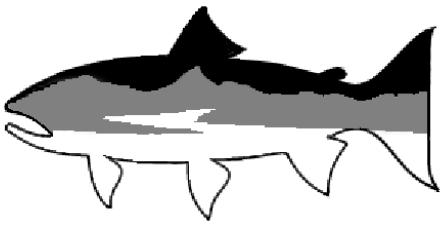
Field Protocol Synopsis

Regional Interagency Monitoring

Aquatic and Riparian Effectiveness Monitoring Program

For the Northwest Forest Plan



Field Season 2002

Version 2.0. For questions or comments, contact Kirsten Gallo, Aquatic and Riparian Effectiveness Monitoring Program. P.O. Box 1148, Corvallis, OR 973393 541.750.7021.

Introduction

The Aquatic Riparian Effectiveness Monitoring Program (AREMP) is currently being implemented to monitor aquatic and riparian ecosystems on federal lands managed under the Northwest Forest Plan. The purpose of the AREMP module is to determine the current condition of 6th field subwatersheds and track the changes in subwatershed condition over time. A total of 250 subwatersheds will be monitored under AREMP, with 50 subwatersheds sampled each year over a five-year period.

Field data collected will provide information on both the physical habitat and the biota. Physical habitat indicators include: bankfull width to depth ratio, entrenchment ratio, pool frequency, sinuosity, gradient, wood frequency, percent fines, and substrate D_{50}. Discharge and water chemistry data were also collected. Biological indicators include: periphyton, benthic macroinvertebrates, aquatic and terrestrial amphibians, and fish.

The stream data will be combined with upslope and riparian information (primarily vegetation and road density) to provide an estimate of watershed condition. Condition will be determined using a decision support model that aggregates all indicators. The stream data collected in the field represent about 2/3 of the data included in the decision support model.

Site Selection

Eighty potential sampling sites were randomly chosen along the stream network in the 6th field subwatershed. In the field, sites were considered for sampling beginning with number 1 and continuing through the list, omitting sites that could not be sampled.

The **only** reasons that sites cannot be sampled include:

- The site is located on private land or cannot be accessed due to private land.

- The site is not safely accessible; i.e., the site cannot be reached without putting the crew in danger. Long hikes down into steep canyons do *not* qualify.
- The stream is too small or not physically samplable. The minimum stream size is about 1 meter (3 feet) wide (wetted width) and 0.1 meters (4 inches) deep in riffle habitats.
- The stream is too large to physically sample (i.e. not wadeable) and is a safety concern for crews.
- The site is located in a lake or pond.

The goal was to sample a total of eight sites within a subwatershed. One site was located in the lowest portion of the watershed on public land that had gradient < 3 % (hereafter referred to as "low gradient". The remaining site locations were randomly selected as described. The length of the site was determined as 20* the bankfull width, with minimum and maximum reach lengths of 150 and 500 m, respectively. The low gradient site was selected because it is a response reach, that is, this reach is expected to respond to upstream impacts in the watershed.

Physical Habitat Mapping

Cross-sectional profiles

Channel cross-sectional and longitudinal profiles were mapped in each sample site using a laser rangefinder. Cross-sectional profile information was used to calculate bankfull width to depth ratios and entrenchment ratios. In the low gradient site and in nonconstrained reaches, 11 cross-sectional profiles were mapped, equally spaced along the length of the sample reach. At each cross section, 11 shots were taken on increment within the bankfull prism, with measurements taken at both wetted edges and the thalweg (Figure 1). Of the eleven cross sections, two randomly selected profiles extended beyond flood prone to

determine flood prone width. Only one point was taken outside bankfull in the remaining cross sections. In the constrained reaches, six profiles were mapped. Each of these was mapped as described for the cross sections in nonconstrained reaches.

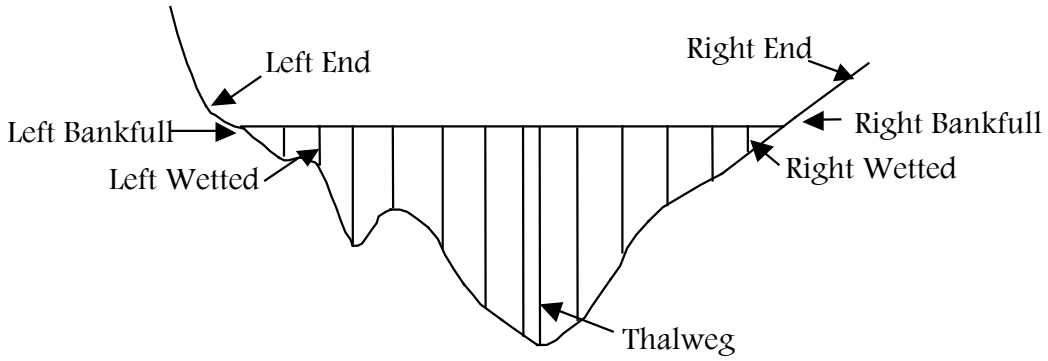


Figure 1. Example cross sectional profile with point labeling (looking downstream).

Longitudinal Profiles

Longitudinal profiles are used to calculate sinuosity, gradient, and pool frequency at all sample sites by shooting points with the laser rangefinder. Shots were taken on an increment that was approximately 1/100 of the sample site length. Additional measurements were taken at each pool tail crest, maximum pool depth, and pool head. The same protocol was used in all sample reaches.

Substrate

The protocol for measuring substrate is the same as that used by the Environmental Protection Agency's Environmental Monitoring and Assessment Program (Peck et al. 1999). In nonconstrained reaches, 11 substrate measurements were taken at each of the 11 transects.

Substrate measurements were taken on evenly spaced increments within the bankfull channel. In constrained reaches, measurements were taken at each of the six transects, and at five intermediate transects as well. The intermediate transects were set up midway between the primary transects (Peck et al. 1999). Percent fines was measured in the tails of scour pools as described by the USDA Forest Service Region 5 SCI protocol (1998). Three measurements were taken using a Klamath grid in each pool tail in the reach (maximum of 12 pools).

Large Wood

The large wood protocol was adapted from that used in the Oregon Department of Fish and Wildlife's Stream Habitat Surveys (Moore et al. 1999). Within each reach, pieces of large wood were counted if they had a minimum length of 3 m and were at least 0.3 m in diameter at breast height (DBH). Length and DBH were estimated for each piece. Measurements of length and DBH were taken on the first 10 pieces in the reach and every 5th piece thereafter. In addition, notes were made on the location within the channel, whether the piece was natural or artificial (i.e., had a cut end or was part of a man-made structure), and whether the piece was single or part of an accumulation. Large wood in jams (defined as five or more pieces) was not measured, however the presence of the jam and its approximate size was documented.

Other Chemical and Physical Parameters

Discharge was taken at one location within the sample site using a flow meter. Water samples for nutrient analyses (total Kjeldahl nitrogen and total phosphorus) were taken at one location within the subwatershed, at the lowest point in the subwatershed on federal land. Additional information on temperature, dissolved oxygen, pH, and conductivity was collected at

each sample site. All of these physical and chemical data were used as support data for the biological sampling. An overview of the sampling is shown in Figure 2.

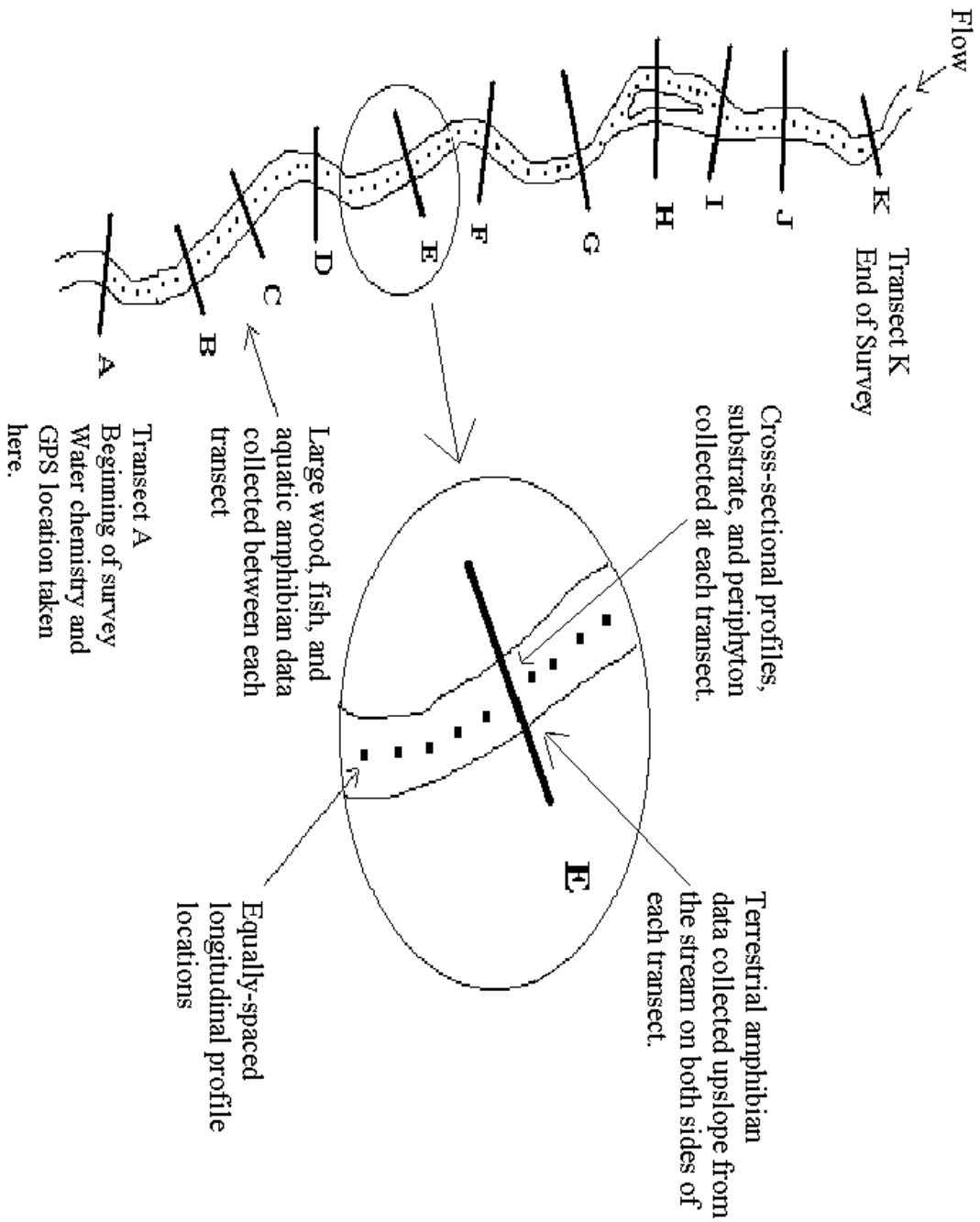


Figure 2. Overview of site layout including sampling strategy for nonconstrained sample sites.

BIOLOGICAL SAMPLING

Periphyton

The periphyton protocol used for both field collection and lab analysis is the same as that outlined by the EPA EMAP (Peck et al. 1999). Benthic periphyton samples were collected at all sites. At each transect, periphyton was removed from a 12-cm^2 area. Eleven subsamples from the transects (including intermediate transects in constrained reaches) were composited into a single sample for the reach.

Benthic Macroinvertebrates

The benthic invertebrate protocol is the same as that described by Hawkins et al. (2001) for the River InVertebrate Prediction And Classification System (RIVPACS) sampling program. Benthic invertebrate samples were collected at all sites. Two subsamples were taken in each of four riffles in the reach using a kick net. The eight subsamples were composited into a single sample for the reach.

Fish and Aquatic Amphibians

Fish and aquatic amphibian sampling was conducted at all sites within specified subwatersheds. At each site, a single pass with an electroshocker was conducted between each transect. All animals were identified and enumerated. Approximately 10-20 % of the fish were measured, and their condition was estimated using displacement. Snout-vent lengths were measured for all aquatic amphibians. Snorkeling was used to determine fish and aquatic amphibian presence where TES fish species were present.

Terrestrial Amphibians

Time and area-constrained searches were conducted for terrestrial amphibians at each site within the subwatershed. At each transect, searches began at the wetted edge and continued up the bank on either side of the stream for five minutes (ten minutes total at each transect). Special attention was given to seeps, springs, or other hot spots. Snout-vent lengths were measured for all captured amphibians.

REFERENCES

Hawkins, C.P., J. Ostermiller, and M. Vinson. 2001. Stream invertebrate, periphyton, and environmental sampling associated with biological water quality assessments. Field Protocols. Utah State University, Logan, UT.

Moore K, K. Jones and J. Dambacher. 1999. Methods for stream habitat surveys, aquatic habitat inventory project, Natural Production Program: Oregon Department of Fish and Wildlife, Corvallis, OR.

Peck, D.V., J.M. Lazorchak, and D.J. Klemm (editors). 1999. Unpublished draft. Environmental monitoring and assessment program – surface waters: Western pilot study field operations manual for wadeable streams. EPA/XXX/X-XX/XXXX. U.S. Environmental Protection Agency, Washington, D.C.