V. MANAGEMENT APPLICATIONS

There are two principal areas where biological criteria can improve and enhance overall water quality management programs. These are the demonstration of use attainment/non-attainment of aquatic life uses in surface waters and the discovery and quantification of aquatic environmental degradation. Within the context of these two major areas of application are a number of benefits to different classes of surface water regulation (i.e., NPDES permits, nonpoint source management, habitat protection, etc.).

Environmental Problem Discovery

The overall success of environmental regulation is determined in part by how successful we are at defining problems. The role of biological criteria in this process is to provide a holistic characterization of problems that eventually leads to their correction. The Nimishillen Creek and Cuyahoga River examples show that we cannot regulate that which we do not know about. Furthermore, we will not be aware of many significant problems without direct information from the receiving waters. The inherently broad ability of biological communities to detect problems makes them particularly well suited for problem discovery and quantification. One distinct advantage is that sampling need not be conducted during "critical" periods such as extreme low-flows or high flow runoff periods. It was pointed out earlier that the inherent characteristics of biological communities make them continuous indicators of past events and conditions. Thus surface water regulatory programs should derive significant benefits from having biological field monitoring and objective evaluation criteria.

Water Quality-Based Effluent Limits

The Ohio EPA Five-year Surface Water Monitoring Strategy (Ohio EPA 1985b) outlines general management procedures for using surface water monitoring data to conduct water quality-based effluent limit determination. In this application the role of the biological criteria will be to provide an objective assessment of whether or not aquatic life uses are attained in the surface water body affected by the point source(s). The general rationale of this approach is described in Chapter 3 of the Five-year Monitoring Strategy.

There are examples where biological impairment has not been evident under effluent loadings that were predicted to cause WQS violations by a Level 1 exposure assessment. Obviously in these situations the complexities and dynamics of the receiving water environment are such that these WQS applications are incomplete and the indications of use attainment should take precedence. However, when biological impairment is observed there are currently few practical alternatives to using a Level 1 or 2 exposure assessment to set water quality-based effluent limits. The role of the biological impact assessment data is to provide a site-specific perspective on the application of these predictive techniques.

A shift in emphasis on only numerical limits to one which includes the relationship between entity performance and the response of the biota in the receiving waters is needed. Too often the success of pollution abatement
programs are measured by the degree of compliance with numerical limits in the absence of knowledge about instream conditions. This has resulted in a tendency to dwell on what it will take to meet permit limits 100 percent of the time rather than directing attention to what the actual operation of a facility has achieved in the receiving waters. This approach is likely to be more cost-effective because it includes reliance on observed rather than predicted environmental results alone.

Finally, this approach further fills some important "gaps" in surface water resource management. Biosurveys and biocriteria provide a "reality check" on regulatory actions. Given the potential for the traditional chemical/toxicity approach to be under or over protective this is a significant benefit. A direct measure of use attainment is provided that portrays the resultant efforts of pollution control agencies in tangible terms. For example, it is much more meaningful to show compliance with calibrated and verified IBI, IC1, and/or IwB than it is to only dwell on the number of actions (e.g. number of permits issued, etc.) taken, although the latter is an indispensable function of a regulatory agency. Quantifying conditions for the application of anti-degradation to the higher quality resources is another important function of biosurveys. The biocriteria and biosurvey/ecoregion approaches provide a "feedback loop" for pollution control efforts by quantifying the use attainment status of surface waters. These latter two functions will be particularly useful in the emerging nonpoint source management and abatement programs.
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