Beneficial Use Reconnaissance Program
2001 Annual Work Plan
For Wadeable (Small) Streams

Idaho Department of Environmental Quality

State Office of Technical Services

2001

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For Wadeable (Small) Streams

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Abstract

In 1993, the Idaho Division (now Department) of Environmental Quality (DEQ) embarked on a pilot monitoring program, the Beneficial Use Reconnaissance Project (now Beneficial Use Reconnaissance Program [BURP]) aimed at integrating biological monitoring with physical habitat assessment to characterize stream integrity and the quality of Idaho's waters. The program has been implemented statewide since 1994. DEQ's past monitoring and assessment practices and the U.S. Environmental Protection Agency's rapid bioassessment protocols (RBPs) provided the foundation for BURP monitoring protocols. The purpose of BURP is to assist in determining the existing uses and beneficial use support status of Idaho's water bodies. The purposes of an annual BURP work plan are to provide background information about the program and list program objectives for a specific year. A companion to this work plan, the *Beneficial Use Reconnaissance Program Field Manual for Wadeable (Small) Streams* (Clark, in prep), describes the methods used in BURP. The objectives for BURP in 2001 are to: 1) establish and monitor long-term reference trend sites; 2) fill in missing data gaps; and 3) examine macroinvertebrate sample size requirements. The Boise, Coeur d'Alene, Idaho Falls, Lewiston, Pocatello, and Twin Falls DEQ Regional Offices will each have a sampling crew for the 2001 field season. The field season will begin July 1 and end October 15, 2001. Each crew will sample approximately 50 stream sites. Current estimates are that DEQ will monitor 364 BURP stream sites during the 2001 season. Pilot projects include a stream reference condition variability study and testing new methods for increasing the macroinvertebrate sample size. The objectives of the reference condition variability study are to set up a new reference network based on a documented, systematic and standardized process with selection criteria, to evaluate annual variability in BURP measurements, and to evaluate crew and parameter variability within a season. Idaho received near record low precipitation during the winter of 2000/2001. The resulting forecast of near record low stream flows will present both challenges and opportunities for the 2001 program and monitoring crews. Opportunities include the chance to sample at or near record low flows, which will help define the range of natural variation within the stream system. Challenges will include a test of our methods to monitor low flows. The crews will take note of dry streams.

Introduction

Regulatory Framework (Clean Water Act)

The history of the current regulatory framework for clean water programs in the United States began with the Water Pollution Control Act of 1948 (Public Law 80-845)(Water Environment Federation 1987). This was the first comprehensive statement of federal interest in clean water programs. In 1972, the U.S. Congress passed Public Law 92-500, the Federal Water Pollution Control Act, more commonly known as the Clean Water Act (CWA) (Water Environment Federation 1987). The goal of the act was to restore and maintain the chemical, physical, and biological integrity of the nation waters (Water Environment Federation 1987). One of the goals of the 1977 amendment was protecting and managing waters to insure swimmable and fishable conditions. This goal, along with the 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality to more than just chemical characteristics. The CWA and the programs it generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987.

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the nation. The Idaho Department of Environmental Quality (DEQ) implements the CWA in Idaho while the EPA works with Idaho water quality programs and certifies the fulfillment of CWA requirements and responsibilities.

DEQ is charged (Clean Water Act, CFR, 39:3601) with providing consistent water body monitoring and assessment methods (Grafe et al. 2000). BURP procedures and DEQ monitoring protocols provide this consistency. The assessment methods (Grafe et al. 2000) determine if a water body is supporting or not supporting beneficial uses (see Table 1) such as aquatic life. The Idaho *Water Quality Standards and Wastewater Treatment Requirements* are the rules concerning beneficial uses and associated criteria (State of Idaho, Administrative Rules, 58.01.02). The Idaho water quality standards consist of three parts: 1) beneficial uses; 2) numeric and narrative criteria; and 3) antidegradation. Beneficial uses are described in more detail below.

History of the Beneficial Use Reconnaissance Program

In 1993, DEQ embarked on a pilot project known as the Beneficial Use Reconnaissance Project (now known as the Beneficial Use Reconnaissance Program) aimed at integrating biological monitoring with physical habitat assessment to characterize stream integrity and the quality of the water (McIntyre 1993). This project was also developed to meet the CWA requirements of monitoring and assessing biology and developing biocriteria. This pilot, named the Beneficial Use Reconnaissance Project (BURP), relied heavily on protocols for monitoring physical habitat and macroinvertebrates developed by Idaho State University and DEQ in the early 1990s. It closely followed the *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish* developed by EPA (Plafkin et al. 1989). This document was an attempt to use the best science and understanding available to

characterize water quality based on biological communities and their attributes. Because of the success of the 1993 pilot, DEQ decided to expand the project statewide in 1994 (McIntyre 1994; Steed and Clark 1995). BURP has remained in use statewide since 1994 (Idaho Division of Environmental Quality 1995; Beneficial Use Reconnaissance Project Technical Advisory Committee 1996, 1997, 1998, 1999). BURP is the ambient monitoring strategy for the State of Idaho at this time. BURP monitoring was greatly reduced in 2000 in order to revise the monitoring and assessment documents and to begin assessment of collected data. Grafe et al. 2001 has created a draft assessment document for the purpose of assessing these data. At the end of the 2000 BURP season a total of 4160 stream sites had been sampled in Idaho, making us a national leader in monitoring for bioassessment. Also in 2000, the *Beneficial Use Reconnaissance Project* was renamed the *Beneficial Use Reconnaissance Program* to emphasize its importance as a permanent DEQ monitoring program.

Overview of Rapid Bioassessment

Barbour et al. (1999) defines biological assessment as "an evaluation of the condition of a waterbody using biological surveys and other direct measurements of the resident biota in surface waters." The concept of "rapid bioassessment" resulted from a report by EPA, which suggested a restructuring of monitoring programs at that time (U.S. Environmental Protection Agency 1987). EPA's answer to this suggestion resulted in the first Rapid Bioassessment Protocols (RBPs) being published (Plafkin et al. 1989). RBPs were found to be faster, and thus cheaper, than previous monitoring techniques.

The RBPs have been used nationwide by a wide variety of federal agencies, most states and other monitoring entities and have improved over the years (Barbour et al. 1999). Idaho's BURP uses many of the RBP methods and makes modifications to fit Idaho's landscape and DEQ's objectives (Beneficial Use Reconnaissance Project Technical Advisory Committee 1999). A more detailed review of RBPs can be found in Idaho's 1998 303(d) list report (Idaho Division of Environmental Quality 1998).

Purposes of the BURP Annual Work Plans

The purposes of BURP's annual work plans are to provide background information about BURP and list yearly objectives. Annual work plans also help provide consistency within the program and serve as a substantial portion of BURP's quality assurance/quality control (QA/QC) program. The annual work plan will give the monitoring objectives for the year. The plan gives the priorities for the watersheds and streams to be sampled. Any pilot projects planned for the year are described as well as any other special considerations that may be unique to a given year. A companion to this work plan is the *Beneficial Use Reconnaissance Program Field Manual for Wadeable (Small) Streams* (Clark in preparation), which describes the field methods used in detail.

Beneficial Uses of Water in Idaho

The beneficial uses of water in Idaho are defined as "any of the various uses of water, including, but not limited to, aquatic biota, recreation, water supply, wildlife habitat, and aesthetics" (Grafe et al. 2000). These beneficial uses are listed in Table 1. Since 1993, the purpose of BURP has been to help determine the status of these beneficial uses and to establish existing uses (McIntyre 1993, 1994; Idaho Division of Environmental Quality 1995; Beneficial Use Reconnaissance Project Technical Advisory Committee 1996, 1997, 1998, 1999).

Table 1. The beneficial uses of Idaho water as specified in the Idaho water quality standards (State of Idaho, Administrative Rules, 58.01.02).

Beneficial Use Category	Beneficial Uses
Aquatic Life Support	Cold water biota, salmonid spawning, seasonal cold water biota, warm water biota, modified
Contact Recreation	Primary (swimming), secondary (boating)
Water Supply	Domestic, agricultural, industrial
Other	Wildlife habitat, aesthetics, special resource waters

BURP Support Status

The purpose of BURP is to collect and measure key water quality variables that aid DEQ in determining the beneficial use support status of Idaho's water bodies. The determination will tell if a water body is in compliance with water quality standards and criteria and if the water is meeting reference conditions. Reference conditions are those that fully support applicable beneficial uses with little affect from human activity and represent the highest level of support attainable, by bioregion. BURP provides the data used in the *Water Body Assessment Guidance* (Grafe et al. 2000). For more details on how assessments are done, data representativeness and handling, as well as other policies, see Grafe et al. (2000).

Currently, DEQ recognizes three categories of beneficial use support status: fully supporting, not fully supporting, and not assessed. "Fully supporting" means that the water body is in compliance with water quality standards and criteria, and meeting the reference conditions for all designated and existing beneficial uses as determined through the *Water Body Assessment Guidance* (Grafe et al. 2000). Not fully supporting refers to a water body that is not in compliance with water quality standards or criteria, or not meeting reference conditions for each beneficial use as determined through the *Water Body Assessment Guidance* (Grafe et al. 2000). The "not assessed" category describes water bodies that have been monitored to some extent, but are missing critical information needed to complete an assessment. Not assessed can also mean that DEQ has not visited the water body and has no information on it.

Annual Work Plan, 2001 Field Season

Objectives

The objectives for BURP for the 2001 field season are:

1. establish and monitor long-term reference trend sites,
2. fill in missing data gaps, and
3. examine macroinvertebrate sample size requirements.

Several authors (Bahls et al. 1992; Grafe 1999; Harrelson et al. 1994; King 1993; McGuire 1992, 1995) have pointed out the need for long-term monitoring data of least-impacted (reference) sites. The purpose of long-term monitoring efforts is to help determine the range of natural variation within a water body (Barbour et al. 1999). For several years, BURP monitoring has placed emphasis on least-impacted (reference) conditions (McIntyre 1994; Idaho Division of Environmental Quality 1995; Beneficial Use Reconnaissance Project Technical Advisory Committee 1996, 1997, 1998, 1999).

Idaho's surface water quality monitoring is based on watersheds. The watersheds are grouped into hydrologic units, identified by hydrologic unit codes (HUCs)(Figure 1).

DEQ is developing a statewide monitoring strategy that may incorporate targeted, census, and probabilistic sampling as a means to describe water quality conditions in Idaho. This strategy will consider resources available to implement. The DEQ monitoring strategy will tie into the EPA development of a Consolidated Assessment and Listing Methodology (CALM) which has the purpose of improving state monitoring and assessment programs (U.S. Environmental Protection Agency 2001). Six major parts make up CALM: 1) making decisions on attainment/non-attainment of state water quality standards (covering listing/de-listing decisions); 2) designing comprehensive state monitoring networks that support attainment decisions; 3) reporting and presentation of data; 4) upgrading elements of state monitoring programs; 5) identifying causes and sources of impairment; and 6) addressing issues such as pathogens, nutrients, sedimentation, and fish advisories.

The overall goal of the CALM is to both strengthen and streamline the water quality monitoring, assessment and listing process for purposes of both sections 305(b) and 303(d) of the Clean Water Act. CALM will provide guidance on the monitoring data and assessment methods needed to support decision making, and on communicating water quality conditions to the public. The benefits of the CALM are, therefore, increased monitoring on all waters, improved decision making on water quality standards attainment and listing impaired waters, and clearer communication to the public on water quality issues in each state and across the nation (U.S. Environmental Protection Agency 2001).

Special Considerations for 2001 field season

The winter 2000/2001 snowpack and resulting stream flows for the state of Idaho, as well as the Pacific Northwest and southern Canada, are near record lows (Natural Resources Conservation Service 2001). The Natural Resources Conservation Service (2001) states that "Idaho water

users should prepare for one of the lowest runoff years ever." They note that as of May 1, 2001, the "lowest streamflow forecasts are 20-40% of average across southern and central Idaho; some of these are near record low volumes."

The low water will present a challenge to sampling crews. They will probably begin sampling in areas likely to have little or no water later in the season (arid, low elevation sites first, for example). The low water year can also help us define the range of natural variation for the streams. It will be important to monitor these conditions as they may present variations from biological and habitat conditions sampled in wetter years. Dry streams will be noted.

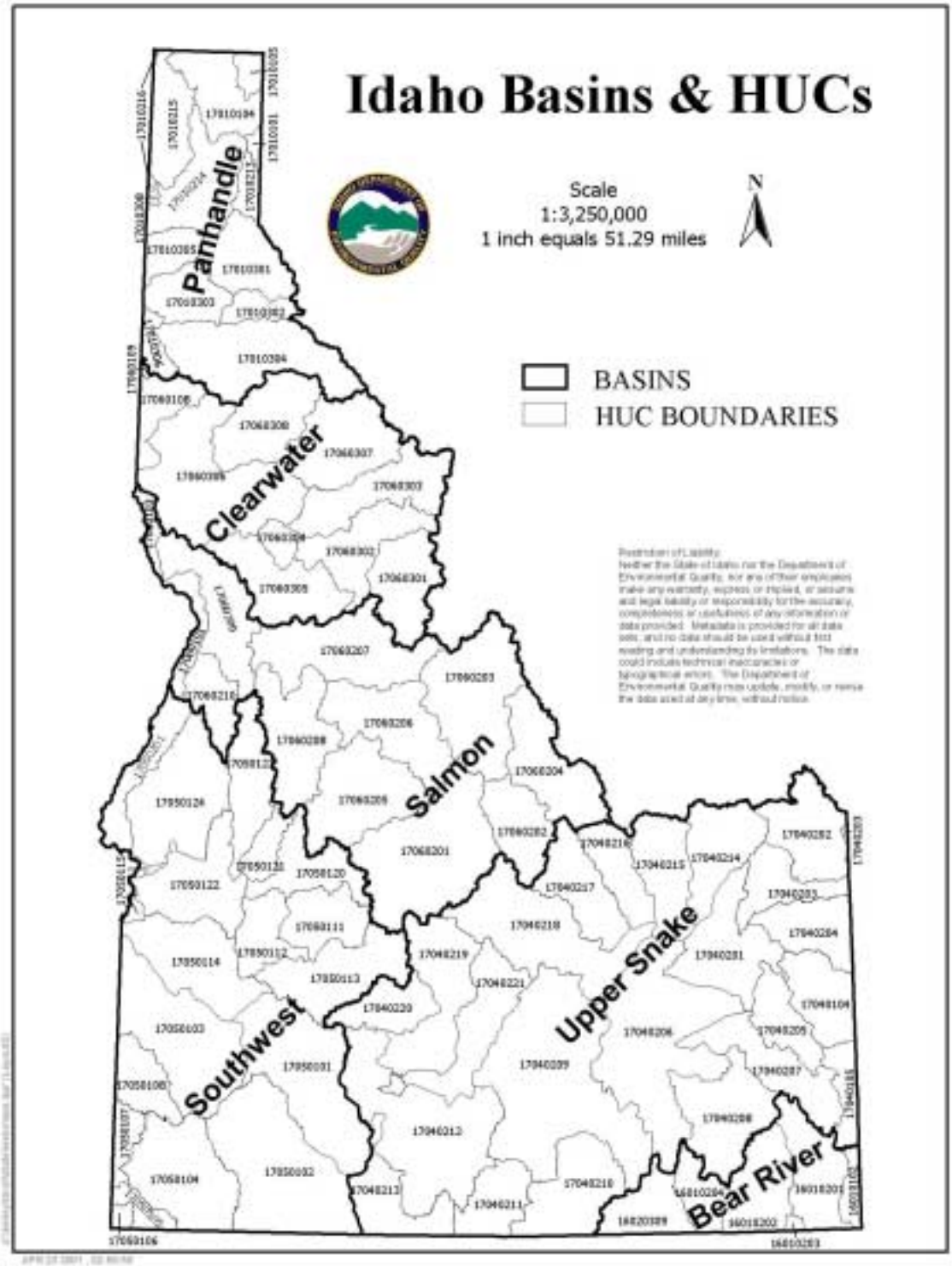

Figure 1. Major hydrologic basins and hydrologic unit codes (HUCs) in Idaho.

Streams and Stream Sample Sites

The Boise, Coeur d'Alene, Idaho Falls, Lewiston, Pocatello, and Twin Falls DEQ Regional Offices will each have a sampling crew for the 2001 field season. Contact information for the DEQ Regional Office BURP Coordinators is given in Figure 2. The previous DEQ Regional Office designations (for example NIRO) as well as the current DEQ Regional Office designations (CDA) are given for reference. Figure 2 also shows the approximate area of field operations for each office and coordinator. The field season will begin July 1 and end September 15.

Each crew will sample approximately 50 stream sites. The BURP sites will include 40 samples collected from reference sites (five sites in four bioregions, two visits during 2001). The core reference stations will be sampled on a regular basis to help establish a range of conditions and trends. Crews will typically sample lowland and rangeland areas earlier in the season and work upwards (increase elevation) toward forested streams to avoid problems encountered with early season runoff (snowmelt). The plan is to sample each stream at what are summer low flow conditions. A short narrative of what each DEQ Regional Office plans for the 2001 field season is given below. Table 2 contains a tabular list of projected BURP sites and samples for the 2001 field season.

- Boise Regional Office – The Boise Regional Office has several high priority monitoring objectives for the 2001 field season: monitoring trend sites (six sites sampled twice), all water bodies within subbasins that have upcoming subbasin assessments (SBAs), sites needed to complete total maximum daily loads (TMDLs), and the monitoring of six reference sites. Specific areas of emphasis will be the South Fork Payette subbasin (16 sites), the Middle Snake-Succor subbasin (16 sites), and the Weiser subbasin. No additional electrofishing sites are planned.

- Coeur d'Alene Regional Office – Regional Office personnel estimate they will sample about 40 sites this field season plus the monitoring of three reference sites. The Regional Office will concentrate on the Kootenai watershed. They plan to collect about 60 bacteria samples (including some that exceed the threshold) and expect to collect fish assemblage data at about 10 additional streams to make up for some data missing from past years.

- Idaho Falls Regional Office – Idaho Falls personnel plan to sample approximately 150 sites in 90 streams in 18 HUCs plus the monitoring of five reference sites. They plan to sample fish at each 2001 BURP site, but will do no additional fish sampling as they have fish data for all previous sample sites. They estimate that 10 per cent of the bacterial samples may exceed the threshold and require the additional 30-day sampling regime.

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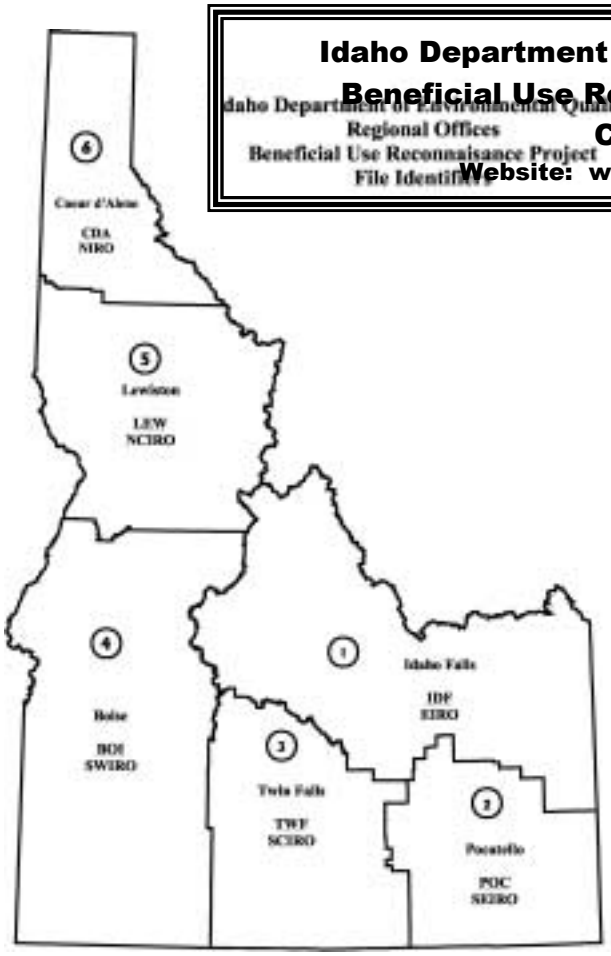

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Figure 2. Idaho Beneficial Use Reconnaissance Program contacts for 2001

Table 2. Estimated streams and number of stream sites to be monitored during the 2001 BURP field season. Total number of bacteria samples to be taken and additional fish assemblage sites to be sampled are included.

Regional Office	Stream Names and Stream Sites	Total # Sites	Estimated # Bacteria Samples	Estimated # Additional fish Sites
Boise	Middle Snake-Succor South Fork Payette Trend sites Reference Total	16 16 (each of 6 sites twice) 12 6 50	Those sites as determined necessary by the screening process	0
Coeur d'Alene	40 Kootenai watershed Reference Total	40 3 43	60	10
Idaho Falls	90 Reference Total	150 5 155	225	0
Lewiston	Lower NF Clearwater R. Reference Total	40 2 42	40	6
Pocatello	30 Revisit 1995 sites where possible Reference Total	40 3 43	30	20 total
Twin Falls	Camas Prairie Little Wood River area Reference Total	50 1 51	50	Some
Totals for State		**384**	**405+**	**36+**

- Lewiston Regional Office (including the Grangeville Satellite Office) – The Lewiston Regional Office plans to place emphasis on the lower North Fork of the Clearwater River.

They estimate that they will sample 30-40 sites this field season plus the monitoring of two reference sites.

- Pocatello Regional Office – Pocatello personnel estimate that they will sample about 40 sites in 30 streams this year plus the monitoring of three reference sites. They plan to revisit 1995 sites where possible and to electrofish about 20 streams and sites. The Pocatello office intends to sample 30 sites for bacteria.

- Twin Falls Regional Office – The Twin Falls Regional Office plans to sample 40-50 sites during the 2001 field season plus the monitoring of one reference site. They plan to focus on the Camas Prairie and Little Wood River drainages and are scheduled to sample about 40 sites. They will also sample one reference site for study. Each site will be sampled for bacteria and fish. Sites from past years that are missing fish data will be sampled for fish.

Pilot Projects

Pilot projects use sampling methods that the DEQ BURP Technical Advisory Committee wish to try in an experimental way to see if the methods obtain the needed data and information for a particular objective. The results of pilot projects are evaluated for utility in the statewide BURP sampling efforts. Two pilot projects are scheduled for the 2001 field season.

Pilot Project #1 - Reference Variability Study

This project is described in detail in Fore and Grafe (2001). A brief outline of the study is given below. The purpose of this study is to determine how much water quality measurements may vary according to differences associated with location, time of sampling, or other aspects of the sampling event. Specifically, DEQ will evaluate variability associated with year-to-year sampling, index period, and collection of data.

Core reference stations will be established in each bioregion. Estimates of variability from the sampling will be used to determine the number of sites to be regularly sampled to establish reference condition. Depending on observed patterns of variability, some indices or bioregions may require more (or less) intense sampling. Estimates of annual and index period variability for 2001 will guide site selection and sampling design for 2002-2003.

Five sites will be sampled in each of the Northern Mountains, Central and Southern Mountains, Snake River Basin and High Desert, and Northern Basin and Range bioregions. These sites must meet the standard selection criteria for reference conditions, have been previously sampled, and typical for the bioregion. Site selection criteria are given in Fore and Grafe (2001).

Each site location will be visited twice during the 2001 field season. For the initial and repeat visits, different crews will collect data. For 2001, a total of 40 samples will be collected from the reference sites (five sites in each of four bioregions and two visits).

Data collection will be done following Clark (in preparation). For the repeat visit, macroinvertebrates will be sampled at different riffles within the same reach and electrofishing will occur 100 m upstream of the sample reach.

Data analysis will consist of estimates of variability used in two calculations. First, confidence intervals will be derived for reference sites (by bioregion) and indexes based on the observed variance. Second, statistical power analysis will incorporate estimates of annual and index period variability to determine the magnitude of change each DEQ multi-metric index can detect through time.

Pilot Project #2 – Macroinvertebrate Sample Size

DEQ has selected the 500-organism count for macroinvertebrate samples for most studies including BURP (Clark and Maret 1993, Clark In Preparation). These samples are collected in three riffles in the stream study reach and then subsampled to obtain a minimum of 500 organisms.

A recent analysis of our data (Jessup and Gerritsen 2000) expressed concerns that three Hess samples may fail to capture a total of 500 or more organisms. This may influence the results by underestimating the total number of taxa present (Jessup and Gerritsen 2000).

This pilot project will include taking a fourth riffle sample to attempt to increase the number of macroinvertebrates sampled and thus have more samples that meet the minimum of 500 organisms target. The field crews will take an additional sample at the third riffle to avoid the process of cleaning the Hess net between samples and moving to a fourth riffle. This will increase the amount of stream bottom sampled in a reach by 25% and should also increase the number of macroinvertebrate individuals collected. We will do this at 10% of the sample reaches.

DEQ will evaluate these data after the 2001 macroinvertebrate samples have been identified. It will be an easy comparison to see what percentage of samples met the 500-organism minimum during 2001 compared to past years. At this time DEQ will determine if we make the permanent change to three or four riffle samples.

Other Monitoring Projects

The EPA is conducting a study in the western United States (EPA Regions 8, 9, and 10) that will advance the science of ecological monitoring and demonstrate techniques for regional-scale assessment of the condition of ecological systems. The objectives of this project, called Environmental Monitoring and Assessment Program (EMAP), the Western Pilot Study, are to "develop the monitoring tools (biological indicators, stream survey design, estimates of reference condition) necessary to produce unbiased estimates of the ecological condition of surfaces waters across a large geographic area (or areas) of the west; and demonstrate those tools in a large-scale assessment" Peck et al. (2001). Unbiased estimates require either a complete census of the ecological resources through remote sensing or a rigorous probability survey design that allows extrapolation of results from the sample to the entire resource of interest. Both strategies are used in the EMAP Western Pilot Study: a census for land

cover/land use and probability survey for other resources. The study will use a random or stratified random sampling scheme and a rich suite of indicators that include both biota and morphological aspects. See Tonning (1999) for a good overview of the Western Pilot Study. Hughes et al. (2000) provide a current overview of the survey in the United States.

Peck et al. (2001) provides a detailed field manual for the EMAP Western Pilot Study. The manual describes guidelines and standardized procedures for evaluating the biological integrity of surface waters of streams. The document contains the EMAP surface water field operations and bioassessment methods for evaluating the health and biological integrity of wadeable freshwater streams in the Western Pilot Study area.

Each western state participating in the study will sample approximately 50 sites over a four-year period. Idaho will sample about 15 sites per year under this program. Cynthia Grafe is the DEQ program contact and Darcy Sharp is in charge of field monitoring.

QA/QC

The quality assurance/quality control (QA/QC) aspects of BURP are critical to its success and have a direct relationship on the utility, repeatability, and defensibility of the data obtained by DEQ's sampling efforts. QA/QC are included in every aspect of BURP, including:

- preparing monitoring documents;
- educating and training BURP coordinators and crews (Beneficial Use Reconnaissance Program Technical Advisory Committee in preparation);
- preparing, calibrating, and maintaining field equipment;
- taking samples;
- conducting independent field audits, writing subsequent reports, and following up on issues raised in the audits;
- housing voucher specimens in a museum collection (Clark 2000); handling data; checking individual field sheets (Idaho Division of Environmental Quality 1999);
- entering, analyzing, and managing data (Radian International 1999);
- writing reports; and all other aspects of using the data.

Safety Considerations

Safety will remain the priority for all BURP sampling conducted in 2001 and in the future. DEQ takes safety issues very seriously. Major safety aspects of the monitoring are discussed in the *Beneficial Use Reconnaissance Program field manual for wadeable (small) streams* (Clark in preparation). In general, DEQ requires that all staff and crewmembers dealing with BURP receive first aid and CPR training or are hired with these current certifications. DEQ requires that vehicles are stocked with emergency items, including a first aid kit, fire extinguisher, and other safety items. Safety issues concerning of working around water and using sampling equipment are discussed in the BURP field manual (Clark in preparation), the BURP training manual (Beneficial Use Reconnaissance Program Technical Advisory Committee in preparation), and in training classes. Each BURP crew is responsible for its own safety. DEQ will provide the tools and training necessary for crews to conduct their field work in a safe manner.

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The BURP Coordinators (Cindy Barrett, Dave Hull, Angie Petersen, Glen Pettit, Steve Robinson, Bob Steed, Daniel Stewart, and Sean Woodhead) were helpful in supplying the required information concerning their 2001 planned activities and offered other assistance with the completion of this work plan. Barry Burnell and Amy Luft reviewed early drafts of this document and provided valuable suggestions and assistance with it. Cyndi Grafe, Michael McIntyre, and Darcy Sharp reviewed sections of the draft and gave suggestions for improvement. Cyndi Grafe provided information on the stream reference condition variability study. Bill Kelley made Figure 1 and Darcy Sharp created Figure 2.

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