CALM Supporting Information – Bioassessment

Biocriteria (biological criteria) are a way of expressing the qualities that must be present to support a desired condition of a waterbody. Biocriteria are narrative statements or numeric expressions that describe a reference biological condition (structure and function) of aquatic communities inhabiting waters of a given designated aquatic life use.

The primary goal of the Clean Water Act is to restore and maintain the physical, chemical, and biological integrity of the nation's surface waters (Clean Water Act Section 101[a][2]). Because this goal addresses physical, chemical, *and* biological integrity it can fundamentally be viewed as an ecologically-based goal. The phrase biological integrity originated in Section 101[a][2] of the Federal Water Pollution Control Act amendments of 1972 (CWA) and has remained a part of the subsequent reauthorizations. The biological integrity language of the Clean Water Act, was eventually defined by Karr and Dudley (1981) as ". . . the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitats of a region." The Environmental Protection Agency (EPA) adopted a similar version of this definition in the biological criteria national program guidance (EPA 1990). Biological criteria are based on measurable and predictable characteristics of aquatic communities such as species richness, key taxonomic groupings, functional feeding and reproductive guilds, environmental tolerance, and evidence of stress. Measurable characteristics of a biological community have generally been termed "metrics". Examples of common metrics include those discussed in the Rapid Bioassessment Protocols (RBPs) (Plafkin et al. 1989, Barbour et al. 1999). The resulting numerical expressions reflect the health and condition of aquatic communities.

Biological criteria are a way of expressing the qualities that must be present to support a desired condition of a waterbody. Biological criteria can be narrative or numeric expressions that describe a reference biological condition (structure and function) of aquatic communities inhabiting waters of a given designated aquatic life use and are derived from biological monitoring and calculating indices (Index) of the composition, diversity, and functional organization of a reference aquatic community and comparison to stressed sites. Reference conditions should represent unimpaired or minimally impaired conditions and be the foundation for biocriteria. Biological criteria scores (multimetric approach) or Observed vs Expected values (statistical approach) can be established for the different biological conditions characterized by the aquatic life use classification system. Biological assessments are then conducted to determine if a waterbody is attaining its specified designated aquatic life use by comparing the assessment results with the biocriteria established for that region and waterbody type.

Biological criteria serve as the standard against which biological assessment (bioassessment) results are compared. Biological assessment is a method to evaluate the biological condition of a waterbody. Biological assessments are a means to measure the cumulative impact of stressors such as toxicants, temperature, dissolved oxygen, sedimentation/siltation, and flow regimes as well as factors that influence the above parameters such as riparian conditions and physical stream characteristics (geomorphology). Biological communities integrate these stresses over time and provide an ecological measure of fluctuating environmental conditions. Biological assessments reflect the condition of overall ecological integrity (i.e., when the biological community is healthy, typically the chemical and physical

components of a waterbody are also in good condition). Therefore, biological assessments directly and comprehensively assess the condition of ecosystem health (integrity), a primary goal of the CWA.

The SWQB began sampling benthic macroinvertebrates at select sites in 1979. Data from these monitoring efforts has been used extensively for establishment and refinement of designated aquatic life uses and for the development and application of biocriteria. In September 2002, the New Mexico Biocriteria Development Team (NMBDT), composed of several SWQB staff, local academicians/consultants Drs. Gerald and Donna Jacobi, Tetra Tech consultants, as well as a representative from NMED Department of Energy (DOE) Oversite Bureau, and Los Alamos National Laboratory (LANL), compiled benthic macroinvertebrate and site data collected from streams and rivers of New Mexico over the past 20+ years (796 discreet samples from 420 sites). These data were used to populate New Mexico's version of the Ecological Data Application System (EDAS), a data analysis system developed for EPA and used to calculate indices and provide a mechanism for integrating biological and physicochemical data. The resulting database was used by Tetra Tech and the Drs. Jacobi to develop a provisional Stream Condition Index (SCI) for New Mexico's perennial, wadeable streams in the Mountain Ecoregion. The Mountain Ecoregion is composed of Omernik Ecoregions 21 (Southern Rockies) and 23 (Arizona/New Mexico Mountains). A report was completed in April 2006 detailing the SCI to date, including site scoring, reference site selection, metric selection, and index calculation (Jacobi et al., 2006). The application of this report for assessment purposes is further described in New Mexico's Comprehensive Assessment and Listing Methodology (CALM).

Literature Cited

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