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Box 25046 M.S. 407

Denver Federal Center

Denver, Colorado 80225

NATIONAL WATER QUALITY LABORATORY TECHNICAL MEMORANDUM 1998.10

August 12, 1998

Subject: National Water Quality Laboratory, Biological Unit availability to process benthic Macroinvertebrate samples for the Water Resources Division

Effective dates

of change: August 12, 1998

To: Robert M. Hirsch, Chief Hydrologist, Water Resources Division
Janice R. Ward, Chief, Office of Water Quality
Stephen K. Sorenson, Asst. Chief, Office of Water Quality
Regional Hydrologists
Regional QW Specialists
District Chiefs
District QW Specialists
NAWQA National Leadership Team
NAWQA Study Unit Chiefs
NAWQA Regional Biologists
NAWQA Study Unit Biologists

Authors: Robert S. Williams, Jr., Chief, NWQL (bobwill@usgs.gov, 303-467-8002)
Timothy L. Miller, Chief, NAWQA (tlmiller@usgs.gov, 703-648-6868)
Stephen R. Moulton II, BU Invertebrate Specialist, NWQL (smoulto@usgs.gov, 303-467-8171)
Gary Cottrell, BU Acting Supervisor, NWQL (cottrell@usgs.gov, 303-467-8248)

Revision: None

INTRODUCTION

The National Water Quality Laboratory (NWQL) and the National Water Quality Assessment Program (NAWQA) are pleased to announce that the NWQL Biological Unit (BU) is now available to process benthic macroinvertebrate samples for the Water Resources Division (WRD). The BU was originally set up and has been fully supported by NAWQA since 1993. In February 1997, the BU was reorganized and aligned with the NWQL Production Program for internal operational consistency. Since then, the BU benthic macroinvertebrate staff has worked closely with NAWQA and National Research Program personnel to streamline benthic macroinvertebrate sample processing and data release. These efforts have resulted in elimination of the FY94 NAWQA

backlog and the subsequent ability to devote 25 percent of the BU benthic macroinvertebrate resources to other WRD samples. Samples will be processed in the order they are received within a maximum six month turnaround time. We expect the demand for benthic macroinvertebrates to increase about 10 percent each year over the next few years and that the BU will operate on a reimbursable basis by FY02.

This memorandum provides WRD customers with an overview of the BU benthic macroinvertebrate staff and descriptions and prices for benthic macroinvertebrate sample processing packages offered by the BU.

OVERVIEW OF BU BENTHIC MACROINVERTEBRATE STAFF

The BU benthic macroinvertebrate staff consists of 17 employees with over 100 years of collective experience processing benthic macroinvertebrate samples. Sample preparation, sorting, and slide mounting are performed by Bachelor's level biologists having backgrounds in aquatic biology. Taxonomic identification and enumeration of benthic macroinvertebrates is performed by trained Master's level biologists. These individuals have joined the BU from across the United States thereby creating a centralized expertise in North American benthic macroinvertebrate taxonomy. The BU benthic macroinvertebrate staff maintains a rigorous internal Quality Control (QC) program to ensure that benthic macroinvertebrate samples are processed in accordance with BU standard operating procedures. Additionally, taxonomic identifications are verified for accuracy and consistency using an ever-growing taxonomic library and reference specimen collection. The BU benthic macroinvertebrate taxonomists also interact with recognized specialists across North America to confirm identifications and resolve problematic taxonomic issues.

DESCRIPTIONS AND PRICES OF BENTHIC MACROINVERTEBRATE SAMPLE PROCESSING PACKAGES

Three types of taxonomic assessment are available for benthic macroinvertebrate samples. Each provides a level of taxonomic resolution designed to meet customer needs in addressing various water quality (QW) monitoring objectives (Table 1). The three types of taxonomic assessment are:

- 1) Rapid Taxonomic Assessment (RTA)
 - a. Provides a rapid, inexpensive assessment of benthic macroinvertebrate samples based on major taxonomic divisions (usually family).
 - b. Good for screening many sites to detect initial QW impairment.
 - c. Comparable to U.S. Environmental Protection Agency (USEPA) Rapid Bioassessment Protocol (RBP) II.
- 2) Standard Taxonomic Assessment (STA)
 - a. Represents a level of taxonomic resolution between RTA and CTA (see No. 3 below.)
 - b. Provides same levels of taxonomic resolution accepted by NAWQA and comparable to taxonomic levels sought by most state agencies.
 - c. Comparable to USEPA RBP III.

- 3) Custom Taxonomic Assessment (CTA)
 - a. Provides species level resolution where possible (i.e., if the taxonomy of the group permits it.)
 - b. Provides lower taxonomic resolution of macroinvertebrate community structure often needed for assessment of specific organism tolerances to organic and inorganic pollution.
 - c. Specific customer needs and costs are negotiated.

Table 1. Levels of taxonomic resolution for the Rapid Taxonomic Assessment (RTA), Standard Taxonomic Assessment (STA), and Custom Taxonomic Assessment (CTA).

Organism Group	RTA	STA	CTA
Snails	Family	Genus	Species
Clams & mussels	Family	Genus	Species
Worms & leeches	Family	Worms/family Leeches/genus	Species
Macro-crustaceans	Family	Genus	Species
Aquatic insects	Family	Genus/species	Species*

*where the STA only provides genus

Five different benthic macroinvertebrate sample processing packages are offered by the BU to analyze semi-quantitative, quantitative, and qualitative sample types. Laboratory processing methods are documented and can be made available to the customer. Pricing of these packages (Table 2) varies with the level of organism subsampling and taxonomic assessment. Under normal operating capacity, the BU benthic macroinvertebrate staff has a goal of releasing data within six months after receiving samples. Quicker turnaround times may be negotiated at a higher cost. Standard features in each of these packages include:

- 1) Ten percent of the samples processed (semi-quantitative and quantitative samples only) are evaluated to assess picking effectiveness.
- 2) Ten percent of the samples processed are evaluated to assess the accuracy of organism identification and enumeration.
- 3) Data are reviewed to ensure correct and consistent data entry.
- 4) Taxonomic data are arranged in a phylogenetic hierarchical manner based on evolutionary relationships.
- 5) Electronic data are released in a format usable in common spreadsheet and database software packages (e.g., Microsoft Excel™ and Access™.)

SEMI-QUANTITATIVE AND QUANTITATIVE BENTHIC MACROINVERTEBRATE SAMPLE PROCESSING PACKAGES

- 1) 500 fixed-count organism subsampling method with STA
 - a. This method follows a random grid removal/picking approach.
 - b. The goal of this method is to produce a subsample of 500 +/- 20% (400 - 600) organisms within a 3-hour picking time limit.

- c. Organisms are identified using the STA and enumerated.
 - d. This processing package is currently used by NAWQA to process their Richest Targeted Habitat (RTH) samples.
- 2) 300 fixed-count organism subsample with STA
- a. This processing package follows the same method used in the 500 fixed-count package but produces a subsample of 300 +/- 20% (240 - 360) organisms within a 2-hour picking time limit.
 - b. Organisms are identified using the STA and enumerated.
- 3) 100 fixed-count organism subsample with STA
- a. This processing package follows the same method used in the 500 fixed-count package but produces a subsample of 100 +/- 20% (80 - 120) organisms in a 1-hour picking time limit.
 - b. Organisms are identified using the STA and enumerated.
- 4) 100 fixed-count organism subsample with RTA
- a. This processing package produces a subsample of 100 +/- 20% (80 - 120) organisms in a 1-hour picking time limit.
 - b. Organisms are identified using the RTA and enumerated.

QUALITATIVE BENTHIC MACROINVERTEBRATE SAMPLE PROCESSING

- 5) 2-hour visual sort with STA
- a. A trained technician visually scans a sample to remove as many taxonomically distinct organisms as possible. Removal of organisms is based on gross morphological differences, organism maturity/condition, and life stages (e.g., larvae, pupae, and adults.) Mature, undamaged organisms are likely to ensure a reliable identification to genus or species.
 - b. A taxonomist identifies the sorted organisms using the STA.
 - c. The product is a list of taxa (without enumeration's) present in the sample.
 - d. This processing package is currently used by NAWQA to process their Qualitative Multihabitat (QMH) samples.

Table 2. Cost of benthic macroinvertebrate sample processing packages available at the BU for FY99.

Benthic Macroinvertebrate Sample Processing Packages	Price
500 fixed-count organism subsample with STA	\$560
300 fixed-count organism subsample with STA	\$420
100 fixed-count organism subsample with STA	\$270
100 fixed-count organism subsample with RTA	\$150
2-hour visual sort with STA	\$440

CUSTOM BENTHIC MACROINVERTEBRATE SAMPLE PROCESSING

- 1) Whole Benthic Macroinvertebrate Sample Processing
 - a. This type of sample processing does not include any subsampling of substrate or organisms.
 - b. The actual cost of this processing will depend on the following information provided by the customer: type of sample (quantitative or qualitative), location of collection, date of collection, collection gear and mesh size used, type of substrate sampled, and approximate volume of substrate collected.
- 2) Custom Taxonomic Assessment
 - a. The BU benthic macroinvertebrate staff will provide custom taxonomic identification of benthic macroinvertebrate organisms to meet the customers needs.
 - b. Actual cost must be negotiated, and the final taxonomic resolution achieved by the BU will depend on the state of knowledge for species-level identification in each taxonomic group.
- 3) Benthic Macroinvertebrate Voucher Collection
 - a. A curated, synoptic voucher collection can be provided to the customer that represents a permanent record of all the different benthic macroinvertebrate organisms identified from the samples.
 - b. Actual cost of this collection must be negotiated depending on the diversity of organisms identified and other specific needs of the customer.

For more information, contact Steve Moulton (smoulto@usgs.gov, 303-467-8171) for initial inquiries and technical questions or Gary Cottrell (cottrell@usgs.gov, 303-467-8248) for information about pricing.

/signed/
Robert S. Williams, Jr., Chief
National Water Quality Laboratory
Branch of Analytical Services

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