

# *2008 Stormwater Needs Assessment*

## **Executive Summaries**



Clark County Clean Water Program  
*Protecting water through stormwater management*





# 2008 Stormwater Needs Assessment Program

## Executive Summaries

Clark County Public Works Clean Water Program

April 2009





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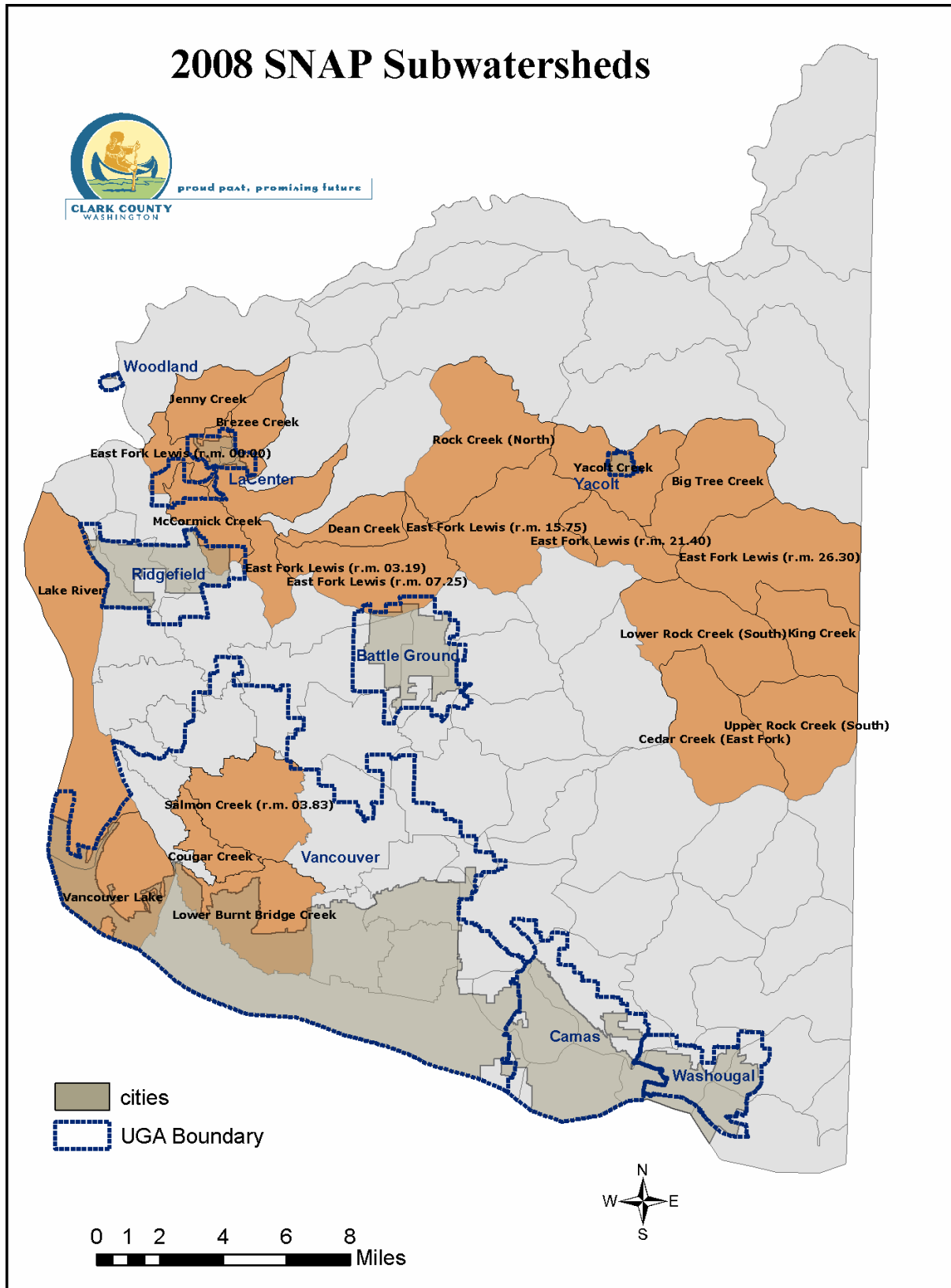
# 2008 Stormwater Needs Assessment Program

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# 2008 Stormwater Needs Assessment Program

## Map of Subwatersheds Assessed in 2008



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# 2008 Stormwater Needs Assessment Program

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## Big Tree Creek/King Creek/East Fork Lewis River (RM 26.30)

### Executive Summary

#### Study Area

This Stormwater Needs Assessment report includes the Big Tree Creek, East Fork Lewis River (RM 26.30), and King Creek subwatersheds in the upper East Fork Lewis River watershed. The assessment addresses only those portions of these subwatersheds that are within unincorporated Clark County.

#### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

#### Findings

##### Watershed Conditions

The table on the following page summarizes conditions in the three study area subwatersheds including water quality, biological health, habitat, hydrology, and the stormwater system.

##### Ongoing projects and involvement

The Washington Department of Ecology is developing Total Maximum Daily Load (TMDL) for bacteria and temperature in the East Fork Lewis River watershed, including the assessment area.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall Fecal coliform bacteria Temperature	<ul style="list-style-type: none"> <li>• Fair to Good</li> <li>• Big Tree Creek fails the fecal coliform standard</li> <li>• All three are included in the East Fork Lewis River fecal coliform TMDL</li> <li>• All three fail the temperature standard</li> <li>• All three are included in the East Fork Lewis River temperature TMDL</li> </ul>
<b>Biological</b> Anadromous fish	<ul style="list-style-type: none"> <li>• Known use by winter and summer steelhead (East Fork Lewis River (RM 26.30) and King Creek); no anadromous use of Big Tree Creek</li> <li>• High regional recovery priority in East Fork (RM 26.30); medium in King Creek; low in Big Tree Creek</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria  Riparian  Wetland	<ul style="list-style-type: none"> <li>• Road density percentage and Percent forested (Big Tree Creek) fall into the Non-Functioning category</li> <li>• Percent forested (EF 26.30 and King Creek), stream crossing density, and projected effective impervious area fall into the Properly Functioning category</li> <li>• Percent total impervious area is in the marginally functioning range</li> <li>• Riparian forest shade of 40-70% for all three</li> <li>• Large woody debris recruitment potential is primarily low in Big Tree Creek, low to high for King Creek, and mostly high for East Fork Lewis River (RM 26.30)</li> <li>• Primarily limited to riparian areas and floodplains</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology Future condition	<ul style="list-style-type: none"> <li>• No hydrologic data available, but likely typical for partly forested rural areas</li> <li>• Impervious area projected to remain at levels that do not alter hydrology if existing forest cover is retained or expanded</li> </ul>
<b>Stormwater (Unincorp. areas)</b> System description  Inventory System adequacy  System condition	<ul style="list-style-type: none"> <li>• Primarily road-side ditches</li> <li>• No public stormwater facilities; two private</li> <li>• Complete</li> <li>• Assumed adequate treatment</li> <li>• No flow control other than infiltration in ditches</li> <li>• No illicit discharge screening conducted</li> <li>• Offsite assessment for outfalls to critical areas found 13 of 14 outfalls in compliance (East Fork Lewis River (RM 26.30), and 2 of 2 in compliance (Big Tree Creek); no outfalls to critical areas in King Creek</li> </ul>

### Opportunities

## 2008 Stormwater Needs Assessment Program

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Opportunities for stormwater-related projects are very limited in this assessment area. One potential project was identified through this assessment: an outfall to a critical area in the East Fork Lewis River (r.m. 26.30) subwatershed was noted due to ongoing erosion and instability.

Non-project stormwater management recommendations address areas where CWP programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the study area include:

- Continue county support for Ecology's TMDL development process for bacteria and temperature
- Examine the use of small projects to improve stormwater retention and treatment in roadside ditches
- Consider fish barrier removal projects as existing roads and culverts are upgraded or replaced
- Develop a system to provide education about appropriate ditch maintenance practices to rural landowners
- Perform focused monitoring to locate fecal coliform sources (Big Tree Creek)

## 2008 Stormwater Needs Assessment Program

<b>Table 5: Likely Water Quality Concerns, Sources, and Solutions for Big Tree Creek, East Fork Lewis River (RM 26.30), and King Creek</b>				
<b>Characteristic</b>	<b>Beneficial Use Affected</b>	<b>Potential Sources</b>	<b>Mechanism</b>	<b>Solutions (bold indicates direct Clean Water Program involvement)</b>
Fecal coliform bacteria	Extraordinary primary contact recreation (Big Tree Creek)	failing septic systems	groundwater seeps	<b>Storm sewer screening for source identification and removal</b>
		livestock, wildlife, pets	overland runoff storm sewers/ditches direct access	<b>Education programs</b> Agricultural Best Management Practices Septic system inspection and maintenance
Water temperature	Char spawning/rearing  Core summer salmonid habitat (anadramous)	vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b> Streamside planting/vegetation <b>Riparian preservation through acquisition</b> <b>Education programs</b>

# 2008 Stormwater Needs Assessment Program

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## Breeze Creek/Jenny Creek Executive Summary

### Study Area

This Stormwater Needs Assessment report includes the Breeze Creek and Jenny Creek subwatersheds in the lower East Fork Lewis River watershed. The assessment focused on those portions of the study area that are within unincorporated Clark County.

### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

### Findings

#### Watershed Conditions

The table on the following page summarizes conditions in the two study area subwatersheds, including water quality, biological health, habitat, hydrology, and the stormwater system.

#### Ongoing projects and involvement

Current projects sponsored by Lower Columbia Fish Recovery Board (Lower East Fork Lewis River Restoration Plan) include channel restoration, riparian and stream bank revegetation, and aquatic habitat enhancement and restoration. The Clark County Legacy Lands Program and Clark County Clean Water Program are participating in project selection and development for this effort.

The Washington Department of Ecology is developing Total Maximum Daily Load (TMDL) for bacteria and temperature in the East Fork Lewis River watershed including both Breeze Creek and Jenny Creek.

There are no stormwater projects in Breeze Creek or Jenny Creek subwatersheds under the 2009 through 2014 Stormwater Capital Improvement Program.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall  Fecal coliform bacteria  Temperature	<ul style="list-style-type: none"> <li>• Poor (Brezee Creek) to Good (Jenny Creek)</li> <li>• Significant increasing trend in turbidity (Brezee Creek)</li> <li>• Both fail state standards; Brezee Creek by a large margin.</li> <li>• All are included in East Fork Lewis River fecal coliform TMDL</li> <li>• Both subwatersheds fail temperature standard</li> <li>• Streams are included in East Fork Lewis River temperature TMDL</li> </ul>
<b>Biological</b>  Benthic macro-invertebrates  Anadromous fish	<ul style="list-style-type: none"> <li>• Low to moderate biological integrity for Brezee Creek and moderate to high biological integrity for Jenny Creek</li> <li>• Known Coho and Winter Steelhead (Brezee Creek and Jenny Creek) Presumed Fall Chum and Summer Steelhead (Brezee Creek)</li> <li>• Low to high regional recovery priority; Brezee Creek as a Tier 1 and Jenny Creek as a Tier 4 (mouth to full barrier falls)</li> </ul>
<b>Habitat</b>  NOAA Fisheries criteria    Riparian    Wetland	<ul style="list-style-type: none"> <li>• Forest percentage and road density (Brezee Creek and Jenny Creek) and total impervious area (Brezee Creek) fall into the Non-Functioning category</li> <li>• Projected effective impervious area falls into the Potentially Unstable category</li> <li>• Stream crossing density falls in the Functioning category</li> <li>• Overall riparian conditions rated as marginal or impaired</li> <li>• Overall shade low to high in Brezee Creek; minimal for Jenny Creek</li> <li>• Large woody debris recruitment varies from none to moderate</li> <li>• Potential wetland areas associated with stream channel floodplains and tributary headwaters</li> </ul>
<b>Hydrology and Geomorphology</b>  Overall hydrology  Channel stability	<ul style="list-style-type: none"> <li>• Streams are generally higher gradient and have limited floodplain</li> <li>• Mixed rural land use suggests higher storm flows than forested areas</li> <li>• Projected unstable to very unstable</li> </ul>
Future condition	<ul style="list-style-type: none"> <li>• Projected impervious area in the Brezee Creek and Jenny Creek subwatersheds places them in the "Potentially Unstable" category</li> </ul>
<b>Stormwater (Unincorp areas)</b>  System description  Inventory  System adequacy  System condition	<ul style="list-style-type: none"> <li>• Primarily road-side ditches</li> <li>• No public stormwater facilities; one private facility</li> <li>• Complete</li> <li>• Assumed adequate treatment; inadequate flow control</li> <li>• 271 outfalls screened for illicit discharges; all were in compliance</li> <li>• Two outfalls draining to critical areas in compliance</li> </ul>

# 2008 Stormwater Needs Assessment Program

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## Opportunities

Projects listed in the SNAP report represent only a small part of those required to protect and restore streams within the study area. Opportunities for stormwater-related watershed improvement projects include the following:

- Focused stormwater outreach and education to streamside landowners in headwaters areas.
- Focused monitoring to determine if fecal coliform sources are present.
- Inspection of one potentially at-risk earthen dam.
- Inspection of one culvert causing localized backwater conditions.
- Potential purchase or protection of four parcels suitable for large-scale wetland restoration.
- Exclusion of livestock from stream in multiple locations.
- Investigation of three potential illicit discharges.
- Evaluation of several potential fish barriers, and removal of several known barriers in Brezee Creek and tributaries.
- Promotion of riparian enhancement projects, particularly in the upper and lower portions of watershed.

Non-project stormwater management recommendations address areas where CWP programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the study area include:

- Pursue future collaborative stormwater activities with the City of La Center in the Brezee Creek subwatershed.
- Continue to leverage projects with the Lower Columbia Fish Recovery Board through the Lower East Fork Lewis River Aquatic Habitat Restoration Plan.
- Continue active participation in Ecology's bacteria and temperature TMDL development for the East Fork Lewis River watershed.
- Replace deteriorated stream name signs at road crossings.
- Perform targeted monitoring or screening to identify fecal coliform sources.
- Develop technical assistance to aid rural property owners to effectively follow recently adopted runoff reduction practices for construction projects
- Develop a system to provide education about appropriate ditch maintenance practices to rural landowners.
- Examine the use of small projects to improve stormwater retention and treatment in roadside ditches.
- Consider fish barrier removal projects as existing roads and culverts are upgraded or replaced.
- Develop literature and distribute to landowners educating about the water quality impacts and other potential hazards of on-line and off-line ponds.
- Increase education and technical support regarding the removal of invasive plants, and provide a list of suggested plants for stream revegetation and local nurseries that stock them for distribution to landowners.

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**Table 6. Known Water Quality Concerns, Sources, and Solutions for Brezee Creek and Jenny Creek**

Characteristic	Beneficial Use Affected	Potential Sources	Mechanism	Solutions ( <b>bold indicates direct Clean Water Program involvement</b> )
Fecal coliform bacteria	Primary contact recreation	failing septic systems or sanitary sewer systems	groundwater seeps roadside ditches	<b>Storm sewer screening for source identification and removal</b> <b>Education programs</b> <b>Storm water facility designs/retrofits to optimize bacteria reduction (see Schueler, 1999)</b> Agricultural Best Management Practices Septic and sanitary sewer system inspection and maintenance
		livestock, pets, wildlife	overland runoff roadside ditches direct access	
Water temperature	salmonid rearing habitat	vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b> <b>Streamside planting/vegetation enhancement/riparian preservation through acquisition</b> <b>Education programs</b> Pond removal or limitation Decreased water withdrawals
		ponds	direct solar radiation stagnation	
		low summer flows	decreased resistance to thermal inputs	
Turbidity	Salmonid spawning, rearing, and migration;  Aesthetic enjoyment	erosion ( <i>development projects; land clearing; cropland; channel erosion</i> )	overland runoff roadside ditches channel dynamics	Erosion control regulations <b>Storm sewer system cleaning and maintenance</b> <b>Storm water facility designs/retrofits to optimize settling and removal of suspended silt/clay</b> Agricultural Best Management Practices Stream bank stabilization/rehabilitation <b>Storm water outfall/facility retrofits to reduce flow-induced channel erosion</b>

# 2008 Stormwater Needs Assessment Program

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## Cedar Creek (East Fork)/Upper and Lower Rock Creek (South) Executive Summary

### Study Area

This Stormwater Needs Assessment report includes the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds in the East Fork Lewis River watershed. The assessment addresses only those portions of these subwatersheds that are within unincorporated Clark County.

### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

### Findings

#### Watershed Conditions

The table on the following page summarizes conditions in the three study area subwatersheds, including water quality, biological health, habitat, hydrology, and the stormwater system.

#### Ongoing projects and involvement

The Washington Department of Ecology is developing Total Maximum Daily Load (TMDL) for bacteria and temperature in the East Fork Lewis River watershed, including the assessment area.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall Fecal coliform Bacteria  Temperature	<ul style="list-style-type: none"> <li>• Good to Excellent</li> <li>• Lower Rock Creek (South) meets bacteria standards year-round; no data for others</li> <li>• All are included in East Fork Lewis River fecal coliform TMDL</li> <li>• Lower Rock Creek (South) fails temperature standard, but among coolest streams measured; no data for others</li> <li>• All are included in East Fork Lewis River temperature TMDL</li> </ul>
<b>Biological</b> Benthic  macroinvertebrates Anadromous fish	<ul style="list-style-type: none"> <li>• High biological integrity (Lower Rock Creek (South)); no data for others</li> <li>• Known use by winter and summer steelhead (Cedar Creek (EF) and Lower Rock Cr (South); presumed use in Upper Rock Cr (South)</li> <li>• High regional recovery priority for Lower Rock Creek (Tier 1) and lower priority for the other two subwatersheds (Tier 4)</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria  Riparian  Wetland	<ul style="list-style-type: none"> <li>• Road density metric is in the Non-Functioning category (Lower Rock Cr); the other two subwatersheds are in the Functioning category</li> <li>• Percent total impervious area, percent forest cover, stream crossing density, and projected effective impervious area are in the Functioning category for all three subwatersheds</li> <li>• Overall shade is low to moderate (20-40%) for Lower Rock Creek; moderate to high (70-90%) for Cedar and Upper Rock Creek</li> <li>• Large woody debris recruitment potential varies from low to high throughout these subwatersheds</li> <li>• Primarily limited to riparian areas and stream channel floodplains</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology  Future condition	<ul style="list-style-type: none"> <li>• No hydrologic data is available, but regime is likely typical for forested watersheds</li> <li>• Impervious area projected to remain at levels that do not alter hydrology if forest cover is retained</li> </ul>
<b>Stormwater (Unincorp areas)</b> System description  Inventory System adequacy  System condition	<ul style="list-style-type: none"> <li>• Primarily road-side ditches</li> <li>• No public stormwater facilities; two private facilities</li> <li>• Complete</li> <li>• Assumed adequate treatment</li> <li>• No flow control other than infiltration in ditches</li> <li>• No illicit discharge screening was performed</li> <li>• Conditions largely undocumented but presumed functional</li> </ul>

## 2008 Stormwater Needs Assessment Program

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### Opportunities

Opportunities for stormwater-related projects are very limited in this assessment area. No specific projects are recommended.

Non-project stormwater management recommendations address areas where CWP programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to this assessment area include:

- Continue county support for Ecology's TMDL development process for bacteria and temperature
- Examine the use of small projects to improve stormwater retention and treatment in roadside ditches
- Consider fish barrier removal projects as existing roads and culverts are upgraded or replaced
- Develop a system to provide education about appropriate ditch maintenance practices to rural landowners

## 2008 Stormwater Needs Assessment Program

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**Table 5: Likely Water Quality Concerns, Sources, and Solutions for Cedar (East Fork), Upper Rock Creek (South), and Lower Rock Creek (South) Subwatersheds**

<b>Characteristic</b>	<b>Beneficial Use Affected</b>	<b>Potential Sources</b>	<b>Mechanism</b>	<b>Solutions (bold indicates direct Clean Water Program involvement)</b>
Water temperature	Core summer salmonid habitat (anadromous)	vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b> <b>Streamside planting/vegetation enhancement</b> <b>Riparian preservation through acquisition</b> <b>Education programs</b>
	Salmonid spawning and rearing (resident)	low summer flows	decreased resistance to thermal inputs	

# 2008 Stormwater Needs Assessment Program

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## Dean Creek/East Fork Lewis River (RM 07.25)

### Executive Summary

#### Study Area

This Stormwater Needs Assessment report includes the Dean Creek and East Fork Lewis River (RM 07.25) subwatersheds in the middle East Fork Lewis River watershed. The assessment addresses only those portions of these subwatersheds that are within unincorporated Clark County.

#### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

#### Findings

##### Watershed Conditions

The table on the following page summarizes conditions in the two study area subwatersheds including water quality, biological health, habitat, hydrology, and the stormwater system.

##### Ongoing projects and involvement

The Washington Department of Ecology is developing Total Maximum Daily Load (TMDL) for bacteria and temperature in the East Fork Lewis River watershed.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall Fecal coliform bacteria Temperature	<ul style="list-style-type: none"> <li>• Poor to Good</li> <li>• East Fork Lewis River (RM 07.25) just fails the fecal coliform standard</li> <li>• Both are included in the East Fork Lewis River fecal coliform TMDL</li> <li>• Both fail the temperature standard</li> <li>• Both are included in the East Fork Lewis River temperature TMDL</li> </ul>
<b>Biological</b> Anadromous fish	<ul style="list-style-type: none"> <li>• Known use by Coho and chum salmon, winter and summer steelhead (East Fork Lewis River (RM 07.25)); Coho salmon and winter steelhead (Dean)</li> <li>• High regional fish recovery priority in East Fork Lewis River (RM 07.25) and lower Dean Creek; lower priority in upper Dean Creek</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria  Riparian  Wetland	<ul style="list-style-type: none"> <li>• Road density and percent forested fall into the Non-Functioning category for both subwatersheds</li> <li>• Percent total impervious area is marginally functioning for both</li> <li>• Stream crossing density falls into Properly Functioning for both</li> <li>• Projected effective impervious area should remain properly functioning for Dean Creek, while that for Manley Creek, an East Fork Lewis River (RM 07.25) tributary, could become non-functioning</li> <li>• Riparian forest shade is mostly low (&lt; 20%) for both subwatersheds</li> <li>• Large woody debris recruitment potential varies from none to high for both subwatersheds</li> <li>• Primarily limited to riparian areas, floodplains, and tributary mouths, but also includes wetlands in headwater areas</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology Future condition	<ul style="list-style-type: none"> <li>• No flow data available, but hydrology likely typical for partly forested rural areas</li> <li>• Impervious area projected to increase especially for Manley Creek, in East Fork Lewis River (RM 07.25), to the point that it may alter hydrology if not properly mitigated during development</li> </ul>
<b>Stormwater (Unincorp. areas)</b> System description Inventory System adequacy  System condition	<ul style="list-style-type: none"> <li>• Primarily road-side ditches</li> <li>• Two public stormwater facilities in East Fork Lewis River subwatershed</li> <li>• Complete</li> <li>• Assumed adequate treatment by vegetated roadside ditches</li> <li>• No flow control other than infiltration in ditches</li> <li>• Illicit discharge screening at five sites indicated no significant problems</li> <li>• Offsite assessment for 21 outfalls to critical areas found all in compliance in East Fork Lewis River (RM 07.25); no mapped outfalls to critical areas in Dean Creek</li> </ul>

## 2008 Stormwater Needs Assessment Program

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### Opportunities

Several opportunities for stormwater-related projects were identified, primarily stormwater capital facility improvements, infrastructure maintenance, and technical assistance. Identified opportunities include:

- Potential retrofit projects for erosion reduction in roadside ditches
- Evaluation of several undersized culverts
- Maintenance projects related to clogged or crushed culverts
- Technical assistance visits to ten private landowners to help address water quality and erosion issues
- One referral to Clark Public Works Capital Improvement Program for evaluation of significant sediment accumulation

Non-project stormwater management recommendations address areas where CWP programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the study area include:

- Continue county support for Ecology's TMDL development process for bacteria and temperature.
- Examine the use of small projects to improve stormwater retention and treatment in roadside ditches.
- Consider fish barrier removal projects as existing roads and culverts are upgraded or replaced.
- Develop a system to provide education about appropriate ditch maintenance practices to rural landowners.
- Provide technical assistance to rural development projects required to implement stormwater controls

## 2008 Stormwater Needs Assessment Program

**Table 5: Likely Water Quality Concerns, Sources, and Solutions for Dean Creek and East Fork Lewis River (RM 07.25)**

Characteristic	Beneficial Use Affected	Potential Sources	Mechanism	Solutions (bold indicates direct Clean Water Program involvement)
Fecal coliform bacteria	Primary contact recreation	failing septic systems	groundwater seeps	<b>Storm sewer screening for source identification and removal</b> <b>Education programs</b> Agricultural Best Management Practices Septic system inspection and maintenance
		livestock, wildlife, pets	overland runoff storm sewers/ditches direct access	
Water temperature	Core summer habitat	Riparian vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b> Streamside planting/vegetation <b>Riparian preservation through acquisition</b> <b>Education programs</b>
		low summer flows	decreased resistance to thermal inputs	

# 2008 Stormwater Needs Assessment Program

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## East Fork Lewis River (RM 00.00)/ East Fork Lewis River (RM 03.19)/McCormick Creek Executive Summary

### Study Area

This Stormwater Needs Assessment report includes East Fork Lewis River (RM 00.00), East Fork Lewis River (RM 03.19), and McCormick Creek subwatersheds. The assessment focused on those portions of the study area that are within unincorporated Clark County.

### Intent

Stormwater Needs Assessment reports compile summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. The assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Regional Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

### Findings

#### Watershed Conditions

The table on the following page summarizes conditions in the three study area subwatersheds, including water quality, biological health, habitat, hydrology, and the stormwater system.

#### Ongoing projects and involvement

Current projects sponsored by Lower Columbia Fish Recovery Board (Lower East Fork Lewis River Restoration Plan) include channel restoration, riparian and stream bank revegetation, and aquatic habitat enhancement and restoration.

Other projects are coordinated by Clark County Legacy Lands Program, Clark County Clean Water Program, Clark County Capital Improvement Program, and the Department of Ecology. The watershed continues to benefit from the efforts of these groups.

There are no stormwater projects in the East Fork Lewis River (RM 00.00), East Fork Lewis River (RM 03.19), and McCormick Creek subwatersheds under the 2009 through 2014 Stormwater Capital Improvement Program.

The Washington Department of Ecology is developing Total Maximum Daily Load (TMDL) for bacteria and temperature in the East Fork Lewis River watershed including McCormick Creek.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall Fecal coliform bacteria Temperature	<ul style="list-style-type: none"> <li>Poor (McCormick Creek) to Good (East Fork Lewis River (RM 00.00) and East Fork Lewis River (RM 03.19))</li> <li>All three fail standards; McCormick Creek by a large margin</li> <li>All are included in East Fork Lewis River fecal coliform TMDL</li> <li>East Fork Lewis River subwatersheds fail temperature standard; McCormick unknown</li> <li>Highest recorded temperatures of entire East Fork system (2005)</li> <li>All three are included in East Fork Lewis River temperature TMDL</li> </ul>
<b>Biological</b> Benthic macro-invertebrates Anadromous fish	<ul style="list-style-type: none"> <li>Low biological integrity for McCormick Creek; moderate biological integrity for East Fork Lewis River (RM 03.19); no data for East Fork Lewis River (RM 00.00)</li> <li>Known winter and summer steelhead, Coho, chum, fall Chinook (EF (RM00.00) and EF (RM 03.19); Presumed and potential winter steelhead and Coho (McCormick Cr)</li> <li>Moderate to high regional recovery priority (EF (RM 00.00) and McCormick = Group B, Tier 2; EF 03.19 = Group A, Tier 1)</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria Riparian Wetland	<ul style="list-style-type: none"> <li>Forest, total impervious area, and road density percentages fall into the Non-Functioning category for all three</li> <li>Projected effective impervious area falls into Non-Functioning (McCormick, EF 00.00), and Functioning (EF 03.19) categories</li> <li>Stream crossing density falls in the Functioning category for all three</li> <li>Overall riparian conditions impaired, except EF 00.00 (marginal)</li> <li>Overall shade is low at 0-20%; upper McCormick Creek is shaded</li> <li>Large woody debris recruitment varies from none to moderate</li> <li>Extensive floodplain wetlands along East Fork mainstem within EF 00.00 and 03.19; some wetlands near channels in McCormick</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology Channel stability	<ul style="list-style-type: none"> <li>East Fork Lewis River is tidally influenced in this study area</li> <li>Mixed rural land use suggests higher storm flows than forested areas</li> <li>Projected unstable to very unstable</li> </ul>
Future condition	<ul style="list-style-type: none"> <li>Projected impervious area in East Fork Lewis River (RM 00.00) and McCormick Creek places them in Non-Functioning category</li> </ul>
<b>Stormwater (Uninc)</b> System description Inventory System adequacy System condition	<ul style="list-style-type: none"> <li>Primarily road-side ditches</li> <li>Four public stormwater facilities; thirteen private facilities</li> <li>Complete</li> <li>Assumed adequate treatment; inadequate flow control</li> <li>208 outfalls screened for illicit discharges. All were in compliance</li> <li>12 of 13 outfalls draining to critical areas in compliance</li> </ul>

# 2008 Stormwater Needs Assessment Program

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## Opportunities

Projects listed in the SNAP report represent only a small part of those needed to protect and restore streams within the study area. Field work and review of existing information identified numerous projects and actions that can improve stream conditions, including the following:

- Focused stormwater outreach and education to streamside landowners in headwaters areas.
- Inspection of one potentially at-risk earthen dam.
- Inspection and repair of two plugged culverts causing localized flooding.
- Maintenance to bring four public stormwater facilities into compliance with county standards.
- Potential retrofit of one stormwater outfall causing significant erosion.
- Cleanup of four illegal dump sites.
- Ditch retrofits to provide water quality treatment.
- Potential purchase or protection of three parcels suitable for large-scale wetland restoration.
- Technical assistance visits to landowners with potential source control and water quality ordinance issues.
- Exclusion of livestock from the stream in two locations.
- Investigation of two potential illicit discharges.
- Investigation of two significant headcuts and possible stabilization.
- Potential large-scale cooperative project with City of LaCenter and City of Ridgefield for multi-use regional sports complex with stormwater benefits.
- Evaluation of several potential fish barriers, and removal of several known barriers in lower McCormick Creek and tributaries.
- Small or large-scale invasive plant removal and riparian restoration projects.

Non-project stormwater management recommendations address areas where county programs or activities could be modified to better address National Pollution Discharge Elimination System (NPDES) permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the study area include:

- Pursue future collaborative stormwater activities with the City of LaCenter
- Continue to coordinate with the Lower Columbia Fish Recovery Board through the Lower East Fork Lewis River Aquatic Habitat Restoration Plan.
- Continue active participation in Ecology's bacteria and temperature TMDL development for the East Fork Lewis River subwatershed.
- Increase maintenance of stormwater swales to increase treatment effectiveness and reduce erosion.
- Replace deteriorated stream name signs at road crossings.
- Perform targeted monitoring or screening to identify fecal coliform sources.
- In collaboration with LaCenter and Ridgefield, consider stormwater basin planning as a tool to better manage stormwater impacts due to future growth in the East Fork Lewis River (RM 00.00) and McCormick Creek subwatersheds.

## 2008 Stormwater Needs Assessment Program

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- In developing areas, emphasize stormwater management that focuses on reduction of runoff and diffuse infiltration close to the source rather than in centralized facilities. Low impact development (LID) practices should be encouraged.
- Examine the use of small projects to improve stormwater retention and treatment in roadside ditches.
- Consider fish barrier removal projects in the upper McCormick Creek subwatershed as existing roads and culverts are upgraded or replaced. Restoring access to fish habitat is a priority in this study area.
- Develop literature and distribute to landowners educating about the water quality impacts and other potential hazards of on-line and off-line ponds.
- Increase education and technical support regarding the removal of invasive plants, and provide a list of suggested plants for stream revegetation and local nurseries that stock them for distribution to landowners

## 2008 Stormwater Needs Assessment Program

**Table 5: Likely Water Quality Concerns, Sources, and Solutions for East Fork Lewis River (RM 00.00), East Fork Lewis River (RM 03.19), and McCormick Creek Subwatersheds**

<b>Characteristic</b>	<b>Beneficial Use Affected</b>	<b>Potential Sources</b>	<b>Mechanism</b>	<b>Solutions (bold indicates direct Clean Water Program involvement)</b>
Fecal coliform bacteria	Primary contact recreation	failing septic systems or sanitary sewers	groundwater seeps	<b>Storm sewer screening for source identification and removal</b> <b>Education programs</b> Agricultural Best Management Practices Septic system inspection and maintenance
		livestock, wildlife, pets	overland runoff storm sewers/ditches direct access	
Water temperature	Salmonid spawning and rearing	vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b> <b>Streamside planting/vegetation enhancement / riparian preservation through acquisition</b> <b>Education programs</b>
		low summer flows	decreased resistance to thermal inputs	
Turbidity	Salmonid spawning rearing, and migration  Aesthetic enjoyment	erosion ( <i>development projects; land clearing; cropland; impervious surfaces; channel erosion</i> )	overland runoff storm sewers/ditches channel dynamics	Erosion control regulations <b>Storm water facility designs/retrofits to optimize settling and removal of suspended silt/clay</b> Agricultural Best Management Practices Stream bank stabilization/rehabilitation <b>Storm water outfall/facility retrofits to reduce flow-induced channel erosion</b>
Total phosphorus	Aesthetic enjoyment	natural groundwater	groundwater seeps	Erosion control regulations Septic system inspections and maintenance <b>Storm water facility designs/retrofits to optimize settling and removal of suspended silt/clay</b> Agricultural Best Management Practices
		erosion	(see turbidity)	
		livestock, wildlife	(see bacteria)	
		failing septic systems	(see bacteria)	

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# 2008 Stormwater Needs Assessment Program

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## Lower Burnt Bridge Creek

### Executive Summary

#### Study Area

This Stormwater Needs Assessment report includes the Lower Burnt Bridge Creek subwatershed in southern Clark County. The assessment area focused on unincorporated areas outside the city of Vancouver.

#### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

#### Findings

##### Watershed Conditions

The table on the following page summarizes conditions in the study area, including water quality, biological health, habitat, hydrology, and the stormwater system.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall Fecal coliform bacteria Temperature	<ul style="list-style-type: none"> <li>• Poor to very poor</li> <li>• Fails state fecal coliform bacteria standard</li> <li>• Included in Burnt Bridge Creek bacteria TMDL</li> <li>• Fails state temperature standard, except at the mouth of Cold Creek</li> <li>• Included in Burnt Bridge Creek temperature TMDL</li> </ul>
<b>Biological</b> Benthic macro-invertebrates Anadromous fish	<ul style="list-style-type: none"> <li>• Poor biological integrity.</li> <li>• Known use by Coho salmon and Winter Steelhead; Presumed presence of Coho salmon within Cold Creek.</li> <li>• No regional fish recovery priority ranking; assumed low</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria  Riparian Wetland	<ul style="list-style-type: none"> <li>• Percent forested, road density, and impervious area metrics suggest habitat is not properly functioning</li> <li>• Stream crossing density suggests properly functioning condition</li> <li>• Lacking forest except for parks</li> <li>• Several mitigation opportunities, including east of St. Johns Road at NE 54<sup>th</sup> Street, and north of Minnehaha Street</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology  Future condition	<ul style="list-style-type: none"> <li>• Peak discharges are much lower and of longer duration than a typical urban stream</li> <li>• Nearly all of the runoff in southern part is routed to drywells</li> <li>• Flat topography slows runoff rates through low gradient drainage systems</li> <li>• Impervious surface projected to be very high; impact is reduced because much runoff is sent to drywells</li> </ul>
<b>Stormwater (Unincorp areas)</b> System description  Inventory status System adequacy  System condition	<ul style="list-style-type: none"> <li>• Primarily drywells and some piped infrastructure              West of I-5: mostly drywells and some pipes              Cold Creek: mostly pipes, some drywells              East of I-5: drywells and pipes</li> <li>• Complete</li> <li>• Likely inadequate treatment</li> <li>• Much of area developed before treatment and flow control requirements existed</li> <li>• 71% of facility components in compliance with county standards at time of inspection</li> </ul>

# 2008 Stormwater Needs Assessment Program

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## Opportunities

Projects listed in the SNAP report represent only a small part of those needed to protect and restore Lower Burnt Bridge Creek. Potential project opportunities were identified based on current conditions and local program capabilities. Several opportunities exist for stormwater-related watershed improvement, including the following:

- Technical assistance visits to businesses with potential source control problems
- Coordination with other county departments and with local agencies such as Vancouver/Clark Parks & Recreation, Washington Department of Fish and Wildlife, Washington Department of Transportation, and City of Vancouver Water Resources Program to explore potential cooperative projects
- Inspection of publicly owned stormwater facilities and referral to appropriate county programs for corrective measures
- Potential capital improvement projects including drywell and bio-filtration swale retrofits
- Evaluation of potential wetland enhancement or advanced mitigation projects within tax-exempt parcels
- Promotion of riparian enhancement projects

Non-project stormwater management recommendations address areas where county programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the Lower Burnt Bridge Creek watershed include:

- Encourage the use of Low Impact Development techniques for new and re-development

## 2008 Stormwater Needs Assessment Program

**Table 5: Likely Water Quality Concerns, Sources, and Solutions for Lower Burnt Bridge Creek**

<b>Characteristic</b>	<b>Beneficial Use Affected</b>	<b>Potential Sources</b>	<b>Mechanism</b>	<b>Solutions (bold indicates direct Clean Water Program involvement)</b>
Fecal coliform bacteria	Primary contact recreation	failing septic systems	groundwater seeps	<b>Storm sewer screening for source identification and removal</b>
		livestock, wildlife, pets	overland runoff storm sewers/ditches direct access	<b>Education programs</b> Agricultural Best Management Practices Septic system inspection and maintenance
Water temperature	Salmonid spawning, rearing, and migration	vegetation removal	direct solar radiation	<b>Stormwater infiltration (when feasible) to increase baseflow</b>
		low summer flows	decreased resistance to thermal inputs	<b>Streamside Planting/vegetation enhancement/ riparian preservation through acquisition</b>
		in-line ponds	direct solar radiation	<b>Education programs</b>
Dissolved oxygen	Salmonid spawning rearing, and migration	elevated water temperature	see above	<b>Stormwater infiltration (when feasible) to increase baseflow</b>
		stagnant or low flow	dry climate cycles water withdrawals limited mixing (low gradient)	<b>Streamside planting/vegetation enhancement/ riparian preservation through acquisition</b>
		excessive algal or plant growth	elevated nutrients (overland flow or groundwater) respiration processes	

# 2008 Stormwater Needs Assessment Program

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## Rock Creek (North)/East Fork Lewis River (RM 15.75)

### Executive Summary

#### Study Area

This Stormwater Needs Assessment report includes the Rock Creek (North) and East Fork Lewis River (RM 15.75) subwatersheds in northeastern Clark County. The assessment effort focused on the unincorporated areas within these subwatersheds.

#### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

#### Findings

##### Watershed Conditions

The table on the following page summarizes conditions in the study area's two subwatersheds, including water quality, biological health, habitat, hydrology, and the stormwater system.

##### Ongoing projects and involvement

The Washington Department of Ecology is developing Total Maximum Daily Loads (TMDL) for bacteria and temperature in the East Fork Lewis River watershed.

This assessment did not identify any major projects in the study area sponsored by regional entities such as the Lower Columbia Fish Recovery Board, Clark County Legacy Lands, and Clark County Transportation Improvement Program.

There are no Clark County Clean Water Program stormwater projects in the assessment area under the 2009 - 2014 Stormwater Capital Improvement Program.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall Fecal coliform bacteria Temperature	<ul style="list-style-type: none"> <li>• Good (East Fork Lewis River (RM 15.75)); Poor to Fair (Rock Creek (North))</li> <li>• East Fork Lewis River (RM 15.75) meets fecal coliform standard year-round; Rock Creek fails the standard year-round</li> <li>• Both included in the East Fork Lewis River fecal coliform TMDL</li> <li>• Both fail temperature standard</li> <li>• Both are included in the East Fork Lewis River temperature TMDL</li> </ul>
<b>Biological</b> Benthic macro-invertebrates Anadromous fish	<ul style="list-style-type: none"> <li>• Moderate biological integrity for both East Fork Lewis River (RM 15.75) and Rock Creek (North)</li> <li>• Known use by fall Chinook and Coho, chum salmon, winter and summer steelhead (East Fork Lewis River (RM 15.75)); Coho salmon and winter steelhead (Rock Creek (North))</li> <li>• High regional recovery priority (Tier 1) for East Fork Lewis River (RM 15.75); Lower priority (Tier 2) for Rock Creek (North)</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria Riparian Wetland	<ul style="list-style-type: none"> <li>• Road density falls into Non-Functioning category (both subwatersheds)</li> <li>• Percent total impervious area (both) and percent forested (Rock Creek (North)) are marginally functioning</li> <li>• Percent forested (EFLR (15.75)), as well as stream crossing density and projected effective impervious area (both subsheds) fall into the Properly Functioning category</li> <li>• Overall shade varies at 20 to 70% (East Fork Lewis River) and 0-90% (Rock Creek (North))</li> <li>• Large woody debris recruitment potential is moderate to high for East Fork Lewis River (RM 15.75); estimated as low to high for Rock Creek (North)</li> <li>• Limited to riparian areas and stream channel floodplains, and larger areas in the Fargher Lake and Gabriel Road vicinities (Rock Creek (North))</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology Future condition	<ul style="list-style-type: none"> <li>• No detailed hydrologic assessment available for either subwatershed</li> <li>• Impervious area projected to remain at levels that do not alter hydrology if existing forest cover is retained or expanded</li> </ul>
<b>Stormwater (Unincorp. areas)</b> System description Inventory status System adequacy System condition	<ul style="list-style-type: none"> <li>• Primarily road-side ditches</li> <li>• No public stormwater facilities; limited number of private facilities</li> <li>• Complete</li> <li>• Adequate treatment is probably provided by vegetation in ditches</li> <li>• No flow control other than ditch infiltration</li> <li>• Twenty-four outfalls discharging to critical areas; all were in compliance</li> <li>• 193 public outfalls inspected for illicit discharges; none detected</li> </ul>

# 2008 Stormwater Needs Assessment Program

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## Opportunities

Projects listed in the SNAP report represent only a small part of those needed to protect and restore streams within the study area. Field work and review of existing information identified numerous projects and actions that can improve stream conditions, including the following:

- Focused stormwater outreach and education to streamside landowners based on assessment results.
- Ditch retrofits to provide water quality treatment
- Evaluation of wetland and riparian enhancement projects in areas having conservation covenants
- Evaluation of two culverts for potential modifications to reduce erosion
- Technical assistance visits to landowners with potential source control and water quality ordinance issues.
- Small or large-scale invasive plant removal and riparian restoration projects.
- Evaluation/maintenance of several clogged and undersized culverts
- Exclusion of livestock from the stream in four locations.

Non-project stormwater management recommendations address areas where CWP programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the study area include:

- Continue to coordinate with Washington Department of Ecology during East Fork Lewis River bacteria and temperature TMDL development.
- Develop a system to provide education about appropriate ditch maintenance practices to rural landowners
- Provide technical assistance to rural development projects required to implement stormwater controls
- Replace deteriorated stream name signs at road crossings.
- Continue to encourage and support riparian planting efforts by private landowners
- Consider focusing future assessments on smaller tributary streams which typically have the most severe stormwater problems

## 2008 Stormwater Needs Assessment Program

**Table 6. Known Water Quality Concerns, Sources, and Solutions for Rock Creek (North)**

Characteristic	Beneficial Use Affected	Potential Sources	Mechanism	Solutions (bold indicates direct Clean Water Program involvement)
Fecal coliform bacteria	Primary contact recreation	failing septic systems	groundwater seeps roadside ditches	<b>Storm sewer screening for source identification and removal</b> <b>Education programs</b> <b>Storm water facility designs/retrofits to optimize bacteria reduction (see Schueler, 1999)</b> Agricultural Best Management Practices Septic and sanitary sewer system inspection and maintenance
		livestock, pets, wildlife	overland runoff roadside ditches direct access	
Water temperature	Core summer salmonid habitat	vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b> <b>Streamside planting/vegetation enhancement/riparian preservation through acquisition</b> <b>Education programs</b> Pond removal or limitation Decreased water withdrawals
		ponds	direct solar radiation stagnation	
		low summer flows	decreased resistance to thermal inputs	
Turbidity	Salmonid spawning, rearing, and migration; Aesthetic enjoyment	erosion ( <i>development projects; land clearing; cropland; channel erosion</i> )	overland runoff roadside ditches channel dynamics	Erosion control regulations <b>Storm sewer system cleaning and maintenance</b> <b>Storm water facility designs/retrofits to optimize settling and removal of suspended silt/clay</b> Agricultural Best Management Practices Stream bank stabilization/rehabilitation <b>Storm water outfall/facility retrofits to reduce flow-induced channel erosion</b>

# 2008 Stormwater Needs Assessment Program

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## Salmon Creek (RM 03.83)/Cougar Creek Executive Summary

### Study Area

This Stormwater Needs Assessment report includes the Cougar Creek and Salmon Creek (RM 03.83) subwatersheds in the lower Salmon Creek watershed.

### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

### Findings

#### Watershed Conditions

The table on the following page summarizes conditions in the three study area subwatersheds including water quality, biological health, habitat, hydrology, and the stormwater system.

#### Ongoing projects and involvement

The Salmon Creek Watershed Council, Clark Public Utilities, and Ecology are actively involved in improving and protecting lower Salmon Creek and Cougar Creek through local grass-roots organizing, riparian enhancement work, and ongoing TMDL adaptive management. Clark County is also working on development and redevelopment plans in the Three Creeks Planning Area, Highway 99 Planning Area, and the WSU Agricultural Research Station, all of which lie partly or wholly within the Cougar Creek and Salmon Creek (RM 03.83) subwatersheds.

Clark County Clean Water Program (CWP) participates in the TMDL process through implementation of the Stormwater Management Program, provides water quality monitoring, and supports various local organizations working within this assessment area.

There are five CWP stormwater projects in this area under the 2009 through 2014 Stormwater Capital Improvement Program, and two major road projects in the 2008 through 2013 Transportation Improvement Program (Highway 99 – NE 99<sup>th</sup> Street to 119<sup>th</sup> Street, and NE 88<sup>th</sup> Street from Highway 99 to NE St. John's Rd).

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall  Fecal coliform bacteria  Temperature	<ul style="list-style-type: none"> <li>• Poor to Very Poor</li> <li>• Multiple segments are included in the 303(d) list of impaired water bodies</li> <li>• Both subwatersheds fail state bacteria standard</li> <li>• Both included in the Salmon Creek fecal coliform TMDL</li> <li>• Temperatures range from among the coolest (Cougar Creek and Tenny Creek) to among the warmest (Salmon Creek mainstem) within the watershed</li> <li>• Both subwatersheds will be included in Salmon Creek temperature TMDL</li> </ul>
<b>Biological</b> Benthic macro-invertebrates Anadromous fish	<ul style="list-style-type: none"> <li>• Low biological integrity</li> <li>• Known use by Coho salmon and winter steelhead (Salmon Creek mainstem); Cougar Creek inaccessible due to natural barriers</li> <li>• Medium regional recovery priority (primarily Tier 3 and Tier 4 reaches)</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria  Riparian  Wetland	<ul style="list-style-type: none"> <li>• Road density, percent forested, and percent impervious area metrics indicate habitat is not properly functioning</li> <li>• Stream crossing density metric is in the properly functioning category</li> <li>• Stream shade levels are highly variable; overall below state targets</li> <li>• Invasive plant species are extensive</li> <li>• Large woody debris recruitment potential is low to medium in SC 03.83; ranges from low to high in Cougar Creek</li> <li>• Large expanses of potential wetland in Salmon Creek floodplain and major tributaries (Suds, Tenny, LaLonde)</li> <li>• Pockets of potential wetland in Cougar Creek headwaters</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology Future condition	<ul style="list-style-type: none"> <li>• Significantly altered from historical conditions</li> <li>• Streams are very flashy; flows are indicative of unstable channel conditions</li> <li>• Impervious area projected to remain at high levels, with associated channel instability and habitat degradation</li> </ul>
<b>Stormwater (Unincorp. areas)</b> System description  Inventory System adequacy  System condition	<ul style="list-style-type: none"> <li>• Primarily piped system; among the most heavily developed areas in county</li> <li>• Nearly 600 public facilities; numerous private facilities</li> <li>• Nearly complete</li> <li>• Inadequate treatment and flow control; extensive need for system retrofits</li> <li>• Much of the area built out prior to significant stormwater regulation</li> <li>• 77 percent (Cougar Creek) and 67 percent (Salmon Creek (RM 03.83)) of public facility components in compliance with county standards at time of inspection</li> <li>• 62 outfalls discharging to critical areas; six causing significant erosion</li> <li>• 222 outfalls inspected for illicit discharges; two illicit connections found and removed</li> </ul>

# 2008 Stormwater Needs Assessment Program

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## Opportunities

Projects listed in the SNAP report represent only a small part of those needed to protect and restore streams within the study area. Field work and review of existing information identified numerous projects and actions that can improve stream conditions, including the following:

- Focused stormwater outreach and education to streamside landowners based on assessment results
- Retrofits or new facility construction for numerous stormwater outfalls and piped systems to provide flow control and/or treatment
- Repair, replacement, or installation of numerous energy dissipation devices at stormwater outfalls
- Potential large-scale stormwater control projects within the headwaters of Cougar Creek, particularly at the former WSU Agricultural Research station
- Evaluation of three potential wetland enhancement projects
- Investigation of four potential illicit discharges
- Technical assistance visits to landowners with potential source control and water quality ordinance issues
- Numerous small and large-scale invasive plant removal and riparian restoration projects
- Evaluation/maintenance of several clogged and undersized culverts
- Cleanup of over 30 sites with trash accumulation or dumping
- Evaluation of numerous potential channel rehabilitation projects

Non-project stormwater management recommendations address areas where CWP programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the study area include:

- Continue to coordinate with Washington Department of Ecology during Salmon Creek TMDL adaptive management (fecal coliform and turbidity), and TMDL development (temperature)
- Encourage and participate in intra-departmental coordination during ongoing planning efforts in the Three Creeks and Highway 99 special planning areas
- Replace deteriorated stream name signs at road crossings
- Coordinate and leverage opportunities with groups and agencies active in the Salmon Creek watershed
- Continue to encourage and support riparian planting efforts by private landowners
- Consider stormwater basin planning as a tool to better manage stormwater impacts as redevelopment occurs (a pilot project is planned for Cougar Creek)
- Continue to expand efforts to design and build runoff reduction strategies in county right-of-way
- Focus additional maintenance effort on bioswales, particularly with regard to sediment accumulation
- Focus additional maintenance effort on repairing and maintaining energy dissipaters
- Educate landowners to discourage disposal of trash and yard debris in streams or other receiving waters

## 2008 Stormwater Needs Assessment Program

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- Encourage landowners to adopt runoff reduction practices, such as disconnecting downspouts where feasible
- Focus overall management efforts on achieving a stabilized hydrologic regime and channel structure, which will increase the success of future channel and riparian rehabilitation

## 2008 Stormwater Needs Assessment Program

**Table 7: Known Water Quality Concerns, Sources, and Solutions for Cougar Creek and Salmon Creek (RM 03.83)**

<b>Characteristic</b>	<b>Beneficial Use Affected</b>	<b>Potential Sources</b>	<b>Mechanism</b>	<b>Solutions (bold indicates direct Clean Water Program involvement)</b>
Fecal coliform bacteria	Primary contact recreation	failing septic systems	groundwater seeps storm sewers	<b>Storm sewer screening for source identification and removal</b> <b>Education programs</b> <b>Storm water facility designs/retrofits to optimize bacteria reduction</b> (see Schueler, 1999) Agricultural Best Management Practices Septic and sanitary sewer system inspection and maintenance
		sanitary sewer leaks	groundwater seeps storm sewers	
		livestock, pets, wildlife	overland runoff storm sewers direct access	
Water temperature (mainstem Salmon Creek only)	Core summer salmonid habitat	vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b> <b>Streamside planting/vegetation enhancement/riparian preservation through acquisition</b> <b>Education programs</b> Pond removal or limitation
		low summer flows	decreased resistance to thermal inputs	
Total solids	Core summer salmonid habitat	erosion ( <i>development projects; land clearing; cropland; impervious surfaces; channel erosion</i> )	overland runoff storm sewers channel dynamics	Erosion control regulations <b>Storm sewer system cleaning and maintenance</b> Agricultural Best Management Practices Stream bank stabilization/rehabilitation <b>Storm water outfall/facility retrofits to reduce flow-induced channel erosion</b>

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# 2008 Stormwater Needs Assessment Program

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## Vancouver Lake/Lake River Executive Summary

### Study Area

This Stormwater Needs Assessment report includes the Vancouver Lake and Lake River subwatersheds, on the Columbia River floodplain in western Clark County.

### Intent

Stormwater Needs Assessment reports compile summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. The assessments are conducted at a subwatershed scale, providing a greater level of detail than regional WRIA or ESA plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

### Findings

#### Watershed Conditions

The table on the following page summarizes conditions in the Vancouver Lake and Lake River subwatersheds, including water quality, biological health, habitat, hydrology, and the stormwater system.

#### Ongoing projects and involvement

The Vancouver Lake Watershed Partnership (VLWP) is actively involved in improving and protecting Vancouver Lake and Lake River through support and study of long-term lake management options. Ecology is coordinating TMDL efforts in Burnt Bridge Creek and Salmon Creek, two primary tributaries to the Vancouver Lake/Lake River system. The Clark County Clean Water Program (CWP) participates in the VLWP and its technical advisory group, and supports the TMDL process through implementation of the NPDES permit and the support of various local organizations working within the Columbia River floodplain. The US Fish and Wildlife Service owns and operates extensive wildlife refuge lands within these two subwatersheds.

There are no significant Clark County capital improvement projects planned in these subwatersheds under the 2008-2013 Transportation Improvement Program or the 2009-2014 Stormwater Capital Improvement Program.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall  Nutrients Turbidity Temperature	<ul style="list-style-type: none"> <li>• Poor to Fair</li> <li>• Included on state 303(d) list of impaired water bodies for fecal coliform (both), and temperature (Lake River only)</li> <li>• Extremely high levels of phosphorus and nitrogen</li> <li>• Very poor water clarity</li> <li>• Elevated summer temperatures</li> </ul>
<b>Biological</b> Algae  Fish	<ul style="list-style-type: none"> <li>• Intense blue-green algal blooms</li> <li>• Routine summer lake closures (swimming) due to potential toxins in blooms</li> <li>• Included on state 303(d) list of impaired water bodies for multiple chemical toxins in fish tissue</li> <li>• Presumed use by fall Chinook, Coho, and winter steelhead</li> <li>• Low regional recovery priority (LCFRB Group D, Tier 4)</li> <li>• Fish community dominated by warm-water species</li> </ul>
<b>Habitat</b> NOAA Fisheries and Washington Conservation Commission criteria  Riparian  Wetland	<ul style="list-style-type: none"> <li>• Forest cover and impervious area percentage fall into the Non-Functioning category</li> <li>• Road density and crossings fall into the Functioning category.</li> <li>• Lake River has good streambank stability, but overall habitat is not properly functioning</li> <li>• Large Woody Debris recruitment potential low (Lake River).</li> <li>• Overall shade below state targets (Lake River)</li> <li>• Extensive wetland and potential wetland areas</li> <li>• Wetland restoration likely to have a high benefit for regional watershed processes</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology  Future condition	<ul style="list-style-type: none"> <li>• Highly influenced by Columbia River flows and tides</li> <li>• Large contributing area, including Burnt Bridge Creek, Salmon Creek, Whipple Creek, Flume Creek</li> <li>• Impervious area not projected to increase in Lake River subwatershed</li> <li>• Impervious area projected to increase in Vancouver Lake subwatershed</li> </ul>
<b>Stormwater (Unincorporated areas)</b> System description  Inventory status System adequacy  Condition	<ul style="list-style-type: none"> <li>• Very limited stormwater infrastructure; primarily road-side ditches</li> <li>• No public stormwater facilities, one private facility</li> <li>• 40 stormwater outfalls</li> <li>• Complete</li> <li>• Adequate control and unknown treatment</li> <li>• Most urbanized areas drain directly to the Columbia River</li> <li>• Assumed adequate; illicit discharge screening not conducted</li> </ul>

## 2008 Stormwater Needs Assessment Program

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### Opportunities

No specific stormwater management project opportunities were discovered through this assessment.

The 2004 habitat report for Lake River (R2 Resource Consultants) and 2008 Technical Foundation for Future Management of Vancouver Lake (VLWP) include priority project areas that local jurisdictions should consider in these subwatersheds. These include riparian forest restoration adjacent to Lake River, particularly on the western shore, protection of hillslope processes, and invasive species removal in both the Vancouver Lake and Lake River subwatersheds.

Non-project stormwater management recommendations address areas where county programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the Vancouver Lake and Lake River subwatersheds include:

- Vancouver Lake and Lake River restoration and protection has active support and involvement through the Vancouver Lake Watershed Partnership and ongoing TMDL work by Ecology. Support for and coordination with these efforts should be continued and enhanced whenever feasible.
- Collaboration between Clark County, City of Vancouver, and Vancouver-Clark County Parks and Recreation should be pursued for stormwater activities in parklands, and for connected stormwater systems or shared water bodies.

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# 2008 Stormwater Needs Assessment Program

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## Yacolt Creek/East Fork Lewis River (RM 21.40)

### Executive Summary

#### Study Area

This Stormwater Needs Assessment report includes the Yacolt Creek and East Fork Lewis River (RM 21.40) subwatersheds in north-eastern Clark County. Assessment effort focused on the unincorporated areas.

#### Intent

Stormwater Needs Assessment reports compile and provide summary information relevant to stormwater management, propose stormwater-related projects and activities to improve stream health, and assist with adaptive management of the county's Stormwater Management Program. Assessments are conducted at a subwatershed scale, providing a greater level of detail than regional Water Resource Inventory Area (WRIA) or Endangered Species Act (ESA) plans. Stormwater Needs Assessments are not comprehensive watershed plans or stormwater basin plans.

#### Findings

##### Watershed Conditions

The table on the following page summarizes conditions in the study area's two subwatersheds, including water quality, biological health, habitat, hydrology, and the stormwater system.

##### Ongoing Projects and Involvement

This assessment did not identify any major projects in the study area sponsored by regional entities such as the Lower Columbia Fish Recovery Board, Clark County Legacy Lands, and Clark County Transportation Improvement Program.

There are no Clark County Clean Water Program stormwater projects in the assessment area under the 2009 through 2014 Stormwater Capital Improvement Program.

The Washington Department of Ecology is developing a Total Maximum Daily Load (TMDL) for bacteria and temperature in the East Fork Lewis River.

## 2008 Stormwater Needs Assessment Program

Category	Status
<b>Water Quality</b> Overall Fecal coliform bacteria Temperature	<ul style="list-style-type: none"> <li>• Good</li> <li>• East Fork Lewis River (RM 21.40) meets standard year-round; Yacolt Creek does not meet standard during wet season</li> <li>• Both are included in the East Fork Lewis River fecal coliform TMDL</li> <li>• East Fork Lewis River (RM 21.40) fails standard; Yacolt Creek unknown</li> <li>• Both are included in the East Fork Lewis River temperature TMDL</li> </ul>
<b>Biological</b> Benthic macro-invertebrates Anadromous fish	<ul style="list-style-type: none"> <li>• Moderate to high biological integrity (Yacolt Creek); no data available for East Fork Lewis River (RM 21.40)</li> <li>• Known use by winter and summer steelhead (East Fork Lewis River (RM 21.40)); no anadromous use of Yacolt Creek</li> <li>• High regional recovery priority (East Fork Lewis River (RM 21.40)); Tier 1</li> </ul>
<b>Habitat</b> NOAA Fisheries criteria Riparian Wetland	<ul style="list-style-type: none"> <li>• Road density percentage falls into the Non-Functioning category</li> <li>• Percent total impervious area (both) and percent forested (Yacolt Creek) are marginally functioning</li> <li>• Percent forested (East Fork Lewis River (RM 21.40)), stream crossing density, and projected effective impervious area fall into the Properly Functioning category</li> <li>• Overall shade is low to moderate at 20% to 40% for both subwatersheds</li> <li>• Large woody debris recruitment potential is mostly high for East Fork Lewis River (RM 21.40); estimated as low to moderate for Yacolt Creek</li> <li>• Limited to riparian areas and stream channel floodplains</li> <li>• Suitable for wetland protection</li> </ul>
<b>Hydrology and Geomorphology</b> Overall hydrology Future condition	<ul style="list-style-type: none"> <li>• No detailed hydrologic assessment available</li> <li>• Measured flows in Yacolt Creek indicate low flashiness</li> <li>• Impervious area projected to remain at levels that do not alter hydrology if existing forest cover is retained or expanded</li> </ul>
<b>Stormwater (Unincorp. areas)</b> System description Inventory status System adequacy System condition	<ul style="list-style-type: none"> <li>• Primarily road-side ditches</li> <li>• No public or private stormwater facilities</li> <li>• Complete</li> <li>• Assumed adequate treatment</li> <li>• No flow control other than infiltration in ditches</li> <li>• No outfall screening was performed</li> <li>• Conditions largely undocumented but presumed functional</li> </ul>

## 2008 Stormwater Needs Assessment Program

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### Opportunities

Specific project opportunities were limited to two stormwater outfalls causing erosion and streambank instability.

Non-project stormwater management recommendations address areas where CWP programs or activities could be modified to better address NPDES permit components or promote more effective mitigation of stormwater problems. Management recommendations relevant to the study area include:

- Continue to participate Ecology's TMDL development for fecal coliform and stream temperature
- Look for opportunities to coordinate stormwater management activities with the Town of Yacolt
- Examine the use of small projects to improve stormwater retention and treatment in roadside ditches
- Develop a system to provide education about appropriate ditch maintenance practices to rural landowners
- Replace missing or deteriorated stream name signs

## 2008 Stormwater Needs Assessment Program

**Table 5: Likely Water Quality Concerns, Sources, and Solutions for East Fork Lewis River (RM 21.40) and Yacolt Creek Subwatersheds**

<b>Characteristic</b>	<b>Beneficial Use Affected</b>	<b>Potential Sources</b>	<b>Mechanism</b>	<b>Solutions (bold indicates direct Clean Water Program involvement)</b>
Fecal coliform bacteria	Primary contact recreation	failing septic systems or sanitary sewers	groundwater seeps	<b>Storm sewer screening for source identification and removal</b>
		livestock, wildlife, pets	overland runoff storm sewers/ditches direct access	<b>Education programs</b> Agricultural Best Management Practices Septic system inspection and maintenance
Water temperature	Core summer habitat	vegetation removal	direct solar radiation	<b>Stormwater infiltration to increase baseflow</b>
		low summer flows	decreased resistance to thermal inputs	<b>Streamside planting/vegetation enhancement / riparian preservation through acquisition</b>
		ponds	direct solar radiation	<b>Education programs</b>



