Standards for Non-Potable Water Quality (Newsletter)*

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Chemical standards are appropriate for human drinking water sources, but generally not for non-potable waters supporting fish and wildlife. This is because water chemistry is highly variable, measurements are isolated in time and space, and point measures are difficult to interpret as suitable for fish and wildlife. Biological-based standards of water quality are more appropriate because the presence of aquatic organisms reflect water quality integrated over time and space.

Biological water quality measures have been of interest to ecologists and regulators for about 40 years. In the 1970s the EPA proposed a Rapid Bioassessment Protocol (RBP) while other federal agencies and academics offered different approaches (e.g., the US Fish & Wildlife Services' Habitat Suitability Index, HSI). Proposed biological water quality standards use diversity indices, indices of biotic integrity, and EPT ratios (the relative number of individuals in three orders of aquatic insects, a taxonomic level three times removed from that of species). These efforts have not won broad adoption because they do not capture sufficient ecological and geomorphological variability and they remain difficult to interpret and compare among sites, times, and collecting techniques.

Comparison of natural animal assemblages in flowing water ecosystems with human economic systems helps us understand the issues and problems. Ecologists categorize plants as producers and animals as consumers. However, the currency of natural systems is not goods and services but energy and nutrients. Energy and nutrients are difficult to directly measure and aggregate to meaningful information. However, aquatic organisms present the integrated and aggregated results to us by their presence, numbers, and condition. Biological indices tradtionally used for water quality standards are too simplified and lack inclusion of relevant locational information.

It is relatively easy to overcome scientific shortcomings of biological water quality standards for non-potable waters by applying a consistent process producing site- and project-specific results. While the scientific portion can be straight-forward, ensuring that it is understood, accepted, and appreciated by regulators and legislators at state and federal levels may be more difficult.

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Looking at aquatic ecosystems, fish populations are better integrators of water quality on temporal and spatial scales than are the macroinvertebrates on which they feed. Fish presence, particularly over time, tells us that water quality is acceptable to them. In those drainages without known fish populations it is possible to compare relevant factors and determine if fish populations could be supported.

Some necessary components of a functional standards process include spatial factors (e.g., where in the drainage basin the regulated activity and known fish populations are located), terrain (e.g., the compass direction of water channel flow), drainage density, vegetation, basin hydrology, channel characteristics, water and air temperatures, and dissolved oxygen. The results are assembled in a framework producing relative values of fish and wildlife suitability. Because there are no crisp thresholds separating acceptable from unacceptable (it is a continuum varying by geographic location), the interpretation is left to the regulatory agency. With experience, patterns associated with suitability will appear and make the interpretations easier. Understanding the breadth of factors contributing to suitability values assists regulators in making well informed decisions that are technically sound and legally defensible.