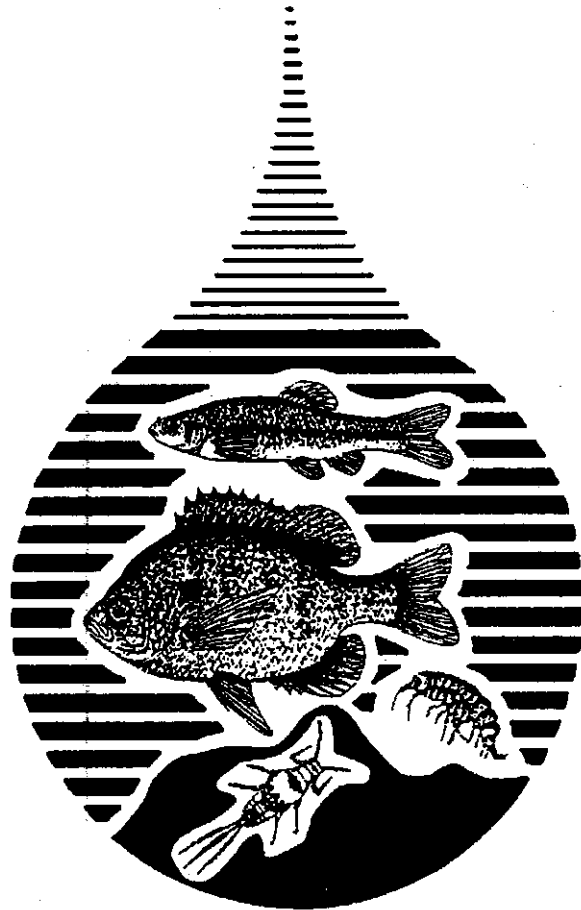




Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers:

Periphyton, Benthic Macroinvertebrates, and Fish Second Edition



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FOREWORD

In December 1986, U.S. EPA's Assistant Administrator for Water initiated a major study of the Agency's surface water monitoring activities. The resulting report, entitled "Surface Water Monitoring: A Framework for Change" (U.S. EPA 1987), emphasizes the restructuring of existing monitoring programs to better address the Agency's current priorities, e.g., toxics, nonpoint source impacts, and documentation of "environmental results." The study also provides specific recommendations on effecting the necessary changes. Principal among these are:

1. To issue guidance on cost-effective approaches to problem identification and trend assessment.
2. To accelerate the development and application of promising biological monitoring techniques.

In response to these recommendations, the Assessment and Watershed Protection Division developed the rapid bioassessment protocols (RBPs) designed to provide basic aquatic life data for water quality management purposes such as problem screening, site ranking, and trend monitoring, and produced a document in 1989 (Plafkin et al. 1989). Although none of the protocols were meant to provide the rigor of fully comprehensive studies, each was designed to supply pertinent, cost-effective information when applied in the appropriate context.

As the technical guidance for biocriteria has been developed by EPA, states have found these protocols useful as a framework for their monitoring programs. This document was meant to have a self-corrective process as the science advances; the implementation by state water resource agencies has contributed to refinement of the original RBPs for regional specificity. This revision reflects the advancement in bioassessment methods since 1989 and provides an updated compilation of the most cost-effective and scientifically valid approaches.

DEDICATION

All of us who have dealt with the evaluation and diagnosis of perturbation to our aquatic resources owe an immeasurable debt of gratitude to *Dr. James L. Plafkin*. In addition to developing the precursor to this document in 1989, Jim was a driving force within EPA to increase the use of biology in the water pollution control program until his untimely death on February 6, 1990. Throughout his decade-long career with EPA, his expertise in ecological assessment, his dedication, and his vision were instrumental in changing commonly held views of what constitutes pollution and the basis for pollution control programs. Jim will be remembered for his love of life, his enthusiasm, and his wit. As a small token of our esteem, we dedicate this revised edition of the RBPs to his memory.

ACKNOWLEDGMENTS

Dr. James L. Plafkin of the Assessment and Watershed Protection Division (AWPD) in USEPA's Office of Water, served as principal editor and coauthor of the original Rapid Bioassessment Protocols document in 1989. Other coauthors of the original RBPs were consultants to the AWP, Michael T. Barbour, Kimberly D. Porter, Sharon Gross and Robert M. Hughes. Principal authors of this revision are Michael T. Barbour, James (Sam) Stribling, Jeroen Gerritsen, and Blaine D. Snyder. Many others also contributed to the development of the original RBP document. Special thanks goes to the original Rapid Bioassessment Workgroup. The Workgroup, composed of both State and USEPA Regional biologists (listed in Chapter 1), was instrumental in providing a framework for the basic approach and served as primary reviewers of various drafts. Dr. Kenneth Cummins and Dr. William Hilsenhoff provided invaluable advice on formulating certain assessment metrics in the original RBP approach. Dr. Vincent Resh also provided a critical review that helped strengthen the RBP approach. While not directly involved with the development of the RBPs, Dr. James Karr provided the framework (Index of Biotic Integrity) and theoretical underpinnings for "re-inventing" bioassessment for water resource investigations. Since 1989, extensive use and application of the IBI and RBP concept has helped to refine specific elements and strengthen the overall approach. The insights and consultation provided by these numerous biologists have provided the basis for the improvements presented in this current document.

This revision of the RBPs could not have been accomplished without the support and oversight of Chris Faulkner of the USEPA Office of Water. Special thanks go to Ellen McCarron and Russell Frydenborg of Florida DEP, Kurt King of Wyoming DEQ, John Maxted of Delaware DNREC, Dr. Robert Haynes of Massachusetts DEP, and Elaine Major of University of Alaska, who provided the opportunity to test and evaluate various technical issues and regional specificity of the protocols in unique stream systems throughout the United States. Editorial and production support, report design, and HTML formatting were provided by a team of Tetra Tech staff — Brenda Fowler, Michael Bowman, Erik Leppo, James Kwon, Amanda Richardson, Christiana Daley, and Abby Markowitz. Technical assistance and critical review was provided by Dr. Jerry Diamond of Tetra Tech.

A Technical Experts Panel was convened by the USEPA to provide an in-depth review and recommendations for revisions to this document. This group of esteemed scientists provided not only useful comments, but assisted in revising sections of the document. In particular, Drs. Jan Stevenson and Loren Bahls revised the periphyton chapter; and Dr. Phil Kaufmann provided assistance on the habitat chapter. The Technical Experts Panel included:

Dr. Reese Voshell, Virginia Tech University (Chair)
Dr. Loren Bahls, University of Montana
Dr. David Halliwell, Aquatic Resources Conservation Systems
Dr. James Karr, University of Washington
Dr. Phil Kaufmann, Oregon State University
Dr. Billie Kerans, Montana State University
Dr. Jan Stevenson, University of Louisville

Dr. Charles Hawkins (Utah State University) and Dr. Vincent Resh (University of California, Berkeley) served as outside readers.

Much appreciation is due to the biologists in the field (well over a hundred) who contributed their valuable time to review both the original and current documents and provide constructive input. Their help in this endeavor is sincerely appreciated.

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LIST OF ACRONYMS

Acronym	Full Name (acronym stands for)
AFDM	Ash Free Dry Mass
ANOVA	Analysis of Variance
APHA	American Public Health Association
ASTM	American Society of Testing and Materials
AUSRIVAS	Australian River Assessment System
AWPD	Assessment and Watershed Protection Division
BEAST	Benthic Assessment of Sediment
BMP	Best Management Practices
CBWD	Chesapeake Bay and Watershed Programs
CWA	Clean Water Act
DEC	Department of Environmental Conservation
DEM	Department of Environmental Management
DEM	Division of Environmental Management
DEP	Department of Environmental Protection
DEQ	Department of Environmental Quality
DHEC	Department of Health and Environmental Control
DNR	Department of Natural Resources
DNREC	Department of Natural Resources and Environmental Control
DQO	Data Quality Objectives
EDAS	Ecological Data Application System
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, Trichoptera
GIS	Geographic Information System
GPS	Global Positioning System
HBI	Hilsenhoff Biotic Index
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
ITFM	Intergovernmental Task Force on Monitoring
ITIS	Integrated Taxonomic Information Service

Acronym	Full Name (acronym stands for)
IWB	Index of Well Being
MACS	Mid-Atlantic Coastal Systems
MBSS	Maryland Biological Stream Survey
MIWB	Modified Index of Well Being
NAWQA	National Water Quality Assessment Program
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source pollution
PASS	Preliminary Assessment Scoresheet
PCE	Power Cost Efficiency
POTWS	Publicly Owned Treatment Works
PTI	Pollution Tolerance Index
QA	Quality Assurance
QC	Quality Control
QHEI	Qualitative Habitat Evaluation Index
RBP	Rapid Bioassessment Protocols
RDMS	Relational Database Management System
RM	River Mile
RPS	Rapid Periphyton Survey
SAB	Science Advisory Board
SCI	Stream Quality Index
SOP	Standard Operating Procedures
STORET	Data Storage and Retrieval System
SWCB	State Water Control Board
TCR	Taxonomic Certainty Rating
TMDL	Total Maximum Daily Load
TSN	Taxonomic Serial Number
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WPA	Watershed Protection Approach
WQD	Water Quality Division

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