



## Project Summary

# National Surface Water Survey, National Stream Survey, Pilot Survey—Field Operations Report

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The National Stream Survey (NSS) is one of the programs within the National Surface Water Survey of the U.S. Environmental Protection Agency. The proposed research plan for Phase I of the NSS was evaluated during a pilot survey conducted in the spring and summer of 1985. A base of operations that included a mobile laboratory was established at Sylva, NC. Selected locations of 61 streams in the southern Blue Ridge region of the United States were sampled four times during a 57-day period. This report chronicles the activities required to plan and conduct the field operations of the NSS pilot survey.

Preparatory activities for the NSS pilot survey are described, including the personnel training program and site reconnaissance activities. The equipment and protocols (including quality assurance measures) used to collect water samples and to conduct field measurements of pH, conductivity, and dissolved oxygen are presented. Field laboratory activities are summarized, including a protocol for preparing a fraction for analysis of organically-complexed monomeric aluminum species. The fractionation procedure used was feasible, but alternative methodologies should be investigated. Certain protocols for collecting samples or conducting field measurements were compared against possible alternatives. Filtering samples during collection was determined to be unfeasible. Use of a peristaltic pump to collect samples was found to be more suitable

than collecting discrete grab samples. Measurements of pH could be conducted at streamside without concern for effects of CO<sub>2</sub> degassing. Experiments investigating the holding time of unpreserved water samples are presented in two appendices to this report. The results of these experiments indicate that sample holding times could be extended without compromising the accuracy or quality of the data.

The NSS pilot survey was completed on schedule and demonstrated that a large-scale synoptic survey of streams was logistically feasible. The NSS also confirmed that the basic research design, quality assurance plan, and data analysis plan of the NSS would provide the necessary information to meet the objectives of the NSS. Pertinent cost information and specific recommendations regarding various aspects of field operations are provided for those planning similar projects.

*This Project Summary was developed by EPA's Environmental Monitoring Systems Laboratory, Las Vegas, NV, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back)*

### Introduction

The National Surface Water Survey (NSWS) is a three-phase program designed and implemented by the U.S. Environmental Protection Agency. This large-scale survey is a part of the



National Acid Precipitation Assessment Program. A primary objective of the NSWS is to provide quantitative regional-scale assessments of the present chemical status of surface waters potentially at risk from acidic deposition. The NSWS is composed of two major component projects: the National Lake Survey (NLS) and the National Stream Survey (NSS).

In preparation for Phase I of the NSS, a pilot survey of 61 streams was conducted in the southern Blue Ridge area of the eastern U.S. during the spring and summer of 1984. The pilot survey served to evaluate all aspects of the proposed NSS Phase I research plan, including data quality objectives, sampling design, sampling and analytical methodologies, equipment, field logistics, and the data analysis plan. This report documents and evaluates those activities that were related to planning and conducting the field operations of the NSS pilot survey. The Environmental Monitoring Systems Laboratory of the EPA in Las Vegas, Nevada (EMSL-Las Vegas), was responsible for planning and conducting the pilot survey field operations. Support for this effort and field personnel were provided by Lockheed Engineering and Management Services Company, Inc.

### **Planning and Preparation for Field Operations**

Protocols for collecting water samples from streams and for measuring certain chemical and physical parameters in the field were developed by considering recommended methodologies, quality assurance requirements, and available equipment. Protocols to be used in a field laboratory trailer to measure conductivity and to prepare a fraction for analysis of organic monomeric aluminum were also developed.

Potential sites for the location of the pilot survey field station were evaluated, and a field laboratory trailer designed for use in NSWS studies was transported to Southwest Technical College in Sylva, NC. Personnel who had previous experience in NSWS projects were recruited as field samplers or field laboratory analysts. Each group was trained over a 5-day period to become familiar with protocols and other aspects of field operations. Additional training was conducted at the field station before the start of sampling activities.

A total of 61 stream reaches (i.e., a length of stream between two points of confluence with tributaries) were targeted for sampling. Fifty-six of these reaches (termed "regular" reaches) were

selected according to the statistical design set forth in the NSS research plan. The remaining six reaches were selected as "special interest" sites because of (1) the availability of historical water quality data or because (2) they were sampling sites of ongoing studies by other investigators. Basic access information on each reach was obtained from persons familiar with the area before the start of field operations. A dossier was compiled for each sampling site that included maps and other pertinent access information. Each site was visited just before the start of sampling operations to verify the access information, record site characteristics, and to install hydrologic staff gauges.

### **Field Station Operations**

Field operations were conducted between March 1 and April 30, and between June 26 and July 17, 1985. In the spring sampling period, each stream reach was sampled near its downstream end three times at two-week intervals. During the third round of visits, 23 reaches were also sampled near their upstream end. During the summer sampling period, all reaches were sampled once at both downstream and upstream ends. Three two-man teams used four-wheel drive vehicles to access most sampling sites. Access to a few sites required additional travel by foot, boat, or horseback. Each team could sample one to three streams per day. Water samples were collected at each location by using a portable peristaltic pump. Stream pH was measured on two different aliquots of stream water: one exposed to the atmosphere (open system measurement), the other not exposed to the atmosphere (closed system). Conductivity and dissolved oxygen were measured *in situ*. The specific procedures and associated quality assurance and quality control measures are described in the report.

Water samples were returned to the field laboratory within 9 hours of collection. Samples were organized into a batch for analysis and processing. Quality assurance samples were also included in each batch. At the field laboratory, samples were analyzed for pH and DIC (closed system measurements), turbidity, and true color. Bulk water samples were also processed into eight different aliquots and were preserved for later analysis at a contract analytical laboratory. Two of these aliquots were prepared for analysis of monomeric aluminum species. Preparation of these

aliquots involved an extraction procedure using methyl isobutyl ketone (MIBK). In one aliquot, extraction was preceded by passing the sample through an ion-exchange column to remove inorganic aluminum complexes. The following day, preserved aliquots were shipped to the contract analytical laboratory via overnight courier. Field and field laboratory data forms were shipped to the data management center (Oak Ridge National Laboratory) and to quality assurance personnel (EMSL-Las Vegas).

The pilot survey was successfully completed on schedule. Fifty-seven days of operation were required to complete the required sampling. A total of 759 samples were analyzed, including quality assurance samples. The field sampling effort required almost 45,000 miles of vehicle travel and 8-14 hours of field time per day. Each sampling team was outfitted to collect samples and field data at a cost of between \$2,500 and \$3,000.

### **Observations and Recommendations**

A major objective of the pilot survey was to evaluate the suitability of the equipment and the protocols used to collect and analyze stream water samples. All field protocols were evaluated and alternative equipment or methodologies were tested when possible. Selected field laboratory protocols were also tested.

The results of these evaluations indicate that the equipment and protocols used in the field to collect samples and conduct field measurements satisfied the requirements of the NSS. The filtration of stream water as it was being collected, however, proved to be unfeasible. Comparison of the two streamside pH measurements (open system vs. closed system) indicated that there was no apparent effect of CO<sub>2</sub> outgassing, and the open system measurement was recommended for future use. Measurement of conductivity at the field laboratory proved feasible in terms of required bench space and equipment. The preparation of the two aluminum extracts was very time-consuming, however, and alternative methodologies should be investigated. Two experiments were conducted during or immediately following the pilot survey to determine the length of time water samples could be held unpreserved without a significant change in chemical composition. These experiments, described in two appendices to the report, indicated that sealed syringes are impermeable to carbon

dioxide for at least 7 days if kept refrigerated and that water held in refrigerated plastic containers without headspace did not show substantial changes in chemical composition for at least 84 hours after collection

Problems encountered and corrective actions implemented during the pilot survey are summarized for four major areas: field safety, planning activities, field sampling operations, and field laboratory operations. Recommendations for future consideration are also presented where appropriate.

This report is submitted in partial fulfillment of contract 68-03-3249 by Lockheed Engineering and Management Services Company, Inc., under the sponsorship of the U.S. Environmental Protection Agency. This report covers a period from January 1985 to July 1985 and work was completed as of September 1986.

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*The complete report, entitled "National Surface Water Survey, National Stream Survey Pilot Survey Field Operations Report," (Order No. PB 87-188-702 AS, Cost \$18.95) will be available only from*

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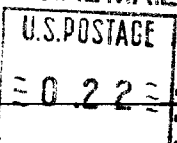
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