

States and Tribes Embrace Bioassessment and Biocriteria for Protecting Streams and Small Rivers



The miles of streams and small rivers assessed for biological condition increased from 65,000 in 1995 to almost 440,000 in 2001.

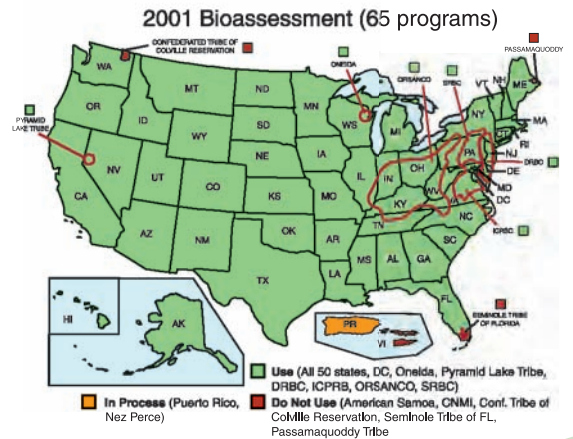
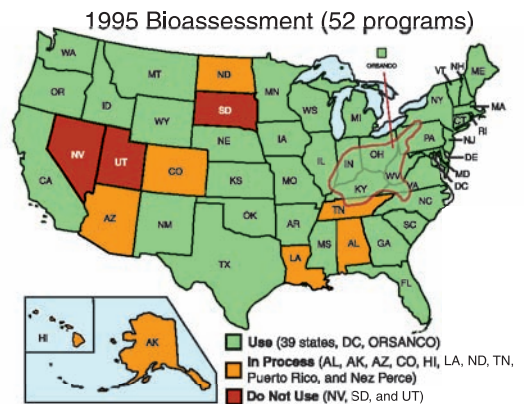
GROWTH OF THE NATION'S PROGRAMS

- **More States, Tribes and other programs are using bioassessment and biocriteria than ever before for streams and small rivers**

- The number of programs using bioassessment has increased from 41 to 57.
- Puerto Rico and the Nez Perce Tribe have programs under development.

- **Use of Bioassessment in Water Resource Management programs has increased by more than 20%**

- All 50 states, the District of Columbia and the Ohio River Valley Water Sanitation Commission (ORSANCO) have incorporated bioassessment in their water resource management programs for streams and small rivers.



MAKING PROGRESS WITH EPA SUPPORT

Since 1987, U.S. EPA has actively supported bioassessment programs and the development of biocriteria. A close and cooperative relationship between EPA and the state, tribal, territory, and interstate commission programs has resulted in more rigorous and standardized biological assessments. Significant progress was revealed in a recent study jointly conducted by the Office of Water (OW) and the Office of Environmental Information (OEI). The detailed findings have been published in *Summary of Biological Assessment Programs and Biocriteria Development for States, Tribes, Territories, and Interstate Commissions: Streams and Wadeable Rivers* (EPA-822-R-02-048), available on EPA's web site at <http://www.epa.gov/bioindicators>. With this major progress on streams and small rivers, states, tribes, territories and interstate commissions can begin to focus on developing biocriteria for other water bodies (lakes, reservoirs, wetlands, estuaries, large rivers, intermittent and ephemeral streams) for which EPA has developed methods and guidance.

Biological assessments and criteria give the programs a tool for directly determining the health of their aquatic life resources, for improving aquatic life designated uses, and for setting biocriteria to protect those uses. Biocriteria act as the water body "response criteria" and complement chemical and other criteria designed to manage pollutants and other stressors introduced into the water body.

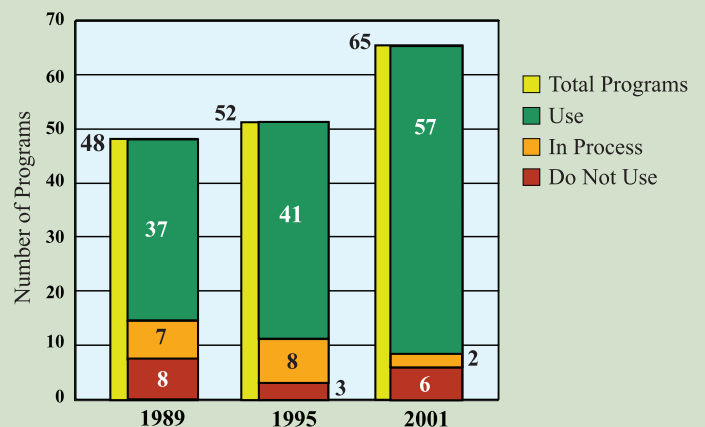


Figure 1: Growth in Programs Using Bioassessment for Water Quality Management of Streams and Small Rivers.

BIOASSESSMENT

The presence, condition, numbers and types of fish, insects, algae, plants, and other organisms provide direct, accurate information about the health of water bodies. Biological assessments measure these factors and are the primary tool used to evaluate the condition of water bodies. Because biological communities are affected by all of the stressors to which they are exposed over time, bioassessments provide information on disturbances not always revealed by water chemistry or other measurements.

With time and understanding, more states, tribes, and territories are realizing the benefits of using biological information in their water management programs.

Bioassessments help states, tribes, and other programs develop expectations for biological conditions, particularly for streams and small rivers. Recent research efforts by ORD to resolve technical issues such as determining stream classification and setting reference conditions has been very helpful to the states, tribes, and territories. Direct technical assistance by OW, ORD, and OEI has been critical to achieving this progress. Substantial work remains to begin using bioassessment/biocriteria in other water bodies.

Biological Assessment:
an evaluation of the biological condition of a waterbody using surveys of the structure and function of a community of resident biota.

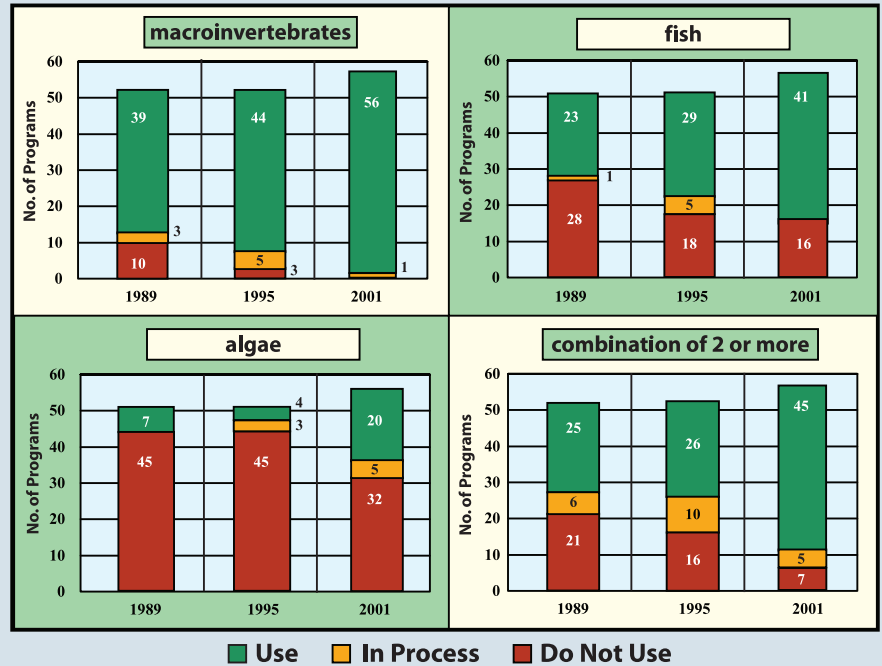


Figure 2: Growth by Types of Assemblages Used for Bioassessment in Streams and Small Rivers.

Use of multiple types of animals and plants (assemblages) to assess water bodies has increased from 24 in 1989 to 26 in 1995 to 45 in 2001!

Assessment of only one type of animal or plant life leads to only 80-85% effectiveness in identifying aquatic life use attainment or non-attainment. Assessment of a water body's biology can include the analysis of macroinvertebrates (insects), periphyton (algae), or fish life. EPA recommends the use of two or more of these groups of biological assessments.

Use of macroinvertebrates to assess water bodies has increased from 39 in 1989 to 44 in 1995 to 56 in 2001!

Benthic macroinvertebrates are used in all but one bioassessment program (Hawaii is developing its assessment based on macroinvertebrates), but the use of fish and algae (periphyton) for evaluation purposes is increasing. Use of all types of organisms increased between 1995 and 2001 (see Figure 2).

BIOCRITERIA

Biocriteria are either narrative statements or numeric values that describe the biological condition of a water body necessary to protect an aquatic life use. Aquatic life uses are the goals for the protection and restoration of aquatic life. Designated uses for aquatic life can cover a range of biological conditions to both protect intact communities and establish restoration goals for compromised ecosystems.

Biological Criteria: narrative descriptions or numerical values of the structure and function of aquatic communities in a waterbody necessary to protect the designated aquatic life use, implemented in, or through water quality standards.

Bioassessments and biocriteria give States a tool for directly determining the health of their aquatic life resources, for improving aquatic life designated uses, and for setting biocriteria to protect those uses.

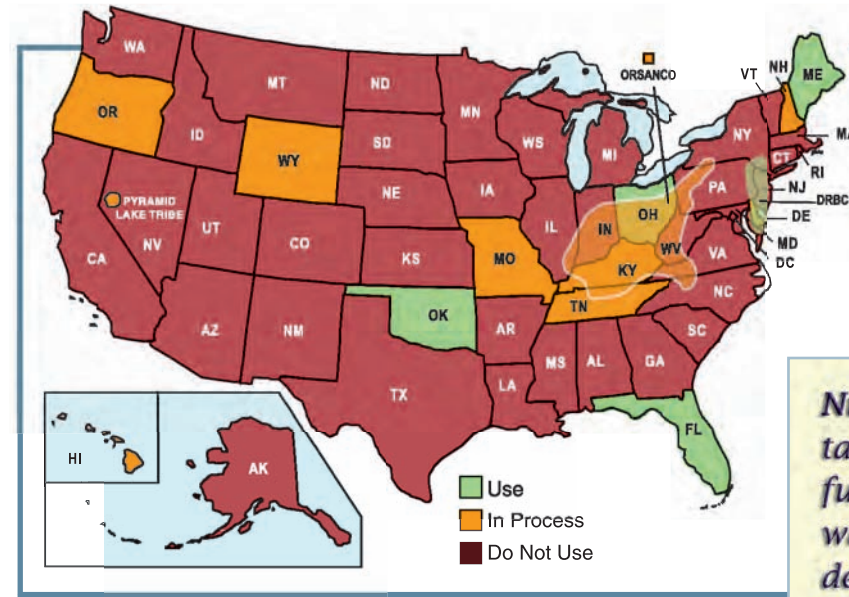
These narrative and/or numeric biocriteria may be formally adopted into water quality standards along with an anti-degradation policy intended to protect waters from further deterioration.

2001 Numeric Biocriteria in WQS

• Five programs have incorporated Numeric Biocriteria into their Water Quality Standards in 2001

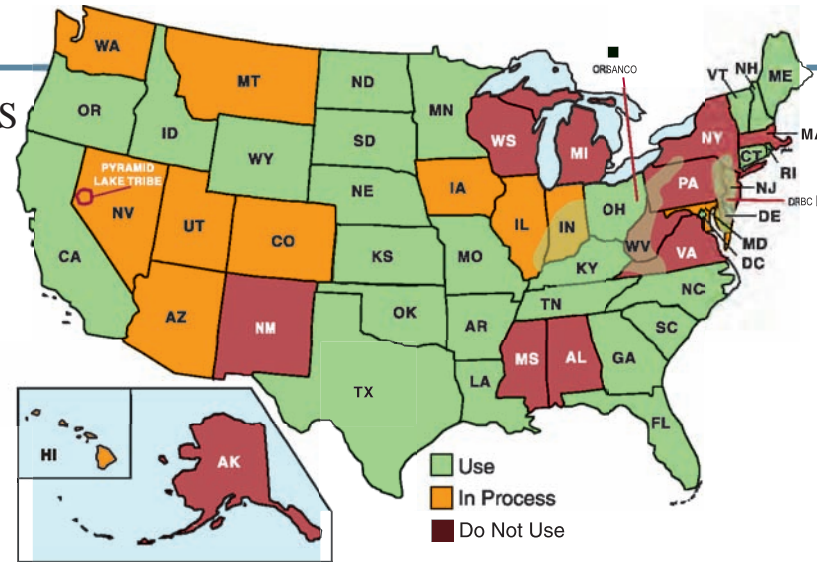
- Ten programs are now in the process of developing Numeric Biocriteria

Numeric Biocriteria: specific quantitative measures of the structure and function of aquatic communities in a waterbody necessary to protect a designated aquatic life use.



2001 Narrative Biocriteria in WQS

Narrative Biocriteria: written statements describing the structure and function of aquatic communities in a waterbody necessary to protect a designated aquatic life use.



• A total of 29 national programs have incorporated Narrative Biocriteria into their Water Quality Standards in 2001.

- Of the 29 programs, 22 have also developed quantitative implementation procedures or translators for their narrative criteria to use in their water quality management programs.

Sixteen states are in the process of developing numeric or narrative biocriteria. The greatest increase in the use of narrative water quality standards took place between 1989 and 1995. Numeric biocriteria has increased steadily.

Maine has just completed development of numeric biocriteria in their water quality standards program. Numeric criteria were developed for dissolved oxygen and bacteria, and are designed to measure the response of benthic macroinvertebrates to human influences. Narrative criteria cover habitat and

aquatic life in rivers and streams. Maine's numeric biocriteria protocol provides a statistically defensible and reproducible decision-making tool for making quantitative determination about attainment of biological water quality standards.

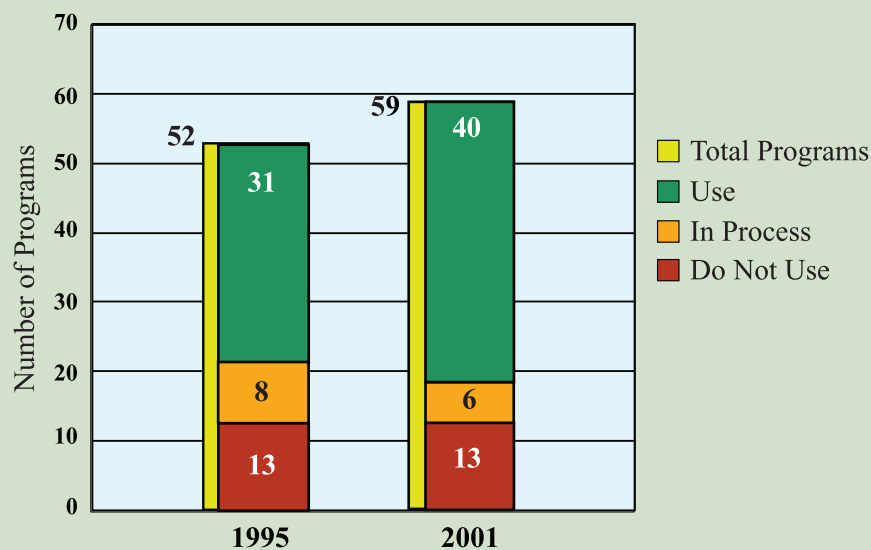


Figure 3: Growth in Programs Using Bioassessment to Determine Aquatic Life Use Attainment in Streams and Small Rivers.

AQUATIC LIFE USE SUPPORT

Aquatic Life Use Support (ALUS) is a determination of the ability of a water body to support aquatic life. ALUS ratings are either fully supporting, partially supporting, or non-supporting of aquatic life. Water bodies that cannot fully support aquatic life are considered impaired and listed by the states and tribes on their 303(d) list.

Use of bioassessment to determine Aquatic Life Use (ALU) attainment has increased from 31 States and Tribes in 1995 to 40 States and Tribes in 2001

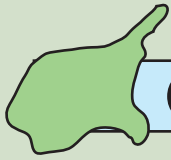
Aquatic Life Use: a beneficial use designation in which the waterbody provides suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms; classifications specified in state water quality standards relating to the level of protection afforded to the resident biological community by the state agency.

Bioassessment can help states and tribes develop the targeted biological condition for a waterbody. Because chemical water quality standards alone may not ensure a healthy biological condition, most states are integrating biological information in their ALUS attainment determinations.

In Idaho, for example, the designated aquatic life use of a waterbody is dependant upon its ability to support the actual

or future use of the waterbody. Water bodies are evaluated to determine if the quality standards are being achieved and whether a healthy, balanced biological community is present. Aquatic Life Use designations are divided into two types; cold-water ALUs and warm-water ALUs. Three types of parameters are utilized to determine beneficial use status: Aquatic Habitat Parameters, Biological Parameters, and Natural/Reference Conditions. ALUs are also utilized as part of the determination of TMDLs in Idaho.

EXAMPLES OF PROGRESS



ORSANCO

The Ohio River Valley Water Sanitation Commission (ORSANCO) is conducting biological monitoring of the Ohio River to develop techniques for large rivers in general and using biological monitoring assessment and criteria to characterize the Ohio River's condition. The Commission is in the process of developing numeric biological criteria, and expanding its program into the tributaries and reaches of the Ohio River basin.

- ORSANCO collects data, develops methods, conducts sampling and develops assessment indices from the Ohio River for the eight states it represents. Their primary objective is to determine the extent to which the Ohio River will be capable of sustaining fish and other aquatic life.
- Both macroinvertebrates and fish are used by ORSANCO to assess the Ohio River basin.
- ORSANCO's narrative biocriteria are supported by the numeric biocriteria that are being developed.

ONEIDA NATION OF WISCONSIN



The Oneida Nation has recently made great strides to implement a bioassessment program. In 1999, the Tribe began to sample macroinvertebrates and utilize their findings. A formal biological monitoring program was established in 2000, including qualitative sampling and the development of standardized operating procedures. Future plans include sampling of invertebrates and fish. The Tribe has included biocriteria in its WQS.

- Previous to initiation of its formal biological monitoring in 2000, the Tribe established an onsite aquatic invertebrate taxonomy laboratory. Best management practices have been tested and Standard Operating Procedures have been developed.
- The Tribe uses both macroinvertebrates and fish to assess its water bodies.
- Bioassessment data is being used to assess the aquatic resources, determine the cause and effect of pollution, for monitoring, and for watershed based management.



OREGON

Oregon has an extensive history in the use of biological data in water quality assessments. The program has grown since the early 1990's. Oregon's primary objectives are to identify trends in stream conditions and biological assemblages, identify the primary chemical and physical parameters impairing biological assemblages, assess the effectiveness of restoration projects and management activities designed to improve stream conditions, and help standardize protocols for biological assessments throughout the state and region.

- The Oregon Department of Environmental Quality (DEQ) sets water quality standards to protect "beneficial uses" such as recreation, fish habitat, drinking water supplies, and aesthetics. DEQ monitors water quality with regular sampling of more than 50 rivers and streams in the 18 designated river basins found in Oregon.
- Multiple assemblages are used by Oregon to assess water bodies.
- Narrative criteria were adopted in Oregon's water quality standards and are applied using a numeric approach.



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VERMONT



Vermont has been conducting aquatic biological health assessments since the early 1970s. From 1985 to 2001, approximately 1,500 stream assessments were completed using macroinvertebrates and/or fish from more than 900 wadeable stream reaches. Two Vermont-specific fish community Indexes of Biotic Integrity have been developed. Revisions in 2000 introduced the concept of reference-site conditions for assessment of biological condition. Vermont's program utilizes a biocondition gradient to establish tiered aquatic life uses classifications.

- The Vermont Department of Environmental Conservation (VTDEC) collaborates with academic institutions, neighboring states, special groups, and volunteer monitors in their research.
- Multiple assemblages are used by Vermont to assess its water bodies.
- VTDEC uses narrative tiered biocriteria that is independent of the Water Quality standards. Numeric criteria are found within the VTDEC procedural documents.

BIOASSESSMENT PROGRAM GOALS AND OBJECTIVES

EPA's Office of Water declared the following goals and objectives for the biocriteria program:

- Biocriteria/bioassessments will be used in ongoing regulatory programs.
- Biocriteria/bioassessments will be used to assess the effectiveness of water quality management efforts.
- Bioassessment data and biocriteria will be used to better communicate the health of the Nation's waters.
- All states/tribes will use bioassessments/biocriteria to evaluate the health of aquatic life in all water bodies.
- Bioassessment data will be used by all states/tribes to better define aquatic life uses.
- Numeric biocriteria will be adopted in all state/tribal water quality standards to protect aquatic life uses.

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