NW BIOLOGICAL ASSESSMENT WORKGROUP
Port Townsend, Washington - WEDNESDAY - November 2, 2005
ABSTRACTS

A Summary of Western EMAP Findings
Bob Hughes, Oregon State University
There are 628,625 km of the RF3 stream network in the EMAP West region that is labeled perennial; but 33% is non-perennial, or non-stream, ranging from 55% in the Xeric region to 24% in the Mountains. Of the remaining 420,855 km of perennial streams and rivers, land owners denied access to 73,967 km (18%), varying from 16% in the Mountains to 26% in the Xeric. An additional 42,344 km (11%) was physically inaccessible, leaving 304,544 km, representing 48% of the original frame length, and 72% of the target stream length.

Only 44% of the stream and river length in the West is considered in least-disturbed (good) condition, and 26% is in most-disturbed (poor) condition. Of the three climatic areas of the West, the mountains are in the best shape with 56% of the length of flowing waters in good condition. The plains and xeric regions present the most concerns with 40 and 36% of the length of streams and rivers in good condition. Respectively, 20%, 42% and 46% are in poor condition, but the actual number of stream miles in poor condition is greatest in the mountains because of greater stream density. Both fish and macroinvertebrate assemblages indicate that 44% of stream length is in good condition, but fish and macroinvertebrates indicate 30% and 20% respectively is in poor condition. Riparian habitat disturbance is the most widespread stressor observed across the West, and in each of the three major regions. Excessive mercury in fish is widespread across the xeric and plains areas but less so in the mountains. Non-native vertebrates, primarily fish, are very common across the entire West. High nitrogen concentrations are found in just over one-quarter of western streams, and assemblages are almost four times as likely to be in poor condition when nitrogen exceeds a critical threshold as when nitrogen is below this critical value. Excess salinity also poses a high relative risk to fish and macroinvertebrates when it occurs, but is present in only 5% of the stream resource.

Three IBIs For Western Streams and Rivers: A Structured Approach For Metric Development
Thom Whittier, Oregon State University
From 2000 to 2003, aquatic vertebrate assemblage data were collected from 844 stream and river sites in 12 western USA states, by the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program. We used those data to develop an index of biotic integrity (IBI) for each of three large-scale ecoregions: the forested mountains, the xeric lands, and the northern great plains. We used a structured approach to evaluate, select and score metrics, to produce comparable IBIs. We divided the initial 237 candidate metrics into nine metric classes. For each ecoregion, we then sequentially eliminated metrics through a series of tests that evaluated metric range, signal to noise ratios, responsiveness to disturbance, and redundancy to select the single best metric in each class. Selected metrics were scored 0 to 10 and these scores were summed and scaled to a 100 point range. The final IBIs for the Mountains and Xeric each had seven metrics, and were similar to each other; the Plains IBI had eight metrics. In the Mountains, IBI scores were skewed toward relatively high values with half of the estimated stream length having scores > 71. In the Xeric and Plains the reverse occurred, with half the stream length having scores ≤ 33 and ≤ 35, respectively. An estimated 15% of Xeric stream length had scores >71 (ranging to 100), while in the Plains the maximum IBI score was 78.

Oregon’s Monitoring Strategy

Rick Hafele, Oregon DEQ

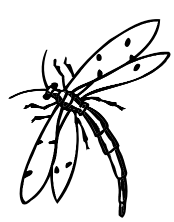
Over the last nine months we have met with regional DEQ staff and water quality program managers throughout the agency in order to develop a comprehensive statewide monitoring strategy. The result has been numerous discussions about what type of data (including biological) staff and managers see as most critical to successfully implementing their programs. While biological data is seen as useful it is rarely seen as critical. In this presentation I would like to share and discuss (i.e. hear how the heck you're doing it in your state!) ways to incorporate biological results into regulatory programs, especially the TMDL program.

Snake River Snail Sampling Study and Initial Results and Sampling Alternatives to Address Information Needs

William H. Clark, Idaho Power Company, Boise, ID and Leska S. Fore, Statistical Design, Seattle, WA

Federal re-licensing of five hydroelectric dams in the Mid-Snake River (Idaho, USA) triggered population assessments for two hydrobiid snails listed as threatened and endangered under the Endangered Species Act. The Bliss Rapids snail (BRS), Taylorconcha serpenticola, has been listed as threatened and the Idaho springsnail (ISS), Pyrgulopsis idahoensis, listed as endangered in 1992. A study was developed to study two hydropower operations (run of river and load following). Information needs established for this part of the study were depth distribution of the snails and their survival in the fluctuation zone. We established four study sites for each of the two listed species. Random sample collection was done at 30 quadrats for each site representing a winter and summer period during 2004-2005, run of river years. Samples are collected with the suction dredge method and involve SCUBA where river depth dictates. Listed snail presence/absence and total counts are recorded as well as physical habitat structure and water quality variables for each quadrat sampled. Associated Mollusca are collected and identified.
Data show that BRS occur from the water surface to 16’ and ISS from the water surface to 6’ in depth. BRS is found mainly on the undersides of cobbles and boulders in the upper reach and ISS is found in finer sediments in the lower reach of the project area.

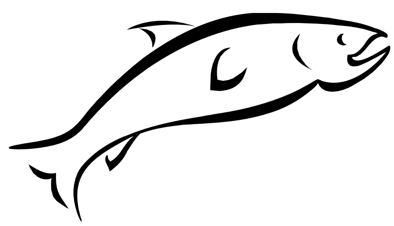
After two years of sampling, we have found that proportional occurrence changed significantly at some sites during run-of-river, that is, under control conditions. When snails differ under control conditions, how should changes under load following conditions be interpreted? We are currently grappling with the idea that some species may be too rare or elusive to sample with any reasonable level of confidence. ESA is structured to track population size or some surrogate of size or density. When species are too variable to measure, ESA offers no guidance. New survey sampling methods offer some help for rare and elusive species (e.g., 2-stage or cluster sampling), but have their own limitations for cryptic species, as these snail are. The ESA procedures/regulations/framework does not provide the flexibility to address a different question when questions related to population size are unanswerable. For example, identifying unique habitats might be a better use of funds than trying to count the uncountable.
In this narrow ESA context, we are currently considering options for improving the sampling design for the future sampling.



Kootenai River Issues:
1) Didymosphenia geminate - A Nuisance Diatom Downstream from Libby Dam
2) Artificial Fertilization - Will Nutrient Additions Enhance Native Fisheries?

Charlie Holderman, Kootenai Tribe of Idaho and Gary Lester, EcoAnalysts

The Kootenai River system has been highly degraded due to the construction of Libby dam and the loss of floodplain connectivity. Loss of nutrients from annual flooding and downstream transport have let to a collapse in native fisheries, including white sturgeon, burbot, and several resident salmonid species. Beginning in 2000 a large-scale controlled experiment was initiated to evaluate the effects of whole river fertilization on primary, secondary and tertiary trophic levels of the aquatic food web. Four years of pre-treatment monitoring of water chemistry and biology indicated the river was ultra-oligotrophic in some reaches. Macroinvertebrate biomass, diversity and fish condition factors are low and generally decline in a downstream direction from Libby Dam. Nutrient additions began in the summer of 2005. It is hypothesized that nutrient enhancement will help stimulate productivity in the river.



NW BIOLOGICAL ASSESSMENT WORKGROUP
Port Townsend, Washington - THURSDAY - November 3, 2005
ABSTRACTS

The Pacific Northwest Aquatic Monitoring Partnership: A Forum for Regional Coordination
Bayer, Jennifer M., PNAMP Coordinator, US Geological Survey
The purpose of the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) is to provide a forum for coordinating state, federal, and tribal aquatic habitat and salmonid monitoring programs. Improved communication, shared resources and data, and compatible monitoring efforts provide increased scientific credibility, cost-effective use of limited funds and greater accountability to stakeholders. PNAMP provides leadership through the development and the advancement of recommendations and agency level agreements that are considered for adoption by the participating agencies. PNAMP has adopted the following goals:1) improve communication between monitoring programs across state, tribal, and federal organizations; 2) improve scientific information needed to inform resource policy and management questions and decisions; 3) seek efficiencies and cost-effectiveness across monitoring programs through compatible and cooperative monitoring efforts; 4) promote science-based credibility of monitoring and assessment efforts; 5) share resources and information between monitoring programs across state, tribal, and federal organizations. PNAMP receives significant policy support and direction by member organizations, commitments of technical resources and staff time and funding for the coordination itself. As part of a monitoring coordination structure, PNAMP has identified and developed technical working groups for five key elements of monitoring: watershed condition monitoring, effectiveness monitoring, fish population monitoring, estuary monitoring, and data management.

LARGE RIVERS

Background: What do we mean by large river? What are the needs for this kind of information?
Gretchen Hayslip, EPA Region 10
This session will be focusing on rivers that are too large to safely and/or adequately assess by wading (i.e. existing methods). We are interested in this topic because existing monitoring methods don't work in these systems, therefore they are often not monitored or assessed ecologically by state and federal agencies. However, larger rivers are of concern to the public and decision-makers. Today we will cover what is currently being done in this area, what can we learn from these existing efforts that is applicable to other large rivers, what are the gaps in our knowledge and how can we work together to fill them.

Presentations of ongoing work:

Idaho Rivers EMAP
Mary Anne Nelson, Idaho DEQ
Idaho's rivers present some of the more challenging of waters in the State for monitoring, not only due to their relative size compared to wadeable streams but because of their remoteness. Idaho's River Intensive Regional EMAP work focused on these large non-wadeable rivers over the past three years and is wrapping up with data assessment and reporting. Rivers in the State were separated into three separate regions, Northern Mountains, Central and South Mountains, and Basin BioRegions, and monitored according to EPA's non-wadeable operational manual with a study reach length modification of 40 times the wetted width. During this study, a total of 57 randomly selected sites on fourth order or greater rivers within Idaho were evaluated according to Idaho's water body size criteria to ensure that the rivers were large enough for the study and monitored. This presentation covers challenges faced during monitoring and describes the evaluation and reporting of collected data.

THURSDAY – ABSTRACTS – Continued

Forest Service Large Rivers Monitoring
Frank McCormick, FS

Distribution of Fish and Associated Environment Variables in the Lower Boise River
Dorene MacCoy, USGS
Within the last century, the lower Boise River has been transformed from a meandering, braided, gravel-bed river that supported large runs of salmon to a channelized, regulated, urban river that provides flood control and irrigation water to over 1,200 mi^2 of land. An understanding of the current status of the river's fish communities and related environmental conditions is important to support the ongoing management of the Boise River. Fish community data collected by the U.S. Geological Survey and the Idaho Department of Fish and Game from 1974 to 2004 describe the status of fish communities in the lower Boise River. None of these data sets comprised a sampling of the entire lower Boise River; various reaches were studied at various times. Though each set of data was collected to address different study objectives, combining them provides an estimation of the distribution of fish in the lower Boise River over the last 30 years. Twenty-two species of fish, in 7 families, have been identified in the lower Boise River - 3 salmonidae, trout and whitefish; 2 cottidae, sculpins; 3 catostomidae, suckers; 7 cyprinidae, minnows; 4 centrarchidae, sunfish; 2 ictaluridae, catfish; and 1 cobitidae, loach.

Analysis of fish community data using an Index of Biotic Integrity (IBI) for Northwest Rivers shows a decline in the biotic integrity in a downstream direction, with the lowest IBI near the mouth of the Boise River. A larger number of tolerant and introduced fish were found in the lower reaches of the river. Changes in land-use, habitat, and water quality, as well as regulated streamflow have affected the lower Boise River fish community. Biotic integrity declined with increasing maximum instantaneous water temperature, specific conductance, and suspended sediment. Reduced biotic integrity also correlated with increased: area of developed land, impervious surface area, and the number of major diversions above a sampling reach. Fish communities in the upstream reaches were dominated by invertivores and picivores, whereas the downstream reaches were dominated by tolerant, omnivorous fish. The percent of sculpin found in the river decreased in a downstream direction, and sculpin disappear completely at sites below Glenwood Bridge. The reason for the absence of sculpin in the downstream reaches is unknown. Sculpin are abundant in most Idaho streams and are native to cold water gravel-bed rivers such as the lower Boise River. The loss of sculpin in the downstream reaches of the lower Boise River raises a red flag and further study is needed to identify the reasons for their disappearance. The condition of the mountain whitefish (*Prosopium williamsoni*) throughout the lower Boise River was good and was similar both to the condition of mountain whitefish from least-disturbed rivers in southern Idaho and to the North American standard weight for mountain whitefish.

Biological Monitoring in the Elwha River Basin Pre Dam Removal
Sarah Morley, NMFS
In order to effectively evaluate the potential effects of dam removal on benthic invertebrate and periphyton assemblages in the Elwha River Basin, a coordinated data-collection effort is needed for establishing pre-dam removal conditions. Building on earlier monitoring work conducted by the Lower Elwha Tribe and the USGS in the mid-90's, we began collecting baseline data in the summer of 2004. In order to sample mainstem, tributary, and side channel habitats below, between, and above the dams, data collection was coordinated amongst NOAA, the USGS, and the Lower Elwha Klallam Tribe. The focus of this first year of data collection was on standardizing data collection protocols, collecting a representative number of samples from varied habitats, and on establishing long-term monitoring locations. Along with physical habitat characterization, at each of our monitoring sites we collected benthic invertebrates, periphyton, and water chemistry samples. Based on this collaborative research effort, we will determine adequate sample size, appropriate spatial distribution of samples sites (lateral and longitudinal), and refine sampling protocols as necessary for ongoing dam removal monitoring.

Development of a Large River Bioassessment Protocol (LR-BP) for Macroinvertebrates: Pilot Results from Midwestern Rivers

Flotemersch, Joseph E., Karen A. Blocksom, and Brent Johnson. U.S. Environmental Protection Agency, National Exposure Research Laboratory, Cincinnati, Ohio

We conducted a study using an experimental macroinvertebrate sampling method that was designed to overcome limitations of several field methods currently in use. Our objectives were to: 1) determine the appropriate number of sampling points needed; 2) determine an appropriate laboratory subsample size; and 3) examine how varying reach length affects sample results. For 6 reaches in each of two large rivers, we sampled macroinvertebrates on both banks at 12 transects separated by increasingly larger distances (maximum distance equal to 40 times the wetted width) using a multi-habitat, semi-quantitative technique. Results were compared based on values for nine benthic macroinvertebrate assemblage metrics. Monte Carlo simulations indicated that a representative sample of the assemblage was collected by sampling both banks at 6 transects. While a reach length of 500-m is suggested for general bioassessment activities, analysis of the effects of distance between transects showed that there is flexibility that can accommodate different data quality objectives (e.g., documenting the effectiveness of restoration activities). We recommend that the field method be coupled with a minimum fixed laboratory subsample size of 300 organisms for bioassessment purposes, with the recognition that a subsample size of 500 organisms may be needed to meet the objectives of more rigorous studies.
It is likely this approach will over-sample sites of uniform composition, but the goal was to develop a robust sampling protocol that would perform well across sites of differing habitat composition and disturbance type. Performance characteristics of the method also will be discussed briefly.

Future work:

Developing Rigorous Assessments for Large Pacific Northwest Rivers (RIVMAP)

Bob Hughes, Oregon State University

The purpose of this project is to document the feasibility, logistics, and costs to states of using EMAP indicators and designs to assess the ecological condition, major stressors, and likely human disturbances of entire main-stem rivers in the Pacific Northwest. Rivers change markedly and continuously for natural reasons along their courses, calling for continuous sampling to determine ecological conditions and patterns in large rivers. State agencies continue using a limited number of easily accessible fixed sites to assess water quality of entire rivers. Although capable of detecting extreme changes in water quality, fixed sites are not statistically representative of entire rivers, and they are unlikely to detect alterations in physical and chemical habitat and fish and benthos assemblages, especially those occurring near point sources. Agencies need a cost-effective, probabilistic design that is intermediate between censusing entire rivers and sampling a handful of subjectively-chosen fixed sites. Although ichthyologists know the historical and present fish species distributions along many large American rivers, far less is known about benthos and alien plant species distributions along such rivers.

We will select two large rivers in each of Idaho, Oregon, and Washington. One of each pair will be minimally disturbed, and the other will be disturbed by land use, point sources, or both. We will randomly select 25 sites in each river, and we will sample each site for a distance of 40 times the mean wetted channel width. We will employ standard EMAP protocols for physical and chemical habitat, and for fish and benthos assemblages at all 150 sites. IBI scores will be calculated for both assemblages at each site, and we will determine a sufficient number of sites to assess each river through Monte Carlo simulations. Physical and chemical habitat data plus local, network riparian, and catchment land use will be correlated with IBI scores.

THURSDAY – ABSTRACTS - Continued

Indicators: It Matters What We Measure

James R. Karr, University of Washington

For millennia, nature—specifically living systems—provided food, fiber, and materials to nourish, clothe, and house us. Living systems conditioned the air we breathe, regulated the global water cycle, and created the soil that sustained our developing agriculture. They decomposed and absorbed our wastes. Beyond practicality, nature fed the human spirit. But pressure on nature from the impact of 6 billion humans is taking its toll. Living systems in water bodies illustrate this collapse much as blood-cell counts and blood chemistry reflect the health of a human body. Society has remained largely unaware of the collapse because we saw water narrowly, as a fluid to be consumed or used as a raw material in agriculture or industry. When attempted, monitoring in aquatic systems focused on the presence of chemical contaminants rather than the character of the aquatic biota. In terrestrial systems, counts of T and E species dominated discussion. Fortunately, direct biological monitoring and assessment have gained substantial ground in the last decade because they provide a mechanism to directly assess the condition of living systems, diagnose the causes of degradation, define actions to attain conservation and restoration goals, and evaluate the effectiveness of management decisions. But these biological indicators will not be enough. Society needs new generation indicators to reverse the erosion of living systems, indicators that do not disguise the state of economic, social, or ecological well-being. Without these measures, we will not fully perceive the erosion of Earth's life-support systems—both human and nonhuman, and policymakers will lack the crucial foundation for informed decision making. If we watch such new-generation economic, social, and ecological "health" indicators as closely as we watch the Dow Jones industrial average, perhaps we will again value all of Earth's living and nonliving systems and so improve the state of the biosphere as well as our own lives.

<u>Excluding Rare Taxa Increases the Average Sensitivity of RIVPACS-type Predictive Models</u>

John Van Sickle, Phil Larsen (US EPA, Corvallis OR) and Chuck Hawkins (Utah State University).

The role of rare taxa in bioassessments continues to be vigorously debated. For RIVPACS-type predictive models, this debate centers around the list of macroinvertebrate taxa that one should include in indices such as O/E that measure the difference between observed expected assemblages. We have evaluated the role of rare taxa in 5 existing predictive models, and we describe results for 2 of those models, from Colorado and Oregon. For each model and test site data set, we repeatedly calculated O/E and the mean absolute error (MAE) between observed and expected assemblages, each time using a smaller set of increasingly common taxa. The percentage of Colorado test sites declared to be 'impaired' increased steadily from 30% to 60% as progressively fewer, more-common taxa were included in O/E and MAE, indicating a consistent increase in average model sensitivity. However, only about 10% of Oregon test sites were declared impaired, regardless of the commonness of taxa included in O/E and MAE. We explain these patterns in terms of occurrence frequency distributions of individual taxa at test and reference sites, and we offer suggestions for setting the level of commonness of taxa to be included in bioassessments based on predictive models.

<u>Preparing Bug Data for RIVPACS: What to do and who does it?</u>

Shannon Hubler, ODEQ; Chuck Hawkins, USU/WCM; and Jeff Adams, Xerces

Widespread use of RIVPACS models for bioassessment is a major goal for the Western Monitoring Center (WMC), Oregon Department of Environmental Quality (ODEQ), and the Xerces Society. Using RIVPACS models requires two main datasets: 1) bug data and 2) environmental predictor data. We will show examples of the major steps involved in preparing the bug data files for use with the Western Monitoring Center's web-based software. Specific topics include: necessary formatting of lowest-level taxonomy files, acquiring taxonomic look-up tales, the need for routine database skills, and tools provided by WMC for subsampling and final formatting. Along the way, we will encourage discussions concerning the roles of model builders, WCM, taxonomists, and end-users.

NW BIOLOGICAL ASSESSMENT WORKGROUP
Port Townsend, Washington - FRIDAY - November 4, 2005
ABSTRACTS

Macroinvertebrate Monitoring Methods Comparison in Idaho
Darren Brandt, TerraGraphics and Michael McIntyre, Idaho DEQ

Discussion of Wadeable Stream Macroinvertebrate Sampling and Lab Protocol Standardization
Lil Herger, EPA Region 10 and Rob Plotnikoff, WA Ecology
Consistency in macroinvertebrate data collection has been a historical topic of discussion in the Northwest Biological Assessment Workgroup. The effort to standardize collection protocols among the Pacific Northwest states' biological monitoring programs has received some attention and efforts have been made to evaluate the comparability among sampling protocols. Standard field data collection and laboratory protocols may be needed as more entities become involved in regional monitoring efforts. The purpose of this facilitated discussion is to identify field and laboratory protocols that can be recommended to other sampling entities so that comparable data can be generated on a broader scale. A standard set of protocols should be recommended in the Pacific Northwest with consideration for existing programs and the need for unique evaluations of environmental conditions.

Tiered Aquatic Life Uses (TALU) – Overview of Released Document and Current Status
Evan Hornig, EPA Headquarters
The TALU document provides information that will help States and Tribes assess and communicate current biological conditions and progress towards meeting aquatic life protection goals. The document describes how to define aquatic life uses as tiers of biological condition, from natural to severely-altered. A waterbody's highest attainable use (tier) with its expected biological attributes and appropriate water quality criteria are determined by the waterbody's environmental setting. This tiered approach can help protect high-quality waters, while developing scientifically-sound expectations for restoration of damaged or impaired waters. The document is a result of several years of effort by a workgroup largely comprised of State and Tribal members, and draws from State programs that currently use a tiered approach to their aquatic life use designations.

With release of the draft document, EPA's Office of Science and Technology has requested the Regions share the document with their States and Tribes and initiate pilot demonstrations. During this pilot phase, State and Tribal feedback will be gathered and evaluated to ensure the tiered aquatic life uses approach works well. If necessary, the document will be revised accordingly and a second edition issued.