

# *Chambers-Clover* **Watershed Conference**



**Pacific Lutheran  
University**

**CHRIS KNUTSEN HALL**

**October 5 & 6, 2007**



**Pierce County**

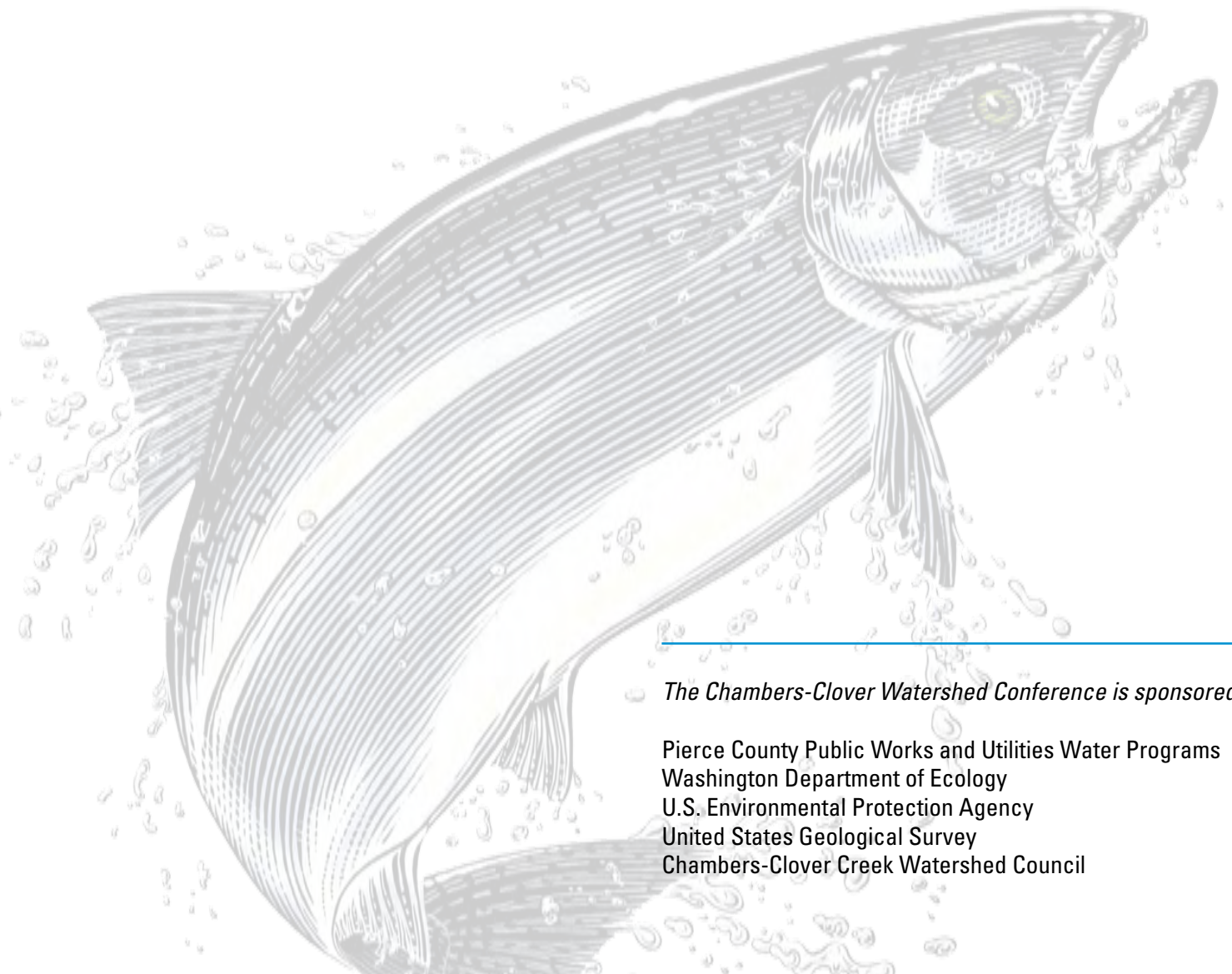
**Public Works and Utilities  
Water Programs Division**

## ***Welcome to the Chambers-Clover Watershed Conference!***

This two-day event gathers together the knowledge and expertise of the resource managers, scientists, academics and citizens of the Chambers-Clover Creek Watershed. We hope you'll leave this event with a greater sense of the natural processes and human activities that influence the management of this unique watershed.

Technical presentations on Day 1 will address the central question, "What do we know about the functioning of the Chambers-Clover Creek Watershed and what are the next steps for its management in the future?" Day 2 presentations will include a summary of the previous day's materials, as well as information for landowners and interested citizens on stewardship and opportunities to become more involved in watershed management.

Please join us at the end of the conference to celebrate the opening of the Naches Trail Preserve. Directions to the site can be found on page 5 of this conference booklet.



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*The Chambers-Clover Watershed Conference is sponsored by:*

Pierce County Public Works and Utilities Water Programs  
Washington Department of Ecology  
U.S. Environmental Protection Agency  
United States Geological Survey  
Chambers-Clover Creek Watershed Council

# Conference Schedule – Day 1

Time	Title/Focus	Presenter
7:30 am	Registration Opens (coffee & refreshments)	
8:15	Introductions and Welcome	Dan Wrye, Pierce County Water Programs (PCWP) Councilmember Dick Muri
	Overview of the Conference	Lorin Reinelt, PCWP
	<b>SESSION 1: Historical Watershed Conditions—What the watershed WAS; what we know; what we don't know</b>	
8:50	Formation of the Chambers-Clover Creek Watershed—The Geologic History (Geochronology)	Kathy Troost, University of Washington
9:10	Basin Hydrogeology (Part 1)—Surface water and Groundwater Interaction (Physical System Overview)	Burt Clothier; Robinson, Noble and Saltbush, Inc. (RN&S)
9:30	Natural (Pre-Human) Conditions—Landscape (“Small Prairie” Stream) and WQ Conditions	Rose McKenney, Pacific Lutheran University (PLU) Lorin Reinelt, PCWP
9:45	Q & A Session	
10:00	Break	
	<b>SESSION 2: Current Watershed Conditions—What the watershed is NOW; what we know; what we don't know</b>	
10:20	Summary of Overall Landscape and Human Changes—forest loss, impervious surfaces, groundwater withdrawal, surface water diversions, sewer and onsite septic systems, channel modifications, wetland and floodplain filling, etc.	Lorin Reinelt, PCWP
10:35	Basin Hydrogeology (Part 2)—Surface water and Groundwater Interaction (Modern Alterations to the System)	Burt Clothier, RN&S
10:55	Water Quality Conditions in Stormwater, Streams and Groundwater	Heather Kibbey, PCWP
11:10	Lake Water Quality and Toxic Algae Conditions	Jean Jacoby, Seattle University
11:25	Chambers Creek Fish Management and Stock Assessment—Past, Present and Future	Rich Eltrich, WA Dept. Fish and Wildlife (WDFW)
11:45	Q & A Session	
12:00	Lunch	

# Day 1 cont'd.

Time	Title/Focus	Presenter
	<b>SESSION 3: <i>Implications for the Future—What's being done now by local governments and resource agencies?</i></b>	
1:05	Surface Water Management: Balancing Urban Stormwater Facilities, Restoring and Mimicking Natural Functionality, and Preserving Natural Functionality—Successes and Limitations	Dan Wrye, PCWP
1:25	Summary of Stormwater Management in Lakewood	Greg Vigoren, City of Lakewood
1:45	Numerical Simulation of the Water Resources in the Chambers-Clover Creek Watershed	Mark Savoca, U.S. Geological Survey
2:05	Monitoring of Groundwater Quality and Quantity, and Swimming Areas for the Protection of Public Health	Ray Hanowell, Tacoma-Pierce County Health Dept.
2:25	Salmon Recovery Planning in Pierce County	Tom Kantz, Pierce County Special Projects
2:45	Q & A Session	
3:00	Break	
	<b>SESSION 4: <i>Next Steps—What's working well? What are the key next steps? What could be and what prevents us from getting there?</i></b>	
3:20	Risks of Plowing Ahead with Incomplete Understanding of the Watershed: Is There a Choice?	Dan Wrye, PCWP
3:30	Panel Discussion	Mark Savoca, Burt Clothier, Dan Wrye, Dick Muri, Al Schmauder
4:20	Closing Remarks, Next Steps	
4:30	Adjourn	

# Conference Schedule – Day 2

Time	Title/Focus	Presenter
8:15 am	Registration Opens (coffee & refreshments)	
8:45	Introductions and Welcome	Dan Wrye, PCWP
	<b>SESSION 1: Summary of Day 1 Conference</b>	
8:50	Overview of Day 1 Content (Historical, current and potential future conditions) Do you know where your water comes from? Where did the water in Clover Creek go? Where does toxic algae come from?	Lorin Reinelt, PCWP
	<b>SESSION 2: What have we done in the watershed over the past 5-10 years?</b>	
9:15	Early Challenges and How Citizens Initiated Changes	Al Schmauder, CCWC
9:30	Pierce County Water Programs Projects and Programs— The Past 10 Years	Hans Hunger, PCWP
9:50	City of Tacoma Chambers-Clover Creek Stormwater Update	Mike Rhubright, City of Tacoma
10:05	Q & A Session	
10:15	Break	
	<b>SESSION 3: What can citizens do to protect and restore the watershed?</b>	
10:30	Municipal Water Law and Water Use Efficiency	Jeff Johnson, Spanaway Water Co.
10:45	Land and Water Stewardship in the Watershed: 1. Protect and steward your land—rain gardens, septic systems, gardening and streamside living 2. Other daily activities—automobile use, pet waste 3. Land preservation—open space preservation, conservation easements	Lorin Reinelt, PCWP
11:00	Q & A Session	
	<b>SESSION 4: Overview of Active Watershed Groups</b>	
11:10	1. Puget Creek Restoration Society 2. Cascade Land Conservancy 3. School Involvement (Washington High School) 4. Chambers-Clover Creek Watershed Council	Sue Penhale Kendra Schmeideskamp Steve Ufer Al Schmauder
11:30	Panel Discussion	Sue Penhale, Kendra Schmeideskamp, Steve Ufer, Al Schmauder
12:00	Closing Remarks and Adjourn	

RIBBON CUTTING AND SITE DEDICATION  
for the  
**NACHES TRAIL PRESERVE**  
*A Natural Conservation Area*

Saturday, October 6, 2007, 1 p.m.– 4 p.m.

The Naches Trail Preserve Partners are pleased to invite you to the official opening of the Naches Trail Preserve, a 50-acre natural conservation area that includes designated public access areas. Pierce County Public Works and Utilities Water Programs Division and Cascade Land Conservancy (CLC) purchased the property in 2003 with a Conservation Futures grant and surface water management funds. Water Programs, CLC, and the Fredrickson Community formed a partnership and steering committee to create the Naches Trail Preserve Stewardship Plan (August 2006) that includes site restoration and trail system plans.

This occasion marks the opening of the first 2,000 feet of the trail. Once completed, the trail will be 1.3 miles long, and the site will be permanently preserved as a natural conservation area. The preserve derives its name from being on or near the historic wagon road from the Cascade Mountains to saltwater in the early days of the Washington Territory.

Join us for the Naches Trail Preserve site dedication and ribbon cutting ceremony on Saturday October 6 at 1 p.m. pm. Enjoy refreshments and a pleasant autumn trail walk with local elected officials and the steering committee.

**DIRECTIONS TO NACHES TRAIL PRESERVE**

Parking for this event is at Clover Creek Elementary, located at 16715 36th Ave. East (see map below). A free shuttle bus will transport you to and from the Naches Trail Preserve.



**DRIVING DIRECTIONS FROM TACOMA:**

- Take I-5 north or south to SR 512
- Proceed east on SR 512 to Canyon Road
- Exit at Canyon Road southbound (right turn)
- Proceed south on Canyon Road approximately 3.6 miles to Military Road. E.
- Turn right (west) onto Military Road E.
- Proceed west on Military Road 0.9 miles to 38th Ave. E. (past the Naches Trail Preserve site). Veer left to remain on Military Road.
- Turn left (south) on 36th Ave. E. and left again into the Clover Creek Elementary School parking lot. Park your car and catch the shuttle to the Naches Trail Preserve.

# Presentation Abstracts – Day 1

## SESSION 1: HISTORICAL WATERSHED CONDITIONS— WHAT THE WATERSHED WAS; WHAT WE KNOW; WHAT WE DON'T KNOW

### *KATHY TROOST, University of Washington* **Formation of the Chambers-Clover Watershed— The Geologic History (Geochronology)**

The Chambers-Clover Creek watershed area lies within the Puget Lowland, a structural and topographic basin. This region has been subjected to cyclical geologic processes from multiple glaciations and tectonic compression. Tertiary bedrock lies more than 1800 feet below the ground in a structural trough known as the Tacoma Basin. The Tacoma fault zone forms the northern boundary of the basin and, in part, parallels the northeastern watershed boundary. Quaternary, last 2.4 my, glacial and interglacial deposits fill the bedrock basin. Glacial advances are characterized by 1) clayey silt lake deposits, 2) sand and gravel outwash, 3) till, then 4) outwash. Interglacial deposits, for example, consist of materials like those accumulating at the landscape today such as river, lake, beach, marine, wetland, and hillslope deposits. Fine-grained lacustrine (lake) and till deposits impede groundwater flow, but often these deposits are discontinuous in nature. Sequences of buried topographies with deep valleys and steep ridges characterize the distribution of these and other deposits in the subsurface. The landscape of the watershed is largely a product of the last (Vashon) glaciation and its related outburst floods. The main trough of Puget Sound and the Puyallup River valley are subglacial troughs that were carved during Vashon ice occupancy. North-south drumlinized (ridged) uplands are interrupted by scour channels that carried flood water and deposits from Glacial Lake Puyallup on the east to Glacial Lake Russell occupying the main trough of Puget Sound. Large sand and gravel deposits accumulated in deltas at the mouths of the outburst channels at DuPont and Steilacoom. These outburst floods left extensive deposits of coarse-grained gravel and cobbles at the ground surface, in places 60 feet thick, over a large area of the watershed, significantly increasing infiltration. Large ice blocks were also presumably carried with the flood water, blocks that were later grounded becoming the source for the kettles lakes of American Lake, Gravelly Lake, and Steilacoom Lake. Since deglaciation about 13,000 years ago, the Puyallup trough has filled with sediment, largely from Mt. Rainier lahars; sea level has continued to rise; and the climate has warmed.

### *BURT G. CLOTHIER, Robinson, Noble and Saltbush, Inc.* **Basin Hydrogeology (Part 1)**

The presentation will focus on an overview of the interaction of surface and groundwater in the Chambers-Clover basin area and summary of the local aquifer systems. The talk will also speculate on the likely “natural” conditions of the watershed in the mid-1800s.

### *ROSE MCKENNEY, Pacific Lutheran University* *LORIN REINELT, Pierce County Water Programs* **An Overview of Natural Conditions in the Watershed (circa 1850s)—The Landscape “Small Prairie” Stream Systems and Natural Water Quality Conditions**

The natural landscape and water quality conditions in the 1850s resulted from geological and glacial history, and the influence of Native American activities. Similar to many other areas in lowland Puget Sound, the Chambers-Clover Creek watershed has experienced disturbance—both natural and human. Glacial erosion and deposition left a broad, low-gradient landscape underlain by large areas of gravelly soil punctuated with ribbons of silt loam and isolated mucks. This landscape supported a mosaic of prairie, forest and wetlands.

The natural water quality conditions were variable in streams, wetlands, lakes and groundwater. Forested, groundwater-driven stream systems were likely cool year-round and supported salmonids. More exposed prairie streams and wetlands were likely seasonally warm with lower dissolved oxygen. Some lakes and wetlands were probably naturally eutrophic, but others dominated by groundwater were likely oligotrophic.

## SESSION 2: WATERSHED CONDITIONS— WHAT THE WATERSHED IS NOW; WHAT WE KNOW; WHAT WE DON'T KNOW

### *LORIN REINELT, Pierce County Water Programs* **Summary of Overall Landscape and Human Changes in the Chambers-Clover Watershed during the Past 150 Years**

The Chambers-Clover Creek Watershed has experienced significant changes over the past 150+ years since the arrival of Euro-Americans. From a hydrologic standpoint, this has involved construction of dams, diversion of stream flows, channeling of creeks, withdrawal of groundwater and construction of impervious surfaces. There was also extensive logging and forest

clearing, as well as filling of wetlands and conversion to pastures and then urban areas. Finally, human activities including the use of automobiles, maintenance of lawns and gardens, animal keeping, onsite septic systems and a variety of industrial and commercial operations have degraded water quality. All of these changes have affected the quantity and quality of groundwater, stream flows and overall environmental health in the watershed.

*BURT G. CLOTHIER, Robinson, Noble and Saltbush, Inc.*  
**Basin Hydrogeology (Part 2)**

The presentation will focus on the effects of hydrologic changes in the watershed: How has development in the basin altered the way water moves through the system? It will include a review of the setting and the changes that have occurred and an assessment of the current state of the system.

*HEATHER KIBBEY, Pierce County Water Programs*  
**Water Quality Conditions in Stormwater, Streams and Groundwater**

The Clover-Chambers basin is the most urbanized basin in unincorporated Pierce County, which means impacts to water resources are greater than other basins in the county. Clover Creek is 303d listed for dissolved oxygen, temperature and fecal coliform. It is on the watch list in some segments for lead, mercury and pH, and meets standards for ammonia, arsenic, cadmium, chromium, copper, nickel and zinc in other segments. Chambers Creek is listed for fecal coliform and copper, and is on watch for pH, temperature and bioassessment. Shallow groundwater in the area has shown some contamination by metals, thus necessitating a change in drywell design. The deep aquifer in Clover-Chambers basin is a sole-source aquifer, and could be at risk from activities at the surface. Pesticides have been detected in surface waters. Pierce County has prioritized Basin 6 for commercial inspection to help keep surface waters clean.

*JEAN JACOBY, Seattle University*  
**Lake Water Quality and Toxic Algae Conditions**

Toxins produced by blue-green algae (“cyanobacteria”) are of increasing concern to lake managers, health officials, the public and others who rely on freshwater systems for a variety of uses. Cyanotoxins have been detected in approximately 20 lakes in Washington including several lakes in the Chambers-Clover Creek watershed. Most of the recent toxic episodes have been documented in western Washington, beginning with wintertime toxic blooms of *Anabaena flos-aquae* in American Lake in 1989. This bloom persisted into spring 1990 and caused multiple animal poison-

ings. Toxic *A. flos-aquae* blooms also occurred in this lake during the winters of 1992, 1993 and 1996. Toxic blooms in this lake were anomalous because the lake is only moderately productive and because the blooms occurred during the winter. These blooms were associated with increased nutrients, especially phosphorus, following winter turnover. In nearby Steilacoom Lake, environmental factors associated with toxic cyanobacterial blooms were investigated during summers 1994 and 1995. A prolonged toxic bloom of *Microcystis aeruginosa* occurred during summer 1994 but not 1995, providing a unique opportunity to compare the environmental conditions that occurred these two years. Total microcystin concentrations ranged from 209 to 1,385 µg/g. Lake characteristics associated with the toxic bloom in 1994 were: decreased water transparency, high water column stability, high surface water temperature and pH, and decreased lake flushing and lower zooplankton abundance.

*RICH ELTRICH, Washington Dept. of Fish and Wildlife*  
**Chambers Creek Fish Management and Stock Assessment—Past Present and Future**

This presentation will provide background information on fish populations that may have historically inhabited Chambers Creek and its tributaries. Hatchery trapping records dating back to 1953 indicate coho, chum salmon, steelhead and cutthroat trout were the predominate species utilizing the habitat of Chambers Creek. We will explore the current management of the fish populations in the Chambers Creek Watershed and look to the possibilities for future fish enhancement within the drainage.

**SESSION 3:  
IMPLICATIONS FOR THE FUTURE—  
WHAT’S BEING DONE NOW BY LOCAL  
GOVERNMENTS AND RESOURCE AGENCIES**

*DAN D. WRYE, Pierce County Water Programs*  
**Surface Water Management: Balancing Urban Stormwater Facilities, Restoring and Mimicking Natural Functionality, and Preserving Natural Functionality: Successes and Limitations**

Pierce County Public Works and Utilities, Water Programs Division, is the surface water management utility for unincorporated Pierce County. Its mission is “to be a responsive service organization that efficiently addresses flood control, water quality and the preservation of natural drainage systems.” The “Clover Creek Basin Plan,” adopted in 2005, is Water Programs’s central workplan for accomplishing its mission in the Clover Creek Basin. Notable projects and programs are discussed, including basin plan-

ning, lands ownership and management, stormwater capital projects, nonpoint source pollution control, and wetland restoration are discussed. Also discussed are limitations to project delivery, including Water Programs service area restrictions, the surface-water orientation, speed of implementation, lack of complete understanding of the hydrology of the basin, available funding and technical staffing levels.

*GREG VIGOREN, City of Lakewood*

#### **Summary of Stormwater Management in Lakewood**

Greg will provide an overview of Lakewood's Surface Water Management Division, including mission statement, goals and funding mechanism. He will also discuss what the City has been focusing on the past few years: construction of stormwater capital projects, particularly water quality and localized flood control; and maintenance with a focus on retrofitting drywells. Future activities will include more of the same: capital projects and effective maintenance, in addition to NPDES permit compliance.

*MARK SAVOCA, U.S. Geological Survey (USGS)*

#### **Numerical Simulation of the Water Resources in the Chambers-Clover Creek Watershed**

The USGS, in cooperation with a broad stakeholder group, is conducting an investigation of the water resources in the Chambers-Clover Creek Watershed. Information describing: 1) hydrogeology of the aquifer system, 2) occurrence and movement of ground-water, 3) streamflows and interactions between streams and aquifers, 4) land cover and ground-water recharge, and 5) water use; will be integrated into a numerical flow model of the watershed. The model will assist water resource managers in developing a long-term watershed management plan.

*RAY HANOWELL, Tacoma-Pierce County Health Dept.*

#### **Monitoring of Groundwater Quality and Quantity, and Swimming Areas for the Protection of Public Health**

The Tacoma-Pierce County Health Department (TPCHD), in partnership with a large number of public water systems, has been tracking groundwater quantity and quality in the urbanized areas of Pierce County since 1997. A report on this work, containing the data collected through 2006, was recently completed and will be available shortly.

The TPCHD also monitors public swimming beaches for bacterial quality and lakes for toxic algae (cyanobacteria) blooms. The swimming beach program samples six beaches each summer for the indicator organism *Escherichia coli* (E. coli). The bacterial quality at all six beaches was good throughout the summer of 2007. Monitoring for toxic algae blooms consists of

responding to calls about algae in lakes and checking a number of lakes weekly through spring, summer and fall. Toxic algae advisories have been issued for Bay Lake, Clear Lake, Spanaway Lake, Steilacoom Lake, Wapato Lake and Waughop Lake in 2007.

#### *TOM KANTZ, Pierce County Special Projects* **Salmon Recovery Planning in Pierce County**

Pierce County is active in salmon recovery planning and project implementation through habitat management and coordination with salmon co-managers. We provided regional leadership in developing the Chinook Recovery Plan chapters addressing the WRIA 10 & 12 watersheds, and the South Puget Sound nearshore. Pierce County has participated in efforts to integrate habitat, hatchery and harvest goals for Chinook populations with the ultimate aim of coordinating and sequencing actions to promote Chinook recovery. This presentation will provide background and an update of current salmon recovery planning activities in Pierce County and the South Puget Sound region.

#### **SESSION 4: NEXT STEPS AND PANEL DISCUSSION—Q & A WHAT'S WORKING WELL? WHAT ARE THE KEY NEXT STEPS? WHAT COULD BE AND WHAT PREVENTS US FROM GETTING THERE?**

*DAN D. WRYE, Pierce County Water Programs*

#### **Risks of Plowing Ahead with Incomplete Understanding of the Watershed: Is There a Choice?**

The Clover Creek Basin has a long history of alteration. Recent projects by government, nonprofit groups and citizens represent progress toward restoring some of the lost functionality in the basin. However, variation in hydrologic function, geology, soils, topography and development history in the area prevents the extrapolation of such site-by-site restoration to the watershed level. While models, monitoring and other tools may be available to inform watershed management decisions in the future, current best professional judgment asserts that stream reach restorations, parcel-by-parcel preservation of functioning floodplains, restoration and re-establishment of functioning wetlands, and retrofitting and separation of storm and base flows remain the most viable management approaches for the foreseeable future. The question in the face of incomplete information is: Do we wait to fill information gaps and slow down the pace of site-by-site restoration and preservation, maintain its current pace or expedite it?

*MARK SAVOCA, BURT CLOTHIER, DAN WRYE,  
DICK MURI, AL SCHMAUDER*  
**Panel Question and Answer Session**

# Presentation Abstracts – Day 2

## SESSION 1: OVERVIEW OF DAY 1 CONFERENCE CONTENT (HISTORICAL, CURRENT AND POTENTIAL FUTURE CONDITIONS)

*LORIN REINELT, Pierce County Water Programs*  
**Overview of the Day 1 Conference Content (Historical,  
Current and Potential Future Conditions)**

Overview of the presentation and discussion from the Day 1 technical conference. Lorin will also provide answers for some frequently asked questions about the watershed: 1) *Do you know where your water comes from?* 2) *Where did the water in Clover Creek go?* 3) *Where does toxic algae in lakes come from?*

## SESSION 2: WHAT HAVE WE DONE IN THE WATERSHED OVER THE PAST 5-10 YEARS?

*AL SCHMAUDER, Chambers-Clover Watershed Council*  
**Early Challenges and How Citizens Initiated Changes**

In the early 1990s neither the State of Washington nor Pierce County had regulations or policies to facilitate volunteer restoration efforts. There was no local land trust, conservation futures did not exist and critical areas were not identified or well protected. This talk will review some of the significant actions citizens took to make changes and the results of those actions. Topics include permitless restoration efforts, organization of volunteers, photos, newsletters, newspaper articles, changing the laws, testifying at hearing, land purchases, donations, t-shirts, presentations and blackberry cobbler and ice cream.

*HANS HUNGER, Pierce County Water Programs*  
**Pierce County Water Programs Projects and Programs—  
The Past 10 Years**

The Chambers-Clover Creek Watershed has had a tremendous amount of work going on in the last 10 years. Water Programs is especially proud of all the capital projects it has completed, starting with the large detention ponds, which look more like habitat areas, built on the North Fork Clover Creek system eight years ago. This was followed by construction of infiltration ponds in the southern part of the watershed to help accommodate groundwater flooding, and today with restoration projects on Clover and Spanaway creeks. There is a lot going on and more projects are planned, but all are important for an area where we continue to see more and more population growth.

*MIKE RHUBRIGHT, City of Tacoma*  
**City of Tacoma Chambers-Clover Creek  
Stormwater Update**—Content to be announced

## SESSION 3: WHAT CAN CITIZENS DO TO PROTECT AND RESTORE THE WATERSHED?

*JEFF JOHNSON, Spanaway Water Company*  
**Municipal Water Law and Water Use Efficiency**

The municipal water law requires water purveyors to collect data and report to the Washington State Department of Health and the public, forecast future water demand and implement water use efficiency measures. Other requirements include monitoring and reducing water system leakage, metering for source and service meters, conservation and goal setting, and annual reporting. Water conservation measures of the Spanaway Water Company include implementation of tiered rates, public education, lead repair incentives and meter change-outs and/or testing.

*LORIN REINELT, Pierce County Water Programs*  
**Land and Water Stewardship in the Watershed**

The watershed conditions in the Chambers-Clover Creek basin are affected by every citizen who lives and works in the watershed. There are numerous things you can do to reduce your ecological footprint. This includes protecting and stewarding your land, including rain gardens, septic systems, gardening and stream-side living. It also involves other daily activities such as automobile use and handling of pet waste. Finally, there are options to preserve land through open space preservation or conservation easements.

## SESSION 4: OVERVIEW OF ACTIVE WATERSHED GROUPS

*AL SCHMAUDER, Chambers-Clover Watershed Council*  
**Citizen Participation as a Member of the Chamber Clover  
Watershed Council**

The purpose and organization of the Watershed Council will be discussed. The five-year action agenda and annual reports will be briefly reviewed. Examples of how the Council works to be a positive force in protecting and enhancing the public's water, wetlands and wildlife will be noted. Opportunities for citizen involvement will be identified to include stewardship, education, habitat projects and monitoring.

# Conference Speaker Bios

## **BURT G. CLOTHIER**, *Licensed Hydrogeologist, RN&S*

Mr. Clothier is a principal hydrogeologist at Robinson, Noble & Saltbush, Inc. and division manager for the company's Hydrogeologic Services Division. An employee since 1990, Burt is a licensed hydrogeologist in Washington, a registered geologist in Oregon, a Fellow of the Geologic Society of London and a member of both national and international professional geologic organizations. His primary responsibilities include project management; water rights technical support and expert witness services; geologic and hydrogeologic data collection, analysis and interpretation; and technical report preparation. In 2006, Burt was appointed to a second 6-year term on the Department of Ecology Technical Advisory Group, providing input and oversight of Washington well-drilling industry regulations. Burt also serves as the technical associate member of the Board of Directors for the Washington State Ground Water Association.

## **RICH ELTRICH**, *Hatchery Complex Manager— South Puget Sound and Hood Canal, Washington Department of Fish and Wildlife (WDFW)*

Rich Eltrich has worked for WDFW for 29 years. Most of his work has focused on hatchery management. His positions have included: 1) Working at various hatcheries as part of management teams, including Humptulips, Skykomish and Minter Creek; 2) Working as an assessment and development biologist in the hatcheries division sited in Olympia; 3) Serving as project leader for the Eastbank Hatchery Evaluation Study sited in Wenatchee; and 4) Working as coho stock assessment biologist for Puget Sound and area biologist for Thurston County. He currently manages the hatchery programs in South Puget Sound and Hood Canal.

## **RAY HANOWELL**, *Environmental Health Specialist II, Tacoma-Pierce County Health Department*

Ray Hanowell is an Environmental Health Specialist II with the Tacoma-Pierce County Health Department and was the lead for the department on three lake projects. Currently, Ray is working on both surface water and groundwater issues in Pierce County. Ray has a bachelor's degree in fisheries from the University of Washington, is a registered sanitarian and is a member of the Washington State Environmental Health Assn.

## **HANS HUNGER**, *Pierce County Water Programs*

Hans Hunger, P.E., is currently the capital improvement program manager for Pierce County's Surface Water Management Division. He has been in the role for the last four years. Previously, he served as a project manager for the Water Programs Division overseeing several stormwater facility projects and long-range basin and watershed planning activities. He was the project manager for the Clover Creek Basin Plan. In addition, he assisted the county in developing standards for low impact development.

## **JEAN JACOBY**, *Seattle University*

Jean Jacoby is an associate dean in the College of Science and Engineering and a professor in the Department of Civil and Environmental Engineering at Seattle University. She received a bachelor's degree in water resources from the University of Wisconsin-Stevens Point and master's and doctoral degrees in environmental engineering and science from the University of Washington. From 1986 to 1991, she worked at consulting firms where she conducted studies of toxic pollution in urban bays of Puget Sound, watershed and water quality investigations and lake restoration projects. Her recent research focus is on toxic blue-green algae. She is currently serving on the Board of Directors for the Washington State Lake Protection Association and the North American Lake Management Society.

## **JEFF JOHNSON**, *Spanaway Water Company*

Jeff Johnson has been the Spanaway Water Company manager since 1991. Previously, he worked at the Fort Lewis Water Plant from 1980 to 1991. He has a bachelor's degree from St. Martins College and a law degree from the University of Puget Sound. He authored ESHB 2013 (passed in the 1997 legislative session), and holds certifications with the Department of Health as water distribution manager III and cross connection control specialist. He is a past board member for Pierce County Regional Water Association (RWA) and founding member and president of the Water Cooperative of Pierce County. He is the Pierce County RWA representative for Washington Water Utilities Council, Central Puget Sound Water Suppliers Forum and Water Resources Advisory Committee, Department of Ecol-

ogy. He is also a member of the American Water Works Association. He is married with two children and has been a Pierce County resident for 37 years. He enjoys scuba diving, climbing and photography.

#### **TOM KANTZ, *Pierce County Special Projects***

Tom Kantz is a special project biologist with Pierce County Special Projects. He manages and updates a database of habitat information for the Ecosystem Diagnosis and Treatment (EDT) model for Chinook and Coho populations in the Puyallup-White and Chambers-Clover Creek watersheds. He participated in the development of Chinook Recovery Plan chapters for these two watersheds and the South Puget Sound near-shore. He also represents Pierce County on technical and advisory committees that address regional salmon recovery and natural resource management issues.

Previously, he was employed as an ecologist with King County, as science program director for the non-profit conservation organization Willapa Alliance, as district biologist for the Pacific Conservation District and as restoration coordinator for the Chinook River watershed in Chinook, Washington. Before moving to the Pacific Northwest, he was an assistant professor in the Biology Department of Coastal Carolina University in Myrtle Beach, South Carolina. He earned his bachelor's degree from the University of California, Berkeley, his master's degree from the University of Texas at Austin and his doctorate from Louisiana State University, Baton Rouge.

#### **HEATHER KIBBEY, *Pierce County Water Programs***

Heather began her career in water quality in 1973 sampling meat packing waste ponds in Auburn as a work-study student. A couple of degrees later and with agricultural and silvicultural research stints in Canada under her belt, she returned to the U.S. and wastewater in 1985. She took her current position in 1991 with Surface Water Management to develop the county's Phase 1 stormwater program, thus utilizing all her past experience and allowing her to argue with regulators on a regular basis (one of her favorite activities). She is chair of the Coalition for Clean Water and is known as the "Goddess of Water Quality." She is a passionate knitter and loves watching her two sons play ice hockey.

#### **ROSE MCKENNEY, *Pacific Lutheran University***

Rose McKenney teaches geomorphology, geographic information systems (GIS) and environmental methods of investigation at Pacific Lutheran University. She received her master's and doctoral degrees in geosciences from Pennsylvania State University and her bachelor's degree in geology from Oregon State University. Her research interests include interactions among hydrologic processes, channel morphology and aquatic or terrestrial communities.

#### **DICK MURI, *Pierce County Councilmember***

Pierce County Councilmember Dick Muri took office on November 19, 2003, as representative of District 6, serving Lakewood, Steilacoom, DuPont, Roy, McKenna, Fort Lewis, McChord AFB and the island communities of Anderson, McNeil and Ketron. Muri chairs the Performance Audit Committee and serves on the Community Development, Economic, Infrastructure and Development, Emergency Preparedness and Public Safety and Human Services Standing Committees.

A retired Air Force Lt. Colonel with 22 years military experience, Muri flew the C-141 as a navigator and served in the Gulf War from 1990 to 1991 as deputy commander of the 628th Military Airlift Support Squadron at Incirlik Airbase, Turkey. From 1992 to 1997, Muri was chief of quality management for McChord AFB, directing a program that won numerous awards for excellence from the United States Air Force and Washington state. Muri received the Tacoma-Pierce County Chamber of Commerce John H. Anderson Military Citizen of the Year Award for 1996 and was inducted into the Fort Lewis Civilian Hall of Fame in a ceremony at Fort Lewis in January 2006. He is married with four children and has been a 23-year resident and active Steilacoom community leader.

#### **LORIN REINELT, *Pierce County Water Programs Division***

Lorin Reinelt is a watershed and lead entity coordinator for Pierce County Water Programs Division. He works for the Puyallup River and Chambers-Clover watershed councils, with a focus on improving water quality and restoring stream habitat. He also is the lead entity coordinator for salmon habitat projects in WRIs 10/12. He has been involved in public service, research, education and consulting on water resources issues for the past 23 years. Previously, he was employed by King County, City of Issaquah, Center for Urban Water Resources Management at UW and in private consult-

ing. He has bachelor's and master's degrees in civil engineering from the University of the Pacific and the University of Washington, respectively and a doctorate in water and environmental studies from Linkoping University, Sweden. He is a registered professional wetland scientist and engineer-in-training.

#### **MIKE RHUBRIGHT, *City of Tacoma***

Mike Rhubright has worked in the environmental field for more than 20 years. He has worked as an analytical chemist in environmental laboratories in Arizona, California and Washington. Mike has experience in a variety of areas including analytical method development, wastewater treatment operations and process control, water reuse and NPDES, and drinking water compliance. Mike is currently a senior environmental specialist for the City of Tacoma Environmental Services Science and Engineering Division. His responsibilities include Thea Foss stormwater contaminate source tracing studies, compliance inspections for industrial and commercial sites, spill response, source control investigations and environmental enforcement. He routinely responds to a range of environmental complaints and provides technical assistance to citizens and businesses. He is the city's representative on the Chambers-Clover Creek and Puyallup River watershed councils.

In his spare time, he serves as the chairman of the Water Conservancy Board of Thurston County, conducting public meetings, hydrogeologic investigations and writing records of decision for water rights transfers and changes of use. He is also a member of the Washington Department of Fish and Wildlife's (WDFW) Steelhead and Cutthroat Policy Advisory Group, providing input and advice regarding steelhead management and recovery to the director of WDFW.

#### **MARK SAVOCA, *USGS***

Mark Savoca is a hydrologist with the U.S. Geological Survey-Washington Water Science Center in Tacoma, where he is currently serving as project chief of a study to develop a numerical flow model of the Chambers-Clover Creek Watershed. Mark has participated in studies of ground-water availability and ground-water quality. He holds bachelor's and master's degrees in geology and a bachelor's degree in anthropology.

#### **AL SCHMAUDER, *Chair, Chambers-Clover Watershed Council***

Al Schmauder is a respected and well-known community activist who has been organizing and leading citizen volunteer projects since 1990. He started the Clover Creek Council, was chair of the Citizens Advisory Committee for Conservation Futures, was vice chair for the initial Watershed Action Plan for the Chambers Clover Watershed and is the current chair of the Chambers-Clover Watershed Council. He was born in Spokane, Washington and graduated from Washington State University, with degrees in accounting and business. He retired from the Army after a 30-year career as an internal auditor. Al is a CPA and a certified internal auditor. He likes to scuba dive in Mexico and kayak locally. In 2007, Pierce County recognized his volunteer work with a Special Achievement Volunteer Award and Citizens for a Healthy Bay awarded him the Bay Hero Award for Environmental Advocate/Citizen.

#### **KATHY GOETZ TROOST, *Director of the Pacific Northwest Center for Geologic Mapping Studies at the University of Washington (UW)***

Kathy Goetz Troost is a licensed geologist in Washington, Oregon and Alaska. Kathy has 28 years of experience as a professional research geologist having worked in both the private and public sectors. She is a member of many professional associations and is chair of the Washington Section of the Association of Environmental and Engineering Geologists (AEG). At the UW, her research focuses on urban geologic hazards, subsurface geology and Quaternary stratigraphy and chronology of the central Puget Lowland. She is lead or coauthor on 19 U.S. Geological Survey/WA Geologic Survey geologic maps in review or recently completed for the Seattle and Tacoma areas. Prior to joining the University of Washington in 1998, she was a senior associate at Shannon & Wilson, Inc., where she had worked as a project manager and project engineering geologist for 19 years at locations throughout the US and Alaska. She managed many large environmental, geological, hydrogeological and geoarchaeological investigations; developed training programs; and supervised staff. She was named the 2004 national Norman Tilford Field Studies Scholar by the Association of Engineering Geologists and is a Fellow of the Geological Society of America.

**GREG VIGOREN, P.E.,** *Surface Water Division Manager,  
City of Lakewood*

In managing the Stormwater Utility Division, Greg Vigoren is responsible for the utility budget, supervising utility employees, overseeing the Public Works Department review of development permits, preparation of a six-year stormwater capital improvement program, stormwater system maintenance and other related duties. Greg is a licensed professional engineer with over 12 years of civil engineering experience. He has been employed by the City of Lakewood for the past 9 years. Greg holds a bachelor's degree in civil engineering from the University of Washington. He is also a veteran of the United States Air Force.

**DAN D. WRYE,** *Pierce County Water Programs*

Dan Wyre has more than 22 years experience in natural resource management, at the local and state level. He is currently the watershed services manager for Pierce County Public Works and Utilities, Water Programs Division, where he manages stormwater management facilities permitting department-owned lands, basin plans, salmon and shellfish recovery and watershed council and public outreach programs. Dan has recently been designated lead on the Puget Sound Partnership for the department. His experience includes 11 years at the state Department of Ecology in wetlands and water quality management, nine years of county environmental and watershed programs and three years at the state Department of Fish and Wildlife in habitat and salmon recovery. He has served on national water quality task forces and provided water quality management consultant services for the U.S. EPA internationally under the U.S. AID program as well county government.

Dan has a Bachelor's degree in geography from the University of Washington and a Master's degree in Public Administration from The Evergreen State College (1987). His thesis was a quantitative analysis of wetlands assessment systems, testing for reproducibility of results. Dan is a third-generation Washingtonian, born in Tacoma. His family has lived in Washington since the 1880s. He is married with three daughters and lives in Olympia. His hobbies are boating, fishing, swimming, local history and spending time with his family.

# Conference Notes

