

**SALMON CREEK FECAL COLIFORM AND TURBIDITY TOTAL MAXIMUM DAILY  
LOAD: REPORT ON NOVEMBER 7, 2007 ADAPTIVE MANAGEMENT MEETING  
(March 11, 2008)**

**Participants**

Denise Smee, Clark Conservation District  
Jeff Schnabel, Clark County Clean Water Program  
Rod Swanson, Clark County Clean Water Program  
Tom Gonzales, Clark County Public Health  
Jeff Wittler, Clark Public Utilities  
Steve Manlow, Lower Columbia Fish Recovery Board  
Donna Bighouse, Washington Department of Fish and Wildlife  
Rex Hapala, Washington Department of Natural Resources  
Kim McKee, Department of Ecology  
Tonnie Cummings, Department of Ecology

**Meeting Objectives**

- Discuss progress in completing implementation activities listed in the 2005 Salmon Creek Fecal Coliform and Turbidity Total Maximum Daily Load (TMDL) Detailed Implementation Plan.
- Identify barriers to completing activities and brainstorm resources needed to overcome those barriers.
- Determine format and content of, and timeline for, adaptive management meeting report(s).
- Agree on frequency of future adaptive management meetings.

**Background**

Salmon Creek flows from the foothills of the Cascade Mountains west to Lake River which in turn flows into the Columbia River. The Cascade foothills are generally forested while the lower drainage is primarily urban. The city of Vancouver lies just south of lower Salmon Creek, and several small towns lie along the tributaries and central plains of the basin (Figure 1). These middle reaches contain a mixture of small towns, large and small-scale farms, pasture, and homes. The basin is highly urbanized near Vancouver, with many small subbasins already heavily developed. These subbasins often experience problems with stormwater runoff, inadequate buffer vegetation, erosion, and sedimentation.

Elevated levels of fecal coliform were measured in the basin as early as the 1980s. Using water quality data collected by local government agencies during 1988 through 1994, Ecology staff conducted modeling to determine the pollution reductions necessary to bring Salmon Creek into compliance with water quality standards for fecal coliform and turbidity. The modeling results were described in a 1995 Ecology report. In a 2001 report, Ecology discussed, in general, the agencies and activities that would contribute to clean-up efforts. More information on responsible agencies and specific activities was provided in Ecology's 2005 Detailed Implementation Plan for the Salmon Creek watershed. Control measures focus on 1) reducing the amount of animal waste entering the creek, 2) locating and eliminating sources of human fecal coliform contamination,

and 3) reducing the amount of sediment entering the creek from stormwater and farming, forestry and construction activities. Salmon Creek also exceeds water quality standards for temperature and dissolved oxygen; those parameters have not yet been addressed in a clean-up plan.

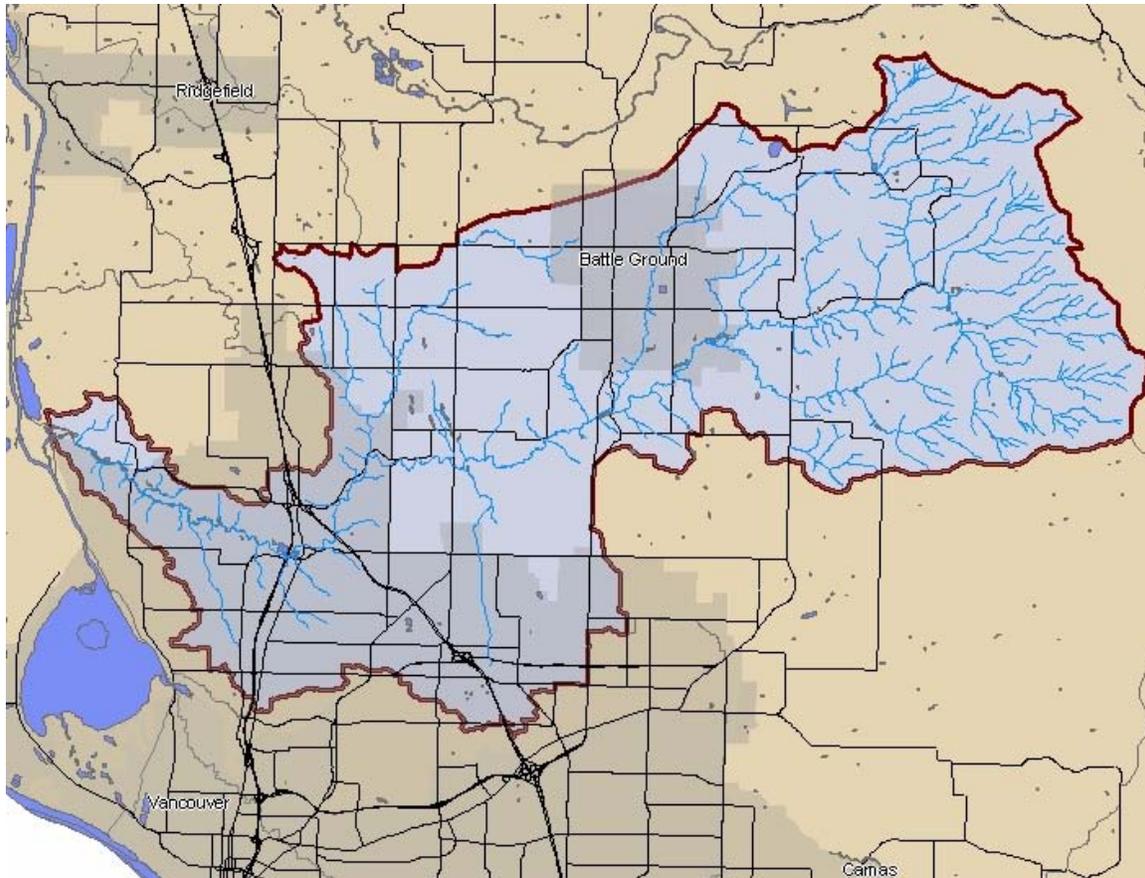


Figure 1. Map of the Salmon Creek watershed (courtesy of Clark County Clean Water Program).

### **Accomplishments to Date and Planned Activities**

Clark Conservation District:

- Successfully competed for a 2-year Department of Ecology grant (G9900128) to provide educational workshops for small acreage landowners.
  - presented 23 workshops addressing issues such as wells and septic maintenance, fencing, manure composting, pasture management, and mud and manure management. Each workshop was attended by 25-30 people.
  - provided best management practices presentations and displays at schools, fairs, and other events.
  - developed and distributed brochures on best management practices.
  - provided technical assistance to numerous landowners that resulted in several riparian restoration projects and implementation of other best management practices.

- Successfully competed for a 3-year Department of Ecology grant (G0200287) to provide education and technical assistance to landowners on management practices that improve water quality in the Salmon Creek watershed.
  - distribute letters and information to 1,747 landowners within the watershed. Mailings included information sheets and brochures on livestock best management practices and letters describing the type of assistance available from the Conservation District. The mailings resulted in over 71 calls to the office.
  - acquired a manure spreader and trailer and developed a manure exchange list to connect landowners with excess manure to residents seeking manure fertilizer.
  - provided support and technical assistance to over 80 farms.
  - completed 21 Conservation Management Plans for landowners.
  - installed 1,851 linear feet of livestock exclusion fencing along waterways.
  - provided financial assistance to landowners that resulted in 6,053 native trees and shrubs planted in riparian areas.
  - hosted 25 free informational workshops on septic system care and maintenance, fencing, pasture management, and manure and mud management. Over 800 residents participated in the workshops.
  - distributed information to over 2,000 people through workshops, displays and presentations.
  - conducted tours of four small farms to show successful implementation of conservation best management practices. 81 people participated in the tours.
- Successfully competed for a 2-year Department of Ecology grant (G0500072) to provide education and technical assistance to landowners on management practices that improve water quality in the Salmon Creek watershed.
  - provided three courses on stewardship for small acreage farms. The courses included 8-12 weekly classes and three field trips. 87 people completed the courses.
  - conducted six workshops geared toward horse owners with 100 people attending. Developed and distributed a publication containing the workshop information.
  - conducted 14 workshops on well and septic maintenance with 309 people attending.
  - created the Clark Conservation District website.
  - attended fairs and other activities and provided information to over 904 people.
  - hosted four workshops on fencing, pasture management, and manure and mud management with 80 people attending.
  - conducted tours of seven small farms to show successful implementation of conservation best management practices. 232 people participated in the tours.
  - provided support and technical assistance to over 40 landowners in the watershed.
  - performed 16 site visits where specific assistance and recommendations were applied.
  - provided financial assistance to landowners that resulted in 3,762 native trees and shrubs planted in riparian areas.
  - installed one off-channel livestock watering facility.

- Successfully competed for a 3-year Department of Ecology grant (G0600179) to conduct livestock surveys in the region (including the Salmon Creek watershed), identify areas of greatest influence, and target those areas for outreach activities.
  - in the summer of 2007, visual animal counts including livestock, domestic pets and waterfowl/wildlife were completed. Survey results will be entered into a GIS database. The project will be completed in late 2008.
- Other recent activities include:
  - developing 30 Small Farm Management and Resource Conservation Plans.
  - developing a Clark County Rural Living handbook.
  - providing continuing education workshops for real estate agents to help them understand issues associated with rural property ownership.
  - providing ongoing technical assistance to landowners.
  - applied for a grant to address the effects of soil erosion from urban development on wildlife habitat.
  - developing best management practices curriculum for high school students.

Clark County Clean Water Program:

Clark County fulfills activities associated with the Salmon Creek TMDL through implementation of its NPDES phase I municipal stormwater management program (SWMP). Details are provided in the county's annual reports to Ecology and in annual SWMP report updates. Highlights include:

- Successfully competed for a three-year Department of Ecology grant (G0300020) to monitor hydrology, water temperature, and benthic macroinvertebrate communities in a number of Clark County watersheds, including Salmon Creek. The monitoring was a component of a watershed characterization study.
- Completed an instream temperature monitoring project in the watershed in 2003 and follow up monitoring in 2005.
- Conducted monthly monitoring of a suite of water quality parameters at eight locations in the Salmon Creek watershed since 2002.
- Spent \$1.8 million on stormwater-related capital improvement projects to reduce stormwater inputs to Salmon Creek and its tributaries between 2002 and 2007 (Table 1).
- In 2006, initiated a 5-year Stormwater Needs Assessment Program to systematically assess and describe stream and storm drainage conditions in Clark County stream basins. The program assesses watershed resources, identifies stormwater-related issues and opportunities, and recommends specific projects or actions to help protect water quality through improved stormwater management. The Salmon Creek watershed is scheduled to be assessed as follows:
  - Mill Creek and Curtin Creek in 2007
  - Cougar Creek, Lower Rock Creek, Upper Rock Creek and the lower part of Salmon Creek in 2008
  - Rock Creek, Morgan Creek, Woodin Creek, and the middle and upper parts of Salmon Creek in 2009
- Initiating a focused bacteria study in the lower Salmon Creek tributaries through an established volunteer monitoring program. Seven sites are monitored bi-monthly for fecal coliform and turbidity.

- Three sites in Morgan Creek are monitored for standard monthly grab sample parameters that include turbidity and fecal coliform bacteria.

Education and outreach activities include co-sponsorship and funding of the WSU Clark County Extension Watershed Stewards and Small Acreage Living on the Land programs as well as numerous other broad-based education activities aimed at changing people’s behavior to reduce pollutants in stormwater. Accomplishments include:

- Provided 98% funding support of WSU Clark County Watershed Stewards Program.
  - Volunteers contributed 2,273 hours and made over 7,000 outreach contacts at a variety of public events, workshops, and trainings.
- Provided 75% funding support of WSU Small Acreage Program
  - Resulted in seven 12-week Living on the Land workshops that included 230 participants (held in Salmon Creek but open to all county residents)
- Specific to Salmon Creek:
  - 9 model/merit farms signage awarded
  - 10 farm tours (3 in 2004, 3 in 2005, 1 2006, 3 in 2007)
  - Two Small Acreage Expo events held that included about 200 participants

Other education and outreach:

- 14,322 students/600 teachers at 25 schools within Salmon Creek watershed attended stormwater storytelling assemblies focusing on stormwater (River Heroes and Living Streams)
- Development regulations include provisions for controlling sediment discharges during all non-agriculture construction projects.
- Illicit discharge screening examined every known stormwater outfall in Mill Creek and Curtin Creek during 2007. Any outfall with dry weather discharges was tested for contaminants that included fecal coliform bacteria. No problem sites were found by screening but one site identified by a complaint is under investigation as a fecal coliform source.
- Stormwater facility maintenance and annual catch basin cleaning help reduce turbidity in stormwater discharges.

Table 1. Capital Improvement Projects in the Salmon Creek Watershed

<b>Project Description</b>	<b>Date</b>	<b>Approximate Cost</b>
Curtin Creek phase I: 1/3 of the project	2007	\$800,000
Carrie Otter stormwater wetland	2006	\$700,000
LaLonde area facilities	2002-2003	\$53,000
99 cartridge Stormfilter® on Highway 99 north of creek	2005	\$141,000
Suds Creek facility retrofit	2004	\$85,000
Bliss Road facility retrofit	2004	\$30,000
26 cartridge Stormfilter® on Highway 99 south of creek	2004	\$30,000

#### Clark County Public Health:

- Successfully competed for 3-year Department of Ecology grant and loan projects (G0400028 and L0400001, respectively) focused on reducing fecal coliform input from on-site septic systems in the Salmon Creek watershed, including:
  - mailed over 7,000 homeowners operation and maintenance brochures and project information sheets. Also contacted many people via participation in fairs and other events.
  - co-hosted 12 free on-site septic system maintenance and operation workshops attended by over 400 people.
  - conducted 584 home surveys to verify usage and functional status of septic systems.
  - ensured correction of 36 failing systems.
  - performed dye testing or water sampling on 12 sites with suspected water quality violations.
  - expanded the Operation and Maintenance database by adding over 4,000 systems that were not previously being tracked.
  - one homeowner in the watershed took advantage of the loan program.
- In October 2007, Clark County Commissioners approved an ordinance strengthening regulations related to on-site septic systems. The ordinance includes:
  - mapping of all septic systems in the county over a 4-year period.
  - more frequent inspection and maintenance of systems. Conventional gravity systems must be inspected every three years, all other systems must be inspected every year, and all on-site systems must be inspected at the time of sale of a house.
  - requirements for some houses to connect to the public sewer when an on-site septic system is failing.
  - operation and maintenance inspections and pumping of septic systems will be submitted electronically to facilitate reporting to the Public Health database.

#### Clark Public Utilities:

- Successfully competed for a 4-year Department of Ecology grant (G0300216) that resulted in 55,385 plants installed over 74 acres, 10,000 linear feet of livestock exclusion fencing, and 2,500 feet of diked and channelized stream reconnected to the floodplain.
- Partnering with Clark Conservation District and using volunteers and other inexpensive crews, planted 121,820 trees in riparian areas as of November 2007 (i.e., 116 acres; 23,280 feet of stream length), with an average survival rate of 85 percent. Using older saplings, watering trees for a couple of years after planting and controlling invasive non-native species contribute to the high success rate.
- Approximately 125 projects were completed and seven planned in the watershed as of October 2006 (Figure 2). One effect of urbanization has been a decrease in the size of more recent riparian restoration projects as parcels are subdivided.

- Currently scheduled to work with ten new landowners in 2008.

## Clark Public Utilities

Commissioner Presentation

October 7, 2006

- ◆ Completed projects
- ☆ Planned projects

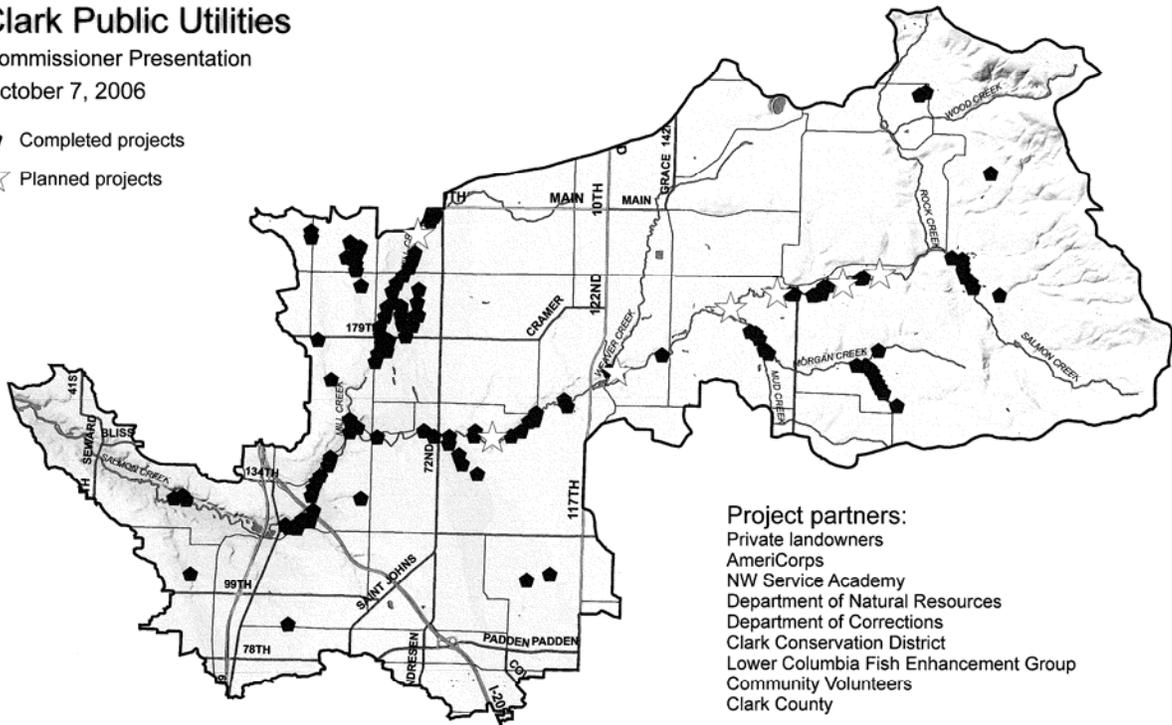


Figure 2. Restoration projects completed and planned by Clark Public Utilities in the Salmon Creek Watershed as of October 2006.

Lower Columbia Fish Recovery Board (LCFRB):

- The NOAA-approved Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan includes a limiting factors analysis for the Salmon Creek watershed. Restoration priorities and strategies have been developed specifically for this watershed. The overall strategy includes a “6-year habitat restoration work schedule” that outlines and prioritizes restoration actions.
- Based on the Recovery Plan, Salmon Creek supports “stabilizing” salmon and steelhead populations. The primary management approach for these populations is that we prevent them from declining further, and improve habitat over the long term.
- The WRIA 27/28 Salmon-Washougal and Lewis Watershed Management Plan, which was approved in 2006, identifies about 150 specific implementation actions. Specific actions related to Salmon Creek address instream flows, water quality, fish habitat and water supplies. The LCFRB is working with the Planning Unit to prepare a “detailed implementation plan” for these actions. The implementation plan is scheduled for completion in 2008.
- As part of the both the salmon recovery and watershed plans, the LCFRB is also developing an integrated regional monitoring program, which is scheduled for completion in June 2008.

Department of Ecology:

- Continues to provide technical assistance to municipalities for stormwater programs, e.g., a position was recently filled in the Vancouver Field Office that is dedicated to dealing with stormwater permits.
- Continues to provide ongoing assistance to local interests in obtaining grant and loan funds.
- Continues to issue NPDES permits under the Clean Water Act.
- Provides continued enforcement of state Water Pollution Control Act.

Washington Department of Fish and Wildlife:

- Administers the Washington State Hydraulic Code by reviewing Joint Aquatic Resource Permit Applications and issuing Hydraulic Project Approvals (HPAs). Reviews approximately 50 applications in the Salmon Creek watershed each year.
- Reviews SEPA applications to evaluate potential impacts on fisheries resources of the state and priority habitats and species. Reviews approximately 300 applications in the Salmon Creek watershed each year.
- Hiring a Growth Management Act/PHS biologist who will oversee issues associated with critical area ordinances and priority habitats and species.

Washington Department of Natural Resources:

The information provided by the Department of Natural Resources is based on the Vancouver Watershed Administrative Unit (WAU). The Salmon Creek watershed is part of the 124,189 acre Vancouver WAU.

- Reviewed 478 Forest Practices Applications in the Vancouver WAU between January 1995 and October 2007; 48 of those applications were reviewed since 2005. The review ensures forest practice activities minimize impacts on streambank vegetation and instream temperature.
- Forest Practices Rules require that forest landowners construct and maintain roads to minimize damage to public resources, including water quality. A Road Maintenance and Abandonment Plan (RMAP) is a forest road inventory and schedule for any needed road work. In the Department of Natural Resources Pacific Cascades Region, a large area which includes the Vancouver WAU, 2,322 RMAPs were approved, and 349 miles of forest road were abandoned, from 2001 to 2006.

Natural Resource Conservation Service: (information provided by Denise Smee)

- Two landowners in the watershed are receiving Farm Bill funds for manure storage to reduce manure runoff into the creek.

#### **Discussion and Decisions Regarding Future Implementation Activities**

- It is challenging to improve water quality in an area, like Clark County, that is experiencing such significant urbanization and growth. Turbidity appears to be getting worse in the Salmon Creek watershed, likely due to all the development taking place. However, conditions would probably be even worse if the implementation activities had not occurred. There is a need to analyze urbanization (for example, using total impervious cover, road density, parcel size, construction permits or some other relevant indicator) and determine how much it is negating clean-up activities.
- It would be useful to perform a trend analysis and other relevant analyses of data collected to date. Tonnie will submit a project request to Ecology's Ecological Assessment Program in January 2008 to perform such analyses.
- Lack of funding is a significant issue. It is very difficult to get money from salmon recovery funds to monitor water quality. The amount of money available from Centennial funds has been steadily decreasing, meaning that fewer projects will be accomplished in the future.
- We discussed how to address the impairments for temperature and dissolved oxygen. General opinion is that if water temperatures improve, the dissolved oxygen problem will be resolved. Given that ongoing restoration activities in the watershed should improve water temperature, Tonnie and Kim suggested the group consider a fast-track, innovative approach to a temperature TMDL. The approach would not require additional data collection; it would develop general shade curves anticipated to bring water temperature down to the water quality standard. The group agreed to this approach, so Tonnie will submit a project request to Ecology's Ecological Assessment Program in January 2008 to conduct an innovative temperature TMDL on Salmon Creek.

- Decision to include narrative, as well as a revised and updated accomplishments table, in the Salmon Creek TMDL adaptive management meeting reports.
- Decision to hold the next adaptive management meeting in fall/winter 2008.

Table 2. Goals and Accomplishments Associated with Salmon Creek Fecal Coliform and Turbidity Total Maximum Daily Load

Agency/Organization	Goals	Accomplishments
<p><b>Clark Conservation District</b></p>	<p>Reduce fecal coliform and turbidity input from farm operations through education and technical assistance</p>	<p>Between 1999 and summer 2007:</p> <ul style="list-style-type: none"> <li>- held 83 educational workshops and farm tours</li> <li>- developed and distributed a number of educational publications</li> <li>- mailed information to 1,747 landowners</li> <li>- acquired a manure spreader and developed a manure exchange program</li> <li>- provided technical assistance to over 120 landowners</li> <li>- completed 21 Conservation Management Plans</li> <li>- installed 1,851 feet of livestock exclusion fencing</li> <li>- provided funding for planting of 9,815 riparian trees and shrubs</li> <li>- provided three 8-12 week courses on stewardship of small acreage farms</li> <li>- created a website for the conservation district</li> <li>- installed one off-channel livestock watering facility</li> <li>- developing 30 Small Farm Management and Resource Conservation Plans</li> <li>- developing best management curriculum for high school students</li> <li>- conducting livestock survey</li> <li>- providing continuing education for real estate agents</li> </ul>

<p><b>Clark County Clean Water Program</b></p>	<p>Implement the NPDES permit for stormwater</p> <p>Continue monitoring water quality</p> <p>Reduce pollutants in stormwater through education and outreach</p>	<ul style="list-style-type: none"> <li>- spent \$1.8 million on stormwater-related capital improvements between 2002 and 2007</li> <li>- initiated a 5-year Stormwater Needs Assessment Program; Salmon Creek subbasins will all be assessed by the end of 2009</li> <li>- monitored hydrology, water temperature, and benthic macroinvertebrate communities as part of a watershed characterization study</li> <li>- completed an instream temperature monitoring project in 2003 and follow-up monitoring in 2005</li> <li>- conducted monthly monitoring of water quality at eight locations since 2002</li> <li>- initiating bi-monthly monitoring of fecal coliform and turbidity at 8 sites</li> <li>- initiated a focused bacteria study at 7 sites in lower Salmon Creek</li> <li>- initiated monthly grab sample monitoring at 3 sites in Morgan Creek</li> <li>- provide 98% of funding support for the WSU Clark County Watershed Steward Program</li> <li>- provide 75% of funding support for WSU Small Acreage Program</li> <li>- awarded model/merit farm signage to 9 landowners</li> <li>- conducted 10 farm tours</li> <li>- conducted 2 small Acreage Expos</li> <li>- conducted stormwater assemblies at 25 schools in the watershed</li> <li>- examined every stormwater outfall in Mill Creek and Curtin Creek to detect illicit discharges</li> </ul>
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<b>Clark County Public Health</b>	Reduce fecal coliform input from on-site septic systems	<ul style="list-style-type: none"> <li>- mailed information to over 7,000 homeowners</li> <li>- held 12 maintenance and operation workshops</li> <li>- surveyed 584 homes to verify status of septic systems</li> <li>- ensured correction of 36 failing systems</li> <li>- tested 12 sites with suspected water quality violations</li> <li>- added 4,000 sites to the Operation and Maintenance database</li> <li>- provided one homeowner with a loan to replace a failing system</li> <li>- in October 2007, county passed an ordinance to strengthen regulations related to on-site septic systems</li> </ul>
<b>Clark Public Utilities</b>	Work with landowners to reduce fecal coliform and turbidity input by restoring riparian areas	<ul style="list-style-type: none"> <li>- 10,000 linear feet of livestock exclusion fencing installed</li> <li>- 2,500 feet of diked and channelized stream reconnected to the floodplain</li> <li>- 121,820 trees planted in riparian areas (116 acres; 23,280 feet of stream length) as of November 2007</li> <li>- Approximately 125 restoration projects were completed and seven planned as of October 2006</li> </ul>
<b>Lower Columbia Fish Recovery Board</b>	<p>During development of the various fish recovery strategies, provide data on stream restoration needs</p> <p>Prioritize and fund projects for stream restoration</p>	<ul style="list-style-type: none"> <li>- Limiting factors analysis completed, restoration priorities determined, and habitat restoration workplan developed</li> <li>- WRIA 27/28 Watershed Plan completed in 2006</li> <li>- Implementation plan and monitoring strategy will be completed in 2008</li> </ul>

<b>Washington Department of Agriculture</b>	Reduce fecal coliform input from livestock by inspecting dairy farms and managing dairy permits and non-dairy permitted facilities	- Ongoing
<b>Department of Ecology</b>	<p>Provide technical assistance to municipalities for stormwater program</p> <p>Provide assistance to local interests in obtaining grant and loan funds</p> <p>Issue NPDES permits under the Clean Water Act</p> <p>Enforce state Water Pollution Control Act (RCW 90.48)</p>	<p>- New position in Vancouver Field Office dedicated to municipal stormwater issues</p> <p>- Ongoing</p> <p>- Ongoing</p> <p>- Ongoing</p>
<b>Washington Department of Fish and Wildlife</b>	<p>Administer the Washington State Hydraulic Code (RCW 77.55) through Hydraulic Project Approvals.</p> <p>Provide technical assistance to the public and other agencies on reducing sediment delivery from projects conducted within waters of the state.</p> <p>Provide technical assistance to local municipalities by updating and revising Critical Area Ordinances and Priority Habitats and Species</p>	<p>- Review approximately 50 hydraulic permit applications for the Salmon Creek watershed each year</p> <p>- Review approximately 300 SEPA applications for the Salmon Creek watershed each year</p> <p>- Hiring new position dedicated to these issues</p>

<b>Washington Department of Natural Resources</b>	Reduce sediment input by implementing Forest and Fish Act requirements with private and state forest landowners	<ul style="list-style-type: none"> <li>- 478 Forest Practices Applications were reviewed for the Vancouver WAU between January 1995 and October 2007; 48 of those applications have been reviewed since 2005</li> <li>- In DNR Pacific Cascades Region, 2,322 RMAPS were reviewed and 349 miles of forest road abandoned from 2001 to 2006</li> </ul>
<b>Natural Resource Conservation Service</b>	Provide technical guidance for Clark Conservation District  Provide technical and financial assistance to farmers	<ul style="list-style-type: none"> <li>- Ongoing</li> <li>- 2 landowners to-date have received funding for manure storage to reduce runoff to creek</li> </ul>