Northwest Biological Assessment Workgroup

17th Annual Meeting – Post Falls, Idaho

WEDNESDAY - November 1, 2006

Welcome, Logistics, etc.
Gretchen Hayslip, EPA Region 10

Guidelines for Creating and Presenting Powerpoint Presentations
Steve Lanigan, USFS

Mercury Concentration in Fish from Streams and Rivers Throughout the Western United States
Spencer A. Peterson, Alan T. Herlihy, Robert M. Hughes, John Van Sickle

We collected and analyzed 2,707 large fish from 626 stream/river sites in 12 western USA states using a probability design to assess the regional distribution of whole fish mercury (Hg) concentrations. Large (> 120 mm total length) fish Hg levels were strongly related to both fish length and trophic guild. All large fish that we sampled exceeded the wet weight detection limit of 0.0024 µg·g-1, and the mean Hg concentration in piscivores (0.260 µg·g-1) was nearly three times that of non-piscivores (0.090 µg·g-1). Fish tissue Hg levels were not related to local site disturbance class. After partialing out the effects of fish length, correlations between Hg and environmental variables were low ($r<0.3$) for the most common genera (trout and suckers). Stronger partial correlations with Hg ($r>0.5$) were observed in other genera for pH, stream size, and human population density but patterns were not consistent across genera. Salmonids, the most common family, were observed in an estimated 125,000 km of stream length, exceeded 0.1 µg Hg·g-1 (deemed protective for fish-eating mammals) in 11% of the assessed stream length, and exceeded the filet equivalent of 0.3 µg Hg·g-1 (USEPA human consumption advisory level) in 2.3% of that length. Piscivores were less widespread (31,400 km), but they exceeded the 0.1 and 0.3 µg Hg·g-1 criteria in 93% and 57% of their assessed stream length, respectively. Our findings suggest that atmospheric transport is a key factor relative to Hg in fish across the western USA.

Determining Metals Concentrations in Crayfish Tissues and Other Pre-project Monitoring to Establish Baseline
Bob Steed, Idaho DEQ

Use of Biological Indicators for Watershed Condition Monitoring
Kirsten Gallo and Steve Lanigan (presenter), USFS

Current Biomonitoring Work at Oregon Department of Environmental Quality
Mike Mulvey, Oregon DEQ

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THURSDAY - November 2, 2006

Identifying Water Quality Impairments Using Biological Evaluations: Determining Causal Factors Through CADDIS

[1]R.W. Plotnikoff, [2]C.D. Wiseman, and [3]M. LeMoine.
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Water quality impairments have typically been identified using surface water chemistry. Few, if any criteria have been promulgated by states for evaluating the biological condition of rivers and streams. Development of analytical tools for determining condition of aquatic biological communities (RIVPACS or MMI) is currently under consideration for use in regulatory decision making. A formal strategy for identifying impairments and developing restoration or reclamation plans in the United States is the Clean Water Act Section 303(d) listing process. Identifying impairments followed by development of a cleanup plan (TMDL ~ Total Maximum Daily Load model), is expected to achieve abatement of pollution problems in segments of watersheds. This traditional approach for addressing water chemistry impairment does not appear intuitive when identification of impairments is based on biological evaluations. Consequently, another process is needed to identify the cause (stressor identification) for biological impairment and then implementation of a plan to abate the sources of pollution. The stressor identification (SI) process uses a technical guidance called CADDIS (Causal Analysis/Diagnosis Decision Information System). This guidance uses environmental information to evaluate the cause(s) of biological impairment measured in aquatic ecosystems. An example for use of the stressor identification process is described from a watershed in southeast Washington State where water chemistry and physical habitat was considered in explaining observed biological impairments.

Fish and amphibian tolerance values and an assemblage tolerance index (ATI) for western USA streams and rivers

Whittier, R.M Hughes, G.A. Lomnicky & D.V. Peck

Aquatic species' tolerances to overall human disturbance are key components of biological assessments of aquatic ecosystems. These tolerance classifications are used to develop metrics used in multimetric indexes, such as the index of biotic integrity (IBI). Usually, species are classified as being tolerant, moderately tolerant, or intolerant (sensitive) to human disturbance. Traditionally for fish based IBIs, these assignments are based on a combination of professional judgment and information from state fish books. For this paper, we used fish and amphibian species data in conjunction with chemical, physical, and landscape indicators of human disturbance collected at 1001 stream and river sites in 12 western USA states sampled by the Environmental Monitoring and Assessment Program (EMAP) in 2000 2004. Using principal components analyses, we created synthetic disturbance variables for nutrients, site scale physical habitat, catchment scale land use, and overall human disturbance. We calculated species' tolerance values for the four synthetic disturbance variables as their weighted averages plus the

standard deviations using relative abundances as the weights. We used the species' tolerance values (based on the overall synthetic disturbance variables) and their relative abundances at each site to calculate an assemblage tolerance index (ATI) score for those sites. We discuss how the tolerance values could be used to establish species tolerance classifications appropriate for regional species pools, and how the ATI could be applied to IBIs and to bioassessments in general.

Modeling Natural Environmental Gradients Improves the Accuracy and Precision of Diatom-based Indicators

Charles Hawkins[1], Yong Cao[1], John Olson[1], Mary-Anne Nelson[2]

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[2]Surface Water Quality, Idaho Department of Environmental Quality, Boise, ID.

Use of diatom-based indicators can contribute significantly to comprehensive assessments of stream biological conditions. In the present study, we developed and evaluated multimetric indices and RIVPACS-type models for Idaho streams. For the multimetric indices, we used Classification and Regression Trees (CART) to partition the natural variability of individual biotic metrics, assuming that different metrics responded to different gradients. On average, 46% of the total variance in the 32 metrics modeled could be explained by CART models, but the predictor variables differed among the metrics. These adjustments affected whether or how strongly many metrics discriminated between reference and test sites. We then selected 7 metrics that had the highest discrimination efficiencies within groups of redundant metrics. Adjusted multimetric indices were more precise than the unadjusted ones (CV approximately 50% lower). Both unadjusted and adjusted indices rated similar proportions of the test sites as in non-reference condition (~75%), however they disagreed on the assessment of many individual test sites. The RIVPACS-type indicator was comparably precise to the adjusted multimetric indices, but rated a lower proportion (40%) of test sites as in non-reference condition. This study showed that CART modeling may be effective in developing single multimetric indices that are precise and robust enough to be used throughout a highly environmentally heterogeneous region. These methods should be applicable to any taxonomic group. The successful development of a diatom-based RIVPACS-type model demonstrates that both types of indices can be used to assess the condition of diatom assemblages.

Bugs, Fish and Periphyton! Assessing the Potential Impacts of Whitewater Boating Flows in a Regulated River Reach, Black Canyon – Bear River, Idaho

Lynn Van Every [1]and Greg Mladenka[1]

The Black Canyon of the Bear River, located near the town of Grace in southeastern Idaho, is a unique resource from both an aquatic ecosystem and whitewater recreation perspective. Since the early 1900's this nearly 6 mile reach of river has been significantly dewatered to provide water to a penstock for downstream power generation. Recently, as a result of FERC relicensing negotiations, this river reach now receives a minimum year round streamflow with subsequent scheduled ramping events (potentially 16 6 hour events from April 15 to July 15) to provide a unique class 4/5 kayaking opportunity. During relicensing negotiations much discussion centered around potential impacts to the aquatic ecosystem from these short term, high energy flow releases. As such, the Black Canyon Monitoring Subcommittee designed a study plan

utilizing primarily bugs, fish and periphyton to evaluate potential impacts to the aquatic ecosystem. The focus of this paper will be on the study design and will present some very preliminary baseline results.

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The Use of Probabilistic Stream Monitoring in the Assessment of Endangered Salmonid Habitat on the Oregon Coast and Lower Columbia
Aaron Borisenko, Oregon DEQ

Development of a Macroinvertebrate Data Analysis Protocol For PNAMP
- Discussion (all)

Development of Biotic Metrics to Distinguish Between Least Impacted and Impacted Springbrooks in Southwest Idaho
Johnna Sandow, Idaho Dept. of Environmental Quality

Updates

1. **REMAP Rivers Project Update**
   Bob Hughes, Oregon State University
2. **National Lakes Survey**
   Gretchen Hayslip, EPA Region 10
3. **Lower Boise and the Statewide Network Projects**
   Dorene MacCoy, USGS
4. **Wetland Bioassessment Project Update**
   Sarina Jepsen, Xerces
5. **11th Annual Taxonomic Workshop of the Northwest Biological Assessment Workgroup, Spring 2007**
   Bob Wisseman, Aquatic Biology Associates, and Sarina Jepsen, Xerces
6. **Others**

THURSDAY EVENING POSTER SESSION

An Assessment of the Chemical, Habitat and Biological Condition of Wadeable Streams Habitat of the Threatened Oregon Coast Coho Salmon
Aaron Borisenko and Michael Mulvey, Oregon Department of Environmental Quality

Using Environmental Monitoring and Assessment Program Data for Describing Condition of Upper Columbia River Basin Streams.
Lillian Herger, Gretchen Hayslip, Peter Leinenbach, and Scott Augustine, U.S. Environmental Protection Agency, Region 10

Impacts of Land-Use Changes and Hydrologic Modification on the Lower Boise River, Idaho, USA
Dorene MacCoy, USGS

An Assessment of the Chemical, Habitat and Biological Condition of Wadeable Streams in the Lower Columbia Region of Oregon
Michael Mulvey and Aaron Borisenko, Oregon Department of Environmental Quality

Random Nutrient Concentration versus Targeted Nutrient Concentration Is There a Difference
Mary Anne Nelson, Michael McIntyre, Michael Edmondson, Johnna Sandow
Idaho Department of Environmental Quality

Idaho's Experience with Random Design using NHD Intermittent streams and other considerations
Mary Anne Nelson, Michael McIntyre, Michael Edmondson, Glen Pettit
Idaho Department of Environmental Quality

Water Quality in the Nation's Salad Bowl: Assessment and Diagnosis in the Pajaro River Valley
Scott Rollins

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FRIDAY - November 3, 2006

Status of Washington's Wadeable Streams

Glenn Merritt, Washington State Department of Ecology

As part of the 2000-2004 Environmental Monitoring and Assessment Program Western Pilot (EMAP-W), we sampled streams located throughout Washington. Our objectives were to assess the ecological condition of wadeable streams, to directly measure biology, to identify and rank stressors, and to test EMAP techniques in Washington State. We sampled 46 probability sites across the state, with additional sites located in a special study area (Wenatchee Basin). Stressor metrics were evaluated by comparing our results with state water quality criteria (oxygen, temperature and pH) and Level-III ecoregion reference conditions. We evaluated macroinvertebrate community conditions using sample scores that had been calculated by the EPA using reference sites located across the western United States. They reported test site scores as the ratio of the number of observed taxa to expected taxa (O/E) for similar reference sites. Based on the O/E scores, we estimated that approximately 11% of Washington's wadeable streams were in poor condition. Stressor metrics showing poor values across much of the state included dissolved oxygen concentration, riparian human disturbance, fish cover, percent sand/fines, and relative bed stability. We compared O/E scores with stressor conditions using Relative Risk analysis. Six metrics showed significant risk to macroinvertebrates. Five of them are related to excessive sedimentation. The sixth, chloride concentration, is an index of human disturbance. Future application of EMAP designs in Washington would likely benefit from advances in the use of biological indicators, especially a Washington-based O/E model, and periphyton community analysis.

Using Web Technology to Enhance Institutional Memory

Leska S. Fore, Statistical Design, Seattle, WA and Jonathan S. Callahan, Mazama Science, Seattle, WA.

Large scale sampling surveys have revolutionized the way we assess and manage natural resources. Recent advances in regional sampling methods, such as probabilistic surveys and trend monitoring for change through time, require new approaches to data management and analysis. Although straightforward in concept, the calculation of summary statistical measures from these designs can be mathematically complex. In addition, given the scope of many regional monitoring programs, several years may pass between survey design and data analysis. Thus, connecting the intended statistical analysis to the data once they have been collected may prove difficult, particularly if the original architects of the sampling design have moved on.

We have developed a prototype for a data browser than connects EMAP survey data to the statistical analysis routines developed specifically for these types of probabilistic sampling surveys. The data browser and its statistical routines are available from a public EPA web server. An intuitive web interface prompts users to select from among macroinvertebrate metrics, measures of physical habitat, and watershed features collected from Region 10 (western EMAP) and Region 3 (WSA). Data may be viewed according to geographic location, as box plots

grouped by a predictive variable, or as CDF's of the regional distribution. The data browser preserves all the statistical complexity that ensures a correct analysis, but allows a biologist or manager less familiar with statistical programming to ignore the details and focus on the results. Thus, a data browser supports natural resource monitoring by ensuring that the correct statistical methods are used by everyone throughout the life of the sampling design.

Molecular Identification for Bioassessment (MIB)

Paula L. Hartzell, US EPA, Corvallis, Oregon

Current assessments of stream community health depend heavily on analyses of macroinvertebrate assemblages. The effectiveness of these analyses depends on the accuracy, precision, timeliness, and reliability of macroinvertebrate identification. The Molecular Identification for Bioassessment (MIB) is a new collaborative project developing and testing molecular methods specifically for stream macroinvertebrate assessment, although these methods will be applicable to other assemblages and environs. Pilot studies include identification of problematic target groups, as well as whole mixed assemblages.

In this report, we present a spectrum of methods and types of questions that can be answered with genomic data, current status of this work, and what remains to be done to make these methods realistically applicable. Examples include identification of individual specimens, mixed assemblages, and community classification without taxonomic identification.
The goal of this presentation is to provide the background information necessary for bioassessment professionals to judge where molecular identification efforts might be fruitful for their particular goals and objectives, and where it would not. We also seek future taxonomic, molecular, and ecology collaborators for development of reference sequences and projects for pairwise comparison of morphological versus molecular methods.

In collaboration with Phil Larsen (US EPA), Charles Hawkins (USU), and Michael Pfrender (USU).

UPDATES - Continued

1. **EPA Landscape/Predictive Tools Steering Committee Efforts**
   Peter Leinenbach, EPA Region 10
2. **Others**

Wrap-up, next steps, and discussion of next years meeting in Oregon