
PRESIDENT'S NOTES

by Anne Savery, President, AWRA Washington Section

YOU ARE INVITED

What: A social and networking event at the Instream Flow Workshop

When: May 28, 2003 at 4 pm

Where: University of Washington, Husky Union Building

Who: Washington Section AWRA local and student chapter members

The Washington Section of the AWRA (WA AWRA) is hosting a social and networking event at the May 28th Instream Flow Workshop at the University of Washington. The social event will take place directly after the program, beginning at 5 pm. WA AWRA will be providing beverages and snacks for workshop presenters and attendees, and our local and student chapter membership.

As a benefit to our members, you are invited to attend the panel discussion at 4 pm on the first day of the workshop. The panel is comprised of speakers who have presented their work earlier in the day, who will have an opportunity to expound further on their topic, or to agree or to disagree with their fellow panelists. The panel format is audience participation - question driven discussion of the ecological and hydrological issues to be considered in instream flow setting methodologies. We are expecting a lively discussion and we want you to be there. Travel and education budgets are tight these days and we don't want our members to miss out on this exciting and timely workshop.

Our members will receive free parking and entry into the workshop for the panel discussion. Afterwards the WA AWRA will be hosting a social for workshop speakers and attendees, and our local and student membership. This is an excellent opportunity for you to network with technical, policy and legal experts in instream flow methodologies and policy.

The WA AWRA Board has created this networking opportunity for our membership as a way to thank you for being a member of our organization and we encourage you to attend. We are working to increase the visibility of this organization in the water resources community as well as to increase our core membership. For more information about the Instream Flow Workshop, please see Steve Hirschey's article in this newsletter.

For questions about attending this event or to sign up, please contact me at:

asavery@canoemail.com http://wetlands.fws.gov/Pubs_Reports/isolated/report.htm

Josh Baldi, Policy Director for the Washington Environmental Council will speak at the next AWRA dinner meeting at Hale's Ales Brewery and Pub in Seattle. Josh will be addressing current proposed water resources legislation and its environmental implications. The meeting is scheduled for June 19. Look for a confirmation flier in the mail, and check:

<http://earth.golder.com/waawra/>

New Flood Stages set for the Deschutes and Stillaguamish Rivers:

From The National Weather Service

http://www.wrh.noaa.gov/Seattle/PNS_FS.txt

Several flood stages have been reset to new levels. For the Deschutes River, the forecast point near Rainier has been reset to a flood stage of 10 feet from the previous stage of 11 feet. The Stillaguamish near Arlington has been reset to 14 feet from the old stage of 16 feet.

Flood stages are set for the level at which flooding becomes a great enough hazard to warrant the issuance of a flood warning to protect lives and property. Changes in river conditions that can affect that level include the elevation of the streambed, boulder and log debris, levee changes, new development, and changes in the stream path. ☸

Energy Regime: A Missing Link in the Restoration of Small Urban Streams?

By Mindy Roberts, University of Washington, Center for Water and Watershed Studies

Humans influence riverine systems by altering one or more of five groups of factors: flow, water quality, habitat, energy regime, and biotic interactions. Most research to date has focused on the first three, but few studies have addressed energy regimes and biotic interactions, particularly in the urban and urbanizing environment.

Forested systems rely on terrestrial organic matter as the primary energy source. Inputs from sources such as leaves from deciduous vegetation or needles from conifers fall into streams where physical, chemical and biological processes break down the organic matter. The energy is used at various trophic levels.

Studies have quantified anthropogenic impacts on leaf litter sources, fate, and transport as a result of forestry, agriculture, highway crossings, and eutrophication. A recent study found the amount of non-forested land in the local riparian area influenced leaf breakdown. However, even as urban development continues to expand in the Puget Lowland and elsewhere, no studies yet describe urbanization impacts on leaf litter dynamics. This paper describes an ongoing study designed to address the effects of urbanization on the sources, transport, and fate of organic matter in small urban streams, presents early results, and discusses potential implications.

Hypothesis

Urbanization may alter the amount of leaf and needle litter falling into streams due to removal or modification of riparian vegetation. Native aquatic species have evolved based on the timing and quality of allochthonous inputs endemic to a particular area. As non-native landscaping or invasive species replace native vegetation along the riparian corridor, the volume, timing, and nutritional content of the organic matter may change. Once leaves and other litter reach streams, it may be transported rapidly out of the system due to the lack of large wood or other retention mechanisms in urban streams. Finally, changes in physical, chemical, or biological processes may alter the decomposition of whatever organic matter remains.

Stream rehabilitation efforts that do not consider the full range of how anthropogenic modifications to riparian vegetation contribute to urban stream degradation may not restore key functions. Vegetation removal from riparian zones can increase water temperature by increasing the amount of solar radiation reaching the water surface, and it can reduce the supply of instream wood that would have protected stream banks and created pools and other retentive channel structures that trap sediments and organic matter. We are beginning to understand the additional roles that riparian forests play in watershed-scale nutrient cycling. The present research ad-

resses the complementary function of riparian zones providing energy sources to small streams.



Early Results

This study of sources, transport, and fate of organic matter in small urban streams is still in the early stages and will continue through 2004. Research sites are located in the Chico Creek and Clear Creek watersheds, located on the Kitsap Peninsula. Chico Creek supports the largest chum salmon run on the peninsula and offers a range of adjacent development conditions. Clear Creek runs through Silverdale and the watershed includes dense commercial and residential land uses.

Both field data and remote sensing information have been used to characterize sites. Riparian vegetation plots were established in the Chico watershed to quantify stem density, composition, and average diameter at breast height of adjacent trees. LiDAR data, provided by the Puget Sound LiDAR Consortium through Kitsap County GIS, provide highly detailed grids of vegetation height, which were spot-checked in the field using a laser range finder. These data, together with color orthophotos, have been used to develop a GIS data layer of riparian tree height, density, and composition to describe vegetation structure.

Litterfall baskets have collected organic matter since summer 2002 at five sites along Chico Creek. Two sites support mature riparian vegetation, dominated by 60-m red cedar, red alder, bigleaf maple, western

hemlock, and Douglas fir. The remaining sites represent modifications typical of residential land use and an urban park, with narrow or negligible strips of disturbed vegetation adjacent to the stream channel. Litter is separated into components (leaves, needles, red cedar, wood, moss and lichens, cones, and other materials), dried, and ashed to provide the mass of litter per unit area over time. Results will be used to compare the quantity of litter among sites and to evaluate patterns in litter components.



Litter samples from several native and non-native vegetation species were collected in fall 2002 and will be analyzed for carbon and nitrogen content. The ratio of C:N is one indicator of the nutritional quality of the source material. Literature values for C, N, or C:N are available for some native species, but very little data quantify nutrient content of non-native species.

Previous studies have used surrogate leaf material placed in streams to determine organic matter retention. The study will quantify surrogate material retention in study stream reaches and will attempt to correlate surrogate material retention with hydraulic retention.

To evaluate decomposition rates, pre-weighed packs of red alder and Himalayan blackberry were placed in streams at several locations in the channels of Chico and Clear creeks, with subsamples collected from 0 to 56 days to determine the change in organic matter content over time. Red alder decomposed more slowly in the urban Clear Creek sites than in the undeveloped and low-development Chico Creek sites, possibly due to enhanced physical abrasion from extensive salmon redd building at the Chico sites. In

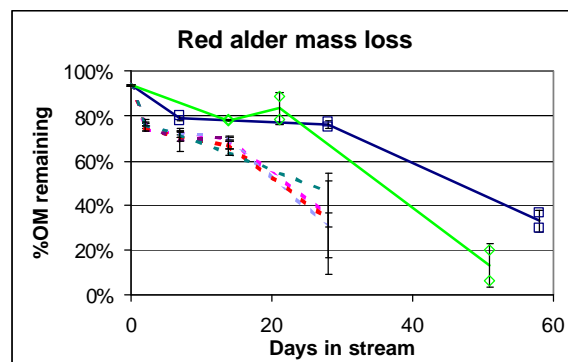
Clear Creek, red alder lost 15% of its organic matter in the first two days due to leaching, while leaching accounted for 25% of the mass loss in the Chico Creek sites in the same time period. Himalayan blackberry followed similar patterns but lost relatively little mass (5 to 10%) due to leaching. More extensive decomposition experiments are planned for fall 2003.

Future Directions and Potential Implications

A range of outcomes, contributing both to better scientific understanding and practical management of stream ecosystems, are anticipated. This work should develop fundamental information on the relative impacts of disturbance on food quantity and quality, based on a moderate number of monitoring locations. The data will be used to quantify the range of variability of organic matter processing, which in turn could lead to a larger and more comprehensive future study.

In addition to quantifying surface organic matter fate and transport, the study will evaluate how organic matter is processed within the gravels. Better understanding of subsurface decomposition should be of great importance, given our emerging understanding of the role of hyporheic zones in natural and urban environments. Results could spur future research into the biological and chemical function of hyporheic zones. Heavy metals and other toxics tend to adsorb to organic matter, and temperature, dissolved oxygen, and redox gradients present in hyporheic zones may significantly affect the attenuation or storage of various compounds present in urban systems.

Understanding the full suite of riparian-stream links and the impacts of altering those links should improve our management of urban riparian zones in the future. We have few opportunities to study undeveloped riparian zones in urbanizing areas like the Puget Lowland, so the time is short for evaluating and



quantifying the energy functions that these riparian zones perform. This should inform efforts to preserve irreplaceable functions, manage future development to maintain those functions, and enhance what has been impaired or lost. ☺

NOTE: Mindy Roberts was one of two student fellowship award recipients granted in 2002 by the WA-AWRA.

Assessing Ecosystems and Instream Flows: A summary of the 2002 AWRA Annual Section Conference, Part 2

Tom Martin, P.E., Battelle

This is the second of a two-part summary of Session 3 of the 2002 Annual Conference of the AWRA Washington Section. The title of the session was "Assessing Ecosystems and Instream Flows." Part 1 appeared in the January 2003 AWRA Newsletter, which included a summary of the first two speaker presentations. This is a summary of the last three speakers: **Ruth Mathews**, a Freshwater Resource Specialist with The Nature Conservancy, **Steve Suagee**, Reservation Attorney of the Colville Confederated Tribes, and **Stan Isley**, a Washington Department of Ecology liaison to the U.S. Bureau of Reclamation's Yakima office.

The title of Ruth Mathews' presentation was "Ecologically Sustainable Water Management—Managing River Flows for Ecological Integrity." Ms. Mathews discussed the significance of variable hydrologic regime in maintaining biodiversity of rivers. Ms. Mathews is a Freshwater Resource Specialist with The Nature Conservancy. Currently, she is leading freshwater biodiversity conservation efforts in the Pacific Northwest to develop and implement plans for ecologically sustainable water management.

For its Freshwater Initiative, the Nature Conservancy developed tools to analyze hydrologic alterations in river ecosystems. The tools provide a road map for working towards ecologically sustainable water management in river basins. Ecologically sustainable water management includes not only ecosystem protection, but also meeting human needs, now and in the future, and sustaining products and services that are provided by freshwater ecosystems. She described a six-step framework for ecologically sustainable water management.

The framework requires a specification of the ecosystem flow requirements. She presented the Richter's Natural Flow Paradigm from his 1997 article "How Much Water Does a River Need?"

"The full range of natural intra- and inter-annual variation of hydrologic regimes, along with associated characteristics of timing, frequency, duration, and rates of change, is necessary to sustain the native biodiversity and evolutionary potential of freshwater ecosystems"

She used Trinity River (California) flow records to demonstrate how various aquatic organisms at several life stages rely on different components of the hydrograph. The range of flows from high to low flows is needed to support biodiversity of these organisms. The goal of ecosystem flow methodologies is to balance natural flow variability with consumptive uses, which tend to reduce flow variability.

Ms. Mathews presented three ecosystem flow methodologies: Building Block, Benchmarking, and Downstream Response to Imposed Flow Transformations (DRIFT). The first two methodologies approach the determination instream flow requirement from opposite directions. The Building Block methodology is a bottom up approach, which currently is more commonly practiced. Starting from zero flow, minimum and maximum flows are "built up" for each season. Hydrograph transitional flows, such as the rate of increase of rising limb, are also specified. On the other hand, Benchmarking Methodology is a top down approach. Protection of ecological integrity is defined as an acceptable departure from the natural flow regime. This approach is referred to as "upside down water rights."

Steve Suagee presented his paper on the Colville Confederated Tribes (CCT) perspective on watershed planning in Washington entitled "Tribal Instream Rights and Regulatory Authority." He is an attorney in the Office of the Reservation Attorney of the Confederated Tribes of the Colville Reservation in Nespelem, Washington, where he has worked for the past 8 years. Currently, he is President of the Board of Directors of the Washington Water Trust, which is a non-profit organization devoted to improving instream flows by acquiring existing water rights from willing transferors.

Mr. Suagee's paper lists some specific reasons for the CCT decision to withdraw from the 2514 planning process. He describes the CCT as being wary of the 2514 process, which was established by state law. State law has historically been hostile toward, or incompatible with, tribal rights that were secured under federal law. Tribal water claims that arise under the doctrine of federal reserved water rights would not be satisfactorily "settled" through the 2514 process. There is inadequate funding support for the process to achieve this outcome. This is particularly a problem in the Okanogan River watershed where most of the watershed area and development pressure is located in Canada. The western boundary of the CCT reservation is the Okanogan River. The CCT considers that there is more potential for efficient resolution of instream flow issues by working directly with the Department of Ecology.

The CCT possesses governmental authority over on- and off-reservation water rights as the successor to the aboriginal government status, which is established in federal law and depends on federal law for its ongoing protection. However there are fundamental conflicts between the federal reserved water rights, particularly instream rights of tribes,

and the rights recognized under state appropriation systems. CCT holds unquantified federal reserve water rights for irrigation and other uses within their 1.4 million acre reservation, and unquantified instream flow rights in rivers and streams within both the Reservation and former North Half of the Reservation, including portions of the Okanogan, Kettle and San Poil River watersheds.

Mr. Suagee explained the CCT governmental authority to regulate water resource management by presenting relevant case law. In summary, the State has no authority to regulate water use on Indian and tribal trust lands with the CCT Reservation; only the CCT has such authority. Furthermore, a federal district court has confirmed that the CCT's reserved instream water rights under the 1872 Executive Order (establishing the Reservation) still existing on the former North Half. One crucial feature of these rights is that they are "inchoate," that is they can remain unquantified over time but not lost if unused. Mr. Suagee states that the absence of quantification has of course created uncertainty, and often hostility, on the part of water rights holders with rights that state law regards as senior but that are junior to unquantified tribal rights. Tribes insist that a proper quantification of instream flow rights for fish purposes includes sufficient water to preserve biological habitat and related geophysical processes of a stream, in order to preserve or restore harvestable populations of fish.

These types of flows have not been achieved under state law, and probably cannot be achieved under state law, as it currently exists. Mr. Suagee concluded that his paper demonstrated that the CCT has the commitment and the capacities to forge ahead with constructive planning for the Okanogan basin in a more direct government to government partnership with the Department of Ecology than is possible under 2514, one that is more appropriate to the Tribe's status and dignity.

The title of Stan Isley's presentation was "The Acquisition of Instream Flow Water Rights." Mr. Isley is a Washington Department of Ecology liaison to the U.S. Bureau of Reclamation's Yakima office. Stan presented his personal views on the subject, which led to several digressions from (or possibly to) the central topic. If the title of his presentation is the true definition of his topic, then the fundamental message was that there is no better approach to rehydrating and restoring our streams than buying /leasing/acquiring water rights. However, since nature cannot provide humanity with an increase in water supply, Mr. Isley believes that we must strive to achieve responsible and sustainable human population levels. Effective watershed management through population control could just as well have been the central topic of Mr. Isley's presentation.

With his practical on-the-ground experience, Mr. Isley is keenly aware of the realities of acquiring water rights. He identified two critical realities. First, water right acquisition will not bring back pre-development streamflows or fish populations. Second, state and federal government must buy back water from the private parties that now own rights to use our public water resources. Restoring normative flows is a realistic goal for water rights acquisition. Normative flows conditions are not circa 1800 conditions. Mr. Isley described normative flow as conditions that sustain healthy salmonid populations in a stream. Normative flow restoration can be better achieved through trust water right acquisition rather than establishing minimum flow rights through rule-setting (WAC). Trust water rights retain the original rights' priority date and are protectable downstream against diversion and use by junior right holders.

Mr. Isley's practical experience also led him into his digression into the question of adequate water supply for an ever-increasing human population. He contributed to a public discussion about off-stream water demands of 5.8 million humans and the threaten streams and salmon. He stated that we need to change the current perception that curtailing human population growth is anti-religious and anti-business. He discussed how this current perception is simply not true. If population grow continues uncurtailed, then Mr. Isley foresees that all of our effort today will be relegated to just a delaying tactic, like rearranging the furniture on the deck of the Titanic. Keeping human population at present levels will allow us to improve water use efficiency, to supply adequate water for current off-stream demands, to restore of normative flow conditions, and to sustain healthy streams and populations of native salmonids.

Mr. Isley finished his presentation with a description of the Teanaway River example. On average, one spring Chinook salmon redd was counted in the entire Teanaway basin from 1980 through 1999. During the late 1990's, Trendwest and Reclamation acquired instream flow water rights by purchase and lease. BPA, the NPPC and the Yakama Nation funded irrigation system improvements and elimination of diversion berms in 2000. These actions improved fish passage through the lower river. Upstream on the North Fork, the same group funded release of facility-reared native spring Chinook at the Jack Creek acclimation pond in 2000. In 2001, the redd counts rose to 21. In 2002, they rose to 110. According to Mr. Isley, this success story resulted from water conservation in the Teanaway Basin. He urged us to do this again in other river basins. ☸

From: <http://www.wa.gov/wdfw/do/weekendr/weekendr.htm> (5/06/03):

Birding enthusiasts have plenty of options this time of year, with a huge array of migratory birds moving through the region. Caspian terns have been seen over downtown Seattle. Their piercing, scratchy call is often heard well before the birds are even seen.

WA-AWRA Fall 2003 Conference: Water's Woven Web in Public Planning, Funding & Development

by Steve Hirschey, Ecology

The topic of this year's annual fall conference of the Washington Section of the American Water Resources Association is the significant role that water plays in our economic and social development. This conference will explore how water is evaluated in planning under the Growth Management Act (GMA) Shoreline Management Act (SMA), Water System Planning, and funding public infrastructure under the Public Works Trust Board (PWTB), Safe Drinking Water Act (SDWA), Salmon Recovery Board, and Centennial Clean Water Fund (CCWF). In addition, the conference will explore how well those planning efforts and expenditure of public funds meet the goals of sustainable water resource management.

GMA: The GMA requires that local governments planning under the GMA take legislative action to review (at seven-year intervals), and if needed, revise policies and development regulations regarding critical areas and natural resource lands to ensure compliance with GMA's requirements. The first statutory deadline for the review and possible revision is December 1, 2004, which applies to Clallam, Clark, Jefferson, King, Kitsap, Snohomish, Thurston, and Whatcom counties, and cities within those counties.

RCW 36.70A.020(10) articulates the goal of protecting and enhancing the state's high quality of life, and expressly includes "water quality, and the availability of water." The review and revision (if necessary) of local government's implementation of GMA and inclusion of best available science in critical area ordinances will be explored from the county, city, and state perspective. In addition, the efficacy of the plans to include watershed planning and related efforts will be evaluated.

The session may include: a focus can be on the updates, what needs to be in them and why; the development of best available science, its use in ordinances and hoped for effects; and a focus on the past 10 years of GMA, has it worked and where is GMA going. Other considerations might be the business or development perspective on the policies and development regulations, and stormwater.

SMA: Several years ago a law was enacted requiring an update to the State's framework for SMA. In response to that law, Ecology proposed new regulations (to replace an existing 25+ year old rule) related to master program development. The proposed rules were challenged by court actions. The litigation resulted in a stipulated settlement and direction to Ecology to again promulgate a rule. Ecology is proposing to have the rule making done in 2003. Most of the rule language comes from the stipulated settlement. After the rule making, local governments are to update their master programs. Significant issues are the rules, money to update the local programs, and the time period to do so.

It is estimated it will cost \$18-20M to update the 250 county and city master programs, which is to be funded by the Legislature. Executive request legislation this year is asking for \$2M to start the process and do some pilot programs.

The law states the date for when the new programs are to be updated, and because of the litigation and lack of funding to redo the master programs, there is no way local governments will comply with the date set in statute. Executive request legislation this year is asking to extend the time for local governments to come into compliance.

The session on this topic may cover the following points: why do shoreline planning, substance and hoped for effect of the rule- state wide; a county/city perspective on development in light of the new rules - what will it look like on the ground; and, business or development perspectives on the new rules, cost to do the rules, cost of compliance, and/or the value to the public at large from implementing SMA.

Water System Planning: Public water system's evaluate water supply and the associated physical and legal availability of water; the "how" of those actions will be explored. The risk analysis and supply reliability (e.g., global warming, or conservation/curtailment) considerations made by public water systems in contracting to provide water or to develop a source will be explained and evaluated. The effect of water use by public water systems on the environment and what, if any, responsibility those systems have to mitigate the impacts will be discussed.

The session may focus on: why do water system planning, its components and effect; a county/city perspective on development based on those water system plans, failing public water systems, and public water supply in general; and, funding of public water supply, where the money comes from, how many dollars are spent, infrastructure needs for the future. Another angle may be limitations of water system planning, what it does not address, and how water system planning relates to GMA and development.

Water as the Thread: The final session will tie it all together. One talk on funding in general, the money spent on water (e.g., SDWA, PWTB, CCWF), and the value that accrues to the public at large - are we spending the money in the right place as we evaluate and use water in our economy. The final talk might be what is missing and where to go from here in sustainable water use from the funding and planning angles. An alternative view might be water for aesthetics, spiritual renewal, and recreation.

If you are interested in contributing to this year's conference planning, please contact the co-chairs: Carolyn Butchart (cbutchar@CH2M.com) and Paul Wetherbee (paul.wetherbee@pse.com). ☺

Instream Flow Workshop at the University of Washington

By Steve Hirschey, Department of Ecology

Instream Flow Science and Management in western Washington: Developing a Comprehensive, Ecosystem-Based Approach is the title of a workshop that will convene May 28-29 at the University of Washington. The workshop is being developed by a team of folks including representatives from Seattle Public Utilities, Seattle City Light, King County, State Departments of Fish and Wildlife and Ecology, the United States Geologic Survey, and Steward & Associates.

The workshop will provide a scientific and technical forum for furthering understanding of the various natural and man-made factors that affect the ecology of western Washington streams and rivers, and for developing ecologically-sensitive approaches to managing runoff and instream flows in those systems. The workshop will bring together scientists, managers, and others with an interest in land and water management to discuss and build upon recent accomplishments in the field of instream flow assessment, and to formulate an agenda for long-term research and implementation. The subject of instream flows – what controls or influences them, how instream flows affect physical and biological conditions, how flows and their impacts can be measured or modeled, and how we can avoid undesirable consequences and facilitate desired outcomes is especially timely in Washington because of the watershed planning currently underway in our State. Implementation of instream flow management will be key in Washington as 31 of 62 Water Resource Inventory Areas (watersheds) are currently planning to address instream flows and the watersheds are moving towards completion of the planning process.

The science surrounding instream flow assessments is rapidly evolving as conflicts over water increase and habitat protection and restoration measures are implemented. The basic premise of the workshop is that a more comprehensive, ecologically-based approach is needed to assess the effects of stream flows on aquatic and riparian ecosystems and to balance human uses of water with the conservation of instream values. The primary goals of the workshop are to facilitate discussion and understanding of flow-related phenomena and existing analytical approaches, identify gaps in scientific knowledge and an agenda for future research, and explore innovative approaches to identifying and attaining ecosystem-based stream flows that accommodate people's water needs.

The workshop planning group has organized a series of talks to illustrate (1) our current understanding of the ecological context of instream flows, including their relationship to and impacts on other riverine processes and components; (2) the im-

pacts that humans have on stream flows; (3) the methods, approaches, and tools used to evaluate and prescribe instream flows and their potential application in various land use/human activity settings; and (4) the need for innovative approaches to achieving ecosystem-based stream flows. These themes are further elaborated upon in the prospectus posted at <http://www.stewardandassociates.com/Instream/index.htm>.

Confirmed speakers include Brian Richter, developer of the Range of Variability Approach to setting instream flows and Director of The Nature Conservancy's Freshwater Initiative; Ian Chisolm, lead author of the recently published book *Instream Flows for Riverine Resource Stewardship*; Clair Stalnaker, Senior Scientist Emeritus and former leader of the Cooperative Instream Flow Service Group within the U.S. Fish and Wildlife Service; Jim Karr, University of Washington Professor and author of *Restoring Life In Running Waters: Better Biological Monitoring*; Jim Gore, internationally known researcher and author of several books on instream flows; Billy Frank of the Nisqually Indian Tribe and the Northwest Indian Fisheries Commission; and Charles Wilkinson, Professor of Law at the University of Colorado, author of numerous books and articles, and described as "the West's leading authority on natural resources law." Additional speakers reflect a diverse mix of regional and national experts on instream flow science, fluvial processes, and the causes and impacts of human activities on stream flows.

The Washington Section of the American Water Resources Association will be hosting a social at the end of the first day of the Instream Flow Workshop on May 28th, immediately following the program. Beer, non-alcoholic beverages and snacks will be provided. The social, which will run from 5 to 7 PM, is open to all workshop participants, as well as to WA AWRA members who are unable to attend the workshop. Individuals who are interested in joining the WA AWRA are also welcome. Non-workshop participants are welcome to arrive an hour early to attend the workshop panel discussion that begins at 4 PM. Free parking passes will be handed out to WA AWRA members who attend the social.

I encourage you to attend the workshop to learn more about instream flow and to contribute to the region's increasing efforts to ensure that water is instream to protect instream values. You can register by contacting Steward and Associates (www.stewardandassociates.com).

I look forward to seeing you at the workshop. ☺

The Fourth Symposium on the Hydrogeology of Washington State

by Peter Sturtevant, CH2M Hill

The Fourth Symposium on the Hydrogeology of Washington State was held in downtown Tacoma April 8-10, 2003. First launched a decade ago through a collaboration of several major agencies, this biennial symposium has evolved into one of the largest water resources gatherings in the Pacific Northwest. The symposium attracted four hundred people to the Tacoma Convention Center. There were over 80 presentations and 26 posters. The Center was ideally sized and laid out to handle the event and the symposium was able to achieve a cozy atmosphere often lacking in national conferences. For instance, there were just two concurrent sessions, making it less likely for one to miss an interesting presentation due to conflicts.

The Keynote Speaker was Richelle Allen-King from Washington State University. Her work in characterizing the chemical quality of shallow groundwater and surface flows from agricultural fields in the Palouse Country has won her the prestigious Darcy Lectureship for 2003. This year she is delivering lectures of her pioneering work all around the world, including this Symposium. Frank Chapelle (U.S. Geological Survey) was a second Keynote Speaker the following day. He delivered a very informative lecture on a model specifically designed to track the decrease of groundwater contaminants through time. The model demonstrates the natural decline of organic contaminants, known as natural attenuation, when given sufficient time, often on the order of many decades. Consensus over how much remediation is justified for a problem that will naturally decline over time has not yet been achieved.

A particularly interesting presentation dealt with long-term glacier monitoring in the North Cascades and Alaska. Edward Josberger of the U.S. Geological Survey presented results from a detailed record of glacial measurements extending back more than 40 years, one of the longest such records in the world. Rapid losses in glacial mass since the 1970's have slowed significantly in recent years and have been generally correlated to the warming and cooling trends of the Pacific Decadal Oscillation. Joshberger's work has also quantified the significant fraction of the summer flow that glaciers contribute to the Nooksack River. After seeing references to this research so often in the popular press, it was instructive to hear from the Researcher in person.

In this age of limited conference budgets, the Symposium is a great value, as conferences go. Sandy Williamson (U.S. Geological Survey) put in an extraordinary amount of time and energy to assure the success of the Symposium as the Symposium Chair this year. Our AWRA Section played a major role in developing the Symposium, as three of our current Board members were active on the Organizing Committee. These included Brian Drost, Scott Bender and myself. It was with great personal satisfaction that I experienced the wonderful success of this year's event. Even now, planning for the next symposium, to be held in 2005, has started. Phillip Long (Pacific Northwest National Laboratory) is the new Chair. If you are interested in getting involved, you can e-mail him at phillip.long@pnl.gov.

ANNOUNCING THE ANNUAL AWARD FOR

OUTSTANDING CONTRIBUTION TO WASHINGTON'S WATER RESOURCES

The AWRA, Washington Section plans to honor an individual at our annual conference on November 13, 2003 for outstanding contribution to the water resources profession in the State of Washington. The winner will be awarded a handsome plaque commemorating the honor. In addition, the AWRA Board will make a donation to a water-related, nonprofit organization of the individual's choosing.

The following criteria will apply.

- Outstanding contribution or achievement in the water resources field in the State of Washington.
- Leadership, so that others are enabled, inspired or organized to advance the understanding, management or wise use of water resources.
- Degree of innovation.
- Interdisciplinary or bridge-building qualities.
- Acknowledgement of the outstanding contribution from a diversity of perspectives.

Current State Chapter members are encouraged to send in a nominating letter for themselves or another candidate. In addition to identifying a nominee, the letter must contain an explanation of how the candidate specifically meets the criteria listed above. An individual need not satisfy all of the criteria to win the award, and other appropriate factors brought up in the nomination letter may be considered. Any person may be nominated for this award, but only current State Chapter members may submit a nomination. The nomination letter must be post-marked by October 1, 2003 to:

Peter Sturtevant, Nominations Subcommittee
c/o CH2M HILL
PO Box 91500
Bellevue, WA 98009-2050

There are lots of people out there working hard to protect and enhance Washington's water resources. This is a chance to bring some much-deserved recognition.

Assessing Ground-Water Vulnerability to Contamination

by Michael J. Focazio, Thomas E. Reilly, Michael G. Rupert, Dennis R. Helsel, USGS

Throughout the United States increasing demands for safe drinking water and requirements to maintain healthy ecosystems are leading policy makers to ask complex social and scientific questions about how to assess and manage our water resources. This challenge becomes particularly difficult as policy and management objectives require assessments of the potential for ground-water resources to become contaminated from anthropogenic, as well as natural sources. Assessments of the vulnerability of ground water to contamination range in scope and complexity. Tradeoffs must be carefully considered among the competing influences of cost, scientific defensibility, and the amount of acceptable uncertainty in meeting the objectives of the water-resource decision maker.

The Safe Drinking Water Act as amended in 1996 began a new era of prevention of drinking-water contamination and emphasized the importance of source-water management. The U.S. Environmental Protection Agency (USEPA) source-water assessment program, which has arisen from the Act, requires States to "assess water systems' susceptibility to contamination". A first step in a 'multiple barrier' approach to protect drinking water, source-water assessments should consider the potential for contamination of ground-water resources. The need for ground-water vulnerability assessments is found in many other water-management programs, including the identification

and location of sustainable sources of drinking water, ground-water disinfection, State pesticide management plans, underground injection of waste, and confined animal feeding operations. A National Research Council (1993) publication summarizes the definitions and approaches that are used by government as well as private and academic organizations in assessing the vulnerability of ground water to contamination. The differences in the effectiveness of individual assessments will be linked to the degree to which the important physical/chemical processes for each particular situation have been identified and accounted for, uncertainty is addressed, and the original science and management objectives are appropriately met.

A new USGS report provides an overview of some of the common approaches used to determine the important factors controlling the vulnerability of ground-water resources to contamination. In addition, the report discusses the strengths and weaknesses of the various approaches as sources of scientifically defensible information for the water-resource management decision-making process. Descriptions of defensible methods are supported by example studies that have been conducted by the USGS often in cooperation with local, state, and regional water-resources agencies.

The full report is available online at:
<http://water.usgs.gov/pubs/circ/2002/circ1224/> ❧

April Dinner Meeting Review: Washington State Surface Water Quality Standards Revisions

Paul Conrecode, Golder Associates

Mark Hicks, Senior Environmental Planner at the Washington Department of Ecology, spoke at the AWRA March Dinner Meeting on "Water Quality Standards and You". His talk focused on revisions to specific criteria, establishment of criteria to protect the quality of agricultural water supply, establishing a water quality antidegradation implementation plan, and restructuring the way uses are designated to waterbodies for protection.

A better understanding of salmonid habitat requirements drives revisions to temperature, dissolved oxygen, and ammonia criteria. For temperature, the existing Classes A and AA will be condensed to a single level of protection for spawning waters, and five categories will be established for aquatic life uses that cover a range of requirements for char, salmon, trout, and native warm water species. In addition, the metric for temperature will change from a 1-Day Maximum to a 7-Day Average Daily Maximum.

For dissolved oxygen, different criteria are assigned to salmonid spawning waters, salmonid rearing-only waters, and native warm water species waters. The

dissolved oxygen metric will also change from a 1-Day Minimum to a 90-Day Average Minimum Value. For ammonia, changes to water quality standards will be categorized as acute criteria for salmonids, and acute and chronic for non-salmonids.

Bacterial standards will also be revised according to three types of use protection: shellfish (eating), primary water contact (swimming), and secondary water contact (wading). Ecology proposes changing to EPA's recommended bacterial indicators – *E. coli* in fresh water, and *Enterococci* in marine waters. Fecal coliform will continue to be used as the indicator for shellfish safety, and the criteria will also remain the same.

New standards will be established for agricultural water supply, specifically in conductivity, bicarbonate, total suspended solids, and pH. The standards will apply to all crop types and irrigation methods. The metric will be an average from April 1 to September 30. ❧

The Landscape of Puget Sound: Tectonics and Glaciers

Chase Barton, Golder Associates

Attendees of the April 17 AWRA dinner meeting at Hale's Brewery in Seattle were fortunate to hear from Derek Booth, co-director of the Center for Water and Watershed Studies at the University of Washington. His talk, titled "The Landscape of Puget Sound: Tectonics and Glaciers", introduced the regional scale geologic processes that are responsible for the framework of the Puget Lowland and how that framework imparts controls on stream and watershed processes. For those accustomed to approaching water resource issues from a reach or basin scale, the evening provided an opportunity to step back and see the relationship between the current character of our local landscape and the major geologic forces that have shaped it over the last few million years.

Dr. Booth presented a simplified model of the regional landscape. The model was composed of four principal components: the 'big hole' (the low region between the Olympics and Cascades), advance outwash plains, troughs, and flutes. 'The big hole', or what is now the Puget Lowland, is the consequence of ongoing tectonic processes over millions of years. The last three topographic expressions however result from the forces of ice and water, which modified the landscape during the last glaciation only thousands of years ago.

Plate tectonics has affected the character of river basins in the Puget Lowland over a wide variety of scales. The Cascade and Olympic Mountains, produced over the last 6 to 14 million years respectively, form the lateral boundary of the Puget Lowland. Each range was generated by complex, and still controversial, dynamics between the Pacific, North American, and Juan de Fuca plates. The formation of these mountains effectively limited the maximum size of river basins in the Puget Lowland and formed a barrier to rivers that may have entered the region from much larger drainage areas. It was into this lowland basin that glaciers advanced and began shaping our current landscape.

There have been at least six continental glacial advances into the Puget Lowland, and the most recent, the Vashon stade of the Fraser glaciation, occurred between 18,000 and 15,000 years ago. A distinct series of depositional environments paralleled the advance and retreat of the glacial lobe into the Puget Lowland and are responsible for much of the surficial geology encountered locally today. As the lobe first advanced into our region, it blocked the Strait of Juan de Fuca, thereby cutting off the drainage path of the rivers and streams flowing west from the Cascades and east from the Olympics. This caused the formation of a lake in the area of what is now Puget Sound. The low energy sediments (primarily silts)

that were deposited in this lake are now known as the Lawton Clay.

As the glacier continued south, at its front was a wide plateau of advance outwash sands and gravels that were discharged in sub-glacial runoff. This plateau, which is the second element of Dr. Booth's regional landscape model, remains a ubiquitous element of our landscape today, and is observed at an elevation of 90-150m from the Cascades west to the Olympics, and from the City of Olympia north past the Canadian border. The sediment of this unit is easily eroded, and thus streams that traverse these upland plateaus are particularly vulnerable to channel enlargement and incision when land use modifications cause changes in hydrology.

On a regional scale the water that discharged from beneath the glacier was a significant agent of erosion as well as deposition. Troughs, such as Puget Sound, Lake Washington, the Kent Valley, and Hood Canal, were scoured by ice and subglacial meltwater under the weight of thousands of feet of ice. These troughs, the third component of the regional landscape model, form a radial distribution pattern, like the spread fingers of a hand, which formed following the surface gradient of the ice surface. Vashon Till, unsorted sand, gravel, silt, and clay, was deposited by the ice itself as it ground over the landscape, and in some places it drapes over the eroded troughs; this indicates that it postdates the voluminous and erosive discharges. As the glacier receded, it continued to discharge tremendous volumes of water and sediment, and many rivers and streams in the Puget Lowland today are clearly "underfit" as they flow through valleys previously eroded by much larger rivers of glacial meltwater. Ollala Creek on the Kitsap Peninsula and the North Fork Stillaguamish west of Darrington are two excellent examples of underfit streams.

Flutes were the last major component of the landscape model that Dr. Booth addressed. Flutes are streamlined grooves and ridges worked in the glacial deposits, which parallel the direction of ice movement. These linear features are clearly observed in high resolution digital elevation maps such as those generated by LiDAR, and impart north-south trending linear control on many wetlands, lakes, streams, and rivers. Echo Lake in Everett is just one example.

Those who attended Dr. Booth's presentation were reminded of just how complex the processes are that are responsible for the formation of the landscape in the Puget Lowland. For further information on the geology of Puget Lowland rivers, pick up a copy of the *Restoration of Puget Sound Rivers*, recently published by the Center for Water and Watershed Studies in association with the University of Washington Press. ☺

Upcoming Events

The Washington Section AWRA holds regular dinner meetings, including a social hour, dinner, and a speaker. Other meetings and conferences are listed on our website, <http://earth.golder.com/waawra>.

May 27, 2003. Program on Climate Change. “**Global Changes, Local Impacts: Consequences of Natural and Human-Caused Climate Change for Life in the Pacific Northwest**” by Dr. Nathan Mantua, Dept. of Atmospheric Sciences and School of Marine Affairs, University of Washington. <http://depts.washington.edu/uwppcc>

May 28-29, 2003. Instream Flow Workshop and WA-AWRA Social. University of Washington. <http://www.stewardandassociates.com/Instream/index.htm>

June 23-26, 2003. World Water and Environmental Resources Congress 2003. Philadelphia, Pennsylvania. <http://www.asce.org/conferences/ewri2003/>

June 29-July 2, 2003. AWRA 2003 International Conference, **Watershed Management for Water Supply Systems**. New York City, New York. Abstracts due November 15, 2002. <http://www.awra.org/>

July 24-25, 2003. ASCE Seminar. **NPDES Stormwater Compliance**. Seattle, Washington. <http://www.asce.org/conted/seminars/environmental.cfm#NPDES>

September 29 – October 1, 2003. 4th Joint Conference of the International Association of Hydrogeologists (Canadian Chapter) and Canadian Geotechnical Society. **Prairie Hydrogeology, Radioactive Waste Management, or Groundwater Management and Protection**. Winnipeg, Manitoba <http://home.cc.umanitoba.ca/~cgsman/cgs2003/>

October 19-22, 2003. American Institute of Hydrology 2003 Annual Meeting and Conference: “**Achieving Sustainable Water Resources in Areas Experiencing Rapid Growth**”, Atlanta Georgia.

October 29-30, 2003 Washington State University “**Getting It Done: The Role of TMDL Implementation In Watershed Restoration.**” <http://www.swwrc.wsu.edu/conference2003/index.html>.

November 2003. WA-AWRA Fall Conference. “**Water In Land Use Planning**” <http://earth.golder.com/waawra>

AWRA national, regional, and state conference meeting schedule <http://www.awra.org/meetings/>.

Northwest Geological Society (<http://www.scn.org/nwgs/>) Meetings and trips.

Washington Hydrologic Society. Monthly meetings. Brian Drost at (253) 428-3600 ext. 2642 (bwdrost@usgs.gov) or Llyn Doremus (360) 592-2632 (ladoremus@aol.com).

Looking for a new position?

Need a new prospect? Check out the jobs and opportunities listed on the AWRA Washington Section Website.

Employers can list available positions, and job seekers can post resumes or peruse the openings.

<http://earth.golder.com/waawra/ASP/jobs.asp>

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