

UPPER MERRIMACK MONITORING PROJECT

a citizen volunteer water quality monitoring program

prepared by

UPPER MERRIMACK RIVER LOCAL ADVISORY COMMITTEE

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Project Description

The Upper Merrimack River Local Advisory Committee (UMRLAC) was established through the New Hampshire Rivers Management and Protection Program (RSA-483). A principal duty of the Committee under this statute is to develop and assist in the implementation of a river corridor management plan for the communities of Boscawen, Bow, Canterbury, Concord, Franklin and Northfield.

A *Management and Implementation Plan* was drafted and adopted by UMRLAC to address issues of the management of Water Resources, Riparian Lands, and Outstanding Resources which combine to form the plan.

Implementation of the plan was initiated in 1995 by UMRLAC by focusing on the water resource management component and the development of a citizen volunteer water quality monitoring project, known as the Upper Merrimack Monitoring Project (UMMP). This project was designed to generate community stewardship throughout the upper Merrimack River Watershed from the confluence of the Pemigewasset and Winnepesaukee Rivers in Franklin, NH to Garvins Falls in Bow, NH. In addition to the initiation of a volunteer interactive river quality assessment program, data generated will provide communities along the river corridor with an impact assessment of nonpoint source pollution within the respective sub-watersheds.

The UMMP for the upper Merrimack River watershed was designed and implemented in 1995 through a Cooperative Agreement between the UMRLAC, the Merrimack River Watershed Council (MRWC) and the NH Department of Environmental Service (NHDES). Technical assistance and biomonitoring protocols were adopted from the River Watch Network Benthic Macroinvertebrate Monitoring Manual. The goal of the UMMP is to determine the impact of point and nonpoint source pollution discharges in the upper Merrimack River watershed. Accumulation and analysis of bi-annual biomonitoring data will reflect the health of the aquatic biota within the upper Merrimack River Watershed and will also expose volunteers from surrounding communities and schools to the concepts of watershed ecology, taxonomy and point and nonpoint source pollution. It is anticipated that the citizen component of this project will heighten community awareness to the effects of point and non point source pollution within the Merrimack River and its tributaries and lead to a strong river and watershed stewardship program in the future. It is also the goal of the parties involved with this project to provide other communities, watershed associations, and local advisory committees with a template for future citizen water quality monitoring projects throughout the Merrimack River Watershed and beyond.

During the summer of 1995, UMRLAC, MRWC and NHDES initiated the UMMP for the upper Merrimack River. The project consisted of macroinvertebrate collection and ambient water quality monitoring at seven sites within the segment (figure 1). Rock baskets were prepared and installed at the seven sites at the end of July by volunteers from the surrounding communities. Three baskets were used at each site to ensure that quality assurance/quality control guidelines were satisfied. In addition to the macroinvertebrate collection, volunteers collected ambient water quality samples every other week from the seven sites from 9/25/95 to 11/20/95. Samples

were analyzed for E. coli bacteria by the Franklin Wastewater Treatment Facility in Franklin, NH. Results are presented in figure 2. Additional parameters will be added to the ambient water quality monitoring matrix in 1996.

Rock baskets were retrieved after a seven week colonization period in the second week of September. Volunteers followed River Watch Network (RWN) field procedures for macroinvertebrate removal and preservation from rock baskets. Enumeration and identification to the family level is currently underway through a series of volunteer workshops hosted by Franklin High School in Franklin, NH. Technical expertise and training is provided to volunteers by personnel from the River Watch Network and NHDES.

This initial collection and interpretation of ambient and biological water quality data will provide the framework for future trend analysis and impact assessments to be made within the upper Merrimack River watershed. Some background data already exists from the Merrimack River Initiative project which was implemented in 1994. Sites for the UMMP were established at locations used for the MRI project. This will promote trend and interpretation analysis of data collected by citizen monitoring efforts during 1995.

The UMLAC is seeking a Local Involvement Grant (LIG) to assist in the acquisition of equipment and supplies to reduce dependency upon other agencies. Once the UMLAC has secured these materials/equipment, the UMMP will be self-sustaining and transferable to the entire upper Merrimack River watershed. The upper Merrimack River and its major tributaries are subject to extensive volumes of stormwater runoff especially during high intensity rains. This runoff can contain nutrients, sediment and various other nonpoint source pollutants that adversely affect river quality. Establishment of a permanent UMMP will identify areas of severe nonpoint source pollution within the upper Merrimack River Watershed and heighten community awareness of Best Management Practices (BMPs) designed to control various sources of nonpoint source runoff. This program will also provide communities with a tool to evaluate the effectiveness of BMP implementation within the watershed by examining the macroinvertebrate community response to these measures. Also, the adoption of the macroinvertebrate identification workshops into the curriculum of schools throughout the watershed will begin to generate a river stewardship movement among the communities in the watershed.

Technical Design

As discussed previously, an ongoing monitoring program is in effect in the upper Merrimack River Watershed that involves citizen biomonitoring and ambient water quality collection. This program is currently measuring the impacts of stormwater runoff, land use activities and discharge from the Franklin Wastewater Treatment Facility. Subsequent macroinvertebrate collections will be conducted each fall and summer to observe seasonal influences upon the aquatic community. Ambient water quality samples will be collected at each macroinvertebrate site on a bi-monthly basis. Sample parameters will include the analysis of E. coli bacteria, pH, turbidity, specific conductance, dissolved oxygen and total phosphorus.

Sample locations currently established are presented in figure 1. Future monitoring sites will be determined by conducting shoreline surveys in Bow and Concord and in the subwatersheds of tributaries to the main stem of the upper Merrimack River. The seven sites established for the 1995-1996 monitoring program were selected in part to reproduce data collected throughout the MRI. Sites 1, 2, 3, 4 and 7 were established in the same locations as previous MRI sites. Stations 5 and 6 were selected to determine the ambient quality and biological diversity above and below significant agricultural operations that border the upper Merrimack River from Northfield to Concord. Stations 3 and 4 are sites above and below the Franklin Wastewater Treatment Facility. Citizen volunteer water quality monitoring at these sites will determine the impact of the treatment plant effluent upon river quality at different times if the year. Continued monitoring at these sites will provide an opportunity to measure the impact of the removal of chlorinated effluent in 1996 when the ultraviolet disinfection system becomes operational at the Franklin Wastewater Treatment Facility. Diversity of the biological community at Station 4 should improve dramatically once discharge of chlorinated effluent is no longer necessary.

Following the field procedures established in the summer of 1995, each monitoring station will be analyzed for macroinvertebrates by installing three rock baskets at each site which allows for two replicate field samples at each site. A ten percent QA/QC sample frequency will be maintained for ambient water quality samples collected at each site. Ambient water quality samples will be delivered to and analyzed at either the Franklin Wastewater Treatment Facility or the NHDES Limnology Center which are both EPA inspected facilities and follow established QA/QC guidelines determined by EPA. Field duplicates for rock basket macroinvertebrate removal will be conducted by a professional aquatic biologist to ensure proper field collection techniques by citizen volunteer monitors.

Project organization and responsibility

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Project schedule

As described above, identification of the samples collected during the summer of 1995 is currently ongoing within the upper Merrimack watershed. Follow-up monitoring is scheduled to begin in June of 1996. The following schedule applies to the summer monitoring program which is contingent upon LIG funding for equipment.

Table 1

Start Date	Task/Event/Output
April 1996	Purchase monitoring equipment
May 1996	Shoreline survey/habitat assessment
June 3 - November 18	Ambient sample collection (bi-monthly)
June 10	Install rock baskets
July 22	Remove rock baskets
August 1996	Macroinvertebrate workshops
September 1996	Report generation

Field Sampling Table

Table 2

Parameter	# of Samples	Volume	Container	Sample Preservation	Holding time	Reference
pH	84	100 ml	LDPE	refrigerate	24 hours	Hydrolab SM 2310B
Conductivity	84	100 ml	LDPE	refrigerate	28 days	Hydrolab SM 2310B
Turbidity	84	100 ml	LDPE	refrigerate	48 hours	SM 2310B
Total Phosphorus	84	50 ml	HDPE	H2SO to pH <2	28 days	EPA 36512 SM 4500-PE
Dissolved Oxygen	84	Field	Field	Field	Field	Hydrolab
E. coli	84	100 ml	Sterile PP	refrigerate	8 hours	SM 9222B
Macroinvertebrates	42		LDPE/ glass	formalin/ alcohol	N/A	River Watch Network

Sampling procedures and chain of custody

Citizen volunteer monitors involved in the collection of ambient water quality samples will be trained by a professional aquatic biologist from NHDES. Volunteers will follow strict sampling procedures defined by EPA and Standard Methods Collection and preservation of samples (1060A, B and C). Samples will be collected in the designated bottles (Table 2). Sample containers will be obtained from the NHDES laboratory or the Franklin Wastewater Treatment Facility laboratory.

Sample bottles will be labeled and marked before each sample collection to prevent sample misidentification. The following information will be included on each ambient sample label: station description and site number, collectors initials, date and time. Labels will be marked with waterproof ink. Information included on macroinvertebrate containers will include: site description and number, replicate number, collectors' initials, date and time. When macroinvertebrates are rough-sorted and sub-sampled, labels will be transferred from containers to organism vials immediately to avoid misidentification.

A sample analysis request sheet will accompany the samples to the laboratory. The collector completes the field portion of this form using information in the field log book and sample labels. The laboratory portion of this form is completed by laboratory personnel and includes: name of person receiving the sample, laboratory sample number, date of receipt and determinations to be performed.

Analytical Procedures

All analytical methods used in this project are referenced in Table 2. Benthic macroinvertebrate collection, identification and enumeration and data manipulation procedures have been adopted from the River Watch Network Benthic Macroinvertebrate Monitoring Manual (Revised 9-95).

Quality Control Samples

Samples will be collected in the designated bottles (Table 2). Sample containers will be obtained from the NHDES laboratory or the Franklin Waste Water Treatment Facility.

The Franklin Wastewater Treatment Facility laboratory and the NHDES Limnology Center currently provide analysis for samples submitted by the UMMP. These laboratories currently operate under strict QA/QC procedures and are both inspected and certified laboratories by EPA. Each laboratory maintains analytical replicate frequencies of at least 10 percent for all parameters analyzed. Spiked sample and laboratory blanks are run periodically to monitor instrument calibration and ensure that sample handling procedures are operating within acceptable ranges.

Two field replicates are performed at each station during the macroinvertebrate collection and colonization period to eliminate interferences that would influence colonization rates on individual substrates. Laboratory verification of macroinvertebrate identifications performed by volunteers will be conducted by a professional aquatic biologist. All identified samples will be stored indefinitely to facilitate the construction of a reference collection for the Citizen Volunteer Water Quality Monitoring Project.

Documentation, Data Reduction, and Reporting

Adequate documentation will be provided to insure that the data derived in sample analysis is justifiable, with respect to the sample and the requirements of the project. Each sample will be documented as to its place of origin, how the sample was taken, person performing collection and conditions relating to sample collection. In addition, members of the project staff working in the field will keep a field notebook of their project activities.

Data reduction and reporting: Raw data will be summarized and incorporated in report form. At the completion of the study, a final report will be submitted to EPA. The final report will detail in text supported by graphics, the method of data collection and results of the field and analytical work. The report will also describe progress in meeting objectives.

Data Validation

Data validation is a process of review of the analytical results and documentation against established criteria. The NHDES laboratory and the Franklin Wastewater Treatment Facility will perform data validation.

Performance and Systems Audit

US EPA Office of Quality Assurance may conduct audits on a time interval to assess the level of adherence to this Work/QA Plan. Audits of field notebooks and other project documents are also inspected by the Office of Quality Assurance.

Corrective Action

When it is found that data is incomplete or that results are unacceptable, the Project Officer may determine that one or more of the following procedures for corrective action shall be undertaken:

1. Incomplete data: Omissions from logs, notebooks and worksheets place the entire analysis in question. Incomplete laboratory data usually calls for reintroduction or re-analysis of the questionable sample if possible.
2. Conflicting data: As in the case of omitted data, conflicted data may require that the entire analytical performance be questioned. In some case, however, other supportive documentation may aid in resolving problems. When this is not available, the Project Officer may require re-sampling or re-analysis of samples if possible.

Poor Performance:

When results from duplicates, spikes, blanks, etc. fall outside acceptable ranges, the available data will be reviewed by the Project Officer. Upon examination, all or some of the following actions may be applied:

1. System audit for analysis in question.
2. Determination of matrix interference.
3. Re-sampling of the questionable sample.
4. Reconsideration of acceptable limits with statements included with results explaining the action/rational taken.
5. Rejection of data and exclusion from the report with written explanation.
6. Rejection of the entire sample/site location with recommendation of relocation of sample site or reconsideration of results sought.

See NHDES Laboratory Standard Operating Procedures for detection limits, accuracy and precision protocols on file with EPA.

