



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

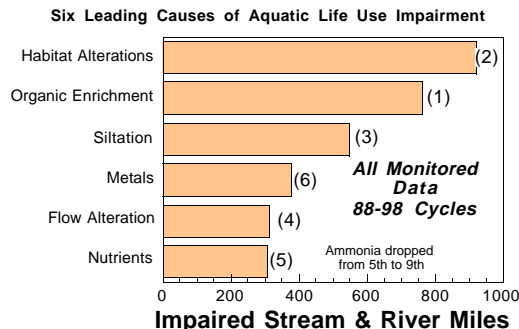
refers to the physical nature of a stream or river and many human activities can directly or indirectly degrade these habitats. Aquatic life is especially dependent on intact stream habitats and the adjacent riparian forest habitat as are many bird and wildlife species. Ohio is not unique in this regard. Benke (1990) report that nationwide, only 2% of riparian areas would meet federal criteria for wild and scenic designations.



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

Figure 1.



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

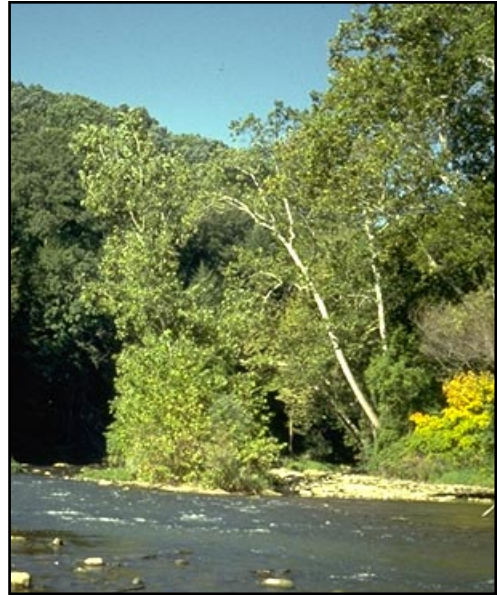
The leading sources of impairment are illustrated in Figure 2. Hydro-modification is leading source of impairment and the origin of the

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. Hydro-modification (activities that result in habitat degradation such as channelization, riparian removal) can originate 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 underestimates their effect on streams.

The average habitat quality measured in streams by subbasin in Ohio is summarized on the map at the left. This figure illustrates the

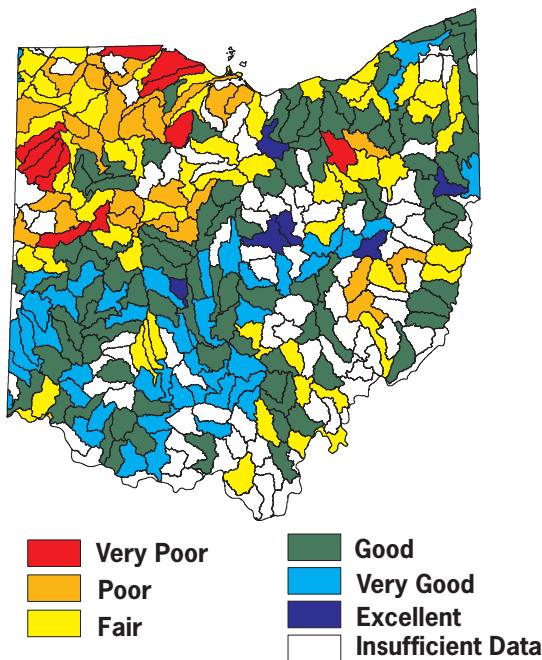


Above: The top photo illustrates a stream with high quality and exceptional aquatic life; stream habitats characterized by the bottom photo (monotonous habitat, slumping bank, no riparian) typically have poor aquatic life.

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-

Average Habitat Quality by Watershed



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

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.

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 scien-

tifically 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:

Figure 2.
Six Leading Sources of Aquatic Life Use Impairment

