Abstract #134

A Rural Revolution of Environmental Collaboration

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Biographical Sketches of Authors

Sheila Vukovich and Lindsay Abraham are Environmental Resource Specialists with the West Virginia Department of Environmental Protection; Office of Abandoned Mine Lands and Reclamation; Stream Restoration Group.

Sheila worked with the West Virginia Department of Environmental Protection's Office of Water Resources from 1979 to 1995 in the NonPoint Source Program dealing with mineral extraction. During that time she was responsible for sampling streams impaired by abandoned mine drainage within the Monongahela River Basin, and documenting the associated mine drainage sources.

In 1995 Sheila was transferred to the "newly" created Stream Restoration Program in the Office of Abandoned Mine Lands and Reclamation where she and Greg Adolfson developed the Holistic Watershed Approach Protocol for stream characterization and restoration, which provides a means for integrating partnerships to effectively achieve restoration efforts.

In 1996, Lindsay Abraham joined Sheila, forming the Stream Restoration Group field team. The Group samples abandoned mine drainage sources and affected receiving streams statewide. This information is used to determine the extent of stream impairment due to abandoned mine drainage sources, types of restoration technologies to implement at reclamation sites, and stream improvement resulting from construction of reclamation projects. In order for these two to accomplish their job duties, the Stream Restoration Group works with watershed associations throughout the State.

Abstract

As government agencies experience funding cuts, we know that to effectively and efficiently obtain adequate data to make informed decisions about watershed protection, restoration, and ecological integrity we must partner with multiple stakeholders. These stakeholders may range in backgrounds, goals, and expectations; so, it is imperative to coordinate data collection and handling efforts to benefit all. This effort demonstrates how a small group, West Virginia Department of Environmental Protection's Stream Restoration Group, developed a philosophy that led to partnerships that fostered many collaborative efforts between watershed associations, government agencies, industry, academia, private clubs, and the public. No one knows the environmental problems, seeks the technical resources, and pursues watershed protection, restoration, and ecological integrity better than those who live there; thus, the formation of watershed associations became the perfect vehicle for a rural revolution of environmental collaboration. The Stream Restoration Group became the driver. Documentation of the Stream Restoration Group history and future possibilities, along with the increasing role of watershed associations serves as an example of partnering opportunities for others.

Key words: partnerships, collaborative efforts, watershed associations, rural revolution, environmental collaboration

Abstract #135

Volunteer Stream Monitoring and Local Participation in Natural Resource Issues

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Kristine Stepenuck coordinates Wisconsin's Water Action Volunteers (WAV) Program, which includes citizen stream monitoring, storm drain stenciling, and river clean up programs. In addition to her role within Wisconsin, she works with partners at the University of Rhode Island Cooperative Extension towards enhancing the capacity of volunteer water quality monitoring within Extension programs across the nation. She holds a B.S. in water resources management from the University of New Hampshire and a M.S. in Natural Resources from the University of Wisconsin-Stevens Point.

Abstract

This research evaluates whether increased learning, local political participation, and more extensive social networks are related to participation in a volunteer stream monitoring project in Wisconsin. We hypothesize that participation in volunteer monitoring increases factual learning among experienced volunteers compared to inexperienced volunteers, that participation also is associated with increased community political participation in community natural resources management, and increased size of personal action networks. We find that participation does not significantly increase factual learning; rather, new volunteers and experienced volunteers were equally knowledgeable about stream-related topics. However, participation does significantly increase the political participation, personal networks, and feelings of community connectedness among volunteers. We consider our findings in light of the possibility for using volunteer monitoring to enhance local social capital and contribute to the adaptive management of water resources.

Abstract #136

The Role of Service Providers in Enhancing Community Control in Volunteer Monitoring Programs

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Biographical Sketch of Author

Julie Vastine is the Assistant Director of The Alliance for Aquatic Resource Monitoring (ALLARM) at Dickinson College. She coordinates ALLARM's involvement in a statewide consortium to provide watershed specific technical assistance, mentoring assistance, and quality control assistance to over 150 volunteer watershed organizations in Pennsylvania. Julie has worked for ALLARM for 4 years and has a B.S. in Environmental Science from Dickinson College, Carlisle, PA.

Abstract

The Alliance for Aquatic Resource Monitoring (ALLARM) is a project of the Environmental Studies Department at Dickinson College in Carlisle, PA. ALLARM, an active player in the Pennsylvania Volunteer Water Quality Monitoring Movement, promotes and establishes collaborative efforts among scientists, managers, policy makers, and the public by engaging watershed communities in citizen science. Playing a "service provider" role, ALLARM provides capacity-building programmatic and scientific assistance to watershed groups. Using the model of Community-Based Participatory Research, I will discuss how ALLARM engages volunteer monitoring community groups in developing and designing monitoring programs, collecting field data, managing data, interpreting data, and conveying results. By providing up-front intensive mentoring assistance for the first 2-3 years, we help watershed groups to develop the tools needed to sustain their organization, to accrue extensive monitoring data, and to address local water quality issues.

ALLARM's approach to working with watershed organizations is one of facilitation and guidance. In the beginning of a partnership with a group ALLARM provides intensive mentoring, training, and technical support. As the partnership evolves the group acquires the skills to continue with less direct assistance. The goal is to build community capacity leading to community ownership and ultimately to sustainability. This model has resulted in a state funded initiative, the Consortium for Scientific Assistance to Watershed, C-SAW of which ALLARM is a part, provides technical assistance under the guiding principle of capacity building as a key component for the long-term sustainability of watershed organizations. Using the Ridge and Valley Streamkeepers as a case study, I will focus on the roles that service providers play in helping to build community sustainability.

Abstract #137

A Tribal Perspective: The Pueblo of Sandia's Water Quality Program

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Biographical Sketch of Author

Scott Bulgrin is employed as the Water Quality Officer for the Pueblo of Sandia and has been in the position since March 2000. Prior to working for the Pueblo of Sandia Scott worked with the U.S. Fish and Wildlife Service in Albuquerque, New Mexico and Arcata, California working with endangered species and juvenile salmonids. Scott has over 15 years experience in the environmental field and has spent a majority of his career working for the Florida Department of Environmental Protection in the area of water quality.

Abstract

The Pueblo of Sandia, a federally recognized Indian Tribe has had a water quality program since 1994. Located just north of Albuquerque, the State of New Mexico's largest city, the Pueblo of Sandia is bordered to the north by the Town of Bernalillo, to the east by the Sandia Mountains, and to the west by the Rio Grande, Village of Corrales, and the City of Rio Rancho. With the Rio Grande being one of the most polluted and endangered rivers in the United States, the Pueblo of Sandia was the first tribe in the United States to apply for Water Quality Standards under the Clean Water Act Amendments of 1987. This was done with the specific intention of protecting ceremonial use of surface waters and the environment. Water Quality Standards were approved by EPA on August 10, 1993. This presentation will highlight the water quality program at the Pueblo of Sandia. The Pueblo of Sandia's water quality program is involved with various aspects of water quality including: surface water monitoring, ambient toxicity testing, NPDES permitting, compliance, and enforcement, storm water runoff, wetland rehabilitation, Bosque restoration, water quality standards, and endangered species monitoring. One goal of the Pueblo of Sandia's water quality program is to create community awareness and involvement in water quality issues. This is accomplished by developing water quality education programs for the community and hiring Tribal student interns during the summer for the program. The goal of this presentation is to show non-Tribal entities and other Tribes what one New Mexican Tribe is accomplishing through its water quality program and the capacity it is building within and outside the Tribal boundaries.

An Intensive Field Sampling Program in Support of a Marine Outfall Siting Study

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Biographical Sketch of Author

Jim Simmonds is a supervisor in King County's Science and Data Management Section, with training and experience in water, sediment, and tissue quality monitoring and risk assessment. He is the project manager for the siting, environmental review, and permitting of the marine outfall component of a new regional wastewater treatment facility. Jim has worked for King County since 1997, previously working as an environmental consultant on a wide range of water quality and risk assessment projects.

Abstract

Population growth in the greater Seattle area has necessitated planning a new wastewater treatment plant with a marine outfall in Puget Sound. King County conducted a marine outfall siting study that included an intensive field sampling program, undertaken to study baseline conditions of the marine environment at several candidate outfall sites as well as throughout central Puget Sound. This sampling program was designed to meet rigorous data quality objectives including low analytical detection limits and robust statistical analysis.

Offshore water column samples and in situ field data were collected over three years to evaluate spatial and temporal differences in concentrations of bacteria, nutrients, dissolved oxygen, trace metals, organic chemicals, and other constituents. Intertidal water samples were collected over two years to evaluate the same constituents. A three-year primary productivity study was conducted to assess nutrient limitation on phytoplankton growth. Sediment samples were collected from candidate outfall sites to examine spatial differences in geophysical characteristics, benthic communities, and concentrations of trace metals and organic. Tissue samples were collected from geoduck clams, a valuable commercial shellfish resource, to determine baseline concentrations of bacteria, trace metals, and organic chemicals.

Results from the field sampling program have been used by project managers and decision-makers to support outfall siting, design, and permitting processes. The results will also be used to design a long-term field sampling program that will monitor the marine environment at the outfall.

Abstract #139

Monitoring all Hydrologic Compartments in a Small Agricultural Watershed in Central California

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Biographical Sketches of Authors

Charles Kratzer is the study unit chief for the San Joaquin-Tulare Basins study unit of the USGS National Water Quality Assessment (NAWQA) Program. In addition to his NAWQA responsibilities, he has led several monitoring efforts related to pesticide and nutrient transport and stream travel times. Joseph Domagalski is the study unit chief for the Sacramento River Basin NAWQA and is the staff scientist for this overall study and the specialist for the vadose zone compartment. Steven Phillips is a groundwater hydrologist and is the specialist for the groundwater flowpath processes and modeling portions of this study. Peter Dileanis is the surface-water hydrologist for both the San Joaquin and Sacramento NAWQA study units and is the specialist for the surface runoff compartment. Celia Zamora is a USGS hydrologist and a graduate student in Hydrogeology at California State University at Sacramento. Her thesis topic is the groundwater and surface water interaction compartment of this study. Michael Majewski is a research chemist involved in several studies of atmospheric deposition and transport and is the specialist for the atmosphere compartment.

Abstract

The San Joaquin Valley, California, study area of the National Water Quality Assessment Program is one of five areas participating in an intensive, nationwide study of the sources, transport, and fate of agricultural chemicals. A goal of these studies is to estimate a mass balance for water and chemicals in a small agricultural watershed. To achieve this goal, all compartments of the hydrologic cycle are being instrumented and monitored. These compartments include the atmosphere, surface runoff, vadose zone, and groundwater. In addition, groundwater processes along a flowpath, and interactions between groundwater and surface water at the toe of the flowpath are being monitored.

The San Joaquin site is located within the Merced River Basin on the east side of the valley. Atmospheric sampling will include rainfall collectors at four sites, weather stations at three sites, and evapotranspiration measurements at two sites. Monitoring of surface runoff will include sampling a culvert that collects runoff from an almond orchard and sampling the receiving stream at three sites. Dye studies will be done to determine travel times in the stream. The vadose zone will be monitored with pan and suction lysimeters to collect water samples below the root zone, time domain reflectometry sensors to measure moisture content, and heat dissipation probes to measure pressure heads. Groundwater levels, temperature, and chemistry will be measured at three monitoring-well clusters along a flowpath and at one or two clusters off the flowpath. The interaction of groundwater and surface water will be monitored using head, temperature, and water-quality measurements in monitoring-well clusters at multiple depths below the streambed and its banks and in seepage meters in the streambed.

Lessons Learned from Long-Term Biological Monitoring Programs

Mark J. Peterson, James M. Loar, Mark S. Greeley Jr., Michael G. Ryon, John G. Smith, and George R. Southworth

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Mark Peterson is a Research and Development (R&D) Staff Member in the Environmental Sciences Division of Oak Ridge National Laboratory (ORNL). Since joining ORNL in 1988, he has been the principal scientist and project manager of numerous projects dealing with the monitoring and assessment of contaminants in aquatic biota at various DOE and DoD sites. He has authored over 70 open literature publications and technical reports dealing with contaminant uptake in aquatic organisms, environmental impact assessment, wetland evaluation, and human and ecological risk issues.

Coauthors and fellow ORNL research staff members James Loar, Mark Greeley Jr., Michael Ryon, John Smith, and George Southworth all work with Mark in leading various components of long-term biological monitoring programs. James Loar has an ecological background and is the overall program manager and group leader. Mark Greeley is the principal investigator for toxicity testing studies, while Michael Ryon and John Smith are the principal investigators for fish and benthic macroinvertebrates tasks respectively. George is an environmental chemist and toxicologist who has particular interests in fate and transport processes.

Abstract

Biomonitoring programs developed in the mid-1980s to assess compliance of DOE facilities with Tennessee water quality regulations have continued until the present day. The aquatic environment near these facilities has been subjected to multiple disturbances, including effluent discharges, sediment/soil contamination, groundwater contamination, and habitat alterations. The long-term monitoring programs have provided many benefits in addition to documenting regulatory compliance. Initial monitoring studies provided detailed site characterizations to identify sources, evaluate potential causes and range of impacts, and determine relative risks to humans and the environment. Especially useful were monitoring methods reflecting short time scales and near-field effects, such as water chemistry, biomarker, and toxicity monitoring. With a better understanding of these impacts, the number of sampling sites was reduced to major source areas and watershed exit points, with the objective of evaluating stream recovery and the effectiveness of remedial actions. Bioaccumulation monitoring and instream community surveys were particularly useful for these temporal evaluations, because relatively long-lived, resident organisms integrate the combined effects of multiple sources/impacts that may occur over time scales of months or years. Lessons learned from these long-term biomonitoring programs include the importance of using (1) multiple and complementary monitoring tasks, (2) quantitative measures that adequately account for sample variability, (3) meaningful sampling locations within the range of site exposure and effects, (4) continuous, same-season monitoring, (5) appropriate and multiple reference sites to measure impacts, and (6) comparable and consistent methodologies across time and space.

Abstract #141

A Collaborative Assessment of the Effects of Watershed Calcium Depletion and Suburbanization on River Water Quality in the Delaware River Basin

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Pete Murdoch is a Research Hydrologist with the Watershed Research Group of the US Geological Survey in Troy, New York. Since 1982 he has lead research projects on watershed processes, and the effects of acid rain and climate change on water quality in streams of the Catskill and Adirondack Mountains of New York. In the mid-1990s he served as the DOI representative to the White House Committee on Environmental and Natural Resources (CENR), where he and others were charged with designing a strategy for integrating the Nation's environmental monitoring and research programs. Since 1998 Pete has been the technical lead on a pilot of that strategy in the Delaware River Basin.

Abstract

The U.S. Geological Survey and the U.S. Forest Service are testing collaborative monitoring strategies in the northern Delaware River Basin through a set of issue-focused parallel studies. The Collaborative Environmental Monitoring and Research Initiative (CEMRI) enhances and links existing monitoring and research programs to address multi-scale environmental issues that could not be assessed by individual programs. Using plot- and watershed-scale sampling approaches, the collaborative study revealed a correlation between soil calcium availability and forest condition in the Catskill Mountains, and a decline in stream water calcium concentrations over the past 50 years.

At the regional scale, the study provided an integrated stream and soil chemistry survey in the upper Delaware basin that indicates a band of low-calcium streams and soils extending from the western Pocono Mountains in Pennsylvania to the eastern Catskills in New York. Land cover analysis by the USFS using high-resolution aerial photography, when linked to stream monitoring data from the USGS, indicates an inverse correlation between stream biological condition (EPT richness) and the suburbanization of watersheds in the Pocono Mountains.

The combination of intensive and extensive data collection, and integration of the forest-, soil-, and water-sampling programs of the USGS and USFS is providing a regional picture of the extent of soil calcium depletion and forest fragmentation, and the effects of these landscape disturbances on water quality in the upper Delaware River Basin.

Abstract #142

Long-term water quality monitoring of small agricultural streams in Alberta, Canada

Sarah L. Depoe, James J. Wuite, and R. David Neilson

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Biographical Sketch of Presenting Author

Sarah Depoe is a water quality specialist with the provincial government in Alberta (Canada) and is an aquatic biologist by training.

Abstract

This presentation will introduce the AESA (Alberta Environmentally Sustainable Agriculture) Stream Survey, a long-term water quality monitoring program underway in Alberta, Canada. Initiated in 1997, this program monitors water quality trends in 23 small agricultural watersheds across the province. Tracking changes in water quality helps the agriculture industry assess whether the changes it is making are having a positive effect on stream quality. Study parameters include nutrients (various forms of nitrogen and phosphorus), fecal bacteria (fecal coliforms and E.coli) and pesticides (>40 compounds). Water samples are collected at the outflow of each watershed during high and low stream flows, and stream discharge is recorded continuously. Results from trend analyses (Seasonal-Kendall) will be presented, and the value of the Alberta Agricultural Water Quality Index (AAWQI) at identifying long term trends will be discussed.

Abstract #143

Quantifying Hydrologic "Flashiness"

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Biographical Sketches of Authors

R. Peter Richards is a Senior Research Scientist at the Water Quality Lab, where he has worked for the past 25 years. Pete's expertise lies in the use of data analysis and statistics to turn masses of data into useful information. He has worked extensively in the areas of pollutant load estimation, detection of trends in chemical constituents, and design of sampling programs for chemical constituents in rivers and streams.

David B. Baker is Director Emeritus of the Water Quality Laboratory. He remains active in a variety of water quality research, monitoring, and management activities. These include topics of natural streamflow restoration in agricultural watersheds, development of comprehensive management plans for addressing TMDL issues in agricultural watersheds, and stakeholder education related to the above topics.

Tim Loftus, director of the Water Quality Laboratory, is an environmental geographer with interests in watershed management, landscape ecology, riparian ecosystems, and environmental policy. As chairman of the Sandusky River Watershed Coalition, Dr. Loftus is currently working to integrate research with development and implementation of watershed action plans that aim to satisfy TMDL requirements for improving water quality at the spatial scale of HUC-11 watersheds.

Abstract

The frequency and rate of change in a stream's flow in response to precipitation is an important element of the flow regime of the stream. This pattern of response is revealed by the stream's hydrograph, and is often described using the term "flashiness", though this term is rarely explicitly defined. Departures from natural flashiness impair aquatic ecosystems, regardless of whether the departures involve decreased or increased flashiness. Departures from the natural flow regime can be caused by many factors, including flow regulation and other forms of hydromodification, land use change, agricultural drainage practices, urbanization, land management practices, and climate change. Changes due to impoundment happen quickly at a known time, but changes due to most aspects of land use and climate change happen incrementally, and may not be evident without a suitable metric to characterize flashiness. We have developed a new flashiness index based on mean daily flows measured at U.S. Geological Survey stream gages. This index shows relatively small inter-annual variability, making it efficient for trend detection. The index was applied to 515 gages in the Midwestern U.S. (1975-2001). Results show strong regional differences in flashiness, and many statistically significant temporal trends. This new index should prove useful for monitoring watersheds for changes in hydrologic regime in response to climate and land use changes, and for summarizing differences between current hydrology and pre-settlement hydrology as determined by land-use/hydrologic-response models.

A Physical Habitat Index Focusing on Salmonids in the Pacific Northwest

Edward A. Chadd[1], Erin M. Clancy[2], and Jon H. Mowe[3]

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Ed Chadd is the co-manager, along with Hannah Merrill, of Streamkeepers of Clallam County, a volunteer watershed monitoring and public involvement program of local government. Among other accomplishments, Streamkeepers has helped to create a unique set of volunteer-friendly physical-habitat monitoring protocols which complement biological and chemical monitoring (see http://www.clallam.net/streamkeepers). He helped to create the program in 1999, after serving as a volunteer in a predecessor program for the prior two years. He has a long history with volunteer and civic organizations (Peace Corps, Student Conservation Association, League of Women Voters), as well as with education (public schools, adult education, Outward Bound, community college). His current mission is as an applied scientist/educator, dedicated to bringing science to the people in a way that can enhance their lives and the planet.

Erin Clancy is a Valle Scholar working on her M.S.E. degree in Civil and Environmental Engineering at the University of Washington. In 2003, she received a B.S. with Distinction in Mathematical Biology from Harvey Mudd College, one of the Claremont Colleges of California. Her current research focus is on water resources and systems engineering, with a particular emphasis on mathematical modeling. She is currently working on the Tualatin Basin (OR) Climate Change Impacts Project, projecting impacts on hydrology, water supply, and stream temperature. Erin did the initial research and drafting of this paper, first as a volunteer and then as a contractor. She is a native of Port Angeles, Streamkeepers' home base.

Jon Mowe is the Environmental/Natural Resources Vocational Teacher at the North Olympic Peninsula Skills Center, a regional training consortium of local school districts, governments, businesses, and Peninsula College. He has created field-based Environmental Science programs both in his current job and a prior job with the Sequim (WA) School District, in both cases collaborating with Streamkeepers to provide a more meaningful experience for his students. He holds an M.Ed. from Eastern Washington University and a B.S. in Fisheries Biology/Management from the University of Washington. He has a long history as a field and laboratory biological technician going back to the 1970s. Jon worked on this paper as a contractor, helping to do further research, analysis, and drafting.

Abstract

Streamkeepers of Clallam County, a volunteer stream monitoring program of local government on the Olympic Peninsula in Washington State, is developing a multimetric Physical Habitat for Salmonids Index (PHI) based on physical-habitat parameters we have been monitoring at several dozen sites since 1999. Such an index would complement indices we already use to characterize biological integrity (B-IBI) and water quality (WQI). In our mostly-rural county undergoing rapid development, with salmon runs ranging from relatively healthy to extinct, we have an opportunity to track environmental impacts while ecosystems are relatively intact, and potentially to forestall further impacts through land-management decisions. This presentation will cover the rationale, development, and further applications of our PHI. We faced the challenge of developing our index with an already-existing data set, in a field where reference-standards are hard to come by. We will discuss some of the challenges we faced and approaches we took to overcome them. We consider our PHI a work-in-progress and have come to the National Water Quality Monitoring Council conference seeking feedback from the scientific community.

A Basinwide Index for Biological Assessment of Potomac Nontidal Streams

LeAnne Astin

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Biographical Sketch of Author

LeAnne Astin is employed as an Aquatic Ecologist with the Interstate Commission on the Potomac River Basin, an interstate compact agency that helps the Potomac Basin states and the federal government to cooperatively address water quality and related resource problems in the river. Since 2000, she has served as the principle researcher and analyst for the Potomac Basinwide Assessments Project, as well as assisting in a variety of other Commission programs. She is also the acting chair of the Methods and Data Comparability Board's Water Quality Data Elements workgroup.

Abstract

The Interstate Commission on the Potomac River Basin (ICPRB) relies on data collected by member jurisdictions (DC, MD, PA, VA, WV) to assess the health of Potomac waters. The ICPRB has developed a consistent approach for analyzing monitoring data from the nontidal Potomac. Six steps were involved in establishing an assessment framework: 1) develop a database structure to integrate monitoring data provided by the jurisdictions; 2) resolve methods and data compatibility issues; 3) establish consistent abiotic criteria to identify reference and impaired sites; 4) screen for robust biological metrics that can distinguish reference from impaired sites; 5) evaluate the validity of aggregating data across ecoregions; and 6) develop a basinwide, ecoregionally calibrated biotic index for assessing Potomac nontidal streams. Basin states' data were combined in a custom database. Criteria for reference and stressed sites were based upon the common habitat and water quality parameters or their analogs used by the states. Seven metrics effectively discriminated impairment: EPT Richness, Hilsenhoff's Family Biotic Index, Percent Clingers, Percent Collectors, Percent 2 (or 5) Dominance, Percent EPT, and Taxonomic Richness. An aggregated index was developed using these metrics, and its ability to distinguish reference from impaired sites in a validation dataset was evaluated. The index accurately identified impaired sites in the calibration dataset for all ecoregions tested, and clearly separated reference and impaired streams for most ecoregions tested in the validation dataset. Reference communities were also compared between ecoregions. Blue Ridge, Central Appalachian Ridge and Valley, and Central Appalachian communities were indistinguishable, supporting aggregating reference site data across these ecoregions. Results suggest that data from diverse sources can be combined to produce scientifically defensible judgments on the condition of aquatic resources, if the synthesis is done with care.

Abstract #146

Are Your Sediment Data Reliable and Comparable?

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Biographical Sketch of Author

Mr. Glysson has over 34 years of service with the USGS as a hydrologic engineer, hydrologist, and supervisory hydrologist, working at all levels of the Water Resources Discipline and has served in supervisory and technical management positions. Mr. Glysson has a M.S. in Engineering Administration and a B.S. in Civil Engineering. He currently serves as the Vice Chair of ASTM International's Committee on Water and Secretary of the Board of Registration for American Institute of Hydrology. He has authored over 35 books, reports, papers, and standards on sediment data collection, analysis, and transport. He has taught the USGS' Sediment Field Data Collection Techniques and Sediment Records Computation and Interpretation Courses, a WMO International Workshop on Sediment Transport Measurements in Beijing, China, and numerous short courses. He has preformed research into the differences between TSS and SSC analyses and co-authored USGS policy memorandum on the subject.

Abstract

Fluvial sediment is one of the most widespread pollutants affecting the nation's rivers and streams. In addition to traditional uses of sediment data, information is needed for contaminated sediment management, dam decommissioning and removal, environmental quality, stream restoration, geomorphic classification and assessments, physical-biotic interactions, and regulatory requirements of the Clean Water Act, including the EPA's Total Maximum Daily Load (TMDL) Program.

Sediment monitoring program are being designed and implement throughout the United States and the world and require millions of dollars to support. No matter how well these programs are designed and funded, they will not succeed in meeting their objectives if the fundamental methods and equipment used to collect and analyze the data are unreliable or lack standardization. Errors associated with using non-standardized methods can far exceed, for example, the magnitude of the load reduction desired by TMDL projects. Unfortunately many engineers and scientist do not realize that the collection and analysis methods they have been using for years may actually induce considerable error and uncertainty into their data and thus can have detrimental effects on the results and management decision based on the data. This paper will present information and case studies concerning the errors associated with using some fairly common and widely used equipment and methods for the collection and analyses of sediment data.

Abstract #147

Monitoring of Steambank Erosion Processes: Hydraulic, Hydrologic and Geotechnical Controls

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Biographical Sketches of Authors

Andrew Simon is a Research Geologist at the USDA-ARS-National Sedimentation Laboratory in Oxford Mississippi. He has over 24 years of research experience (16 with the USGS) in sediment transport and unstable landscapes, particularly incised channels and streambank processes. He is the author of numerous technical publications and has edited several books and journals. Dr. Simon is an adjunct Professor at the University of Mississippi, a Special Professor in the School of Geography, University of Nottingham, and is on the Editorial Board of the journal *Geomorphology*.

Natasha Pollen is a PhD candidate in the Department of Geography, Kings College, London, England specializing in the effects of riparian vegetation on the stability of streambanks. She is the author of several journal and proceedings papers and was the recipient of the Hydrology Section, American Geophysical Union, Student Paper Award in December 2002.

Abstract

Sediment emanating from eroding streambanks represents the dominant source of sediment in many disturbed fluvial systems. Gravitational forces acting on *in situ* bank material act in concert with hydraulic forces at the bank toe and seepage forces within the bank to determine rates of bank erosion and, therefore, bank morphology. Because these processes comprise a mix of hydrologic, hydraulic and geotechnical processes, accurate prediction of sediment loads and erosion rates must be based on accurate characterization of the controlling variables for each process.

A study conducted in the Goodwin Creek, Mississippi highlights the different monitoring requirements. To characterize shear strength and shearing resistance to bank failure, geotechnical properties of the bank are required. A borehole shear-test device (BST) is used to obtain independent measures of cohesion and friction angle *in situ*. Samples of known volume are obtained to determine bulk unit weight and pore-water pressure at the point of testing using a digital, miniature tensiometer. Surveys of the bank profile are used to provide data on bank mass and angle. Tests of the tensile strength of riparian tree roots for a range of diameters and species are conducted so that the effects of root reinforcement are included.

A submerged jet-test device is used to determine the critical hydraulic shear stress and erodibility coefficient of *in-situ* materials. For non-cohesive materials, measures of the particle size distribution based on bulk samples are used. Pressure transducers at the upstream and downstream ends of the reach monitor stage, flow depths and provide data to calculate average boundary shear stress and the confining pressure supporting the bank during high stages. Nests of tensiometers are used to monitor streambank pore-water pressures under three vegetative treatments to establish variations in hydrologic conditions due to the effects of the different vegetation types.

These data are then used together to support numerical bank-stability analyses and models that include sub-routines for bank–toe erosion.

Monitoring Sediment Production and Transport at a Highway Construction Site

Timothy H. Diehl

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Biographical Sketch of Author

Tim Diehl is a hydrologist in the Tennessee District Office of the U.S. Geological Survey. He's worked there since 1989 on a variety of geomorphic and hydrologic studies.

Abstract

The U.S. Geological Survey, in cooperation with the Tennessee Department of Transportation, and in partnership with Mactec Engineering, is monitoring runoff from areas disturbed by highway construction and temporarily stabilized.

Compliance monitoring along the highway right-of-way is carried out on each rainfall of 0.5 inch depth or more. Ten locations have siphoning samplers based on the U-59. These siphoning samplers have been designed for installation in shallow streams whose stage response to rainfall is slight. Each sampler incorporates a crest-stage gage. All samples are analyzed for total suspended solids and turbidity.

At three of these sampling stations, Sigma pumping samplers with pressure sensors collect samples at 15 - minute intervals and record the stage hydrograph.

Two gaging stations have been installed downstream from the highway project, one of which drains some of the temporarily stabilized areas. At these sites, continuous turbidity, temperature, and conductivity are recorded, and pumping samplers collect water samples.

Plans for future sampling include the use of the LISST-Portable instrument to measure suspended sediment concentration in the field, an expanded number of sites, and measurement of discharge at the sites along the right-of-way.

Monitoring stream ecosystems to distinguish between the effects of runoff from a wildfire from anthropogenic disturbances

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Biographical Sketches of Authors

Chester Anderson received his B.A. in Ecology and Evolution from the University of California, Santa Barbara and his M.S. in Entomology from Cornell University. He conducted basic research for 15 years in stream ecology and in high elevation lakes at the Rocky Mountain Biological Laboratory and has been involved in numerous stream monitoring and research efforts for the Pine Lands Commission in New Jersey and a variety of agencies and companies in California, Arizona, New Mexico and Utah. In 1995 he began his own consulting business. Through that business he has developed water quality monitoring studies that include macroinvertebrates, fish, periphyton and water chemistry.

Michiko Burns received her B.Sc. in Biology from Fort Lewis College in Durango, Colorado. She has worked for five years with the National Park Service conducting research studies into noxious weed control using biological control agents. Of late, she has overseen the Water Quality Program of the Southern Ute Indian Reservation, which includes an intensive surface and groundwater monitoring program, The STORET Database Project, a wetland/riparian area study as well as the Missionary Ridge Fire Complex study.

Abstract

An intense fire in the summer of 2002 in the watersheds of 2 regulated and 1 free-flowing stream is resulting in large amounts of sediment and organic matter eroding into the streams, impacting habitat and nutrient dynamics. The streams flow through urban and agricultural landscapes that also add sediment and nutrients and it is important to the agencies that monitor the streams that the effects of runoff from the burn area be distinguished from existing and potential anthropogenic effects and the prolonged drought that is coupled with the effects of the fire. Chlorophyll and ash free dry mass are being utilized to measure levels of periphyton. Pebble count and embeddedness measures are being utilized to assess impacts of sediment to habitat and total volatile solids are being measured to determine amount of organic loading to depositional areas. Significant algal blooms and sediment impacts to habitat are being measured at some sites in each stream. The algal blooms appear to be caused by urban and agricultural runoff and sediment from the burn area appears to be impacting sites in the regulated streams immediately below the burn area but there are no detectable sediment impacts being measured in the lower reaches or at sites in the free-flowing stream.

U.S. EPA's Action Strategy to Strengthen Water Quality Monitoring

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Joan Warren is a program analyst in the Office of Wetlands, Oceans and Watershed within the U.S. Environmental Protection Agency's Office of Water. She has been in the Office of Water for over 15 years, with experience in the wetlands, watershed protection, total maximum daily loads, and monitoring programs. Prior to coming to EPA, Joan worked on water issues for the National Governors' Association and the National Conference of State Legislatures.

Abstract

One of the highest priorities for the water program at EPA is the improvement of water quality monitoring. EPA has developed a strategy for the next three years to improve water quality monitoring, particularly as it relates to the implementation of the Clean Water Act. The action strategy seeks to respond to continued critiques of current approaches to water quality monitoring nationwide, as well as respond to the needs of regions, states, watersheds, and local entities as they address site-specific water quality issues: water quality standards development and revision; TMDL development; and water quality-based NPDES permitting.

The presentation will discuss major barriers, and opportunities identified in developing the strategy, and future actions to address these concerns. The issues raised in the course of developing the action strategy include the need for: devoting additional resources to water quality monitoring; helping states make the difficult choices regarding where to focus their limited resources; articulating more clearly consistent priorities from EPA; increasing the accessibility to and use of water quality monitoring data; obtaining increased and better analysis of data; and conveying this information in a manner that is more useful to decision-makers and the public.

Abstract #151

Wyoming's Credible Data Legislation: Monitoring Water Quality and Extension's Role

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Biographical Sketches of Authors

Quentin is a 30 plus year employee of the University of Wyoming. His three way appointment has provided him opportunity to conducted research, teach, and promote extension programming during these years. His specialty is Wildland Watershed Management and he is focused on knowing more about water quality, riparian zone ecology, and stream function. His recent challenge is to further the understanding of how volunteer water quality monitoring data is interpreted considering function of streamflow dynamics, watershed function, user demands, and regulatory standards.

K.J. Reddy, is a teacher, research scientist, and provides extension expertise to serve natural resources and water quality issues. He teaches Wyoming's water quality courses and has established a recognized and successful water quality research program. His numerous journal publications, book chapters, and featured articles are well received by water quality audiences. He is a respected adviser of high school and college students of all levels. His relationships with diverse clientele are illustrated by his appointments to the University Graduate Faculty; Wyoming TMDL Research Committee; American Water Resources Association TMDL Research Committee; and Review Panel Water Research Journal.

Abstract

In 1999, Wyoming passed legislation requiring the use of "Credible Data" in decisions concerning the attainment of beneficial uses when assessing water quality. Credible data, as defined "…includes scientifically valid chemical, physical, and biological monitoring data collected under an accepted sampling and analysis plan, including quality control and quality assurance procedures and available historical data".

To meet the intent of this legislation, the Wyoming Association of Conservation Districts (WACD) assumed responsibility for conducting water quality monitoring within local districts. WACD's objectives are: 1) Gather credible baseline data to facilitate spatial and temporal analysis of chemical, physical, and biological data. 2) Identify the geographic and temporal extent of impairments, if present. 3) Provide background information for future watershed studies, which integrate user activities of the watershed with monitoring programs so cause and source of water body impairments could be determined should they exist.

WACD, the NRCS, the University of Wyoming Cooperative Extension Service (UWCES), Wyoming Department of Environmental Quality, and the United States Geological Survey trained personnel. Currently, 22 of 24 Wyoming districts are supported by a tax base and 33 of 34 have implemented monitoring programs. The UWCES has completed a 4 year case study of implementation, evaluation, and interpretation of one district's monitoring program. A second case study is in progress. Both are designed to meet the credibility criteria established by Wyoming. This presentation addresses the collaboration needed to monitor water quality and UWCES's extension role in making it happen.

Sustaining Long-Term Water Quality Monitoring Programmes: A New Zealand Case Study

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Biographical Sketch of Author

Mike is a stream biologist with NIWA Ltd., a research and consultancy firm owned by the New Zealand government. NIWA operates the National River Water Quality Network (NRWQN), which is the only national-scale surface water quality monitoring network in New Zealand. Mike has been working with data from the NRWQN since he joined NIWA in 1995. He has been heavily involved in National State of the Environment reporting on behalf of the government, and has carried out trend analyses for both water quality determinants and biological indicators. One of his principle research interests is the description and explanation of temporal patterns in river ecosystems, and he has recently been investigating the influence of climate variability on patterns in water quality and invertebrate communities. Mike is currently overseeing a review of the NRWQN.

Abstract

Long-term water quality monitoring programmes can face a serious conflict between the maintenance of consistency in monitoring methodology (the where, when and what), which is often required to provide high quality information, and the evolving information needs of the resource managers the programme is designed to support. In this paper we describe how these issues have been dealt with in relation to New Zealand's National River Water Quality Network (NRWQN). This monitoring programme was set up in 1989 to i) detect significant trends in water quality; and ii) develop better understandings of the nature of the water resources and hence to better assist their management. The Network consists of 77 sites located throughout the country. All sites have intensive and reliable hydrological information. Regional field teams carry out monthly sampling for 14 water quality parameters, and all samples are returned to a single water quality laboratory for analysis using standard methods. Over the 14 years of NRWQN operation there have been major challenges to the sustainability of the programme through changes in the legislative, organisational, scientific and environmental frameworks within which the Network operates. We describe these changes, and outline the review process whereby we are seeking to meet the changing information needs of resource managers, while also maintaining consistency in monitoring methodology. We suggest that the apparent conflicting demands are not mutually exclusive, and information from existing design can often be tailored to meet changing management expectations.

Abstract #153

Improving the Utility and Comparability of a Regional Monitoring Program – Chesapeake Bay River Input Monitoring

Mary Ellen Ley[1] and Michael P. Senus[2]

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Biographical Sketches of Authors
Mary Ellen Ley has served as the Chesapeake Bay Program's quality assurance coordinator since 1998. Her work encompasses a wide range of activities - from project planning to field and laboratory audits, with the goal of obtaining comparable data from multiple agencies in four states. Mary Ellen began her career as a chemist at Wisconsin's State Laboratory of Hygiene. From 1985 to 1996, she worked with the Wisconsin Department of Natural Resources in the areas of quality assurance, laboratory certification and drinking water regulations. Prior to the Chesapeake Bay Program, she worked with the U.S. EPA Office of Groundwater and Drinking Water on monitoring issues.

Mick Senus has served as project manager for the Chesapeake Bay River Input Monitoring program since 2001. His work includes field sampling, nutrient and sediment load estimation, and trend analysis at four major tributaries. Mick began his environmental career in 1995 for the USDA's Natural Resources Conservation Service where he worked in modeling pesticide transport on agricultural lands. From 1996-1999 he worked at Camp Lejeune, NC for the Department of Defense as project manager remediating numerous hazardous waste sites on the Marine Corps installation under Superfund guidelines. From 1999-2001 he worked to plan and implement monitoring programs in two locations at Aberdeen Proving Ground, MD.

Abstract
The Chesapeake Bay River Input Monitoring Program is a long term, cooperative monitoring effort supported by State and Federal agencies. Since the mid-1980s, Virginia Department of Environmental Quality, Maryland Department of Natural Resources, U.S. Geological Survey, and Metropolitan Washington Council of Governments have monitored water quality at nine River Input stations in nine major tributaries of the Chesapeake Bay watershed. The monitored tributaries represent over 90 percent of the streamflow from the nontidal portion of the Chesapeake Bay watershed and are co-located with USGS stream-gaging stations. The objective of the monitoring program is to monitor concentrations, estimate loads, and calculate trends for nitrogen, phosphorus, and suspended sediment over time. This work provides information to resource managers formulating tributary strategies aimed at Total Maximum Daily Load development for nutrient and sediment control in the Bay. Additionally, watershed modelers use the data for calibrating and validating models.

When monitoring began, cooperating agencies used very similar protocols. Over the years, the protocols diverged as the agencies added or dropped parameters and switched to different sampling and laboratory methodologies. The differences did not significantly affect the site-specific trends, but the absence of certain constituents forced watershed modelers to use calculated values rather than measured values. To generate comparable data and add constituents, several method changes were needed: a) alkaline persulfate digestion instead of Kjeldahl digestion for nitrogen; b) particulate analyses for carbon, nitrogen, and phosphorus; and c) transect (equal-width increment) manual sampling instead of single-point automatic sampling.

This presentation will review the challenges facing this multi-purpose, regional monitoring program. It will discuss the process, costs, and benefits of changing an existing monitoring program to accommodate additional objectives. Finally, results from comparability studies conducted by U.S. Geological Survey staff will be used to estimate the biases between methods and their potential effect on future calculations.