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EMAP-West Communications

Developing Indicators of Condition for Surface Waters of the West

Under the Clean Water Act, the states and tribal nations have responsibility for measuring the extent to which their waters support their designated uses, and for determining the major causes if they are impaired. To respond to this requirement as well as to form the basis for an environmental "report card", a nationally consistent set of scientifically defensible indicators is essential. EPA's national and regional managers are also interested in using indicators in the context of the Government Performance Results Act (GPRA), which requires the Agency to determine if our environmental expenditures are in fact resulting in the environmental benefits or improvements expected. With planning and coordination, the same suite of carefully chosen environmental indicators can meet Clean Water Act, GPRA, and "report card" goals. The Agency's Environmental Monitoring and Assessment Program (EMAP) is making a major contribution to the science of indicator development and its practical application.

Ecological indicators provide measures of the condition of those aspects of the environment we are trying to protect – human health and ecological resources. For example, when we wish to assess the biological condition (or Aquatic Life Use (ALU) in Clean Water Act terminology) of our aquatic systems (streams, rivers, lakes, and estuaries), the most direct measurements are those made of the plants and animals themselves. The chemical and physical properties of aquatic systems are important indicators of the stresses on the systems, and are frequently used to assess the causes of impaired condition.

EMAP has developed a set of criteria for choosing which indicators are useful in a survey of condition of ecological resources. These criteria include:

- Can we practically measure the indicator in a survey?
- Is it responsive to different environmental conditions – natural and/or human caused?
- Is it repeatable – will repeated measurements at the same site give the same answer?
- Can it be "ranked" relative to expectations?

When an indicator passes the above tests, it can successfully be utilized in a regional or national monitoring program.

The Surface Waters component of EMAP-West (covering the twelve conterminous states in EPA Regions 8, 9, and 10) has developed a core set of indicators of ecological condition and environmental stressors. **These include:**

- **Biological assemblages** (fish, macroinvertebrates, and algae)
- **Ambient Water Chemistry** (nutrients, acid/base status, etc.)
- **Fish Tissue Contaminants** (mercury, metals, PCB congeners, persistent organics)
- **Physical Habitat** (sedimentation, in-stream and riparian habitat structure, etc.)
- **Watershed characteristics** (landcover/landuse, road density, population density, etc.)

Biological measures will form the primary basis for assessing Aquatic Life Use support, with chemical, physical, and watershed measures being used to assess and rank the relative importance of specific stressors to ALU. The regional, state, and tribal partners involved in the EMAP-West have all agreed to the core indicators and will, for the first time, use common field and laboratory protocols across the West. Because of this commonality, EMAP-West provides the ability to share environmental indicator data across state and regional boundaries throughout the West for both ambient and reference conditions and will result in the first statistically defensible assessment of baseline conditions for western streams.

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