 | 0.0 |
| Nitrites | 1.2 | 31.4 | 0.0 | 0.0 |
| Radiation | 0.0 | 0.0 | 1.0 | 0.0 |
| Non-Priority Organics | 0.0 | 0.5 | 12.3 | 0.0 |

*Table 4-2. Relative assessment of major, moderate, and minor sources (i.e., miles[1]) which cause impairment of aquatic life uses in Ohio rivers and streams during the 1988 through 1998 305(b) report cycles. Data reflects monitored-level information only. Major, moderate, and minor impacts refer to the high, moderate, and slight magnitude codes specified by the U.S. EPA guidance for the 305(b) report.*

| Source | Major Source | Moderate Source | Minor Source | Threatens Use |
|---|---|---|---|---|
| POINT SOURCES | 737.1 | 294.4 | 83.5 | 154.7 |
| Industrial | 179.2 | 51.0 | 28.2 | 45.5 |
| Municipal | 515.4 | 228.5 | 53.6 | 133.3 |
| Combined Sewers | 246.6 | 39.5 | 9.4 | 0.9 |
| Domest. Wastewater Lagoon | 0.9 | 0.0 | 0.0 | 0.0 |
| AGRICULTURE | 549.9 | 446.4 | 124.3 | 143.8 |
| General Agriculture | 314.6 | 186.5 | 70.9 | 49.6 |
| Non-irrigated Crops | 165.6 | 185.3 | 40.0 | 60.5 |
| Irrigated Crops | 2.3 | 0.0 | 0.0 | 0.0 |
| Specialty Crops | 0.0 | 1.0 | 0.2 | 0.0 |
| Pasture Land | 61.0 | 11.0 | 6.3 | 14.8 |
| Range Land | 31.2 | 63.1 | 6.5 | 19.0 |
| Feedlots | 18.9 | 5.3 | 4.0 | 8.9 |
| Aquaculture | 0.0 | 5.3 | 0.0 | 0.0 |
| Animal Holding | 23.9 | 7.5 | 0.5 | 0.0 |
| Manure Lagoons | 16.7 | 0.0 | 0.0 | 0.0 |
| SILVICULTURE | 0.0 | 5.4 | 0.0 | 1.6 |
| Silviculture | 0.0 | 5.4 | 0.0 | 1.6 |
| CONSTRUCTION | 88.5 | 129.1 | 19.3 | 243.9 |
| General Construction | 4.8 | 9.5 | 0.0 | 17.5 |
| Highway Constr. | 14.2 | 18.9 | 7.5 | 31.3 |
| Sewer Line Construction | 66.0 | 109.8 | 11.8 | 214.7 |
| Other Constuction | 5.5 | 0.0 | 0.0 | 5.0 |
| URBAN RUNOFF / STORM SEWERS (NPS) | 185.7 | 259.9 | 62.0 | 32.6 |
| Urban Runoff / Storm Sewers | 156.5 | 172.5 | 38.9 | 30.5 |
| Industrial Permitted | 8.3 | 13.2 | 0.0 | 0.0 |
| Surface Runoff | 36.0 | 73.4 | 23.1 | 2.1 |
| RESOURCE EXTRACTION | 393.2 | 30.4 | 19.9 | 43.4 |
| General Mining | 43.6 | 0.0 | 7.5 | 0.0 |
| Surface Mining | 202.5 | 0.0 | 0.0 | 33.6 |
| Subsurface Mining | 14.0 | 13.2 | 8.5 | 0.0 |
| Dredge Mining | 0.0 | 0.0 | 0.0 | 3.5 |
| Petroleum Activities | 2.1 | 5.1 | 3.0 | 7.0 |
| Mine Tailing | 13.7 | 0.0 | 0.9 | 6.3 |
| Acid Mine Drainage | 139.0 | 12.1 | 0.0 | 0.0 |
| LAND DISPOSAL | 98.6 | 112.7 | 72.7 | 62.3 |
| Land Disposal | 3.8 | 9.2 | 0.0 | 0.3 |
| Sludge Disposal | 3.2 | 0.0 | 1.0 | 0.0 |
| Wastewater Disposal | 3.8 | 0.0 | 0.0 | 0.0 |
| Landfills | 37.8 | 27.3 | 5.9 | 7.5 |
| Septic Tanks | 49.5 | 87.7 | 56.7 | 54.5 |
| Hazardous Waste | 4.3 | 0.0 | 9.1 | 0.0 |

| | | | | |
|---|---|---|---|---|
| HYDROMODIFICATION | 926.5 | 488.5 | 90.3 | 210.3 |
| General Hydromodification | 82.8 | 102.4 | 15.5 | 11.3 |
| Channelization | 583.2 | 236.1 | 26.6 | 48.9 |
| Dredging | 21.2 | 27.4 | 0.5 | 5.0 |
| Dam Construction | 76.0 | 29.4 | 4.6 | 24.2 |
| Flow Regulation | 57.5 | 31.3 | 16.9 | 10.6 |
| Bridge Construction | 38.2 | 20.3 | 0.0 | 0.0 |
| Riparian Destruction | 121.7 | 110.7 | 14.0 | 126.0 |
| Streambank Disturb. | 124.8 | 117.1 | 13.8 | 37.8 |
| Draining / Filling | 4.6 | 5.2 | 0.0 | 0.0 |
| OTHER | 240.6 | 234.8 | 114.5 | 42.1 |
| Marina(s) | 2.0 | 1.0 | 0.0 | 0.0 |
| Misc. | 8.3 | 0.2 | 0.0 | 0.0 |
| Atmos. Deposition | 0.0 | 2.2 | 0.0 | 0.0 |
| Waste Storage | 3.8 | 2.2 | 0.0 | 2.1 |
| Highway maintenance | 2.6 | 14.4 | 1.4 | 6.0 |
| Spills | 60.0 | 78.4 | 45.4 | 6.0 |
| In-place contaminants | 25.0 | 87.6 | 17.7 | 7.6 |
| Natural Conditions | 130.2 | 58.5 | 50.8 | 11.4 |
| Recreational Activities | 0.0 | 9.6 | 0.0 | 1.5 |
| Upstream Impoundment | 19.4 | 0.0 | 0.0 | 7.5 |
| SOURCE UNKNOWN | 128.0 | 27.2 | 45.6 | 11.4 |

[1] Miles counted total more than total miles assessed because more than one source can be major, moderate, or minor in the same segment.

# *Ohio EPA - Ecological Assessment Unit Technical Fact Sheets:*

| Number | Title |
|---|---|
| FS-8-MAS-98 | The State of the Aquatic Ecosystem: Ohio Rivers and Streams - 1998 Status. |
| FS-9-MAS-98 | The State of the Aquatic Ecosystem: Ohio Rivers and Streams - Forecast Analysis. |
| FS-10-MAS-98 | The State of the Aquatic Ecosystem: Ohio Rivers and Streams - Causes and Sources of Impairment. |

# The State of the Aquatic Ecosystem:

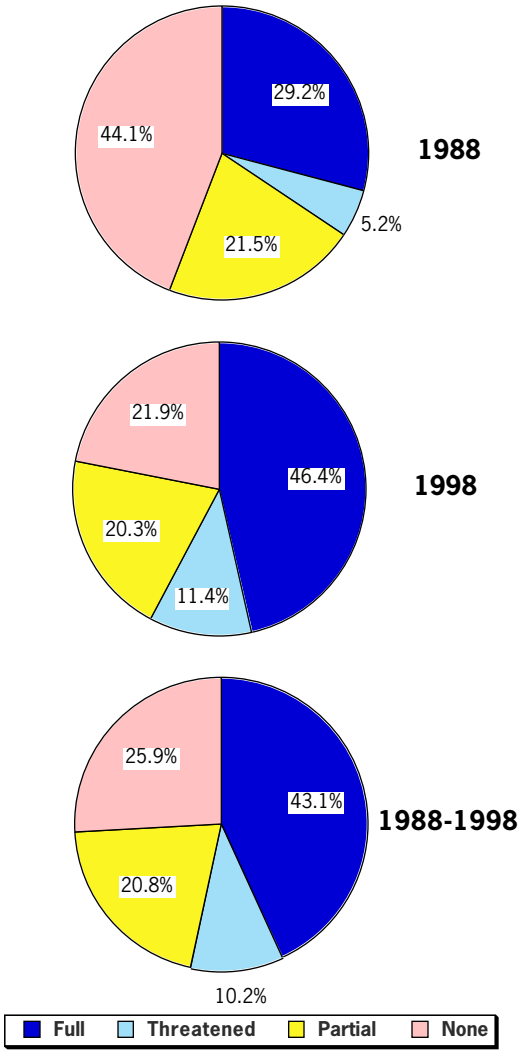
# Ohio Rivers & Streams:

## 1998 Status

Ohio is a water-rich state with more than 25,000 miles of named and designated streams and rivers and a 451-mile border on the Ohio River. The suitability of these waters to support human uses (e.g., recreation and drinking water) and to maintain healthy ecological conditions or "biological integrity" is critical to the sustainable future of Ohio's economy and standard of living.

Ohio uses the fish and invertebrate communities that inhabit streams to assess the health and well-being of Ohio's flowing waters. Aquatic animals are generally the most sensitive indicators of pollution because they inhabit the water all of the time and because of the direct contact of their gills with the water. A healthy stream community is also associated with high quality recreational opportunities (e.g., fishing and otheroutdoor-related activities).

Ohio's short-term goal is for 75% of the stream and river miles to fully attain the applicable aquatic life standards

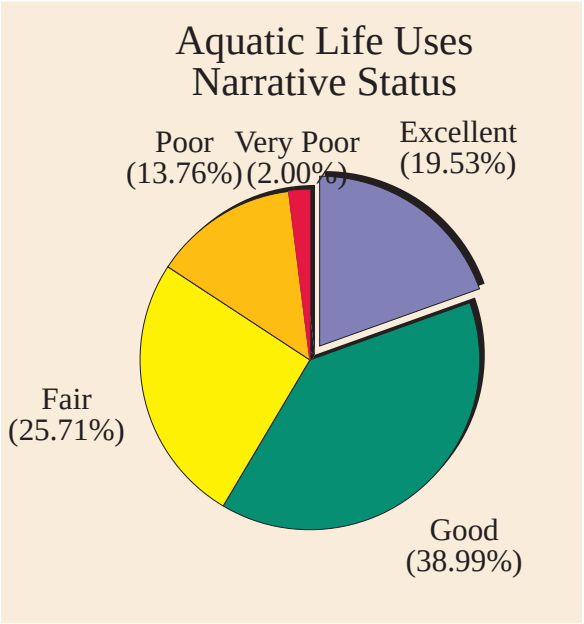



(called "uses") by the year 2000. The most recent Ohio Water Resource Inventory statisics reported here indicate that 52.3% of streams and rivers were fully supporting the applicable aquatic life "uses." This means that more than one-half of Ohio's streams, other than a small proportion of waters maintained as ditches or other physically limited waters, and rivers harbor good or exceptional quality fish and/or aquatic invertebrate assemblages. Statistics of aquatic life use attainment for the most recent two-year cycle (1998 cycle representing data collected in 1995-96) were at 57.8%, continuing a restoration trend of a little over 2 % per year.

In addition to estimating miles meeting aquatic life use goals, in 1998 we categorized streams into narrative ranges of excellent, good, fair, poor, and very poor. For this anlysis, the most limiting biological index was used to determine the narrative range. For example if the fish were excellent, but the macroinvertebrates were good,

the reach was classified as good. One important conclusion based on these statistics is the very small proportion of streams categorized as poor or very poor (15.8% combined). Nearly sixty percent of waters are at least in good condition and of these almost 20% are in excellent condition. Non-attainment has been commonly, but erroneously considered to the equivalent of a "dead" stream. As summarized in the pie chart on the right, very few streams approximate such a state (2%, i.e., those classified as very poor).

Many of the 25.7% of streams that are in the fair range would be canidates for restoration along with some of the waters that rate as good, but that have the potential to be exceptional. For headwater streams habitat and related nonpoint causes such as siltation, nutrients and flow alteration dwarf other causes of impairment. Most small streams have had some direct modification to their morphology. The map of aquatic life attainment status on the next page reflects the regional magnitude of hydromodification across Ohio with most streams in the northwest part of the state remaining impaired after the effects of point sources were reduced between these time periods. A fact sheet on the causes and sources of impairment (FS10-MAS-98) describes these impacts in more detail.




The map on the next page does illustrates the great strides in point source abatement over the past 10-15 years in Ohio in many watersheds. The greatest improvement has occured in parts of the state (e.g., central Ohio) where habitat was intact enough for aquatic life to rebound when chemical stressors from discharges were reduced.

Ohio's list of impaired waters (see map on next page) and the causes and sources associated with the impariment will be the basis for planning a process for stream restoration over the next 10-15 years. Ohio's baseline monitoring program, if maintained, will provide a robust tool for determining whether abatement strategies are working and whether tax or private capital is being spent wisely. Without such a feedback loop there is a great opportunity for the inefficient application of abatement efforts and for the progress documented over the past 20 years to stagnate.

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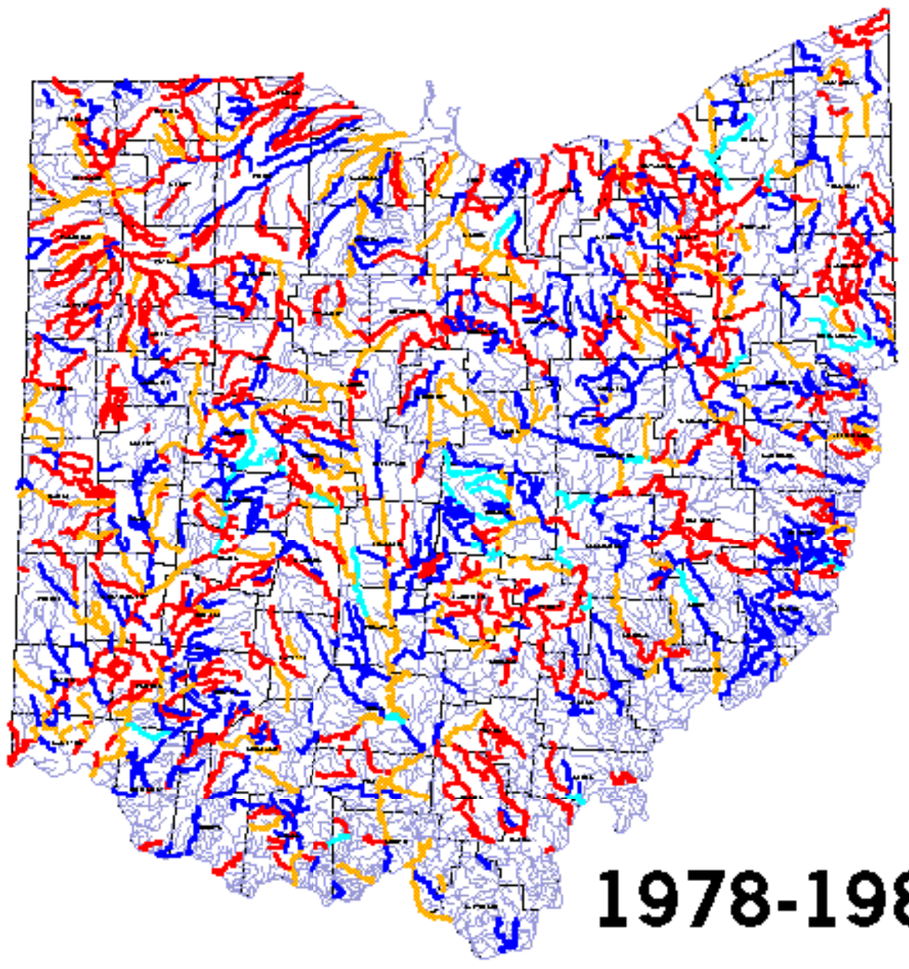
This and other publications are available on the Division of Surface Water Web Site:

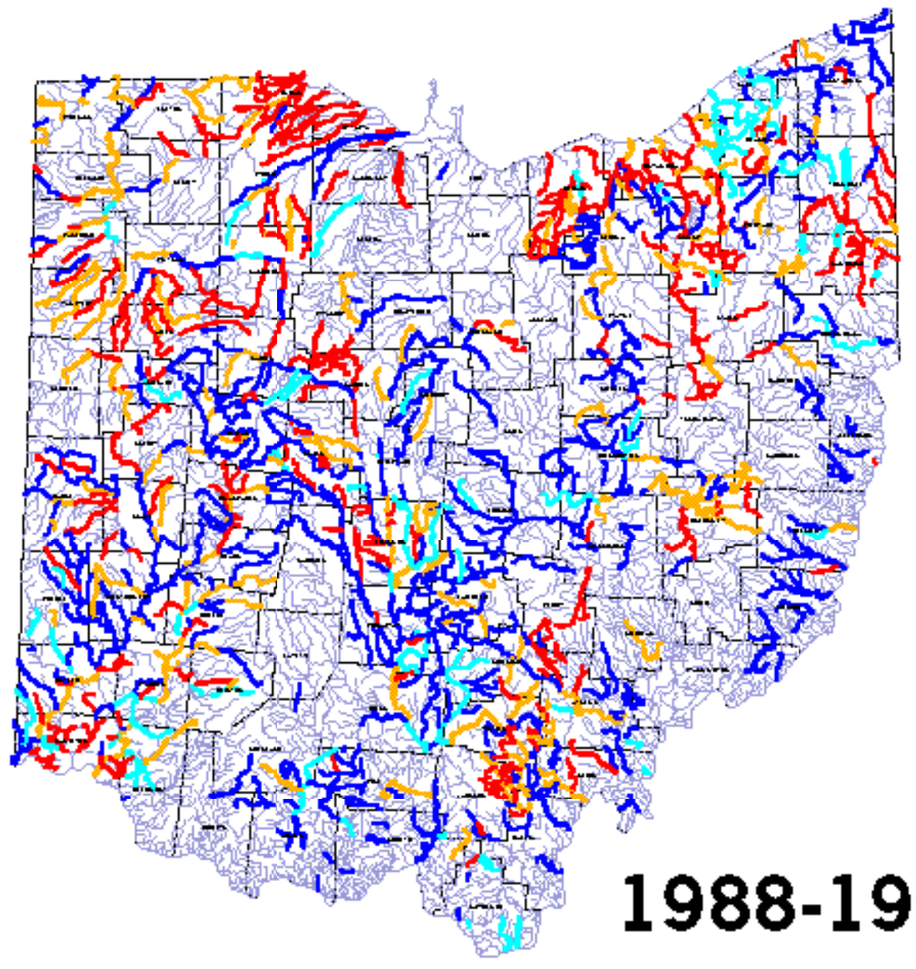
http://chagrin.epa.state.oh.us/

Rosyside dace - an inhabitat of high quality headwater streams in extreme south-central Ohio.

# Aquatic Life Use Attainment in Ohio



1978-1987



1988-1996

**Key:**

- Fully Attaining
- Fully Attaining, but Threatened
- Partially Attaining
- Not Attaining
- Not Assessed


Ohio EPA has been collecting ecological data on the status of its aquatic communities (fish and macroinvertebrate communities) for 20 years. Each warmwater stream in Ohio has one of four aquatic life use goals ("biocriteria") that varies with the ecological potential of that waterway. Biosurvey data tracking achievement of these goals is detailed in the Ohio Water Resource Inventory (1996) and recent data summarized in this and other fact sheets.

A large number of Ohio stream and river segments have been reassessed since point source pollution controls have been implemented to meet water quality standards. One benefit of the monitoring approach employed by Ohio EPA is the ability to forecast water quality changes into the future. A major challenge facing the Ohio EPA water programs is the goal of achieving full support of aquatic life uses in 75% of Ohio's streams and rivers by the year 2000. In order to determine if existing programs are likely to achieve this goal, we must attempt to look forward based on past observation. The current rate of improvement, projected from reassessment results observed between 1988 and 1998 (Fig 1 below), is an accumulating addition of approximately 2.2%percent of restored miles per year (90% Confidence Interval: 0.9-3.8%/year). This rate is largely the product of point source abatement efforts that are now declining in prevalence). Based on the current and projected rate of restoration, 66.1% of streams and rivers monitored in the preceding two-year cycle will be fully supporting their aquatic life uses by the water year 2000 (Assessment cycle 2002). Clearly, there is a gap between the 75% goal and the projected figures.

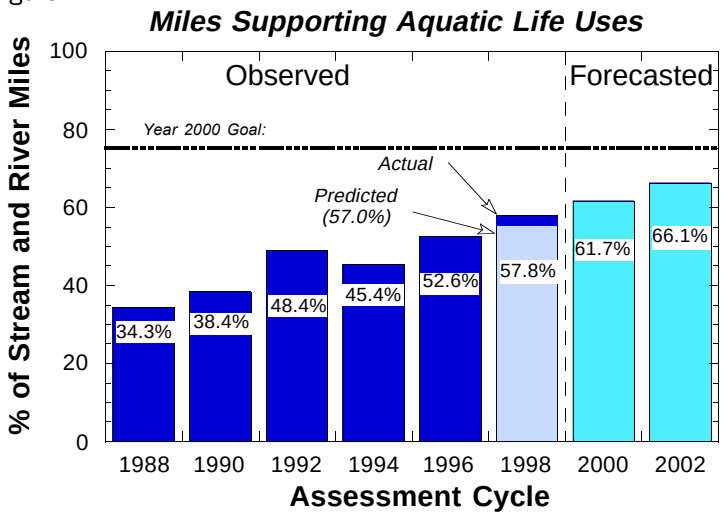
| Ohio 2000 Goals: | |
|---|---|
| **Aquatic Life Uses** | |
| Goal: | 75% |
| Forecast: | 66.1% |
| 1998 Cycle:[1] | 57.8% |

[1] **(95/96 Water Years)**

## Future Actions

A strategy to reach the 75% goal needs to address those causes and sources of impairment that are limiting aquatic life. Point

Figure 1.



sources are dwindling in prevalence (Fig 2). Restored stream miles in the most recent cycle (1998) reflect abatement of point source controls implemented five or more years ago. To reach the 75% goal, there needs to be a shift towards restoring streams limited by nonpoint sources of impairment and to protect streams that are threatened by such sources.

Most of the threats to aquatic life are habitat or runoff related and are associated with suburban development, encroachment on riparian areas or hydromodifications. Existing efforts to control polluted runoff and to restore and protect habitats need to be supported and expanded to achieve the 75% goal. For example, ODNR is currently revisiting its Nonpoint Source Management Strategy in light of the statistics reported in Ohio's Water Resource Inventory and has a series of cross-agency workgroups dealing with important issues (e.g., headwater streams).

Measureable goals need to be developed for restoration and protection efforts so that efforts will be focused and directed. For example, the U. S. Department of Agriculture has set a goal of establishing *two million* miles of stream buffers. In the Chesapeake Bay watershed a goal of resestablishment of 2010 miles of woody riparian zones by the 2010 was established by Maryland, Virginia, Pennsylvania, and the District of Columbia based on the recognition that these habitats ultimately affect the health the bay. Ohio could benefit substantially from such a goal, especially if focused on restoring forested buffers along warmwater, exceptional warmwater, and coldwater streams.

***Habitat modifications to streams are the leading cause of aquatic life impairment in Ohio.***

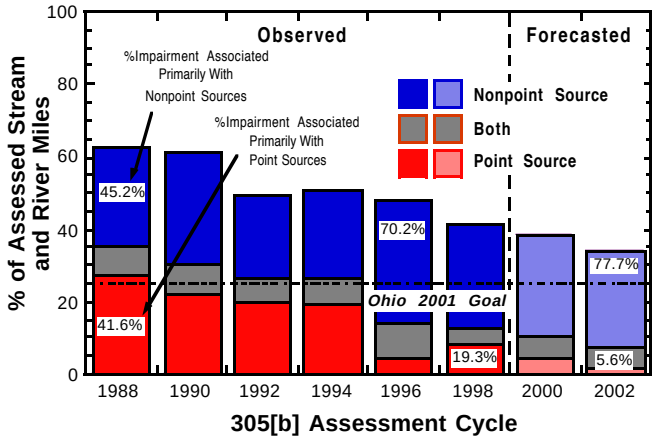



Figure 2.

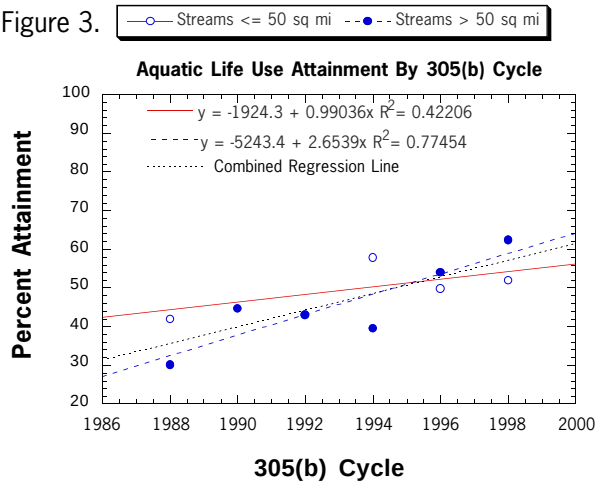
Expansion of the miles of streams covered by the 401/404 water quality certifications will have some effect on stemming unnecessary hydromodifications. This effort, however, does not address the hardening of a watershed and its effects which includes increased bank erosion, more frequent scouring floods, dewatering during drought, and increased delivery of nutrients, sediment, and toxicants via urban runoff. In addition, the loss of riparian vegetation, a key component of ecosystem function is also not addressed directly by either the

stromwater regulations or the 401/404 process.

## Headwater Streams

Small streams are proportionately more affected by habitat degradation than larger waters. Examination of trends in smaller streams (< 50 sq mi, Fig 3) indicates that, as a group small streams have recovered less than larger waters. This is likely a result of the prevalence of habitat impacts which have not been addressed signficantly for Ohio waters. The failure to address such problems will make it likely that many small streams will lose their potential to support high quality biota. The loss of the natural functions of small streams (nearly 4/5th of all streams are headwater sized) will undoubtedly affect the condition of larger waters. The end result will be a gradual loss of the improvements from wastewater treatment that have been achieved with billions of dollars of point source abatement efforts.

Figure 3.




## Site Specific Trends

In addition to tracking trends at the statewide level it is important to examine trends at other scales, from individual sites to watersheds.

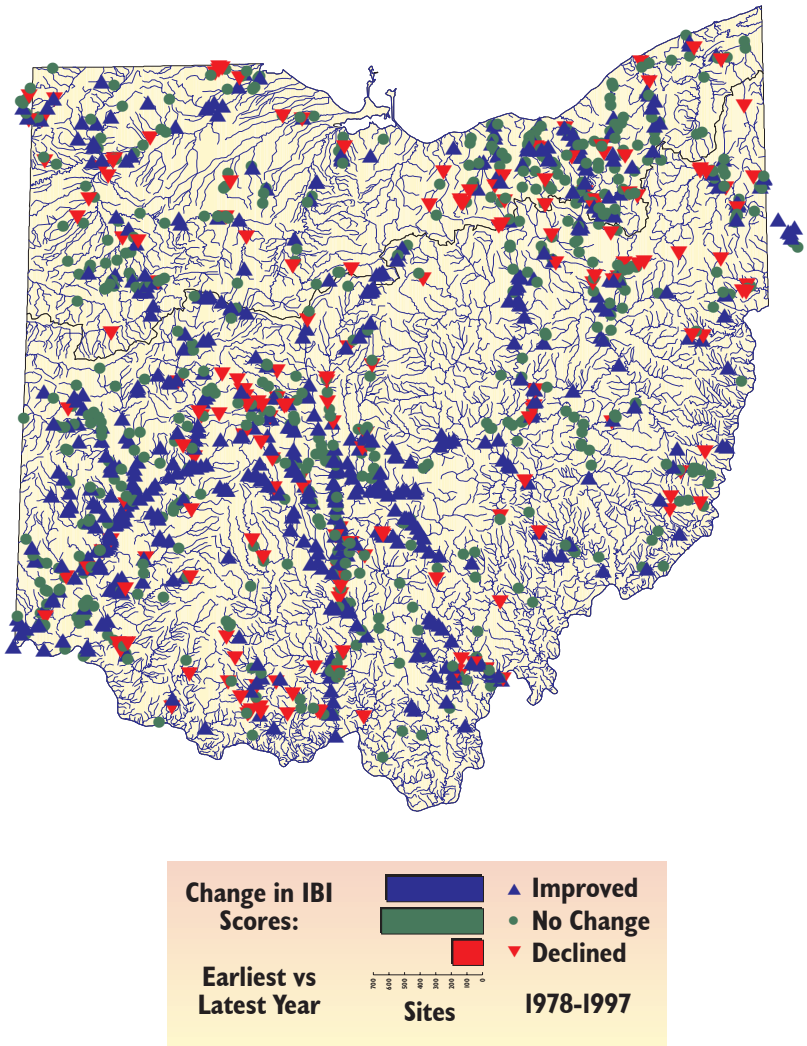
### Individual Sites

The adjacent map illustrates sampling locations were we have sampled fish communities during more than one year. This map reflects the difference in IBI scores between the earlies and latest year and includes data between 1978 and 1997. Differences were classified as significantly improving, no change, and signficant declines depending on the change of 4 IBI units. This data is also illustrated on a "cumulative frequency plot" (Figure 4), which show a statistical difference between the distribution of IBI scores between the earliest and latest years for each site.

It is clear that many more sites have improved or not changed than have declined. Most of the improvements reflect the declining influence of point sources. Declines have occurred for various reasons including habitat destruction and development-related impacts.

### Watersheds

The colorful maps on the bottom of the next page reflect changes



in attainment status within the 93 subbasins delineated for Ohio. Although Ohio streams and rivers will not likely approach 75% attainment of aquatic life uses by the year 2000, we have already surpassed this goal in a number of subbasins. Compared with the status of streams as of the late 1980s, there has been substantial progress in restoring aquatic life.

The pattern of attainment by watershed illustrates that the most progress has occurred in the central, south central, and northeast part of Ohio. Point source abatement efforts have occurred throughout the state. The pattern reflected here is a result of improving subbasins having intact stream habitats present that allowed for quick recovery from the abatement of point source impacts. Much of northwest Ohio has seen extensive stream habitat modifications that have precluded quick recovery and made the effects of remaining nonpoint impacts (e.g., nutrient enrichment) worse. Parts of southeast Ohio are still affected by old mine-related impacts (acid water and sedimentation to stream channels) that have not been abated as fast as point source impacts.

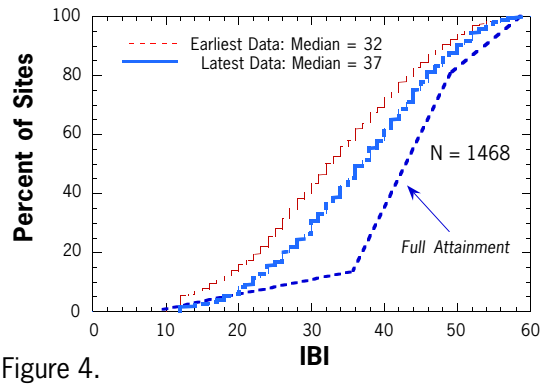


Figure 4.

It is clear that there has been substantial progress in restoring the aquatic health of many Ohio streams. In many ways, however, the most difficult causes and sources of impairment remain: finding ways to reverse the loss of aquatic habitats and polluted runoff in a rapidly urbanizing state.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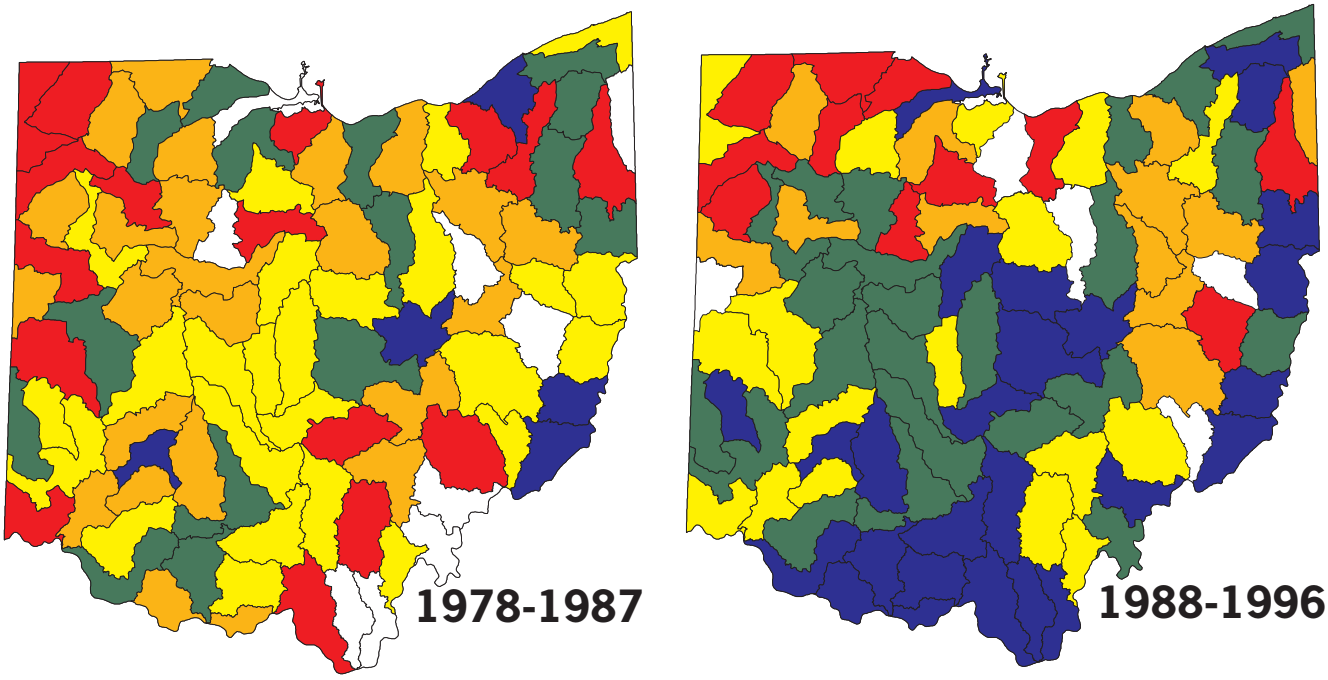



**Aquatic Life Use Attainment in Ohio**


**Fact Sheet #: FS-9-MAS-98**

# The State of the Aquatic Ecosystem:

# Ohio Rivers & Streams:

## Causes and Sources of Impairment

## Introduction

Ohio's streams and rivers have seen a substantial improvement in quality over the past 10-15 years. The majority of this improvement has been a result of investments and improvements in municipal wastewater treatment plants across Ohio.

Ohio uses the fish and invertebrate communities that inhabit streams to assess conditions in Ohio's flowing waters. Aquatic animals are generally more sensitive to pollutants compared to other animals because they inhabit the water all of the time. A healthy stream community is also associated with higher quality recreation opportunities (e.g., fishing, canoeing, and other outdoor-related activities).

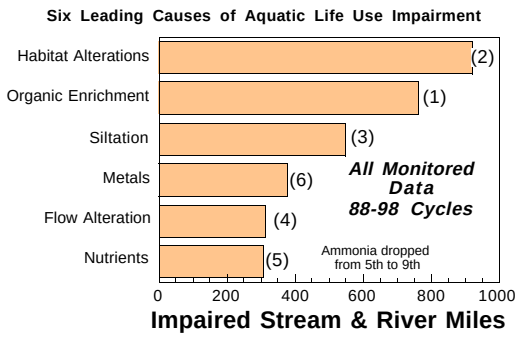
In addition to the biological data, Ohio EPA also collects information on the chemical quality of the water, sediment and effluents; data on the contaminants in fish flesh; and data on the physical nature of streams (i.e., aquatic habitat, siltation). This data is essential to identify the factors that are limiting or impair aquatic life and which constitute threats to human health.

**Causes** of impairment are the "agents" that actually damage or impair the aquatic life in a stream, such as the toxic effects of heavy metals or acidic water. **Sources** of impairment are the origin of the agent. For example, an industry may discharge a heavy metal or a coal mine may be the source of acid water leaching into a stream.

## Leading Causes

The leading causes of impairment to aquatic life in Ohio streams are listed in Figure 1. Although the leading cause had been organic enrichment and low dissolved oxygen since 1988, habitat degradation is now a more extensive cause of impairment. Habitat refers to the physical nature of a stream or river and many human activities can directly or indirectly degrade these habitats. Aquatic life is especially dependent on intact stream habitats and the adjacent riparian forest habitat as are many bird and wildlife species. Ohio is not unique in this regard. Benke (1990) report that nationwide, only 2% of riparian areas would meet federal criteria for wild and scenic designatiions.

Figure 1.




## Point Sources

Organic enrichment and low dissolved oxygen largely originates from the inadequate treatment of municipal wastewater (a “point source”) and is the most rapidly declining cause of impairment. The current extent of miles affected by this cause is probably somewhat overestimated because some of these impacts may have abated, but have not yet

been resurveyed. Although Ohio EPA is on a five-year basin monitoring approach, resources constrain our monitoring and some basins are surveyed on a once every ten year schedule.

Other point source-related causes of aquatic life impairment have also declined in importance since 1988. Ammonia, a toxic component of municipal wastewater, has dropped from the second leading cause in 1988 to ninth. This dramatic improvement resulted from the construction of new sewage treatment plants in the 1980s at a cost of approximately $6 billion throughout Ohio.

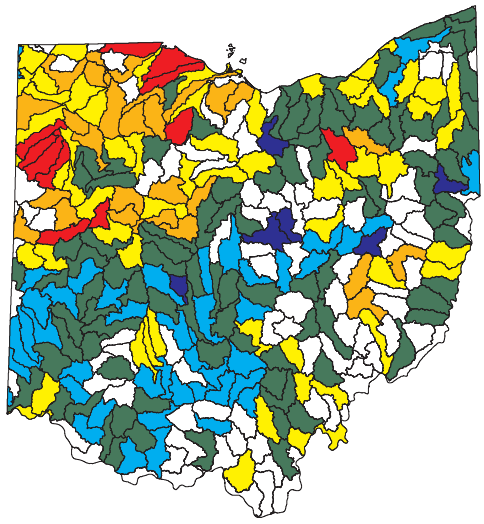
## Nonpoint Sources: Leading Sources of Impairment in Ohio

The leading sources of impairment areillustrated in Figure 2. Hydromodification is leading source of impairment and the origin of the habitat degradation and siltation/sedimentation problems that are the cause of impairment in so many waters. These sources are termed "nonpoint source" in origin because they do not emanate from pipes, but instead are a result of land use activities or direct disturbance of stream ecosystems (e.g., by dredging, urbanization, riparian vegetation removal).

Point sources of impairment are the most rapidly declining pollution source. Hydromodification (activities that result in habitat degradation such as channelization, riparian removal) can orginate from agricultural activities (e.g., drainage activities) and urban/suburban development (e.g., flood control, construction). The reason for the hydromodifications are not tracked in our database, however both agriculture and development/construction activities are the primary sources. Thus the separate categories identifying agricultural and development as sources understimates their effect on streams.

**Above:** The top photo illustrates a stream with high quality and exceptional aquatic life; stream habitats characterized by the bottom photo (monotonous habitat, slumping bank, no riparian) typically have poor aquatic life.

## *Average Habitat Quality by Watershed*




**Above:** This map illustrates average stream habitat quality by watershed in Ohio.

The average habitat quality measured in streams by subbasin in Ohio is summarized on the map at the left. This figure illustrates the habitat affects in the agricultural northwest and in urban areas of Ohio..

Ohio is a diverse State and has embraced a wide variety of economic enterprises over the past 150 years, thus it is not surprising that there is a large variety of causes and sources of impairment. The decline in point source impacts however, does not elimi-

nate these sources as a concern. Most treatment facilities at some point need rehabilitation and new industries continually arise. As cities and counties grow in size and as population centers shift WWTPs may need to be retrofitted or expanded. Since industries often discharge directly to WWTPs the impacts of new classes of pollutants need to be considered. For small facilities proper operation is critical assuring discharge quality and such attributes can change with personnel and other factors.

Even with the need for continued vigilance on point sources of pollution, it is clear that efforts need to focus more on nonpoint sources. A point source approach to monitoring and fixing problems is amenable to a site by site, permit by permit approach. In contrast, abate of nonpoint source impacts will take a watershed approach to be successful

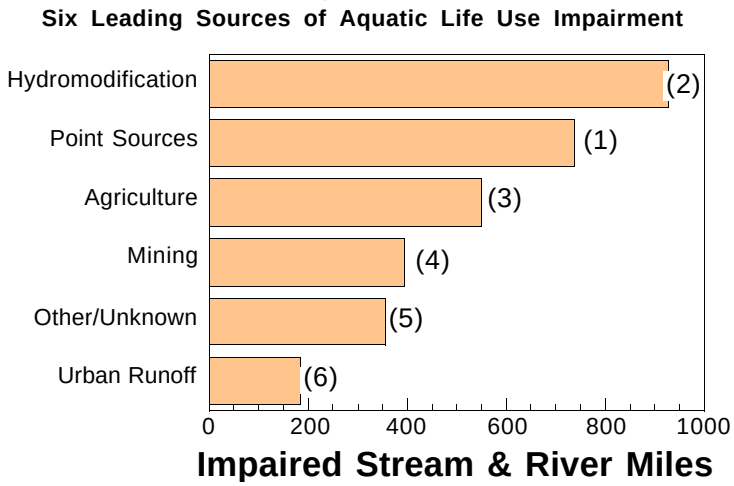
## Watershed Approach

The term "watershed" has been overused and misused when it comes to attacking the nonpoint source problems described above. Simply tacking the word "watershed" onto existing programs will likely fail to make significant inroads into most nonpoint problems. A site-by-site approach that may work for targeting point sources will not work for nonpoint sources because the problems do not originate at a site, but tend to be large scale and often cumulative.

There are a number of opportunities to use a true watershed approach to deal with these problems. All will need to rely on much closer working relationships between state and local agencies and the public to work effectively.

Ohio DNR is now reworking its Nonpoint Source Management Plan by forming a number of working groups, such as the headwater streams working group, that involve multiple agencies and other interested parties. These groups are charged with developing strategies with the ultimate goal of protecting and restoring Ohio's streams and rivers.

Figure 2.




One common need for any successful watershed approach is a foundation of robust monitoring data on which to base priorities and restoration strategies and that should form a baseline to measure success (or failure) of these strategies. (see Theme 2 of Ohio EPA DSW Strategic Plan, right).

A number of federal programs, such as the "Total Maximum Daily Load" listing and related efforts and newer initiatives such as the Clean Water Action Plan announced in 1997, recognize the influence of nonpoint impacts and are attempting to address them.

The information and knowledge illustrated in this fact sheet and from the other initiatives mentioned above will be incorporated into the Ohio EPA strategic planning process, which will direct future efforts to protect and restore the water resources of Ohio in a cost-effective and scientifically sound manner. The themes for the Division of Surface Water strategic plan can be found on the Ohio EPA web site. These themes emphasize a watershed approach as a framework for managing our water resources. They will build upon the successes of our monitoring and assessment program in combination with other information to produce important estimates of water resource quality and to expand our information base to make better decisions about environmental protection. This information will be used to improve our operations and to communicate environmental conditions to the public and stakeholders. This will also be the basis for any new initiatives that might be need to achieve Ohio's water resource goals.

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This and other publications are available on the Division of Surface Water Web Site: