

2008 Stormwater Needs Assessment Program

Cedar Creek (East Fork)/Lower Rock Creek (South)/
Upper Rock Creek (South)
Subwatershed Needs Assessment Report

Clark County Public Works Clean Water Program

March 2009





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Otak Inc. (Jeannine Johnson)

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Acronyms and Abbreviations

B-IBI	Benthic Macroinvertebrate Index of Biological Integrity
BOCC	Board of County Commissioners
BMP	Best Management Practices
CCD	Clark Conservation District
CIP	Capital Improvement Program
CPU	Clark Public Utilities
CRFPO	Columbia River Fisheries Program Office
CWA	Clean Water Act
CWC	Clean Water Commission
CWP	Clean Water Program
DNR	Department of Natural Resources
EDT	Ecosystem Diagnostic and Treatment model
EIA	Effective Impervious Area
EIM	Environmental Information Management
EMAP	Environmental Mapping and Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FPIA	Focused Public Investment Area
FWS	Fall, Winter, Spring
GCEC	Gee Creek Watershed Enhancement Committee
GIS	Geographic Information System
GMA	Growth Management Act
GPS	Geographic Positioning System

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HPA	Hydraulic Project Approval
IDDE	Illicit Discharge Detection and Elimination
LCFEG	Lower Columbia Fish Enhancement Group
LCFRB	Lower Columbia Fish Recovery Board
LID	Low-Impact Development
LiDAR	Light Detection and Ranging
LISP	Long-term Index Site Project
LWD	Large Woody Debris
MS4	Municipal Separate Storm Sewer System
MOP	Mitigation Opportunities Project
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NTU	Nephelometric Turbidity Unit
NWIFC	Northwest Indian Fisheries Commission
ODEQ	Oregon Department of Environmental Quality
OWQI	Oregon Water Quality Index
PFC	Properly Functioning Condition
RM	River Mile
SCIP	Stormwater Capital Improvement Program
SCIPIT	Stormwater Capital Improvement Program Involvement Team
SCMP	Salmon Creek Monitoring Project
SCWC	Salmon Creek Watershed Council
SNAP	Stormwater Needs Assessment Program

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SWMP	Stormwater Management Program
SWMMWW	Stormwater Management Manual for Western Washington
TIA	Total Impervious Area
TIP	Transportation Improvement Program
TIR	Technical Information Report
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
UGA	Urban Growth Area
UIC	Underground Injection Control
USFS	U.S. Forest Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VBLM	Vacant Buildable Lands Model
VLWP	Vancouver Lake Watershed Partnership
WAC	Washington Administrative Code
WCC	Washington Conservation Commission
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
WSDOT	Washington Department of Transportation
WSU	Washington State University

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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.

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

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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

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Introduction

This Stormwater Needs Assessment includes the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds. The Clean Water Program (CWP) is gathering and assembling information to support capital improvement project (CIP) planning and other management actions related to protecting water bodies from stormwater runoff.

Purpose

The Stormwater Needs Assessment Program (SNAP), initiated in 2007, creates a system for the CWP to focus activities, coordinate efforts, pool resources, and ensure the use of consistent methodologies. SNAP activities assess watershed resources, identify problems and opportunities, and recommend specific actions to help meet the CWP mission of protecting water quality through stormwater management.

The overall goals of the SNAP are to:

Analyze and recommend the best and most cost effective mix of improvement actions to protect existing beneficial uses, and to improve or allow for the improvement of lost or impaired beneficial uses consistent with NPDES objectives and improvement goals identified by the state GMA, ESA recovery plan implementation, TMDLs, WRIA planning, floodplain management, and other local or regional planning efforts.

- Inform county efforts to address the following issues related to hydrology, hydraulics, habitat, and water quality:
 - Impacts from current or past development projects subject to lesser or non-existent stormwater treatment and flow control standards.
 - Subwatershed-specific needs due to inherent sensitivities or the present condition of water quality or habitat.
 - Potential impacts from future development.

The CWP recognizes the need to translate assessment information into on-the-ground actions to improve water quality and habitat. Facilitating this process is a key requirement for the program's long-term success.

Results and products of needs assessments promote more effective implementation of various programs and mandates. These include identifying mitigation opportunities and providing a better understanding of stream and watershed conditions for use in planning county road projects. Similar information is also needed by county programs implementing critical areas protections and salmon recovery planning under the state Growth Management Act (GMA) and the federal Endangered Species Act (ESA).

Scope

This report summarizes and incorporates new information collected for the SNAP as well as pre-existing information. In many cases it includes basic summary information or incorporates by reference longer reports which may be

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consulted for more detailed information.

SNAP reports produce information related to three general categories:

- Potential stormwater capital projects for county implementation or referral to other organizations.
- Management and policy recommendations.
- Natural resource information.

Descriptions of potential projects and recommended program management actions are provided to county programs, including the Public Works CWP and Stormwater Capital Improvement Program (SCIP), the Department of Community Development, the Department of Community Planning, and the county's ESA Program. Potential project or leveraging opportunities are also referred to local agencies, groups, and municipalities as appropriate.

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Assessment Approach

Priorities for Needs Assessment in Cedar Creek (East Fork), Lower and Upper Rock Creek (South)

Clark County subwatersheds were placed into a five year schedule for assessment using the procedures described in Prioritizing Areas for Stormwater Basin Planning (Swanson, July 2006).

For SNAP purposes, Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds are categorized as “Largely Forested Land”. Subwatersheds in this category contain significant amounts of private land zoned for industrial forestry and DNR forest lands. These areas have few county roads and probably a limited need for stormwater management. Here, stormwater management is mainly limited to mapping and evaluating the area draining to county outfalls, and possible habitat protection or restoration to mitigate for stormwater impacts to other parts of a watershed.

Assessment Tools Applied in Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South)

The SNAP utilizes a standardized set of tools for subwatershed assessment, including desktop mapping analysis, modeling, outreach activities, and a variety of field data collection. Tools follow standard protocols to provide a range of information for stormwater management. Though not every tool is applied in every subwatershed, the use of a standard toolbox ensures the consistent application of assessment activities county-wide.

Table 1 lists the set of tools available for use in the SNAP. Tools marked with an asterisk (*) are those for which new data or analyses were conducted during the course of this needs assessment. The remainder of the tools or chapters were completed based on pre-existing information.

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Table 1: Stormwater Needs Assessment Tools	
Stakeholders *	Geomorphology And Hydrology Assessment
Outreach And Involvement *	Riparian Assessment
Coordination with Other Programs	Floodplain Assessment
Drainage System Inventory *	Wetland Assessment
Stormwater Facility Inspection	Macroinvertebrate Assessment *
Review Of Existing Data *	Fish Use And Distribution
Illicit Discharge Screening	Water Quality Assessment
Broad Scale GIS Characterization *	Hydrologic Modeling
Rapid Stream Reconnaissance	Hydraulic Modeling
Physical Habitat Assessment	

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Assessment Actions

Outreach Activities

Outreach activities were limited and focused primarily on raising awareness about the SNAP effort. The following activities were completed:

- August 2008 -- press release to local media.
- March 2008 & December 2008-- articles in Clean Water Program E-Newsletter.
- April 2008 -- SNAP information distributed with Clean Water Program information at Small Farm Expo: 69 participants.
- August 2008 – information on the SNAP program distributed at 10-day Clark County Fair.
- Clean Water Program web pages updated as needed on an on-going basis; 138 visitors to the SNAP Web page and 95 unique downloads of SNAP documents (note, these figures are under reported as tracking software only records top 20 pages and documents monthly).
- A description of the SNAP is included in Clark County's annual stormwater management program plan submitted to Ecology.

Clark County Clean Water Commission members were also updated periodically on SNAP progress.

Tools available to educate in response to identified problem areas include the following:

- Site visits by clean water technical assistance staff.
- Letters detailing specific issues to individual landowners.
- General educational mailings to selected groups of property owners.
- Workshops on best management practices, including septic maintenance and mud, manure and streamside property management.
- Referral to other agencies, such as Clark Conservation District or WSU Extension, for educational follow-up.

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Coordination with Other Programs

Purpose

Coordination with other county departments and with local agencies or organizations helps to explore potential cooperative projects and ensure that the best available information is used to complete the assessment.

Coordination is a two-way relationship; in addition to bringing information into the needs assessment process, coordinating agencies may use needs assessment results to improve their programs.

Methods

The CWP maintains a list of potential coordinating programs for each subwatershed area. Coordination takes the form of phone conversations, meetings, or electronic correspondence, and is intended to solicit potential project opportunities, encourage data and information sharing, and promote program leveraging.

Potential opportunities for coordination exceeded the scope of CWP and SNAP resources; therefore, not all potentially relevant coordination opportunities were pursued. Coordination was prioritized with departments and groups thought most likely to contribute materially to identifying potential projects and compiling information to complete the needs assessment.

Results

See Analysis of Potential Projects for an overall list and locations of potential projects gathered during the needs assessment process. Projects suggested or identified through coordination with other agencies are included.

The following list includes departments, agencies, and groups contacted for potential coordination in the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) needs assessment area:

- Lower Columbia Fish Recovery Board
- Clark County Legacy Lands Program
- Vancouver/Clark Parks and Recreation

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Review of Existing Data

Data and information review is incorporated throughout this report in pertinent sections. A standardized list of typical data sources created for the overall SNAP effort is supplemented by subwatershed-specific sources as they are discovered. Data sources consulted for this report include, but are not limited to those listed below:

- LCFRB Habitat Assessments
- LCFRB Workplan / Project List
- Salmon Recovery Plan
- Ecology 303D (list)
- Ecology EIM Data
- Clark County Consproj GIS Layer (conservation projects)
- Clark County 6-year and 20-year TIP
- Clark County Mitigation Opportunities Project
- Clark County 2005 Subwatershed Characterization
- Clark County 2004 Stream Health Report

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Broad-Scale GIS Characterization and Metrics

The broad-scale characterization is a GIS-based exercise providing an overview of the biophysical setting for each subwatershed, background information for use in implementing other SNAP tools, and identification of potential acquisition or project sites. GIS data describes many subwatershed characteristics such as topography, geology, soils, hydrology, land cover, land use, and GMA critical areas. A standard GIS workspace including shape files for over 65 characteristics forms the basis for the characterization.

GIS data are generally used as a tool to complete the report and not presented in the report itself. Summary metrics are taken from existing reports and data; for example, Wierenga (2005) summarized many GIS characteristics for Clark County subwatersheds.

Some of these characteristics are described in greater detail in later sections.

The characterization includes three components:

- A set of four standard map products, as paper maps for SNAP use,
- A summary table of selected subwatershed-scale metrics,
- A brief narrative including comparison of metrics to literature values, conclusions about general subwatershed condition and potential future changes, and potential mitigation or improvement site identification.

Map Products

Four standard SNAP map products are: 1) Stormwater Infrastructure and Hydrologic Soil Groups, 2) Critical Areas information, 3) Vacant Buildable Lands within UGAs, and 4) Orthophoto. These maps are printed out for tabletop evaluations.

General Conditions and Subwatershed Metrics

General Geography

The Rock Creek (South) study area (including Cedar Creek) is in mountainous terrain near the eastern boundary of Clark County, in East Fork Lewis River watershed (Figure 1). The study area comprises three subwatersheds; Cedar Creek (East Fork), Upper Rock Creek (South), and Lower Rock Creek (South). Part of the basin is outside Clark County, in Gifford Pinchot National Forest in Skamania County, and not part of this study. The area is almost entirely commercial forest in state forest lands, with smaller private forest lots and 20 acre zoned residential land.

Topography

The Rock Creek study area is Western Cascade Mountain valleys cut into volcanic rock with a small valley (Dole Valley) forming along the lower half of Rock Creek. The highest mountain tops are 4,500 feet on the eastern basin boundary and about 2,000 feet on the western boundary. Dole Valley is at an elevation of about 800 to 1,000 feet above sea level. Rock Creek and its

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tributaries generally lack well formed floodplains and form canyons in some areas.

Geology and Soils

The Rock Creek study area is underlain by two principal geologic units, Oligocene volcanic andesite lava underlies most of the basin with Dole valley underlain by Ice Age sedimentary rock deposits. Alluvial deposits occur along stream channels.

Soils formed on the volcanic andesite lavas and glacial deposits are generally well-drained mountain soils belonging to the Kinney Series and Olympic Series.

Hydrology

The Rock Creek study area hydrologic framework is determined by geology and topography. Mountain streams are generally a higher gradient and have little or no floodplain. A floodplain is present along portions of Rock Creek in Dole Valley and alluvium appears to be present along lower parts of Cedar Creek and Rock Creek above Dole Valley.

No stream gauge data is available for Rock Creek (South).

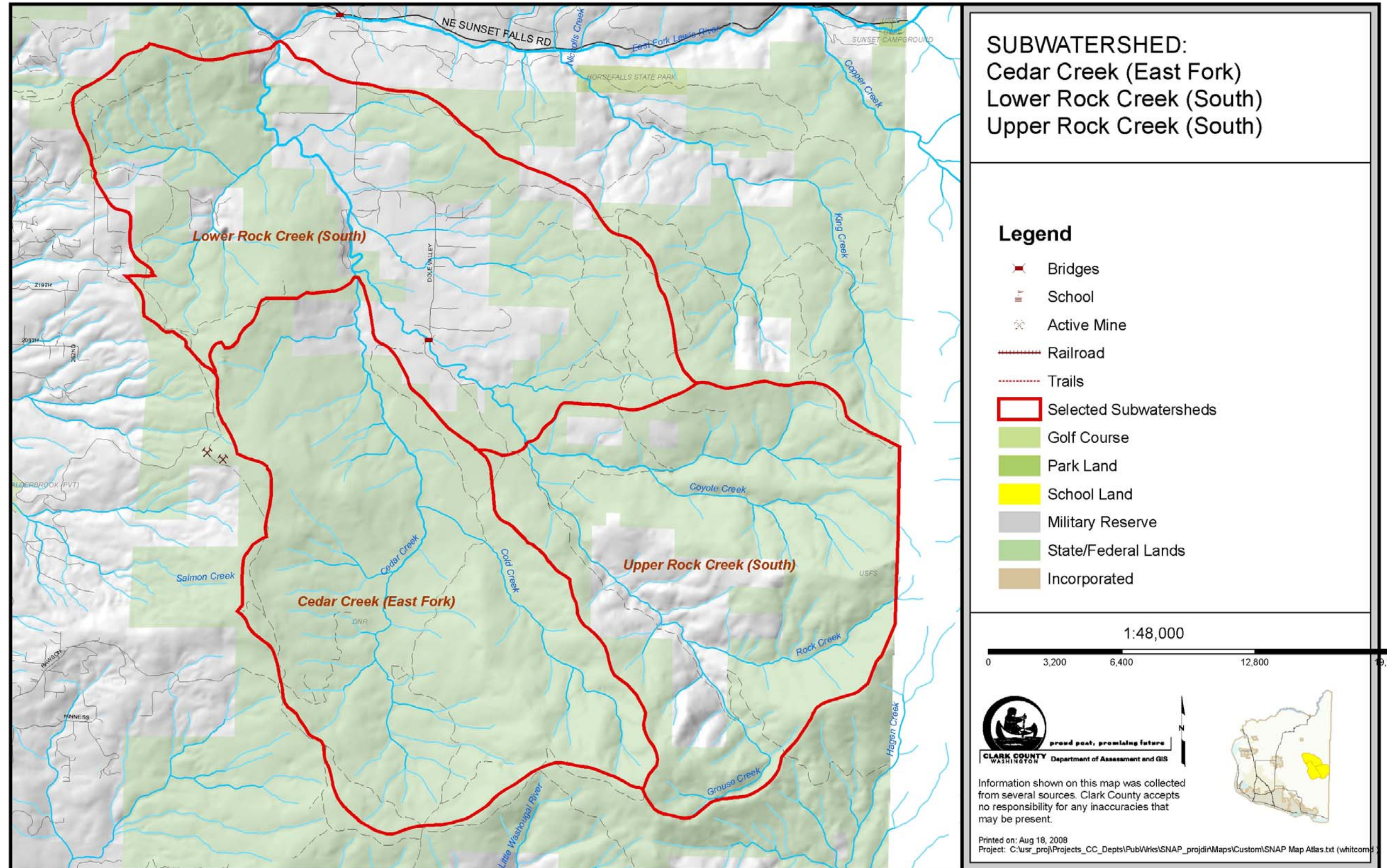


Figure 1: Subwatershed Map: Cedar Creek (East Fork), Lower Rock Creek (South), Upper Rock Creek (South)

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Subwatershed Metrics

Subwatershed scale metrics provide a simple way to summarize overall conditions. Metrics are calculated from Landsat land cover analysis and current GIS data. Benchmarks for properly functioning and not properly functioning, are based on NOAA fisheries standards for salmon protection and restoration (1996 and 2003).

Overall, these metrics suggest that Rock Creek and Cedar Creek have mostly functioning stream habitat (Table 2).

Table 2: Watershed Scale Metrics					
Metric	Upper Rock Creek (South)	Cedar Creek (East Fork)	Lower Rock Creek (South)	Functioning	Non-functioning
Percent Forested (2000 Landsat)	85	88	85	> 65 %	< 50 %
Percent TIA (2000 Landsat)	5	5	5	< 5 %	> 15 %
Road Density 2007 data (miles/mile ²)	1.4	1.6	3.8	< 2	> 3
Stream Crossing Density (crossings per stream mile)	0.6	0.4	1.1	< 3.2/mile	> 6.4/mile
Percent EIA estimated from the Comprehensive Plan	0	0	0.2	< 10 %	> 10 %

Forest Cover

The proportion of a watershed in forest cover is known to have a profound influence on watershed processes. Forest cover estimates are taken from a report summarizing land cover for Clark County (Hill and Bidwell, January 2003). Research in the Pacific Northwest has shown that when forest cover declines below approximately 65 percent, watershed forming processes become degraded (Booth and Jackson, 1997). These include reducing riparian shade, less wood debris delivery to streams, increased stormwater runoff, and increased fine sediment delivery due to mass wasting.

The Rock Creek study area is largely forest tracts in various stages of growth that range from recently cleared to mature forest. Little area is cleared for pasture or residential use.

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TIA (Total Impervious Area)

Total impervious area is one of the most widely used indicators of urbanization and coincident watershed degradation (Center for Watershed Protection, March 2003). Total impervious areas are estimated from land cover data in Hill and Bidwell (January 2003). While various organizations and publications categorize stream condition based on TIA, the NOAA fisheries standard is less than five percent as fully functional and greater than 15 percent as non-functioning. Impervious area estimates from Hill and Bidwell (March 2003) tend to be higher than expected for forested areas because clear cut areas can incorrectly be categorized as forested urban land cover.

Road Density

Road density, including all public and private roads, is an easily calculated development measure. Based on criteria set by NOAA Fisheries to protect salmon habitat, Lower Rock Creek (South) is slightly within the non-functioning (>3 road miles/mi²) category. The remaining portions of the study area are functional, having less than two road miles/mi².

Stream Crossing Density

Stream crossing densities are easily measured using available road and stream channel data. The salmon protection standard considers larger fills over 60 feet wide, which would be approximately five to ten foot high road fill. Rock Creek study area's stream crossing density of 0.4 to 1.1 crossings per stream mile, places it in the functioning category (<3.2 crossings/stream mile) under the NOAA Fisheries criteria.

Future Effective Impervious Area

Effective impervious area is the amount of impervious area that actually drains to a water body. Depending on factors such as soil types and level of development, effective impervious area is about half (lower intensity development) to almost equal (high intensity development) the TIA value.

The 2008 Comprehensive Plan guides development for the next few years and when used to estimate effective impervious area, it can provide a metric for potential hydrologic impacts due to expected development. Virtually no future EIA changes should be seen in Rock Creek and its tributaries because the area is zoned forest and is outside the Urban Growth Area (UGA).

Estimated Channel Stability Based on Forest Cover and EIA

In a recent publication by Booth, Hartley, and Jackson (June 2002), a relationship between forest and percent EIA was presented as a graphic (Figure 2). According to this figure, streams in the Rock Creek study area should have predominantly stable channels under current and future conditions.

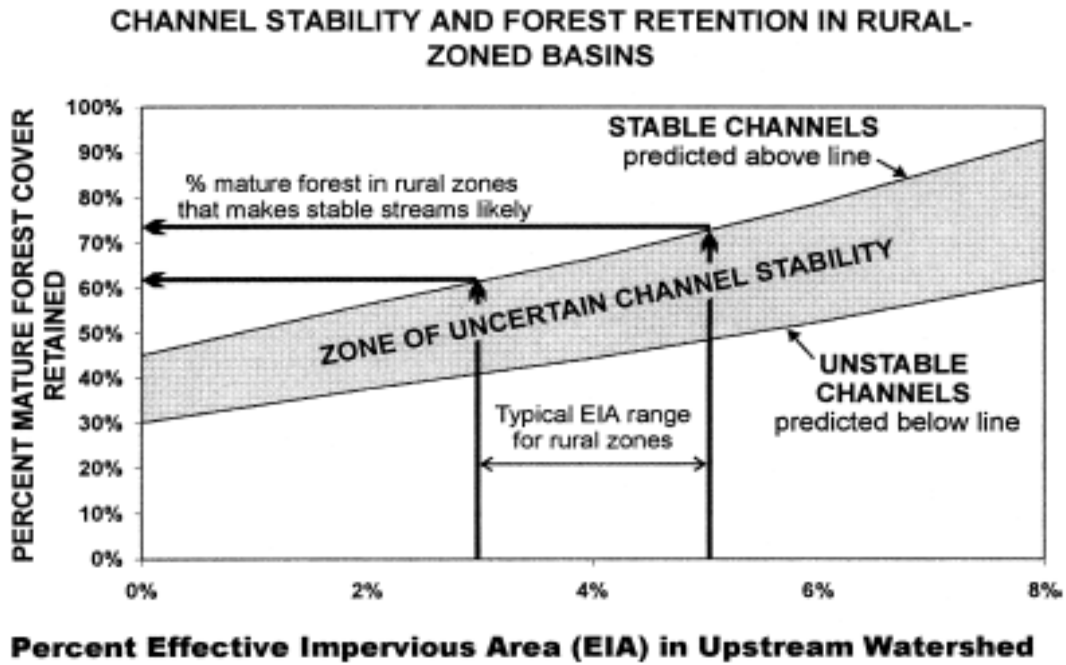


Figure 2: Channel stability in rural areas (Booth, Hartley, and Jackson, June 2002).

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Water Quality Assessment

The Water Quality Assessment summarizes and references available water quality data from the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds. A description of applicable water quality criteria is included, along with discussions of beneficial use impacts, likely pollution sources, and possible implications for stormwater management planning.

Water Quality Criteria

For a full explanation of current water quality standards see the Ecology website at:

<http://www.ecy.wa.gov/programs/wq/swqs/index.html>

Under state water quality standards, the East Fork Lewis River and all tributaries above river mile (RM) 24.60 (including the three subwatersheds in this assessment) are to be protected for the designated uses of: Core summer salmonid habitat; extraordinary primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WAC 173-201A-600 and Table 602).

Table 3 summarizes currently applicable water quality criteria for the assessment area.

Table 3: Applicable Water Quality Criteria	
Characteristic	Criteria
Temperature	≤ 16.0 °C (60.8 °F)
Dissolved Oxygen	≥ 9.5 mg/L
Turbidity	Shall not exceed 5 NTU over background when background is 50 NTU or less.
pH	6.5 – 8.5 units
Fecal coliform bacteria	Geometric mean fecal coliform concentration not to exceed 50 colonies/100mL, and not more than 10 percent of samples exceeding 100 colonies/100mL.
Aesthetics	Aesthetic values must not be impaired by the presence of materials or their effects, which offend the senses of sight, smell, touch, or taste.
Toxics	Toxic substances shall not be introduced, which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health.

Source: Washington Department of Ecology (<http://www.ecy.wa.gov/programs/wq/swqs/index.html>)

303(d) Listed Impairments

The 2008 list of impaired waters may be found on the Ecology website at:

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<http://www.ecy.wa.gov/programs/wq/303d/index.html>

Lower Rock Creek (South) is Category 5 listed for temperature and fecal coliform bacteria on the 2008 303(d) list thus requiring a state TMDL. As tributaries to listed segments, all three subwatersheds are included in ongoing TMDL development for temperature and fecal coliform in the East Fork Lewis River.

Clark County Stream Health Report

In 2004, the CWP compiled available data and produced the first county-wide assessment of general water quality.

While stream data were available for Cedar Creek (East Fork) or for Upper Rock Creek (South), the report utilized a simple predictive model to assign probable stream health. Based on the amount of forested and developed area within these subwatersheds, their probable health score was good to excellent.

Based on limited available datasets for general water quality, fecal coliform, and benthic macroinvertebrates, the Lower Rock Creek (South) subwatershed had good stream health.

The 2004 Stream Health Report may be viewed on the county website at:

<http://www.clark.wa.gov/water-resources/stream.html>.

Available Data

Water quality data are limited for all three subwatersheds, consisting primarily of stream temperature and bacteria data collected by Ecology in 2005 and 2006 during TMDL development. Complete data and available summaries for TMDL development may be viewed on the Ecology website at:

<http://www.ecy.wa.gov/programs/wq/tmdl/EForkLewis/index.html>

Data and information sources reviewed or summarized as part of this water quality characterization are listed in Table 4.

Table 4: Data and Information Sources	
Source	Data and/or Report
Ecology	East Fork Lewis River TMDL technical study for temperature and bacteria
Clark County Clean Water Program	2004 Stream Health Report and draft reports

Water Quality Summary

Ecology collected instream flow and fecal coliform data from Station 27-RCS-3.9 (Rock CK S @ Dole Valley Road) during data collection for the East Fork fecal coliform TMDL. Continuous temperature data were also collected from

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Station 27-RCS-3.9 (Instream Temperature (Rock Ck S RM03.9)) in this assessment area as part of the East Fork temperature TMDL.

Clark County has one historical monitoring station in the assessment area. Station RCS050 is at the same location as the above Ecology stations and was utilized for instream temperature and benthic macroinvertebrate sampling in 2004 under the LCFRB Watershed Characterization.

Fecal Coliform Bacteria

Based on 31 samples (15 wet seasons and 16 dry seasons), Rock Creek (South) at Station 27-RCS-3.9 met state standards for fecal coliform bacteria during both dry and wet season sampling.

During a dry period sampled during 2005, the Rock Creek (South) station carried approximately two percent of the bacteria load measured in the East Fork watershed. During a rain event sampled in 2005, the approximate load was less than one percent of the total.

Water Temperature

Temperature logging at Station 27RCS03.9 indicated that the 7-Day Average Maximum temperature was among the cooler measured within the East Fork. However, the station exceeded current state standards.

Stream Health

The most complete predictor of current stream health in the study area may be the simple land-use model utilized by the CWP for the 2004 Stream Health Report. Based on that model, it is likely that water quality in all three subwatersheds is relatively unimpaired by pollutants. The actual extent of overall water quality impairment is unknown; temperature exceedences are likely the most pressing concern, though available data indicates standards are exceeded only slightly.

Implications for Stormwater Management

Table 5 lists general water quality concerns in the assessment area and potential solutions for each. Solutions listed in bold indicate areas where CWP activities can have a positive impact. It should be noted that CWP activities, though important, are not likely to achieve water quality improvement goals on their own. Other county departments, local agencies, and not least of all, the public, must all contribute to water quality improvement.

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

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

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Drainage System Inventory

Clark County's drainage system inventory resides in the StormwaterClk GIS database and is available to users through the county's Department of Assessment and GIS, or viewable on the internet through the Digital Atlas located at:

<http://gis.clark.wa.gov/imf/imf.jsp?site=digitalatlas&CFID=56651&CFTOKEN=98300052>

Drainage system inventory is an ongoing CWP work effort focused on updating the StormwaterClk database to include all existing stormwater drainage infrastructure.

The work effort during 2008 in the Cedar (East Fork)/Lower Rock Creek (South)/Upper Rock Creek (South) subwatersheds focused on identifying and mapping previously unmapped discharge points and stormwater conveyance. Table 6 indicates the number of features previously inventoried in StormwaterClk prior to 2008 SNAP work, and the number of features added to the database as a result of 2008 SNAP and mapping project implementation.

The drainage system inventory for these three subwatersheds is generally completed. Inventory is ongoing in 2009 as part of a county-wide inventory update.

Table 6: Drainage System Inventory Results, Cedar (East Fork)/Lower Rock Creek (South)/Upper Rock Creek (South)		
Database Feature Category	Previously Inventoried	Added to Database during 2008
Inlet	0	0
Discharge Point (outfall)	0	72
Flow Control	0	0
Storage/Treatment	0	0
Manhole	0	0
Filter System	0	0
Channel	0	186
Gravity Main	0	69
Facilities	2	0

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Stormwater Facility Inspection

The stormwater facility inspection process includes two components:

- A public stormwater facility inspection using state and county standards.
- An off-site inspection to check for problems such as downstream bank erosion.

Component 1: Public Stormwater Facility Inspection

Based on the county's StormwaterCLK database, as of October 2008, there were no mapped public stormwater facilities in the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds.

Component 2: Offsite Assessment

Based on the County's StormwaterCLK database, as of June 2008, there were no mapped outfalls in the assessed subwatersheds that discharged into critical areas.

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Illicit Discharge Detection and Elimination Screening

Illicit discharge screening was not conducted.

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Stream Reconnaissance and Feature Inventory

A rapid stream reconnaissance and feature inventory was not conducted.

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Physical Habitat Assessment

Purpose

Physical habitat assessments provide direct measurements of stream channel morphology, habitat conditions, and riparian conditions for specific stream reaches. This information can be used for planning projects and interpreting hydrologic, macroinvertebrate, and geomorphologic information at reach and subwatershed scales.

Methods

Physical habitat measurements were made for four segments of Rock Creek (South) (between RM 0.5 to RM 6.5) by S.P. Cramer (January 2005) for the Lower Columbia Fish Recovery Board. The project followed modified USFS Level II protocols. No physical habitat survey information is available for Cedar Creek; it is estimated to double the flow of Rock Creek.

Results

The S.P. Cramer report includes a good narrative summary of the habitat survey results, including figures and tables, some of which are presented here. The full report may be found on the CWP website at:

<http://www.clark.wa.gov/water-resources/documents-monitoring.html#strmac>

The Rock Creek reach has a moderate to high gradient and its surveyed segments' habitat types consist of 60 percent to 85 percent riffles, 13 percent to 37 percent pools, with pool tailouts and glides usually accounting for less than 3 percent each.

Information in the SP Cramer report noted that the four surveyed Rock Creek streambed segments are primarily cobble, gravel, and boulders with bedrock and sand at less than 15 percent each. Embeddedness for the four surveyed Rock Creek stream segments is generally rated low with 79 percent to 100 percent in the 0 percent to 25 percent embedded.

Table 7 summarizes habitat evaluations based on Washington Conservation Commission and NOAA Fisheries Properly Functioning Condition standards (from Cramer, 2005, p. 217).

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Table 7: Rock Creek (South) Habitat Ratings- Washington Conservation Commission and NOAA Fisheries Properly Functioning Conditions

Parameter	Reach 1		Reach 3		Reach 4		Reach 5	
	WCC ¹	PFC ²	WCC ¹	PFC ²	WCC ¹	PFC ²	WCC ¹	PFC ²
% Pool by Surface Area	Fair		Fair		Poor		Poor	
Pool Frequency	Poor	NPF	Poor	NPF	Poor	NPF	Poor	NPF
Pool Quality		PF		PF		PF		PF
LWD		NPF		NPF		NPF		NPF
Substrate		PF		PF		PF		PF
Streambank Stability	Good	PF	Good	PF	Fair	At Risk	Fair	At Risk
Barriers	Good	PF	Good	PF	Good	PF	Good	PF

¹ Available ratings: good; fair; poor

² Available ratings: properly functioning; at risk; not properly functioning

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Geomorphology and Hydrology Assessment
A geomorphology assessment was not conducted.

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Riparian Assessment

Purpose

The riparian assessment characterizes existing conditions based on available data, to identify general riparian needs and potential areas for rehabilitation projects. Riparian enhancement projects, such as installation or protection of native plantings within riparian areas, can provide for increased future shading and woody debris recruitment, which can further provide an opportunity for stormwater-related watershed improvement.

The need for riparian rehabilitation tends to be widespread and exceeds the scope and resources of the CWP mission of stormwater management. Therefore, potential riparian projects are usually referred to agencies such as the LCFRB, Lower Columbia Fish Enhancement Group (LCFEG), Clark Public Utilities, Fish First, the Washington State University (WSU) Watershed Stewards Program, and the Clark Conservation District for possible implementation.

This section focuses on opportunities likely to be considered by the CWP SCIP, which are primarily on publicly owned lands within high priority salmon-bearing stream reaches as defined by LCFRB salmon recovery priorities.

Method

Where possible, the assessment is based on GIS data from existing reports, primarily the Habitat Assessment report prepared for the Lower Columbia Fish Recovery Board (S.P. Cramer and Associates, 2005). This report applies primarily to salmon-bearing stream reaches, and therefore, does not provide information for many smaller streams. Results are based on aerial photo interpretation using Washington Forest Practices Board methods for LWD delivery and channel shade estimates.

In streams where no data exists from the LCFRB characterization, an examination of current orthophotographs is used to make a general assessment of riparian condition and identify areas where restoration or preservation projects may be appropriate.

Many riparian project opportunities are discovered through other SNAP activities, including Rapid Stream Reconnaissance feature inventories and geomorphological assessments. Potential projects discovered through these activities are discussed in the respective sections, and most are included on a final list for referral to outside agencies.

The 2005 LCFRB Habitat Assessment report was also reviewed for specific project opportunities within each subwatershed.

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Results

Results are based primarily on the 2005 LCFRB Habitat Assessment for the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds. The full characterization report is available on the Clark County website at:

<http://www.clark.wa.gov/water-resources/documents.html#mon>

For areas within the subwatersheds not included in the habitat assessment, LWD recruitment potential and shade rating analyses were based on a qualitative review of 2007 orthophotographs.

At the subwatershed scale, the LCFRB rated the riparian conditions within Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) as moderately impaired.

Riparian (Large Woody Debris (LWD) Delivery)

Figure 3 shows Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds LWD delivery potential.

The survey included the mainstem of the Rock Creek (South) and a portion of Coyote Creek, a tributary to Rock Creek (South). The mainstem of Rock Creek (South) ranges from low to high LWD recruitment potential along the approximate six-mile distance surveyed. The areas of lower LWD recruitment are due to much of the vegetation in the immediate vicinity of Rock Creek (South) being comprised of hardwoods and young conifers. The surveyed reach of Coyote Creek primarily consists of areas with low LWD recruitment levels. Upstream of the surveyed reach on Coyote Creek, LWD recruitment appears to range from low to moderate based on orthophotography review.

Within the Cedar Creek (East Fork) subwatershed, the surveyed area includes the majority of Cedar Creek and a portion of one its tributaries, Cold Creek. The surveyed portion of Cedar Creek indicated a range of low to high LWD recruitment levels. Areas with lower levels of recruitment were due to riparian area vegetation consisting primarily of hardwoods and young conifers. The uppermost reaches of Cedar Creek, not covered by the survey, appeared to have low to moderate levels of LWD recruitment potential based on orthophotography estimates. LWD delivery potential in the surveyed and non-surveyed areas of Cold Creek appears to be moderate to high.

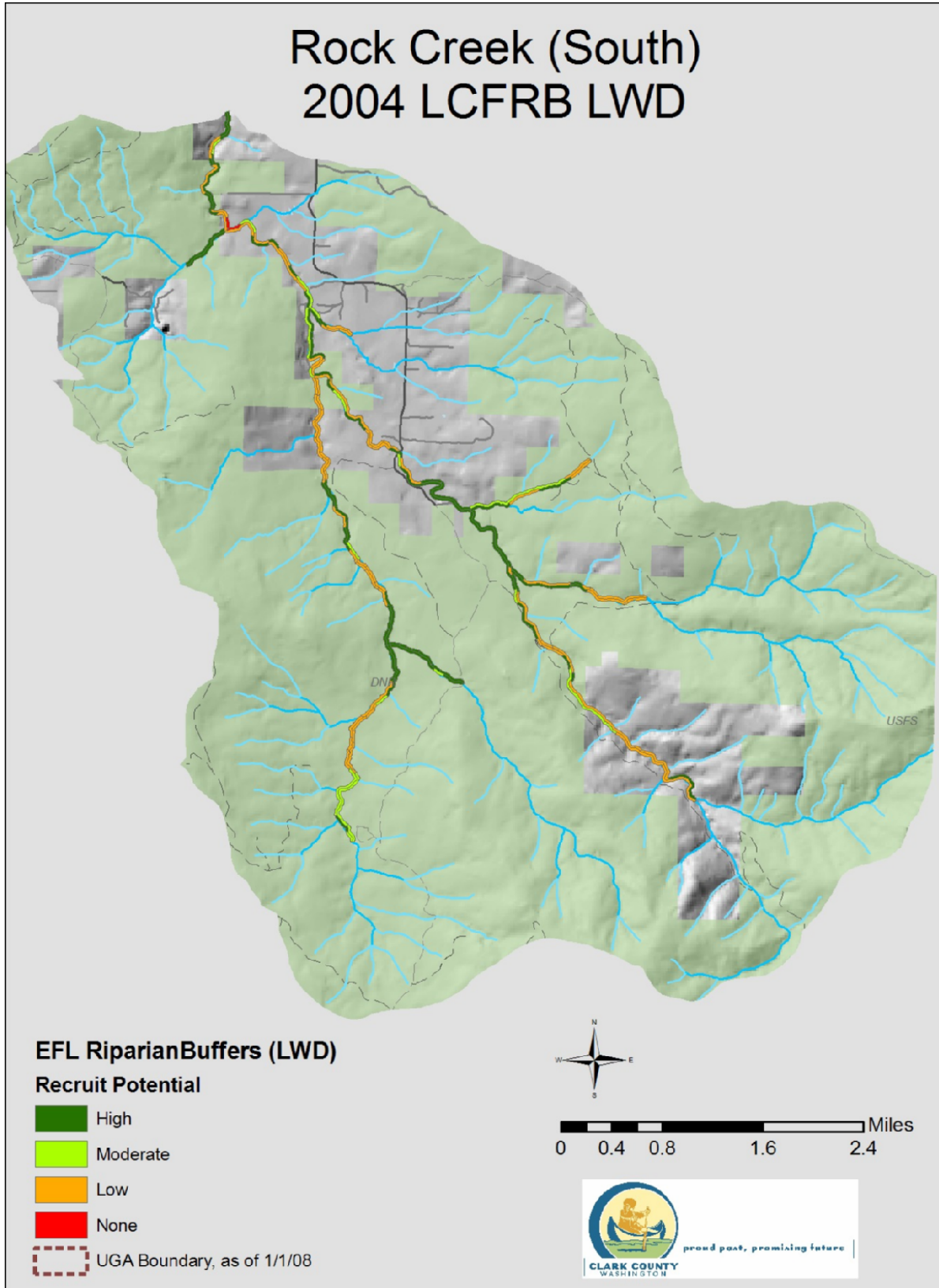


Figure 3: Lower Rock Creek (South), Upper Rock Creek (South) and Cedar Creek (East Fork) LWD Recruitment Potential (adapted from S.P. Cramer and Associates, 2005)

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Shade

Figure 4 includes the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds' shade ratings from the 2005 LCFRB Habitat Assessment. Shade levels along the Rock Creek (South) mainstem transition from 20 to 40 percent in the lower reaches, to 70 percent to 90 percent in the upper reaches. Coyote Creek subwatershed has shade ratings of 40 percent to 70 percent within the surveyed lower reach, transitioning to an estimated 20 percent to 40 percent shade rating in the upper non-surveyed reaches.

Within the Cedar Creek (East Fork) subwatershed, shade levels on both the surveyed and non-surveyed portions of the mainstem of Cedar Creek were 70 percent to 90 percent. Shade ratings in the surveyed and non-surveyed areas of Cold Creek appear to range from 70 percent to greater than 90 percent, based on orthophotography.

Management Recommendations

Overall recommended management activities for the assessment area include riparian forest restoration in areas impacted by logging/forest roads and residential use, protection for hillslope conditions through road management and harvest requirements as stipulated by Habitat Conservation and protection of riparian corridors and stream channels.

Potential Projects

Recommended restoration projects in the Rock Creek (South) subwatershed include patch cutting of riparian hardwoods and conifer planting in areas dominated by hardwoods or where clear-cutting or historical fires have impacted the riparian zone.

Riparian restoration projects in the Cedar Creek (East Fork) subwatershed include plantings in the lower reaches of Cedar Creek and Cold Creek within riparian areas impacted by clear-cuts.

Specific priority project areas listed in the S.P. Cramer and Associates (2005) report are the areas impacted by residential development within the lowest reaches of Rock Creek (South), and downstream of the Dole Valley Road crossing. Additionally, replanting of clear-cut areas on the west bank of lower Cedar Creek (East Fork) and on Rock Creek (South) (upstream of the Dole Valley Road crossing) is also listed as priority project areas.

Although there were several priority project areas within the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds listed for restoration within the S.P. Cramer and Associates (2005) report, this assessment did not discover any specific potential project opportunities likely to be suitable for consideration by the CWP SCIP.

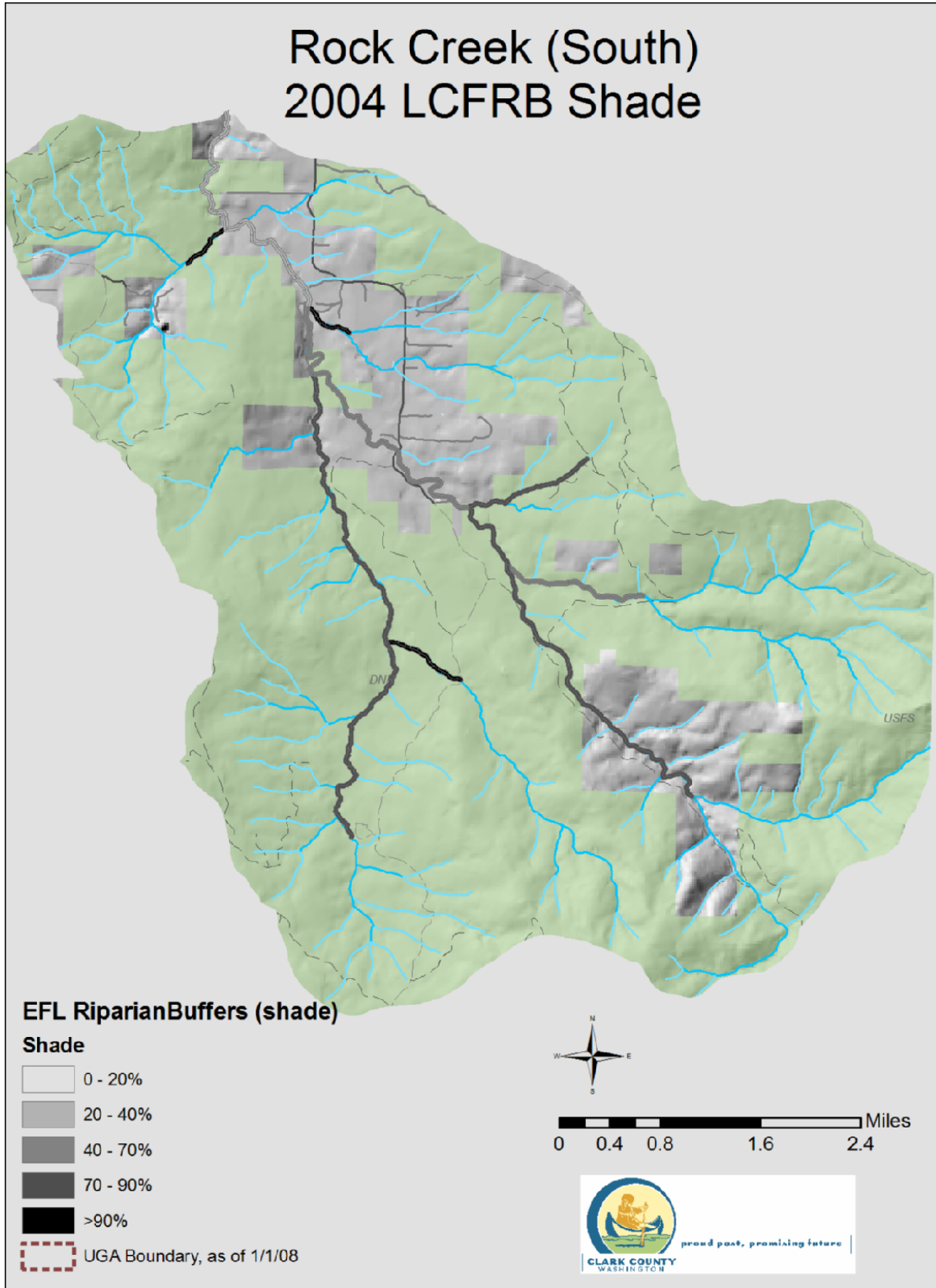


Figure 4: Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) Shade Values (adapted from S.P Cramer and Associates, 2005)

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Floodplain Assessment

A floodplain assessment was not conducted.

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Wetland Assessment

Purpose

Wetlands perform important hydrologic, water quality, and habitat functions. The primary reasons for the wetlands assessments are to:

- Describe wetland conditions related to how they influence hydrology, water quality, and habitat;
- Identify priority potential wetland projects to mitigate for stormwater impacts; and
- Make management recommendations for wetlands related to stormwater management.

A primary objective of the wetland assessment is to identify sites containing modestly sized, degraded or ditched wetlands where minor construction projects can be used to improve wetland hydrology. Improved wetland function can reduce peak storm discharges, increase groundwater recharge, and improve habitat through increasing biodiversity, species population health, and organic input.

Methods

The assessment includes review of existing GIS data for wetlands. Primary information sources are the county wetlands atlas, Draft Watershed Characterization of Clark County Version 3 (Ecology, 2007), and personal communication with other county programs.

Stream Reconnaissance and Geomorphology/Hydrology assessments may also discover potential wetland-related project opportunities. Potential project sites have been reviewed and verified through field reconnaissance and are detailed in the results section below.

Tax-exempt parcels often indicate the presence of publicly owned land, schools, or churches where large parcel sizes and opportunities for leveraging may exist. Potential wetlands were overlaid with tax-exempt parcels and with county vacant buildable lands model (VBLM) information to identify possible wetland enhancement opportunities.

Results

Figure 5 shows potential wetland areas within the Cedar Creek (East Fork), Lower Rock Creek (South), and tributary Upper Rock Creek (South) subwatersheds based on data from the county wetlands atlas, including the Clark County wetland model, National Wetlands Inventory, and high-quality wetlands layer.

The Lower and Upper Rock Creek (South) subwatersheds have large expanses of potential wetland areas associated with Rock Creek and its lower tributaries' riparian corridors and floodplains.

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In the Cedar Creek (East Fork) subwatershed, pockets of potential wetlands are primarily associated with stream channel floodplains of Cedar Creek and its tributary, Cold Creek.

Although there were many areas of potential wetlands within the study area subwatersheds, review of the wetland inventories and studies did not identify any specific project opportunities within publicly held or tax-exempt lands within the assessment area.

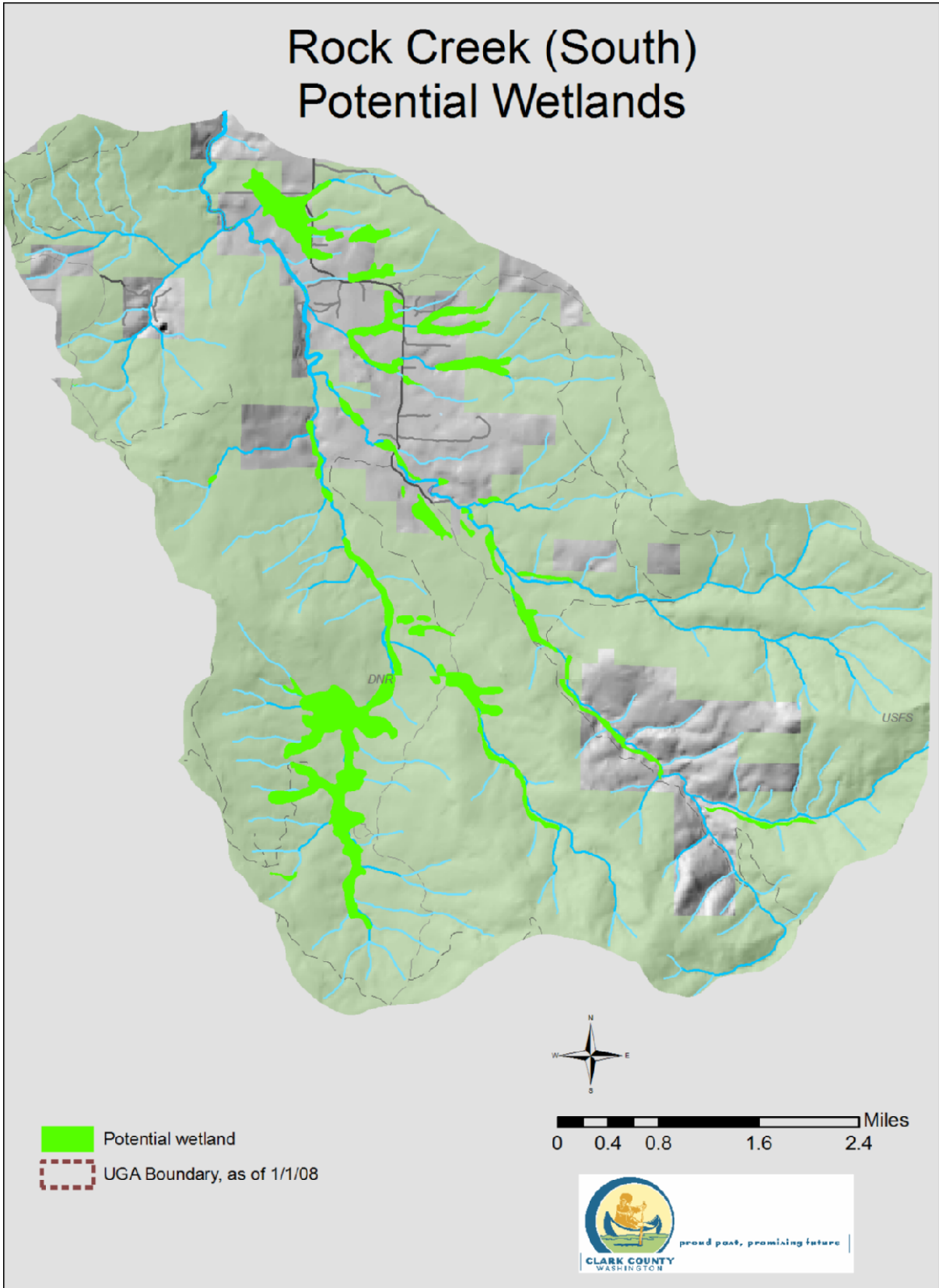


Figure 5: Lower Rock Creek (South), Upper Rock Creek (South) and Cedar Creek (East Fork) Potential Wetlands

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Draft Watershed Characterization

The Washington Department of Ecology completed a prototype watershed assessment to assist in planning wetland and riparian habitat restoration and preservation projects. The Draft Watershed Characterization (Washington Department of Ecology, 2007) may be found on the Clark County website at:

<http://www.clark.wa.gov/mitigation/watershed.html>

Results pertaining to the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds are summarized below.

The entire study area is within the rain-on-snow and snow-dominated mountainous unit. This unit is characterized by rain-on-snow and snow dominated precipitation, generally shallow groundwater flow patterns, consolidated bedrock, and steep topography (Ecology, 2007).

Figure 6 depicts priority areas for protection and restoration of hydrologic processes county-wide based on an analysis of the relative importance and level of alteration in each subwatershed.

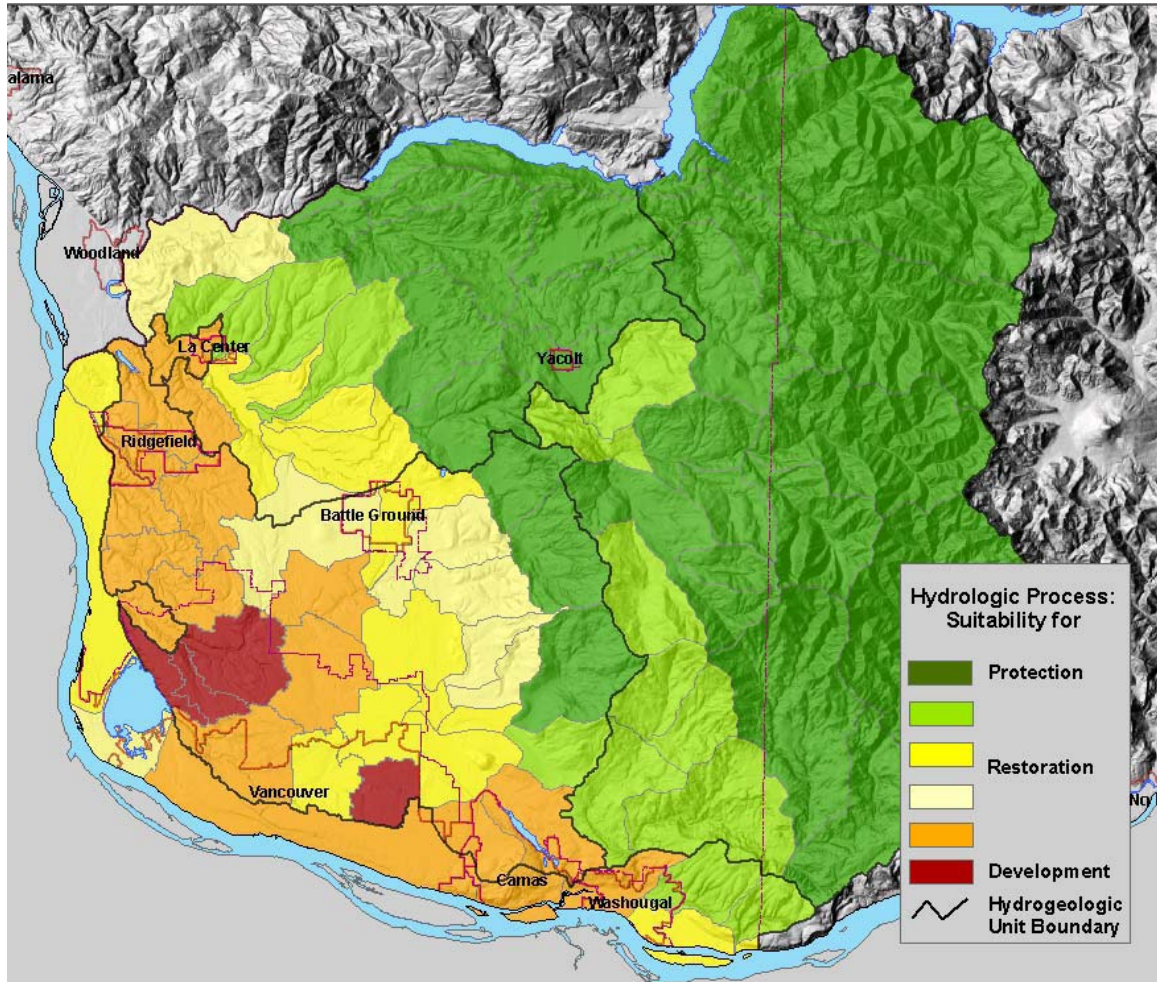


Figure 6: Priorities for suitability of areas for protection and restoration for the hydrologic process (from Draft Watershed Characterization of Clark County (Ecology, 2007)).

In general, green areas have higher levels of importance for watershed hydrologic processes and limited alteration and should be considered for protection. Yellow areas have a higher level of importance for watershed processes and a higher level of alteration and should be considered for restoration unless watershed processes are permanently altered by urban development. Orange to red areas have lower levels of importance for watershed processes and higher levels of alteration and should be considered as more suitable for development. Because orange areas represent a transition from restoration areas, planning measures employing both restoration and appropriately sited development should be considered (Ecology, 2007).

Protection (“green”) is the focus for the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds. According to the Draft Watershed Characterization, protection within these subwatersheds suggests consideration of measures to protect watershed hydrologic processes by maintaining forest cover. Additionally, restoration projects should be undertaken

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because they should have a higher level of potential success relative to other more highly altered units in the county (Ecology, 2007).

Potential Projects

This assessment did not discover any specific potential projects to improve wetland hydrology within the assessment area.

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Macroinvertebrate Assessment

Purpose

The Benthic Macroinvertebrate Index of Biological Integrity or B-IBI (Karr, 1998) is a widely used measurement of stream biological integrity or health based on macroinvertebrate populations. Macroinvertebrates spend most of their lives in the stream substrate before emerging as adults. While in the stream, they are subject to impacts from continuous and intermittent pollutant sources, hydrology and habitat changes, and high summer water temperatures.

The B-IBI score is an index of ten metrics describing characteristics of stream biology, including: tolerance and intolerance to pollution, taxonomic richness, feeding ecology, reproductive strategy, and population structure. Each metric was selected because it has a predictable response to stream degradation. For example, stonefly species are often the most sensitive and the first to disappear as human-caused disturbances increase, resulting in lower values for the metric “Number of Stonefly taxa”.

In addition to the overall B-IBI scores, examining individual metric scores gives insight into stream conditions and better explains differences in the overall score.

Methods

All field and laboratory work followed CWP protocols for macroinvertebrate sampling and analyses (June 2003). Samples are collected during late summer, preserved, and delivered to a contracted lab for organism identification, enumeration, and calculation of BIBI metrics.

Raw data values for each metric are converted to a score of one, three, or five, and the ten individual metrics are added to produce an overall B-IBI score ranging from 10 to 50. Scores from 10 to 24 indicate low biological integrity, from 25 to 39 indicate moderate integrity, and greater than 39 indicate high biological integrity.

Results are influenced by both cumulative impacts of upstream land use and reach-specific conditions at or upstream of sampling sites. Thus, samples from a reach integrate local and upstream influences. Many of the B-IBI metrics are also influenced by naturally occurring factors in a watershed; for example, the absence of gravel substrate can lower scores.

Rock Creek (South) macroinvertebrate samples were collected by volunteers in 2004 and CWP staff in 2007. Both samples were from station RCS050 located on Rock Creek (South) near Dole Valley Road bridge. No Cedar Creek (East Fork) macroinvertebrate samples was collected, nor were previous macroinvertebrate data located for this creek.

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Results

Station RCS050's average B-IBI score was 43, which is in the high biological integrity category. There was only a two point difference between the two B-IBI scores, 42 in 2004 and 44 in 2007. This is well within typical year to year variation of less than five points observed for Puget Sound streams (Karr 1998 and Law 1994).

Table 8 shows station RCS050's ten individual average annual metric results. The majority of metrics scoring high and the lack of low scoring metrics suggest that this subwatershed supports high stream biological integrity.

Table 8: Station RCS050 Average Annual Macroinvertebrate Community Metrics and Total Score (2004 and 2007)			
B-IBI Metrics	RCS050 2004, 2007 2-Yr Averages		
	Value	Score	Category
Total number of taxa	51.5	5	High
Number of Mayfly taxa	11.0	5	High
Number of Stonefly taxa	9.5	5	High
Number of Caddisfly taxa	9.5	3	Moderate
Number of long-lived taxa	7.0	5	High
Number of intolerant taxa	4.5	5	High
Percent tolerant taxa	12.1	5	High
Percent predator taxa	12.7	3	Moderate
Number of clinger taxa	21.0	5	High
Percent dominance (3 taxa)	41.1	5	High
Summary of avg. metric scores		46	High
Multi-year average B-IBI Score		43	High

Booth et al. (2004) found that there is a wide but well defined range of B-IBI scores for most levels of development, but observed overall that B-IBI scores decline consistently with increasing watershed total impervious area (TIA). Figure 7 shows that RCS050 B-IBI scores fall in the upper portion of the range of expected for the amount of TIA. By comparing Rock Creek (South) to the likely range of conditions for watersheds with similar amounts of development, measured as total impervious area, it is possible to make some general statements about the potential benefits from improving stream habitat.

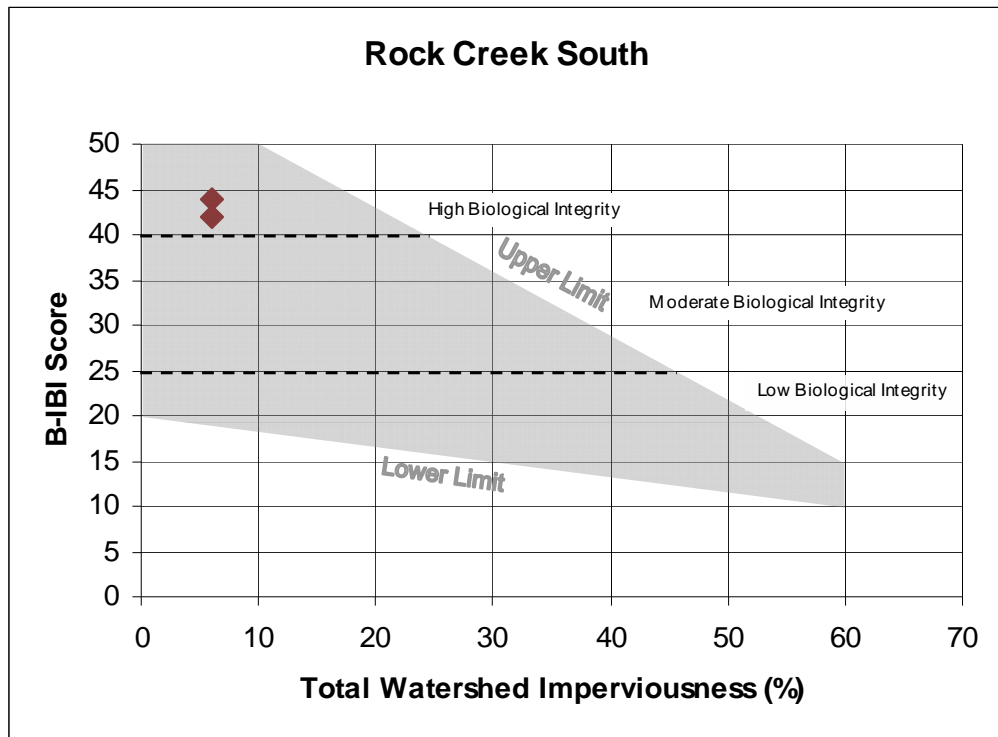


Figure 7: Approximate range of B-IBI in Puget Lowland watersheds, showing progressive decline with increasing imperviousness in the upstream watershed. Adapted from Booth et al., 2004. Markers indicate Total BIBI scores at RCS050 for particular years, versus estimated 2000 subwatershed TIA.

Rock Creek (South) B-IBI scores fall near the top of the expected range for a watershed with six percent impervious area, with only limited room for further improvement. Thus, management strategies to protect existing beneficial stream conditions are important for sustaining high biological integrity.

Management Recommendations for Cedar Creek (East Fork) and Rock Creek (South)

Rock Creek’s (South) high biological integrity results underscore support for continuing management strategies that protect existing beneficial stream conditions.

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Fish Use and Distribution

Purpose

Fish distribution refers to salmon and steelhead use. This information helps to identify stream segments where land-use changes may impact fish populations, informs management decisions, and aids in identifying and prioritizing potential habitat improvement and protection projects.

Methods

Fish distribution for the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds is mapped from existing Clark County GIS information, which reflects data collected and analyzed by the Northwest Indian Fisheries Commission (NWIFC). Fish distribution data for Clark County is available on the County's website.

Several sources of barrier assessment data are available and are briefly summarized here, including:

- WDFW passage barrier database
- SalmonScape (<http://wdfw.wa.gov/mapping/salmonscape/>)
- Clark County 1997 passage barrier data
- Clark Conservation District/LCFRB passage barrier dataset

Many stream crossings have not been assessed for passage barrier potential, and the extent of public and private road crossings is a good indicator of the potential for additional barriers. Road crossings were mapped by overlaying the county road layer with LiDAR-derived stream data.

The barrier assessment data was also reviewed for specific project opportunities within each subwatershed. Potential project sites have been reviewed and verified through field reconnaissance and are detailed in the results section below.

Results/Summary

Distribution

The fish distribution mapped from Clark County GIS information (Figures 8 and 9) varied slightly from fish distribution data originating from the SalmonScape database. These differences are identified within the individual subwatershed discussions below.

The available evidence suggests that anadromous fish use within the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds includes winter and summer steelhead (Figures 8 and 9).

The 2004 LCFRB recovery plan identifies reaches of Rock Creek (South) within the Lower Rock Creek (South) subwatershed as Tier 1 (highest priority). Within the Upper Rock Creek (South) subwatershed, both the mainstem reaches of Rock Creek (South) and Coyote Creek are Tier 4 reaches.

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The Cedar Creek (East Fork) subwatershed contains only Tier 4 reaches, which includes the mainstem of Cedar Creek and its tributary, Cold Creek.

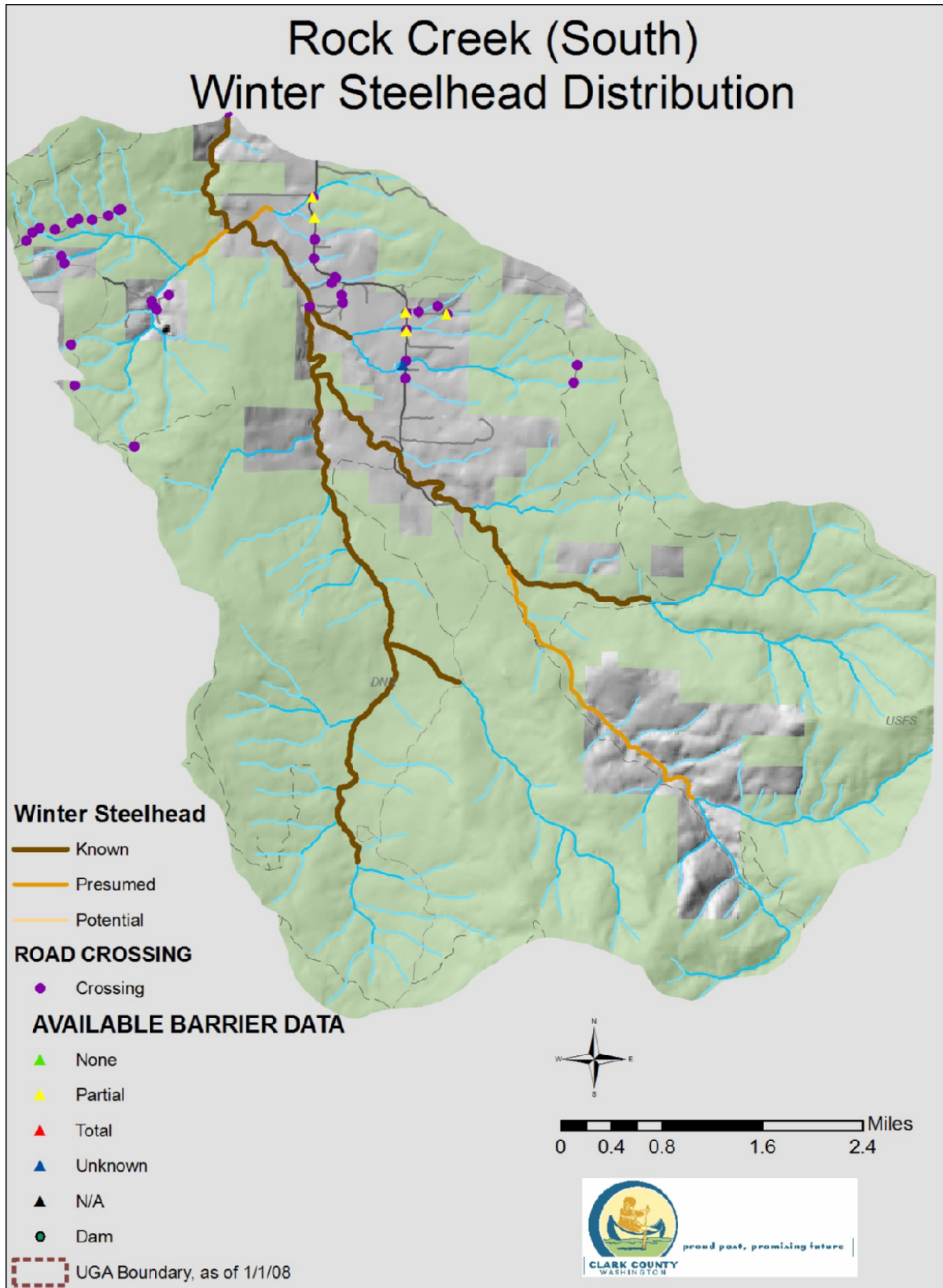


Figure 8: Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) Fish Distribution and Barriers

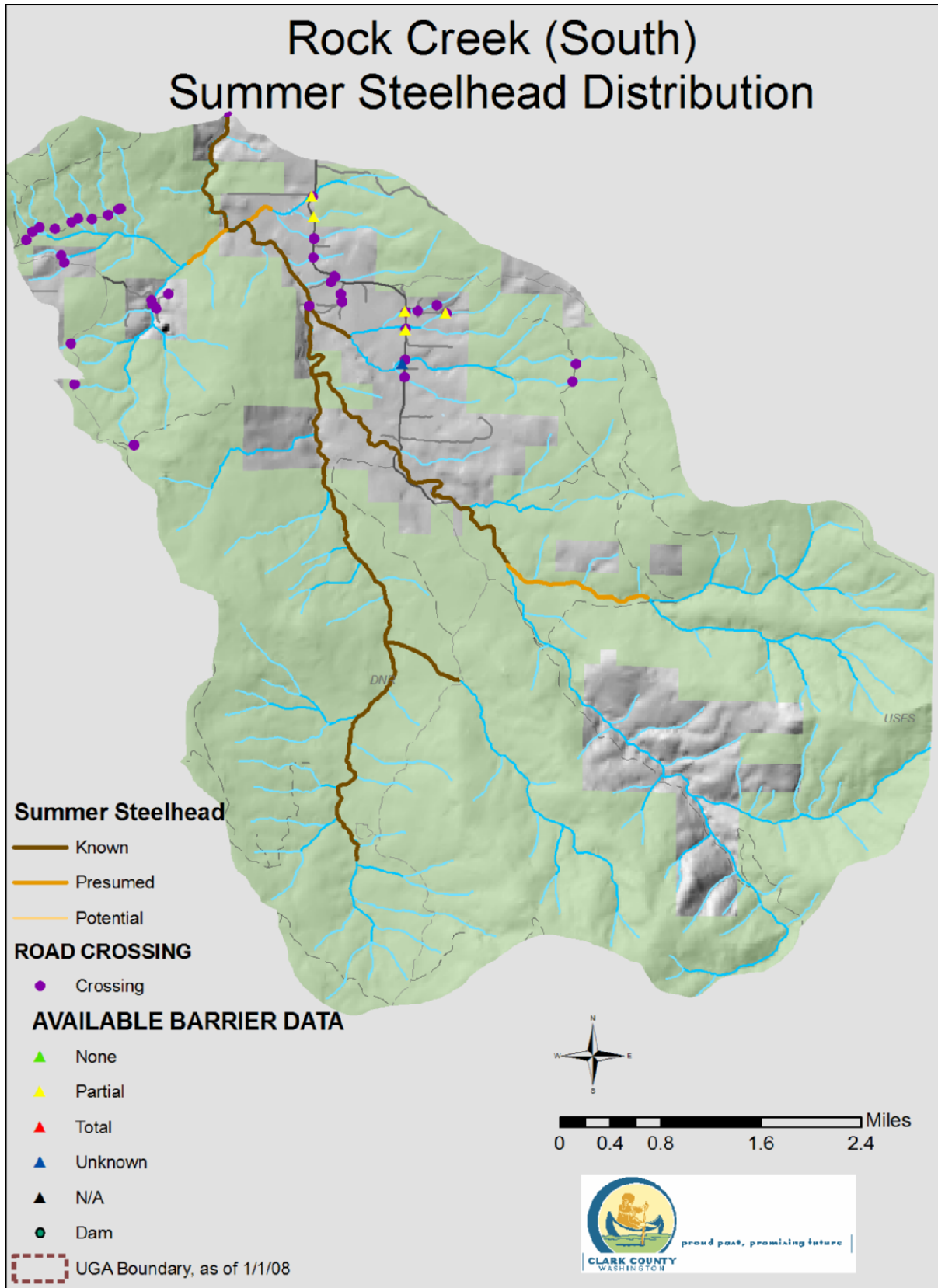


Figure 9: Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) Fish Distribution and Barriers

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Barriers

The WDFW barrier database and the 2007 LCFRB Regional Culvert Inventory provide the most complete assessment of barriers in the Cedar Creek (East Fork), Lower Rock Creek (South), and Upper Rock Creek (South) subwatersheds (Figures 8 and 9).

There are several partial barriers mapped within the Lower Rock Creek (South) subwatershed. These partial barriers are associated with road crossings on NE Dole Valley Road, which are located along several unnamed tributaries to Rock Creek (South). No other mapped barriers are listed within the Upper Rock Creek (South) and the Cedar Creek (East Fork) subwatersheds.

Recommendations

Although there are several partial barriers mapped within the Lower Rock Creek (South) subwatershed, improvement or replacement of these barriers is not recommended as a priority at this time due to the lack of anadromous fish use and the associated low recovery priority ranking.

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Hydrologic and Hydraulic Models

No modeling was performed for this assessment area.

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Analysis of Potential Projects

The analysis of potential projects:

- Briefly summarizes stormwater conditions, problems and opportunities
- Notes recently completed or current projects within the study area that may be relevant to SNAP project selection
- Describes the analytical approach
- Lists recommended projects and activities for further evaluation

Projects or activities are placed in one of several categories.

Summary of Conditions, Problems, and Opportunities

Conditions and Problems

This section briefly summarizes important results from the assessment and identifies overall stormwater-related problems.

Coordination with Other Programs

The Washington Department of Ecology is developing TMDLs for bacteria and temperature in the East Fork Lewis River watershed.

Broad-Scale Characterization

The upper portions of the study area's three mountainous subwatersheds, located near the Skamania County border, are drained by higher gradient canyon streams that eventually flow through a small valley with floodplains. Much of the area has well drained soils. Its land use is dominated throughout by commercial forest cover on state forest lands with some smaller forest lots and 20 acre residential lots.

Standard subwatershed scale metrics compared to selected NOAA fisheries standards suggest the streams in the study area generally have properly functioning habitat. Stream crossing density, percent total impervious area, percent forest, and projected effective impervious area metrics all fall in the Properly Functioning category. Road density percentage indicates marginally functioning habitat in Lower Rock Creek and properly functioning habitat in the other subwatersheds. The study area is expected to change little in the near term based on the 2008 Clark County Comprehensive Plan. Land cover, zoning as commercial forest, and subwatershed metrics suggest that a protection and restoration approach is appropriate.

Water Quality Assessment

Lower Rock Creek (South) is on the 2008 Washington State 303(d) list of impaired waters for water temperature and fecal coliform. State monitoring indicated that Rock Creek (South) slightly exceeds water temperature standards. However, all three of the study area subwatersheds are included in the fecal coliform and temperature TMDLs currently under development by Ecology.

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Drainage System Inventory

The drainage system inventory is generally complete for these three subwatersheds. Priority work in 2008 was identifying and mapping previously unmapped discharge points and stormwater conveyances.

Stormwater Facility Inspection

As of October 2008, there were no public stormwater facilities or outfalls that discharged into critical areas.

Illicit Discharge Screening

Illicit discharge screening was not conducted.

Physical Habitat Assessment

Physical habitat measurements made in 2004 on a lower portion of Rock Creek South indicated that embeddedness was generally low. Pool quality, bank stability, substrate composition, and fish barrier metrics all indicated properly functioning conditions, with some reaches categorized as at risk. Large woody debris and pool frequency metrics were in the not properly functioning category.

Geomorphology and Hydrology

These tasks were not included in this assessment.

Riparian Assessment

The most reliable riparian assessment data in Clark County is limited to the areas assessed during the 2004 LCFRB Habitat Assessment.

Generally, riparian conditions in the surveyed sections of all three subwatersheds were rated moderately impaired. The mainstem of Rock Creek (South) and Cedar Creek (East Fork) range from low to high LWD recruitment potential with their middle reaches having high potential. Riparian shade levels for Rock Creek (South) transition from low to high as it progresses upstream, while Cedar Creek's levels were generally high overall.

Public land is limited within these subwatersheds; therefore, riparian projects would typically be on private land and require landowner cooperation.

Wetland Assessment

Potential wetlands are primarily limited to riparian areas and stream channel floodplains of mainstem streams and the lower part of their tributaries. Ecology's draft wetland characterization of Clark County places all three subwatersheds in a category where the primary priority should be protection of wetland hydrology by maintaining forest cover, followed by potential restoration at sites with high likelihood of success.

Macroinvertebrate Assessment

Based on two samples from Rock Creek (South), the creek has high biological integrity. Management strategies to protect existing beneficial stream conditions

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are important for sustaining this level.

Fish Use and Distribution

The LCFRB (2004) has identified reaches of Lower Rock Creek (South) as the highest priority (Tier 1) for salmon or steelhead recovery, with Upper Rock Creek (South) and Cedar Creek (East Fork), and their tributaries, as lower priorities (Tier 4). All three subwatersheds have known use by winter and summer steelhead.

No high priority barrier removals were noted outside of existing inventories and assessments. Generally, barriers should be considered for removal as existing stream crossings are upgraded or replaced.

Recently Completed or Current Projects

There are no stormwater projects planned for any of these three subwatersheds in the 2009-2013 SCIP or the 2008-2012 TIP.

Analysis Approach

Purpose

The Analysis of Potential Projects narrows the initial list of possible projects to a manageable subset of higher priority opportunities. Listed opportunities in sections of the SNAP report represent sites requiring immediate follow-up, possible stormwater capital improvement projects, referrals to ongoing programs, and potential projects for referral to other county departments or outside agencies.

Stormwater capital improvement project opportunities are recommended for further evaluation by engineering staff, and potential development into projects for consideration through the SCIP process. Referrals to ongoing programs such as IDDE Screening or Operations and Maintenance are addressed within the program work plans and schedules. There are also referrals to other county departments, such as Public Health, or to outside agencies such as Clark Conservation District and Clark Public Utilities for actions outside the CWP scope.

Methods

The project review is qualitative and based on best professional judgment of CWP staff. An initial review is conducted for all potential projects identified during the stormwater needs assessment. Field notes, descriptions, field photos, and other associated information are reviewed. In some cases, additional field reconnaissance is performed.

In general, potential capital projects are evaluated considering problem severity, estimated cost and benefits, land availability, access, proximity and potential for grouping with other projects, and potential for leveraging resources. Based on

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this review, lower priority opportunities are removed from the list. Higher priority projects are recommended for further consideration.

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Emergency or Immediate Actions

Limited field work in the assessment area did not discover any situations that required immediate action.

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Potential Stormwater Capital Projects

No stormwater capital projects were identified.

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Public Works and Clean Water Program Referrals

No specific issues for referral were identified.

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Projects for Referral to other County Departments, Agencies, or Groups
No specific issues for referral were identified.

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Non-Project Management Recommendations

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. Information of this type contributes to adaptive management strategies and more effective stormwater management during the permit term.

Management and programmatic recommendations in the Cedar Creek (East Fork), Lower Rock Creek (South) and Upper Rock Creek (South) subwatersheds, by NPDES permit component, include:

Mechanisms for public involvement

- Publish SNAP report on CWP web page.

Development Regulations for Stormwater and Erosion Control

- EIA is not expected to increase to significant levels due to development envisioned by the Comprehensive Plan. For construction projects, emphasize stormwater management that focuses on reduction of runoff and diffuse infiltration close to the source.

Stormwater Capital Improvements

- Examine the use of small projects to improve stormwater retention and treatment in roadside ditches.
- Consider fish barrier removal as existing roads and culverts are upgraded or replaced. Restoring access to fish habitat is not recommended as a priority at this time because existing known barriers are not located on high priority reaches or reaches with known salmonid use.

Operation and Maintenance Actions

- Monitor a recent road realignment of lower Dole Valley Road (due to bank undercutting) for further potential water quality impacts

Education and Outreach to reduce behaviors that contribute pollution

- Develop a system to provide education about appropriate ditch maintenance practices to rural landowners.

TMDL Compliance

- Encourage continued involvement in Ecology's ongoing TMDL development activities. There are no approved TMDLs in the assessment area.

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