



PRESIDENT'S NOTES

Cleve Steward, WA-AWRA Section President

I remember the many times I traipsed up and down Bear Creek near Redmond counting salmon redds and conducting electrofishing censuses of resident fish populations as part of my graduate research at the UW. In 1978, Bear Creek drained a relatively undisturbed subbasin; in our EPA funded study, it served as a reference stream for Kelsey Creek in nearby Bellevue, which was undergoing rapid urbanization at the time. Along with fellow grad students Joanna Richey and Jim Scott, I was interested in the physical, chemical and biological differences between rural and urban stream systems. That study launched a few careers, including my own, but what made me think of it was the article by UW grad student Arden Thomas that appears in this newsletter. Arden's research also focuses on Bear Creek, which still supports a reasonably healthy biota thanks to the efforts of local citizen conservationists and environmental protection measures imposed by King County. Arden, one of last year's recipients of the WA-AWRA's student fellowship award, is studying the once-abundant western pearlshell mussel, a freshwater filter feeder whose numbers have declined precipitously due to factors exacerbated by human activities. Bear Creek used to support "hundreds of thousands" of western pearlshell mussels; today, the bottom of the stream is littered with broken shells that clearly indicate the population is not faring well.

I distinctly remember the crunch of mussels under my boots as I slogged upstream doing my spawner surveys in the late '70s. Because we put in literally hundreds of hours of electrofishing Bear Creek and other local streams, it occurred to me that our sampling activities may have contributed to the mussels' demise. Electrofishing, because it can prove fatal to fish if improperly conducted, is carefully regulated as a field sampling technique, especially when ESA-listed salmonids are involved. To assuage my guilty feelings, I did a quick web search to see if anyone had studied the effects of electrofishing on freshwater mussels. It turns out someone has; recent field experiments have demonstrated that electrofishing does not adversely affect the short-term survival of the western pearlshell mussel. Whew!

My reason for mentioning this particular guilt spasm is not to gain absolution; it's to highlight the important research that Arden and other UW students are doing. We are very proud of the "up-and-comers", many of whom belong to the University of Washington Student AWRA Chapter, recipient of last year's Best Student Chapter Award from the national AWRA. Our section is fortunate to have strong ties with the UW Student Chapter, the activities and officers of which are featured in this newsletter. For one, students throw great parties; last month's joint mixer at the UW Waterfront Activity Center is a good example – it consisted of beer, camaraderie, more beer, and a presentation by EPA's Calvin Terada on the aftermath of Hurricane Katrina.

Speaking of social gatherings, the Section's bimonthly dinner meetings at the Pyramid Ale House (I know, more beer) near Safeco Field have been outstanding. We have consistently lined up engaging speakers to hold forth on a wide range of water-related topics. Anywhere from 30-40 people show up to hear these presentations, enjoy a nice meal, and network in a relaxed setting with other water resource professionals. If you have not yet attended a dinner meeting, I invite you to come on down. Keep an eye out for an announcement of the date and speaker for the next get together in Seattle.

The last thing I'll mention is a recent teleconference in which I participated with national AWRA officers and other AWRA Section Presidents. The focus of the call was how ties between the National office, state sections and student chapters can be strengthened. Several good ideas emerged that I'll share with you in the next newsletter. One of my suggestions was to make sure that national AWRA members residing in the state of Washington were also signed up as members of the state section. The national office agreed to send us their membership list. If you're on it, but haven't joined WA-AWRA, expect a call! ☺

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June 4, 2007 Board Meeting – All are welcome.

Contact Felix Kristanovich for meeting location details at:
fkristanovich@anchorenv.com.

Rain Gardens – Can Your Garden Help Reduce Combined Sewer Overflows to Lake Washington?

By Robin Kirschbaum and Alice Lancaster, Herrera Environmental Consultants

Like many cities in the United States, a large portion of Seattle's underground drainage pipe networks consist of combined stormwater/sewer systems that were designed to convey both sewage and rainfall runoff from paved surfaces, such as rooftops and roadways. These systems were not designed with adequate capacity for the demands placed on them today. With population and development in Seattle already beyond the designed system capacity in many areas, the combined sewer systems are frequently overwhelmed during large rain storms, resulting in combined sewer overflows (CSOs) into local lakes and Puget Sound.



Seattle Public Utilities is investigating various strategies for controlling these CSO events. Traditionally, large centralized detention facilities have been used to store high flow volumes during the peak of a storm, which are then released back to the system after the storm has subsided. Currently Seattle Public Utilities, in partnership with the U.S. Environmental Protection Agency, is evaluating rain gardens, among other alternative decentralized strategies, for helping to prevent CSOs by capturing and controlling rainwater on individual single-family residential parcels.

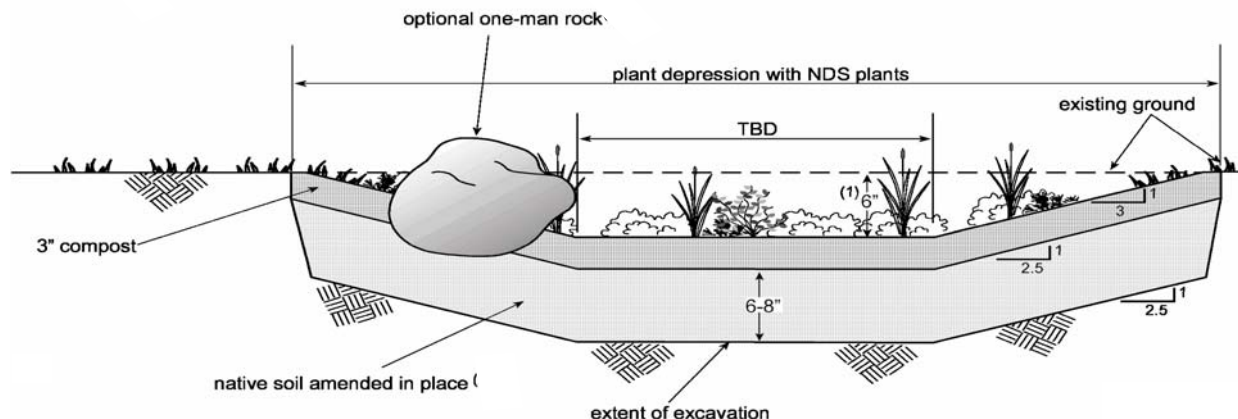
As a part of this evaluation, Herrera Environmental Consultants is helping Seattle Public Utilities conduct a pilot study of decentralized runoff control strategies in the Lakewood neighborhood of Seattle. The primary goal of this study is to evaluate and monitor the degree to which rain gardens, cisterns, bioretention swales, and tightlining of roof runoff to separated storm drains can reduce the frequency and volume of CSO events. A secondary goal of the study is to as-

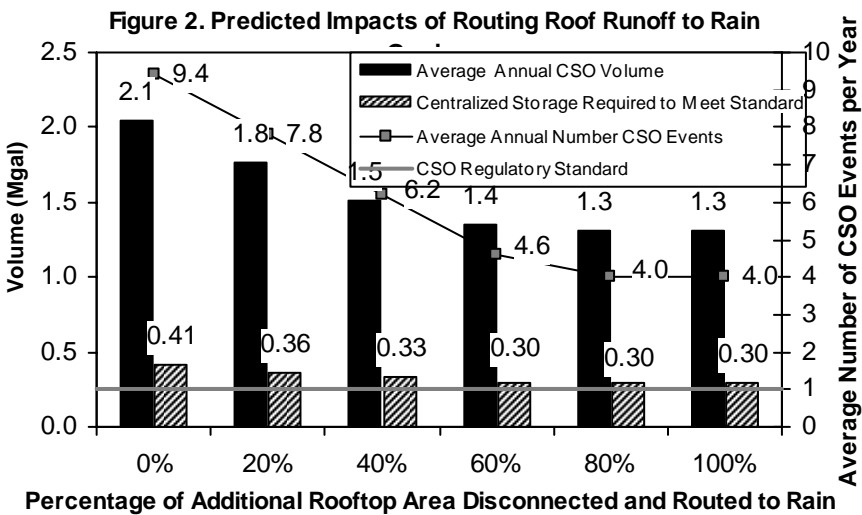
sess the impacts of these decentralized strategies on lake water quality. Also being evaluated in the study are ancillary benefits such as water conservation, educational and stewardship opportunities, and economic advantages. Although several disconnection strategies are being evaluated in the study, this article focuses on rain gardens.

A schematic diagram of the rain garden design developed for the pilot study is provided in Figure 1. The 75-acre pilot drainage basin consists of approximately 390 single-family residential parcels. The basin is partially separated with rooftop runoff connected to the combined sewer system and roadway runoff routed to a separate storm drain system that discharges to Lake Washington.

Hydrologic and hydraulic modeling of the basin was performed using Infoworks CS software. The purpose of the modeling was to predict the reduction in CSO volume and frequency resulting from the alternative strategies. An existing model of the study area was updated to reflect current basin areas and land uses. Based on field observations of existing

Figure 1. Rain Garden Cross-Section





conditions, the model assumed that one-third of the roof area in the basin is disconnected and routed to pervious surfaces and the remaining roof area is directly connected to the combined sewer system. The model was calibrated using 4 months of in-sewer flow data.

The estimated reduction in CSO volume and frequency that could be achieved using rain gardens with various levels of residential participation is graphically illustrated in Figure 2. Under existing conditions (no additional disconnection), the modeling results indicate an average of 9.4 CSO events per year with an average annual CSO volume of just over 2 million gallons. If all of the rooftops in the ba-

sin are routed to rain gardens, the modeling results indicate that an average of 4.0 CSOs would occur each year. Based on this analysis, the rain garden strategy alone does not appear to be able to achieve the regulatory standard of an average of one CSO event per year for the pilot basin. The inability to achieve the standard is, in part, a result of the high infiltration and inflow rates (based on modeling and review of the available in-sewer flow data) for the existing combined sewer pipe network in this basin.

Although rain gardens may not be an appropriate stand-alone solution for achieving compliance with CSO regulations in the Lakewood neighborhood, they can be combined with other practices, such as a smaller centralized storage facility, to help in achieving the regulatory goals. If centralized storage is used alone, the required capacity to meet the regulatory goal was modeled to be approximately 0.41 million gallons. In combination with an assumed 100 percent level of participation among Lakewood residents, the required capacity for centralized storage is reduced from 0.41 million gallons to 0.30 million gallons, equivalent to roughly a 25 percent reduction in required facility size (Figure 2).

2007-2008 WA-AWRA Fellowship Announcement

By Stan Miller

The Washington State Section of the American Water Resources Association announces the availability of applications for the 2007 – 08 Student Fellowship Award. Several changes in procedure have been made for this year's award. The 2007 state conference is a joint effort of the Washington Section and the BC section of the Canadian Water Resources Association. This conference is scheduled for the first week in October. This is too early in the fall for the conference to serve as the venue for the Student Fellowship award presentation. Because of this the Washington Section Board opted to move the award presentation to a special student event to be held later in the Fall. As a consequence, the application deadline for 2007 is scheduled for October 30, 2007 a month later than the regular deadline. Further information on the fellowship and an application form are available on the state section website:

<http://earth.golder.com/WAAWRA/ASP/Home.asp>

The fellowship award consists of a \$1,500 cash award and one-year membership in both the state

and national associations. The national association membership includes a subscription to the Journal of the American Water Resources Association. Winners also receive a paid registration to the state conference. Two awards are presented each year. One fellowship goes to a graduate student enrolled in a multidisciplinary program of study in water resources at any college or university in Washington. The other goes to a member of an AWRA Student Section enrolled in a similar program at the university sponsoring the section.

Earlier this year, long time state section member and two time past president of the State Association Rod Sakrison passed away. Rod was instrumental in establishing the University of Washington AWRA Student Chapter. In recognition of his effort to increase student involvement in AWRA, the AWRA State Section Board unanimously approved identifying the award presented to the student section winner as the Rod Sakrison Memorial Fellowship Award at its March meeting.

Western Pearlshell Mussel Sentinel Study in Bear Creek, Washington

Arden Thomas, 2006-2007 Fellowship Recipient

Wendy Walsh, a resident along Bear Creek and advocate for freshwater mussel conservation, emphasizes that freshwater mussels are invisible to people. We can look right at a freshwater mussel and have no awareness that we are gazing at a living creature. Previously, if you had glanced at the creek bottom of Bear Creek, you could have assumed that the dark cobbles were just that – cobbles, and never have suspected that instead you were looking at hundreds of thousands of western pearlshell mussels (*Margaritifera falcata*). Upper Bear Creek used to support one of the most extensive beds of western pearlshell mussels known to exist in a Puget Lowland Creek. Many of these pearlshell mussels, with a lifespan that reaches 100, would have been as old as the stately western red cedars towering around you. While we are beginning to understand that the health of such a forest depends on nutrients from the salmon returns, a less well known relationship is that these cryptic mussels are dependent on salmonids for successful reproduction. You could have been equally unaware that in the ground under your feet were numerous mussel middens from a time when Native Americans knew this land as their home harvested freshwater mussels.

Today the story is different. Many people are still unaware of freshwater mussels, but if you look at Bear Creek's stream bottom you will not be as easily fooled into seeing dark cobbles. Hundreds of rock-like shells lie open and seem to litter the stream-bottom. If a mussel died recently you may catch a glimmer of the shiny nacre forming the inside of the shell and earning this mussel the name pearlshell. It is often purple, but can also be white or salmon-colored. The story at Bear Creek is not a new story; long-lived organisms with late sexual maturity have the most difficult time adapting to rapid changes to the environment caused by humans. World-wide, freshwater mussels are an imperiled group. Southeast North America is the epicenter of freshwater mussel diversity, but 62 species, 20% of the freshwater mussels in North America, are listed as threatened or endangered. The causes of decline are intrinsic

to water management. Dams, river channelization, depleted fish runs, invasive species introductions, and water quality degradation have impacted freshwater mussel populations by eliminating key habitat features, reducing the presence of the obligatory host fish that mussel larval require for development and dispersal, and poisoning these filter feeders. In the Pacific Northwest, very little research has been conducted on freshwater mussels and little is known about many species' distribution and range. Even less in know about their conservation status.

In Upper Bear Creek, where at least 90% mortality has occurred across a range of mussel size classes, the cause this freshwater mussel die-off is not readily apparent. Extensive water quality monitoring along Bear Creek has failed to identify significant contamination. In 2004, microscopic examination of stained tissue revealed morphological changes in the digestive gland and gill tissues of the Bear Creek mussels, indicating that these mussels were diseased. The Bear Creek subbasin drains 90 km² within the Greater Lake Washington Watershed. This area is experiencing suburban-



Figure 1. Caged western pearlshell mussels in Bear Creek (April 11, 2007)

ization but is also planning for growth in order to help protect water resources. Effort has been made to protect the rural-residential nature of this area, place new development in the uplands, and protect the sensitive wetland headwaters.

For my master's research, I am investigating this pearlshell mussel die-off in Bear Creek by using freshwater mussel surveys and a mussel relocation experiment to answer the following questions:

- 1) How much mortality has occurred and what is the spatial extent of die-offs along Bear Creek?
- 2) Do healthy freshwater mussels become diseased when relocated to Bear Creek?
- 3) If the mussels become diseased, is there a sequence of pathological events that leads to mortality?
- 4) Do histological and physiological parameters provide early indication that the mussels relocated to Bear Creek are stressed?

Mussel surveys will be conducted in order to determine the spatial extent of mussel mortality. In 2002 and 2003, Washington Trout established pearlshell mussel monitoring plots, providing baseline data of the number of living mussels and dead shells in 10 beds along Bear Creek. These beds will be resampled in the summer of 2007, providing robust comparisons of mussel density over time at these sites. Additional surveys will also be conducted upstream of the mussel die-off site to help establish the upstream extent of elevated mortalities.

For the mussel relocation sentinel study, 90 healthy mussels from nearby Cottage Lake Creek were transplanted to Bear Creek in November 2006 and placed in in-stream cages (Figure 1). A control group of 90 mussels was handled identically to the experimental group, but remained in Cottage Lake Creek. The transplant experiment focuses on individual-level responses of transplanted mussels to obtain information on the impact of stressors on mussel anatomy and physiology. Animal behavior observations and survivorship determinations are made weekly. Each month, 3 animals are collected from each site and tissue and physiological condition are assessed. Histology, the microscopic examination of tissue morphology, is being utilized to monitor for changes in gill and the digestive gland tissue similar to those observed in the animals in 2004. Mussel tissue is being archived for possible future contaminant analysis. Additionally, I will determine glycogen levels for the sampled mussels to measure energy reserves and evaluate the general condition of the mussels. In addition to sampling the caged mussels, I sampled three mussels from Cottage Lake Creek that were not used in the caged control treatment, three mussels native to Bear Creek, and one recently dead animal from Bear

Creek in December 2006 to help establish baseline condition for the animals.

Preliminary observations indicate that the transplanted mussels have not had an acute response to conditions in the Bear Creek environment. During the first four months of monitoring there has been no mortality in either the control or experimental transplanted mussels. Mussels in each treatment have also demonstrated similar behavior: mussels in each cage have aggregated at one end of the cage, most mussels have positioned themselves upright, and several mussels siphoning. Histological observation has not revealed any differences in the digestive gland condition (gill tissue examination is still in progress). Sampling of the Bear Creek native mussels in December has revealed that these survivors had better digestive gland tissue condition than those sampled in 2004. Mussels in both the Cottage Lake Creek control and Bear Creek experimental treatments are showing similar patterns in development of gametes, but in the small number of native Bear Creek mussels sampled, no gamete development was observed.

Observations at this stage are very preliminary and continued monitoring through early fall, 2007 should be more informative. While sensitive species are commonly lost from aquatic environments during suburbanization and urbanization processes, detailed studies examining the direct mechanisms of the loss of these species, especially invertebrate species, are lacking. Further elucidation of the cause of mortality of the western pearlshell mussel in Bear Creek should advance understanding of the conditions in Bear Creek that have led to the mussels decline.

Learn about Pacific Northwest freshwater mussels and download the Pacific Northwest Freshwater Mussel Field Guide at:

<http://www.fws.gov/columbiariver/musselwg.htm>

This research is supported by King County and is supervised by Carolyn Friedman, UW School for Aquatic and Fishery Sciences; Susan Bolton, UW College of Forest Resources; Mike Brett, UW Civil and Environmental Engineering; and Deb Lester, King County Department of Natural Resources and Parks. All correspondence should be directed to Arden Thomas at ardent@u.washington.edu.

Opening day of the lowland lakes season has come and gone, but there are still plenty of trout - and other fish ranging from halibut to spring Chinook - to be caught in the weeks ahead.

Trout fishing should be most productive in lowland lakes through June, and then again in September. "Fishing should be good in the higher-elevation lakes, and those stocked with kokanee, right through the summer."

Hatchery crews have already begun stocking lakes since the opening day rush, and will continue plant-

ing trout into September. Plants range from 8-12 inch rainbows to 1.5-pound triploids - nearly 39,000 of which WDFW plans to stock in May.

For more information about stocking schedules, Anderson suggests anglers check the WDFW website at <http://wdfw.wa.gov/fish/plants/index.htm>.

(Excerpts from WDFW Weekender)

Survivability of Pond-Breeding Amphibians in Stormwater Ponds

Amy Yahnke, 2006-2007 Fellowship Recipient

Stormwater ponds are an important aspect of water management in the Pacific Northwest. Designed primarily to manage water fluctuation and reduce pollutant loading to natural wetlands, stormwater ponds have unwittingly been incorporated into the ecological landscape by the wildlife that use them. I was introduced to the ecology of stormwater ponds in 2004, when I was working on my Wetland Science and Management Certificate at the University of Washington. For my field practicum, I attempted to develop a pilot project for stormwater pond management in King County that would minimize the impacts of maintenance activities to amphibians breeding in the ponds. My research into current management practices revealed that tight budgets limited maintenance activities to infrequent dredging and a single annual mow per pond. Although local amphibian declines have been documented, the infrequency of stormwater pond maintenance seemed insufficient to contribute to the growing list of reasons for global amphibian declines. I was still very interested in how stormwater ponds influence our regional amphibian populations, so I entered the University of Washington College of Forest Resources in fall of 2006 to continue the research for my Master's thesis.

Although amphibian breeding occurs in the stormwater ponds, it is difficult to understand population effects without comparing the stormwater ponds to the surrounding natural ponds. Klaus Richter, a senior ecologist for King County, ran an amphibian monitoring program for ten years in which trained volunteers conducted amphibian egg censuses around the county. I intend to take the research from the monitoring program a step further by assessing survivability and health of the amphibians leaving the ponds as juveniles.

Stormwater ponds differ from many natural ponds because they have shallow water and very little shade. Temperature is a cue for amphibian breeding, and it is conceivable that they are attracted to stormwater ponds because the water temperature is warmer than the surrounding forested wetlands

during the winter breeding months. A recent review of multiple telemetry studies shows that certain species of frogs and salamanders may disperse up to 1025 and 287 meters respectively from breeding sites. Although breeding amphibians have a very high fidelity for their natal ponds, they will also colonize new sites for breeding. If populations are being drawn from surrounding areas to breed in stormwater ponds, then mere egg counts in the stormwater ponds alone cannot be relied upon as an indicator of local amphibian population health. Without knowing the rate of survival and health of juveniles who successfully leave the stormwater ponds, we do not know if the stormwater ponds are a source for local amphibian populations, or if they are drawing amphibians from breeding sites with higher survivability and acting as a population sink.

Pond-breeding amphibians such as red-legged frogs (*Rana aurora aurora*) and Northwestern



Author Amy Yahnke with an Olympic torrent salamander.

salamanders (*Ambystoma gracile*) require attachment sites for their large egg masses and often rely on aquatic vegetation. Cattails and rushes invade stormwater ponds, providing sufficient vegetation for amphibian breeding. Even after stormwater ponds have been dredged, amphibians will continue to use the pond for breeding, taking advantage of anything in the water for their egg masses. For example, this winter I surveyed one stormwater pond with no vegetation in the water but Douglas-fir branches blown down from the windstorms. The

woody debris was covered with red-legged frog eggs. The flashy water in stormwater ponds has been shown to leave eggs stranded above or only partially submerged in the water when attached to stiff vegetation such as over-hanging branches or cattails that can't move with the fluctuating water level. Additionally, the stormwater ponds in my practicum research were all designed to hold one foot of water for heavy metals, sediments, and other pollutants from stormwater runoff to settle out as the water is slowly released from the ponds. Reducing pollutant loading on outlet streams and wetlands means that those pollutants remain, and likely concentrate in stormwater ponds, which is of particular concern when considering the numbers of amphibians breeding in the ponds. With this in mind, I started to wonder how pesticides applied to residential landscapes may combine in stormwater ponds, and what effects those pesticide combinations have on developing amphibians and subsequently on local amphibian populations.

Through the use of *in situ* cages I intend to monitor red-legged frog and Northwestern salamander eggs to metamorphosis, analyzing the relative survivability, size, and condition at metamorphosis in stormwater ponds and natural ponds. Because I am interested in pesticides in stormwater ponds, I also need to collect water quality data. Unfortunately, one of the limiting factors to my intended research is the cost of water quality testing and the numbers of various pollutants in addition to pesticides we are likely to find in the water. To help minimize the cost, I am working with King County Water and Land Resources to identify stormwater ponds for my study sites that will also be water quality monitored to fulfill their National Pollutants Discharge Elimination Systems (NPDES) permit requirements. This will provide information on pesticide combinations and rates found in the stormwater ponds, which I can then use to assess toxicological impacts to early amphibian life stages, from embryo to juvenile. Although there is some

data on amphibian toxicology for individual pesticide active ingredients, the effects of chronic exposures to low levels of combined pesticides are generally unknown. In order to isolate the relative hazard of pesticide combinations found in stormwater ponds, I will conduct laboratory toxicology tests to determine impacts to developing amphibians exposed to the combinations and rates of pesticides found in the ponds.

During winter quarter, I took Dr. Grue's Fish and Wildlife Toxicology class to learn about basic wildlife toxicology issues associated with pesticide exposure. Through my involvement in the class I began volunteering in Dr. Grue's lab, where he and his students are studying the exposure of salmonids to various pesticide combinations that have been found in local surface waters, with a focus on enzyme inhibition. In addition to Dr. Grue's class, I have been studying wildlife and community ecology, limnology, and wildlife research techniques in my first year as a Master's student.

My AWRA scholarship award helped cover the cost of books and a trip to the Society for Northwestern Vertebrate Biology conference in Victoria, B.C., where I attended lectures about current amphibian research and met scientists from other government and university institutions who are studying amphibians. Many of the people I met were not aware that amphibians breed in stormwater ponds and raised the same questions about the impacts of stormwater quality on developing amphibians that I am trying to address in my research.

With causes of global amphibian declines linked to everything from pollution and diseases to ultraviolet light, I find it interesting that amphibians in King County are continuously found breeding in stormwater ponds. I hope that my research will play a part in understanding landscape influences on amphibian populations in developing and urban areas. ❧

Member Invitation

Matt Fontaine, University of Washington Graduate Student

As a member of the Washington Section of AWRA, you're invited to join the UW student chapter of AWRA as we tour the Elwha River and dam system. We're planning two tours guided by local experts on Friday June 8 and Saturday June 9. On Friday afternoon we'll visit the dams, hike along the river, and consider the impacts of dam removal on the downstream environment.

Friday night we'll camp at either the Elwha or Altair campgrounds. On Saturday morning we'll visit the river mouth and discuss the impacts of dam removal on coastal geomorphic processes. Saturday afternoon and Sunday are open for self guided hikes.

Come prepared with hiking boots or sneakers, as we may get off the beaten path during these tours. Lodging is available in both Sequim and Port Angeles for those who prefer not to camp. Stay tuned for future emails which will include meeting times and places for both Friday and Saturday. We look forward to seeing you there.

Trip details will be updated regularly on the UW AWRA website:

<http://students.washington.edu/awra/>.

Please forward additional questions to Matt Fontaine at matthew.fontaine@gmail.com. ❧

April 11, 2007 Student/State Mixer Review

Julie Horowitz, University of Washington Graduate Student, UW Student Representative

Photographs of oil drums and gas tanks scattered throughout swamps along the Louisiana coast. Brown lines painted on houses by the Murphy Oil Spill which covered neighborhoods in the St. Bernard Parish. A benzene barge stuck high up on dry ground. Parking lots and playfields filled with refrigerators, freezers, and other appliances awaiting disposal. These were a few of the images Mr. Terada shared at the UW AWRA and WA State Chapter Mixer.



Murphy Oil spill effected area in the St. Bernard Parish. *Photograph from the EPA Region 6 website.*

The University of Washington Student AWRA Chapter and WA-AWRA chapter hosted a joint mixer April 11th at the UW Waterfront Activity Center. The event included refreshments and an opportunity for student and state chapter members to get to know one another, followed by Mr. Calvin Terada's presentation on his experiences as an emergency responder after Hurricane Katrina/Rita.

Mr. Terada is a Federal On-Scene Coordinator for the US Environmental Protection Agency, Region 10, Seattle, WA. As one of US EPA's fifteen emergency responders, he coordinates responses to oil spills, chemical releases, and/or terrorism incidents in Alaska, Idaho, Oregon and Washington. During incidents of national significance, such as Hurricane Katrina/Rita, US EPA On-Scene Coordinators are dispatched to protect human health and the environment. Mr. Terada spent two three-week tours in Louisiana assisting with the Hurricane Katrina/Rita response.

Mr. Terada was responsible for removal of hazardous waste in particular areas of the hurricane affected regions. Through pictures and recounting his experiences he described the huge challenges associated with this task. He told the audience of the difficulty in extracting large oil drums from marsh-areas crawling with poisonous snakes, spiders, and other insects, and often with insufficient equipment.

The quantities of hazardous material collected were astounding. EPA coordinated disposal of 5 million containers of household hazardous waste. This collection included household propane tanks, paint cans, refrigerants from kitchen appliances filled with rotten food, and many unknown substances. For all unidentifiable substances, chemical tests were performed to determine their composition and appropriate disposal techniques. In addition to the logistical and infrastructural challenges, Mr. Terada described the social and personal challenges involved in this mission. Coming into a catastrophic situation of such large proportion required huge staff to collect and process the hazardous waste. Most people who were assigned to work for Mr. Terada had never been trained or previously dealt with hazardous materials.



Household waste pick up following Hurricane Katrina.

Photograph from the EPA Region 6 website.

So, he had to teach, plan and orchestrate a large and varied response. Living conditions for Hurricane responders were typically trailers or tents. According to Mr. Terada, he shared his trailer with two others and his bunk was only four feet long. The personal challenges of working amongst severe devastation were reflected in Mr. Terada's accounts.

Mr. Terada's presentation provided insight into a part of the Hurricane Katrina story not widely heard in newspapers and on television. It was a unique opportunity to hear his stories and insights at this AWRA event. ☞

The Board of AWRA WA seeks to provide through this newsletter a full range of views on water resource issues. Opinions expressed in this newsletter do not necessarily reflect the views of individual Board members, the section membership, or their employers.

Dinner Meeting Review: Dr. David Montgomery Discusses Shortcomings of the Puget Sound Partnership Plan for Salmon Recovery

Pete Sturtevant, CH2M Hill

Noted Geomorphologist Dr. David Montgomery of the University of Washington spoke at the Chapter's April Dinner Meeting. The meeting was held the evening of April 24 at the Pyramid Brewery across from Safeco Field. The event was well-attended with over 40 people in the audience. Dr. Montgomery opened his lecture with an interesting look at the evolutionary tree for salmon. Salmon evolved about 20 million years ago. Dr. Montgomery commented that in modern times it is interesting that there are five species of Pacific salmon but only a single species of Atlantic salmon. He speculates that the Pacific Rim has been far more active, geologically, than the Atlantic coastal area. This may have led to a wider variety of niches for the evolving salmon in the North Pacific Ocean and hence, a variety of species.

Fossil remains of a 5 million year old sockeye have been recovered from the Skokomish Valley in Western Washington. Fossil evidence in the region indicates that the life history of salmon in the Region has been well-established for over a million years.

Dr. Montgomery stated that the well-documented decline of salmon in our Region closely parallels the historic decline of the Atlantic salmon in both Great Britain and the Northeast United States more than a century ago. He cited edicts from British kings, such as Richard the Lion-Hearted, that were meant to protect salmon runs, dating back a thousand years. These edicts, repeatedly issued through the centuries, aimed at maintaining open passage up the rivers and preventing harassment of the fish at their spawning grounds. Dr. Montgomery pointed out that although not as well understood then, as it is today, the edicts and laws effectively covered three of the four "H's" recognized today as necessary for sustainable salmon populations: Hydro (dams), Harvest and Habitat. Despite this, dams and other obstructions were slowly installed over the years. By the middle of the 19th Century more than 90 percent of the rivers in Great Britain were obstructed to salmon migration and salmon largely disappeared before 1900.

Along the Atlantic Coast, salmon historically spawned in American rivers from Connecticut to Maine. But during the Industrial Revolution, numerous rivers were dammed or otherwise harnessed for water power. By the early 1900s, salmon had virtually disappeared from rivers outside of Maine. In both regions laws protecting salmon were on the books but there was inconsistent or nonexistent local enforcement of the laws over the long run. Over a period of a century or

more, salmon slowly declined and disappeared. Dr. Montgomery stated that there should be a fifth "H": History. From the British and Northeast U.S. cases, it is clear that over the long term small, isolated insults can cumulatively contribute to salmon extinction.

Dr. Montgomery then discussed an ongoing project he is directing that historically documents the decline of salmon habitat in the Puget Sound Basin. By examining maps and field notes made by the Government Land Office in the 1860s and 1870s, maps showing wetlands river courses and river side channels have been generated for many of the river valleys. He stated that early aerial photos dating from the 1920s and 1930s can be misleading for determining background conditions because significant development had already occurred by the time these flights occurred. Comparing the maps generated from early accounts with similar maps compiled from current aerial photography shows the dramatic decrease in small streams, river side channels and associated wetlands, all vital salmon habitat. This project has confirmed previous assessments that in many river valleys 80-90 percent of the original salmon habitat has disappeared. He showed a Then-Now comparison of the Skagit River Delta that dramatically illustrated this point.

Dr. Montgomery spent the final portion of his talk discussing what he perceives to be a major weakness in the salmon recovery plan that will be implemented by the Puget Sound Partnership. He stated that in addition to restoration projects to address damage done by past development, much of the emphasis of the plan is being placed upon monitoring and demonstration projects. However, there is no specific plan for dealing with the projected development in the Region, which is expected to significantly grow in population over the next 20-40 years. For instance, the plan strongly supports low impact development (LID) approaches but has no requirement for their implementation. He pointed out a statement within the plan, itself, to the effect that the strategies are not likely to achieve ecosystem goals. Dr. Montgomery argued that the recommendations within the plan are more of a policy framework to begin crafting a concrete strategy to recover salmon but are not in themselves sufficient to assure salmon survival within Puget Sound. Given the historical lessons of salmon protection in other regions, nothing short of a specific, enforceable protection and restoration measures are likely to reverse the long decline of salmon in our Region. ❧

Call for Nominations For Outstanding Contribution to Washington's Water Resources

Pete Sturtevant, CH2M Hill

The AWRA, Washington Section plans to honor an individual at our annual conference on October 4-5, 2007 for outstanding contribution to the water resources profession in the State of Washington. 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 below. An individual need not satisfy all of the criteria to win the award, and other appropriate factors brought up in the nomination letter WILL be considered.

- Outstanding contribution or achievement in the water resources field (broadly defined) 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. Any person may be nominated for this award, but only current State Chapter members may submit a nomination. The nomination letter must be received by **June 15, 2007**. 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.

Submit a letter of nomination to:

Peter Sturtevant
Awards Committee
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 your chance to bring some much-deserved recognition to one of them. ☺

2007 WA-AWRA Conference

Steve Hughes, URS Corporation

Hold the dates – **October 4 & 5, 2007** – for the annual AWRA-Washington Section conference. This year the focus of the annual conference will be on transnational boundary issues in water resources. We have invited the British Columbia Branch of the Canadian Water Resources Association to join us in holding a joint 2-day, international conference. The conference will be held at the Museum of History and Industry (MOHAI) in Seattle, Washington. As a special event, we are planning a dinner and night out on the Town on the 4th. This will be an opportunity for our members to relax, meet, and discuss with our Canadian counterparts their views on common water resources topics.

The talks this year will cover issues related to two of the most important water bodies in the Cascadia Region; Puget Sound and the Columbia River System. Both of these systems are highly regulated and impacted by activities in the United States and in Canada. In this rapidly changing world, issues such as effects of increased urbanization and climate change are contributing to declining health of Puget Sound and water shortages in the Columbia Basin. Degraded water quality, quantity, and overall ecosystem health are legacy issues we as scientists, researchers and regulators are working to improve for future generations. The momentum to address these issues is building in both countries. Coordination on approaches to legislation, regulation, and resource management will ultimately affect the health of the shared transnational resources. Speakers this year will focus on the cross-border approaches and differences in legislation, regulatory frameworks, and engineering approaches to addressing stormwater, climate change, and water management among other things. We think that the topics and speakers will produce an engaging and enlightening conference. Conference logistics and the speaker agenda will be provided as the details are hammered out. Sponsorship opportunities are available. ☺



NEW MEMBERS

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Clare Fogelson, City of Bellingham
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George Schneider, Seattle Public Utilities
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Colin Wagoner, Ridolfi, Inc.
Robert Wheeler, Triangle Associates

North Puget Sound Gray whales continue to mill about Puget Sound as they make their way north. Most of the whales are headed to the Arctic Ocean, where they spend the summer feeding, before heading back south to the coast of Mexico. Some gray whales stop short of migrating all the way to the Arctic and instead linger in the waters of the Pacific Northwest during the summer months.

Southwest Washington The first two weeks of May are historically the best time to catch a hatchery spring chinook salmon on tributaries to the Columbia River, and some anglers are getting a head start, Joe Hymer, another regional WDFW fish biologist, said.

On the Kalama River, boat anglers averaged one chinook for every three rods in creel checks conducted during the last week of April. Bank anglers averaged a fish for every six rods. On the Lewis River, boat anglers averaged a chinook for every four rods, while bank anglers landed one per every six rods during the same week. Some spring chinook are also being caught on the Cowlitz River.

Southwest Washington Fishing began April 28 on more trout lakes in this region than any other season opener, and the creel check results from that day are good indications of what's available in the weeks and months to come.

WDFW northeast district fish biologist Curt Vail of Colville reported some of the best fishing in the state at two Stevens County waters - Cedar and Deep lakes both saw averages of the five-trout daily catch limit per angler checked. The catches at Cedar Lake, just north of Leadpoint near the U.S.-Canada border, are mostly 12-inch rainbows from fry plants, with many carryovers from 17 to 25 inches. Deep Lake, nine miles southeast of Northport, has rainbows averaging 11.5 inches and cutthroat averaging 11 inches.

(From <http://wdfw.wa.gov/do/weekendr/weekendr.htm>)

AWRA-WA BOARD MEMBERS

President: **Cleve Steward**
(360) 862-1255
csteward@stewardandassociates.com

Vice President: **Jacqueline Klug**
(425) 649-7124
jklu461@ecy.wa.gov

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(206) 493-2323
morin@mentorlaw.com

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(425) 827-3243
fkristanovich@anchorenv.com

Editor: **Chris Pitre**
(206) 267-1166
cpitre@golder.com

Past-President: **Mona Thompson**
(206) 764-3600
mona.jean@comcast.net

Director: **Tony Dubin**
(206) 749-2266
tdubin@brwnccald.com

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greylockllc@comcast.net

Director: **Carl Einberger**
(206) 342-1776
ceinberger@geomatrix.com

Director: **Steve Foster**
(425) 450-6316
sfoster@hdrinc.com

Director: **Kenneth Gish**
(206) 623-7580
kennethg@klgates.com

Director: **Steven Hughes**
(206) 438-2159
steven_hughes@urscorp.com

Director: **Tom Martin**
(360) 286-0278
tommartin@wavecable.com

Director: **Stan Miller**
(509) 477-6024
samillerh2o@comcast.net

Director: **Tom Ring**
(509) 865-4946
ringt@yakama.com

Director: **Pete Sturtevant**
(425) 453-5000
psturtev@ch2m.com

UW Student Rep: **Julie Horowitz**
jd27@u.washington.edu

Faculty Advisor: **Anne Steinemann**
(206) 616-2661
acstein@u.washington.edu

2007 Membership / Change of Address Form

(⌂ please circle, as appropriate ↶)

Annual membership in the state chapter costs \$25.

Name _____ Position _____ Affiliation _____

Street Address _____ City _____ State _____ Zip _____

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- Please indicate if you prefer to receive your newsletter electronically.
- Check if you would like to be actively involved on a committee:
You will be contacted by a board member.

2007 Membership Dues: \$25.00. **Checks only.** Please make payable to **AWRA Washington Section.**

Mail to: American Water Resources Assoc. WA. Section
P.O. Box 2102
Seattle, WA 98111-2102

The American Water Resources Association is a scientific and educational non-profit organization established to encourage and foster interdisciplinary communication among persons of diverse backgrounds working on any aspect of water resources disciplines. Individuals interested in water resources are encouraged to participate in the activities of the Washington Section.

Special Thanks!

To Golder Associates for word processing and graphics support on this newsletter.

American Water Resources Association, Washington Section
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