

2010 Stormwater Needs Assessment Program

Lower Fifth Plain Creek/China Ditch Subwatershed Needs Assessment Report

Clark County Department of Environmental Services

March 2011



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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
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

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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
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

Executive Summary

Study Area

This Stormwater Needs Assessment report includes the Lower Fifth Plain Creek and China Ditch subwatersheds within the Lacomas 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 related to stormwater management 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.

Ongoing Projects and Involvement

The DES coordinates with the Washington Department of Ecology, Lower Columbia Fish Recovery Board and Vancouver-Clark Parks and Recreation in efforts to improve stream health.

Ecology is collecting field data for a multi-parameter TMDL during 2010 and 2011. Clark County participates in the TMDL process. There are no planned road improvement projects included in the 2010-2015 Clark County Transportation Improvement Program, and no planned projects in the 2011-2012 stormwater capital program. The stormwater capital database contains one potential reforestation project at Cherry Neighborhood Park (CP-118). This project has not been scheduled.

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Category	Status
Water Quality Overall	<ul style="list-style-type: none"> • No recent data • Included in TMDL under development for fecal coliform bacteria, dissolved oxygen, temperature, and pH above Lacamas Lake
Biological Benthic macroinvertebrates Anadramous fish	<ul style="list-style-type: none"> • Unknown; no data available • No anadramous fish; natural barrier below Lacamas Lake • Resident cutthroat trout may be present; no mapped barriers
Habitat NOAA Fisheries criteria Riparian Wetland	<ul style="list-style-type: none"> • Forest cover, impervious area, and road density fall into the Not Properly Functioning category • Stream crossing density is in the Properly Functioning category • Rated impaired • Large woody debris recruitment potential is little to none in most reaches; shade is below targets • 30 percent of watershed area is wetlands • China Ditch: slope and depressional wetlands interconnected by drainage ditches • Lower Fifth Plain: wetlands primarily along main channels • Protection and restoration recommended in China Ditch; restoration in Lower Fifth Plain (more degraded)
Hydrology and Geomorphology Overall hydrology Future condition	<ul style="list-style-type: none"> • Dominated by drained wetlands and heavily altered streams • Limited floodplains due to ditched channels • Based on projected future impervious area and forest cover, stream channels are expected to be very unstable
Stormwater (unincorporated areas) System description Inventory status System adequacy Retrofit opportunity Maintenance evaluation Offsite assessment Source control	<ul style="list-style-type: none"> • primarily field and road-side ditches; 58 stormwater facilities (32 public), increasing within UGA • Complete; 5,364 stormwater infrastructure features mapped • Largely unknown • Limited; two facilities evaluated, one referral for potential retrofit • Two facilities evaluated; one in compliance • No high priority outfalls; assessment not conducted • One qualifying business; inspection discovered source control issues, subsequently corrected

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Opportunities

Opportunities for stormwater-related projects are limited in this assessment area. Field work and review of existing information identified the following projects and actions that can improve stream conditions:

- Evaluation of one public stormwater facility for potential retrofit
- Evaluation of two potential large-scale wetland and riparian habitat enhancement projects
- Contact one private landowner with opportunity to improve degraded riparian conditions and fence livestock from stream
- Cleanup of one dumping site
- Eradication of one Japanese Knotweed infestation

Non-project recommendations address activities that may promote more effective mitigation of stormwater problems or overall stream improvement. Management recommendations relevant to the assessment area include:

- Implement development regulations to minimize impacts, particularly enhanced nutrient control regulations to protect Lacamas Lake
- Educate private landowners on importance of native riparian vegetation and intact riparian forests for shading streams and preserving hydrology
- Continue collaboration on Lacamas Creek TMDL development. Clark County fulfills its TMDL compliance obligations through ongoing implementation of the Stormwater Management Program
- Provide landowners a list of suggested plants for stream revegetation and local nurseries that stock them
- Encourage appropriate agricultural practices that emphasize soil and water conservation and reduction in nutrient load to streams
- Post stream identification signs where roads cross streams. Repair or replace deteriorated signs
- Protect streams from future stormwater impacts by creating stream buffers, establishing conservation easements, and eliminating agricultural runoff inputs
- Encourage reforestation

Introduction

This Stormwater Needs Assessment includes the Lower Fifth Plain Creek and China Ditch subwatersheds in the Lacamas watershed. 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 SNAP are to:

- Analyze and recommend the best, most cost effective mix of actions to protect, restore or improve beneficial uses consistent with NPDES permit objectives and the goals identified by the state Growth Management Act (GMA), ESA recovery plan implementation, Total Maximum Daily Load (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 also is needed by county programs implementing critical areas protection and salmon recovery planning under the state GMA and federal ESA.

Scope

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

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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: Public Works CWP, Stormwater Capital Improvement Program (SCIP) and Development Engineering; Community Planning; Public Health; Legacy Lands; ESA. Potential project or leveraging opportunities are also referred to local agencies, groups and municipalities as appropriate.

Assessment Approach

Priorities for Needs Assessment in Lower Fifth Plain Creek and China Ditch

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, the Lower Fifth Plain Creek and China Ditch subwatersheds are categorized as “Unincorporated Urban Growth Area.” Subwatersheds in this category typically include significant areas of development and potential re-development inside the Vancouver UGA in unincorporated Clark County, where the county controls development permitting. These are high priority subwatersheds for stormwater needs assessment, considering development pressure, subwatershed characteristics and NPDES permit requirements. A wide range of SNAP tools may be used in assessing subwatersheds in this category.

Assessment Tools Applied in Lower Fifth Plain Creek and China Ditch

SNAP uses a standardized set of tools for subwatershed assessment, including desktop mapping analyses, modeling, outreach activities and a variety of field data collection procedures. 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 with an asterisk (*) are those for which new data was gathered or new analyses were conducted during this needs assessment. The remaining tools or chapters were completed based on pre-existing information where available.

Table 1: Stormwater Needs Assessment Tools

Outreach And Involvement *	Riparian Assessment *
Coordination with Other Programs *	Floodplain Assessment
Drainage System Inventory and Condition*	Wetland Assessment *
Review Of Existing Data	Macroinvertebrate Assessment
Illicit Discharge Screening	Fish Use And Distribution *
Broad Scale GIS Characterization *	Water Quality Assessment *
Rapid Stream Reconnaissance *	Hydrologic and Hydraulic Modeling
Physical Habitat Assessment *	Source Control *
Geomorphology Assessment *	

Assessment Actions

Outreach Activities

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

- Press release to local media.
- April 2010 – article in Clean Water Program E-Newsletter.
- August 2010 – information on the SNAP distributed at 10-day Clark County Fair.
- Clean Water Program web pages updated as needed; 135 visitors to the SNAP Web page since June 2010. (Note: these figures are under-reported as tracking software only records top 20 pages and documents monthly).
- A description of SNAP is included in Clark County’s annual stormwater management program plan submitted to Ecology.

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

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

- Site visits by CWP technical assistance staff
- Letters detailing specific problems and solutions 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

Review of Existing Data

Data and information review are 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:

- LCFRB Habitat Characterization (2004)
- LCFRB 6-Year Habitat Workplan
- Ecology 303(d) list
- WRIA 27/28 Plan
- Ecology EIM data
- Clark County 2004 Subwatershed summary

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- Clark County 2010 Stream Health Report
- Clark County 6-Year TIP

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 describe subwatershed characteristics such as topography, geology, soils, hydrology, land cover, land use and GMA critical areas. A standard GIS workspace, including shape files for more than 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 and conclusions about general subwatershed condition and potential future changes

Map Products

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

General Conditions and Subwatershed Metrics

General Geography

The study area comprises two subwatersheds in the Lacamas Creek watershed. Much of the eastern part of the study area is drained wetlands that give way to low hills to the east. There are numerous agricultural drainage ditches in the China Ditch subwatershed. The study area is primarily agriculture and low density urban residential. The Urban Growth Area of Vancouver includes a small part of the southwestern-most corner of the study area. Lower Fifth Plain subwatershed is at the junction of China Ditch, Fifth Plain Creek, Shanghai Creek and at its terminus, Lacamas Creek.

Topography

The study area is generally flat plains underlain by gently rolling Ice Age Cataclysmic Flood deposits. Hills rise to about 450 ft along the eastern part of the study area where it is underlain by older Ancestral Columbia River sediment.

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Geology and Soils

Areas below about 300 feet elevation are underlain by fine grained Ice Age Cataclysmic Flood deposits. Areas above 300 feet are underlain by weathered ancestral Columbia River gravel deposits often referred to as the Troutdale Formation. There may be limited amounts of stream bed gravel derived from Troutdale Formation rocks in the eastern part of China Ditch subwatershed. Gravel substrate is found in lower Fifth Plain Creek.

The study area soils are primarily loams, including Dollar Loam, Cove Silty Clay Loam and the coarser McBee Silt Loam. Slopes in the study area vary little at primarily 0 to 5 percent.

Hydrology

Geology and topography play the main role in determining study area hydrologic framework. Where the study area is underlain by Ice Age Cataclysmic Flood deposits, hydrology is dominated by drained wetlands and heavily altered streams. Flood plain formation is limited due to channels being modified for drainage.

All tributary streams in the study area drain agricultural or other cleared areas. Stream hydrology is altered considerably from a natural forested condition. Historically, much of the area would have been wetlands, which are now drained by a complex of ditches and channels.

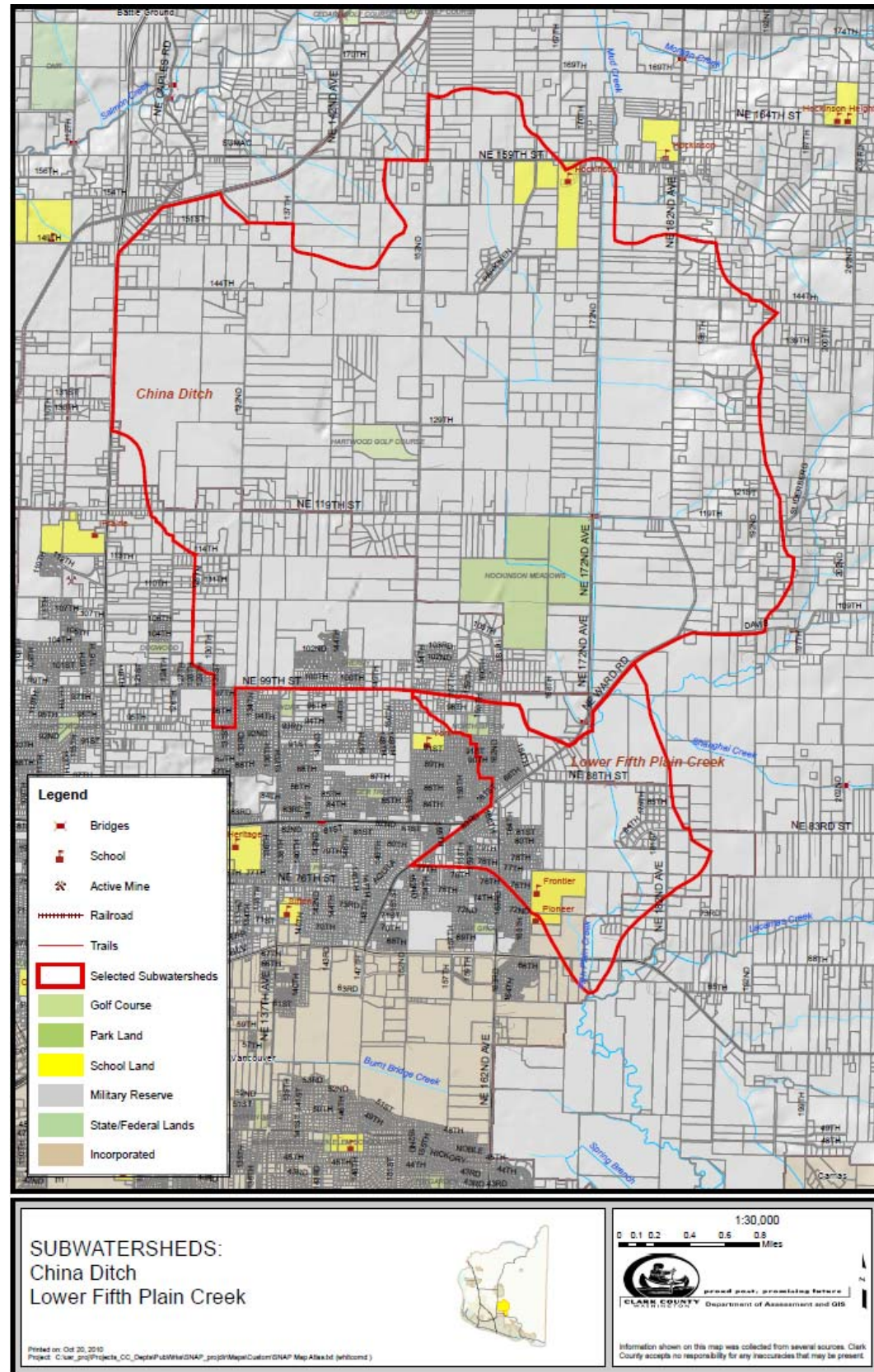


Figure 1: Subwatershed Map: Lower Fifth Plain Creek and China Ditch

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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 the study area has stream habitat that is not properly functioning (Table 2). However, these metrics are largely designed to apply to stream systems developed in hilly or mountainous terrains. In the case of China Ditch subwatershed, the area would have historically been a complex of depressional wetlands and ponds lacking an organized drainage system.

Table 2: Watershed Scale Metrics

Metric	Lower Fifth Plain	China Ditch	Functioning	Non-functioning
Percent Forested (2000 Landsat)	12	15	> 65 %	< 50 %
Percent TIA (2000 Landsat)	32	18	< 5 %	> 15 %
Road Density 2007 data (miles/mile ²)	11	5	< 2	> 3
Stream Crossing Density (crossings per stream mile)	1.3	1.2	< 3.2/mile	> 6.4/mile
Percent EIA estimated from the Comprehensive Plan	22	18	< 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.

Due to historical clearing for agriculture and marshy wetlands, forest cover is minimal and typically confined to public land and small tracts of forest.

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

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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 5 percent as fully functional and greater than 15 percent as non-functioning. Values for both subwatersheds are well beyond the threshold for non-functioning habitat.

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, road densities are approximately two to three-times as dense as the threshold for non-functioning (>3 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 more than 60 feet wide, which would be approximately five- to 10-foot high road fill. The study area subwatersheds both have stream crossing densities within the functioning category (<3.2 crossings/stream mile 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 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. Expected EIA places the study area in the non-functioning category.

Estimated Channel Stability Based on Forest 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 (**Error! Reference source not found.**). According to this figure, streams in both subwatersheds would be expected to have very unstable channels in a typical stream.

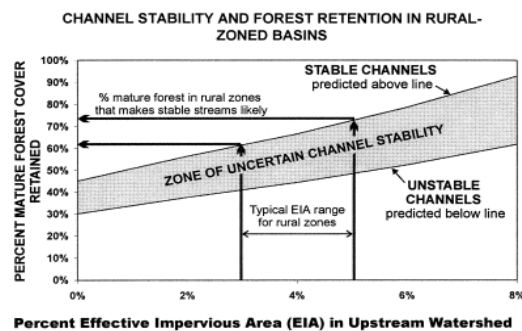


Figure 2: Channel stability in rural areas (Booth, Hartley, and Jackson, June 2002)

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Water Quality Assessment

This section briefly summarizes and references available water quality data from the study area. 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 Washington state water quality standards, all lakes and all feeder streams to lakes 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, Table 602).

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

Table 3: Applicable Water Quality Criteria for Lower Fifth Plain and China Ditch Subwatersheds

Characteristic	Ecology criteria
Temperature	≤ 16° 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% 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 303(d) list of impaired waters is on the Ecology website at:
<http://www.ecy.wa.gov/programs/wq/303d/index.html>

Lower Fifth Plain Creek includes segments that are Category 5 listed (polluted waters that require a TMDL) for temperature and dissolved oxygen and Category 2 listed (waters of concern) for pH and fecal

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coliform. China Ditch includes segments that are Category 5 listed for temperature and dissolved oxygen and Category 2 listed for dissolved oxygen.

Both subwatersheds are included in ongoing TMDL development for fecal coliform, temperature, dissolved oxygen and pH.

Clark County Stream Health Report

In 2010, the CWP compiled available data and produced a countywide assessment of general stream health.

Sufficient data were not available to score the Lower Fifth Plain Creek and China Ditch subwatersheds.

The 2010 Stream Health Report can be viewed on the county website at: <http://www.clark.wa.gov/water-resources/stream.html>.

Available Data

A considerable historical dataset is available for this study area. However, almost no data have been collected in the past decade. A review and summary of historical data and studies are beyond the scope of this document.

Ecology began collecting data for TMDL development in late 2010. Available results and reports may be found on the Ecology website at: <http://www.ecy.wa.gov/programs/wq/tmdl/LacamasTMDL.html>

As of January 2011, the current Ecology dataset is too limited for inclusion in this report.

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Drainage System Inventory and Condition

Inventory

Clark County's drainage system inventory resides in the StormwaterClk GIS database and is available to users through the county's GIS.

Drainage system inventory is an ongoing CWP work effort focused on updating the StormwaterClk database to include all existing stormwater drainage infrastructure. In 2008-2009, the inventory was a significant priority for the CWP, with a major work effort focused on identifying and mapping previously unmapped infrastructure and reviewing existing records for completeness and accuracy.

Table 4 indicates the number of features currently inventoried in StormwaterClk. Of the 58 stormwater facilities, 32 are publicly owned and operated.

Table 4: Drainage System Inventory Results, Lower Fifth Plain Creek/China Ditch

Database Feature Category	Inventoried prior to 2007	Added during 2007-2009	Total Features
Inlet	344	360	704
Discharge Point (outfall)	15	270	285
Flow Control	10	23	33
Storage/Treatment	133	223	356
Manhole	153	117	270
Filter System	3	17	20
Channel	178	1401	1579
Gravity Main	718	1341	2059
Facilities	26	32	58

Condition

Stormwater system condition is assessed based on three components:

- An evaluation of retrofit opportunities at public stormwater facilities
- An inspection and maintenance evaluation at public stormwater facilities
- An off-site assessment to check for outfall-related problems in downstream receiving waters

Component 1: Retrofit Evaluation

Purpose

The purpose of this component is to identify existing public stormwater facilities that may be retrofitted to provide additional storage or treatment, beyond the level intended during original construction.

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Methods

The evaluation is conducted at all public stormwater facilities that contain detention ponds, treatment wetlands, wet ponds, pre-settling cells, open filters or bioswales and discharge to surface waters or stormwater drainage infrastructure that eventually discharges to surface waters.

The retrofit evaluation includes a review of the drainage area, stormwater infrastructure condition, facility lot size, ownership of adjacent parcels, and the functionality of the facility objects listed above. Facilities or parcels with the potential to provide additional storage and/or treatment of stormwater are referred as "potential retrofit" opportunities for further evaluation as Capital Improvement Projects.

Results

Based on the county's StormwaterClk database, as of August 2010, there were 14 mapped public stormwater facilities in the Lower Fifth Plain Creek subwatershed and 18 mapped public stormwater facilities in the China Ditch subwatershed.

Seven percent (1) of the mapped public stormwater facilities in the Lower Fifth Plain Creek subwatershed were evaluated for retrofit opportunities. In the China Ditch subwatershed, six percent (1) of the mapped public stormwater facilities were evaluated for retrofit opportunities.

As listed in

Table 5, one public stormwater facility was referred for further evaluation as Capital Improvement Projects in the China Ditch subwatershed. No referrals were generated for retrofit opportunities in the Lower Fifth Plain Creek subwatershed.

The China Ditch subwatershed generated one referral for further evaluation as Capital Improvement Projects and included an increase in potential storage as part of the project description. The referred facility is 35 years old and has a 2.4-acre lot that contains little storage and minimum treatment abilities.

No major defects or hazardous conditions were discovered in the Lower Fifth Plain Creek or China Ditch subwatersheds.

Table 5: Description of Potential Retrofit Opportunities in China Ditch subwatershed

Identifier	Facility Name	ID	Install Date	Basis for Project	Project Description	Subwatershed
OS-229	Mountain View	1160	01-Jun-75	Potential storage retrofit	Large lot with little infrastructure	China Ditch

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Component 2: Inspection and Maintenance Evaluation

Purpose

The inspection and maintenance evaluation verifies that maintenance activities are implemented and facilities are properly functioning.

Methods

The inspection and maintenance evaluation is conducted at public stormwater facilities in conjunction with retrofit evaluations. Public stormwater facilities were evaluated if they contained detention ponds, treatment wetlands, wet ponds, pre-settling cells, open filters or bioswales and discharge to surface waters or stormwater drainage infrastructure that eventually discharges to surface waters.

Public stormwater facilities that contain filter systems, buried detention or retention vaults, and facilities that infiltrate stormwater typically are not included in this evaluation. They may be inspected on a case-by-case basis as resources allow.

The evaluation is conducted using county and state standards equivalent to maintenance standards specified in Chapter 4, Volume V, of the 2005 Stormwater Management Manual for Western Washington. The standards list the part or component of the facility, condition when repair or maintenance is needed, and expected results. Individual components of a facility are referred to as “facility objects.”

The inspection and maintenance evaluation process involves inspecting all facility objects to determine if maintenance complies with the standards. If any facility object fails to meet the maintenance standards, the entire facility is not in compliance. Noncompliant stormwater facilities are referred to the appropriate department for repairs or maintenance.

Results

Two inspection and maintenance evaluations were conducted; one in the Lower Fifth Plain Creek subwatershed and one in the China Ditch subwatershed. These facilities were found out of compliance and included a total of seven facility objects, of which four (57 percent) were in compliance.

The inspection process in the Lower Fifth Plain Creek and China Ditch subwatersheds generated two referrals to Public Works Maintenance and Operations for needed maintenance activities.

No major defects or hazardous conditions were discovered in the Lower Fifth Plain Creek or China Ditch subwatersheds.

Component 3: Offsite Assessment

Purpose

Discharges from stormwater outfalls can cause moderate to severe erosion as stormwater moves through the riparian zone and to the receiving water. Erosion creates a source of sediment to the stream due to incision and slope failures. It can also increase slope instability problems.

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The Offsite Assessment looks for offsite or downstream problems associated with the county's storm sewer system, particularly from facility outfalls that discharge to critical areas.

Methods

County-owned and operated stormwater outfalls meeting one or more of the following criteria are included in the offsite assessment:

- Within 200 feet of a critical area (e.g. riparian, wellhead protection, landslide hazard, etc)
- Within 300 feet of a headwater stream
- Located on public land
- Originates from a public-dedicated facility currently under the two-year maintenance warranty bond

Stormwater outfalls are prioritized into three categories:

- Priority 1 outfalls are stormwater outfalls that discharge to landslide hazard areas outside of county road rights-of-way
- Priority 2 outfalls are stormwater outfalls that discharge to all other critical areas outside of county road rights-of-way
- Priority 3 outfalls are stormwater outfalls that discharge to critical areas within county road rights-of-way

At a minimum, all Priority 1 outfalls are inspected. As resources allow, Priority 2 and Priority 3 outfalls may be inspected. If an outfall fails to meet the general outfall design criteria or is contributing to a downstream erosion problem, the outfall is not in compliance. Non-compliant outfalls are referred to the appropriate Public Works program for maintenance or repair or, in some cases, referred as potential Capital Projects.

Results

Based on the county's StormwaterClk database, as of August 2010, 11 mapped outfalls in the Lower Fifth Plain Creek subwatershed were discharging to critical areas: no Priority 1 outfalls; three Priority 2 outfalls; eight Priority 3 outfalls.

In the China Ditch subwatershed, 51 mapped outfalls were discharging to critical areas: no Priority 1 outfalls; 21 Priority 2 outfalls; 230 Priority 3 outfalls.

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Table 6 summarizes results in the Lower Fifth Plain Creek subwatershed. There were 11 mapped outfalls discharging to critical areas. Three Priority 2 outfalls and 72 Priority 3 outfalls were not assessed.

Table 6: 2010 Off-site Assessment Project Activity Summary for Lower Fifth Plain Creek subwatershed

Metric	Number of Outfalls		
	Priority 1	Priority 2	Priority 3
Total number of mapped outfalls	0	3	8
# of outfalls assessed	n/a	0	0
# of outfalls compliant	n/a	n/a	n/a
# of noncompliant outfalls	n/a	n/a	n/a
# of referrals initiated	n/a	n/a	n/a
# of referrals ongoing	n/a	n/a	n/a
# of outfalls fixed	n/a	n/a	n/a

Table 7 summarizes results in the China Ditch subwatershed. There were 251 mapped outfalls discharging to critical areas. Twenty-one Priority 2 outfalls and 230 Priority 3 outfalls were not assessed.

Table 7: 2010 Off-site Assessment Project Activity Summary China Ditch subwatershed

Metric	Number of Outfalls		
	Priority 1	Priority 2	Priority 3
Total number of mapped outfalls	0	21	230
# of outfalls assessed	n/a	0	0
# of outfalls compliant	n/a	n/a	n/a
# of noncompliant outfalls	n/a	n/a	n/a
# of referrals initiated	n/a	n/a	n/a
# of referrals ongoing	n/a	n/a	n/a
# of outfalls fixed	n/a	n/a	n/a

Potential Projects

The offsite assessment project yielded no potential project opportunities.

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Management Recommendations

Drainage system inventory is an ongoing CWP work effort focused on updating the StormwaterClk database to include all existing stormwater drainage infrastructure. Prior to 2007, stormwater drainage infrastructure in the Lower Fifth Plain Creek and China Ditch subwatersheds included 1,580 objects. In 2007-2009, an additional 3,784 previously unmapped objects were added to the StormwaterClk database.

Retrofit evaluations conducted at two public stormwater facilities generated one referral for further evaluation as a potential capital improvement project, and it included an increase in potential storage as part of the project description. The referred facility is 35 years old and has a 2.4-acre lot that contains little storage and minimum treatment abilities. Historic drainage problems were noted at this facility.

The inspection and maintenance evaluation is conducted at public stormwater facilities in conjunction with retrofit evaluations. The most common facility objects found out of compliance were detention ponds. Excessive sedimentation and berm settlements were the most common noncompliant defect across facility objects. Correcting facility sedimentation issues and berm restoration will bring both facilities into compliance.

Outfall assessments generated no potential project opportunities. Future efforts should be made to assess Priority 3 outfalls, which make up nearly all of the outfalls discharging to critical areas in these subwatersheds. Maintaining the frequency of offsite assessment activities may reduce downstream erosion problems by discovering potential issues before they become more serious erosion problems.

Illicit Discharge Detection and Elimination Screening

Illicit discharge screening was not conducted.

Source Control

Purpose

Source control visits to Clark County businesses provide both an educational and technical assistance purpose. An initial site visit allows staff to educate owners and employees by providing basic information about nearby water resources and Clark County's Water Quality Ordinance (13.26A). The initial site visit also provides information on how Clark County's storm sewer system works, how the site is connected to this storm system, and how the activities performed by the business may impact their subwatershed.

Most importantly, the source control visit can find, then eliminate or change, business activities that negatively impact stormwater runoff.

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Methods

Under the County's 2007 NPDES municipal stormwater permit, each year staff is required to visit 20 percent of businesses that perform one of many potential pollution-generating activities listed in the permit. Additionally, the permit requires visits to any business with a paved parking area. To simplify project planning and tracking, the CWP plans to visit 20 percent of all county businesses each year.

To determine which specific businesses will be inspected each year, SNAP prioritizes a list of subwatersheds where source control visits will be performed. Once those subwatersheds are determined, GIS maps are developed to highlight all parcels paying the Type 4 (commercial and industrial property) and Type 3 (Multi-Family property) Clean Water Fee. Each highlighted parcel is labeled with the parcel number (Property Account Number).

At each site, staff asks the business manager or owner to lead a tour of the business, inside and out. By closely observing business activities and asking questions, staff gains information about site-specific conditions and current stormwater best management practices (BMPs).

If any business related activities allow contaminants to enter stormwater runoff, specific BMPs are suggested to the business manager or owner. Following the tour, BMP sheets explaining the issue and required fixes are left with the manager or owner. If the BMP will take some time to implement, a follow up visit date is agreed upon. Letters are sent to businesses when multiple activities require BMPs and/or when a specific BMP may take some time to implement. Letters usually give a deadline for completion of BMP implementation.

Following the deadline date, a follow up visit is made to the business to confirm BMP implementation. As long as some corrective effort has been made, the source control staff will continue working with the business until it is in compliance. However, if the business fails to take any corrective action despite repeated visits, a referral to Clark County Code Enforcement and possibly the Washington Department of Ecology is made to assist with compliance through enforcement.

During or immediately after each site visit, a Business Site Visit Report Form is completed for entry into the Tidemark database.

Results

In 2010, staff visited all the businesses required under the NPDES permit in the Lower Fifth Plain Creek/China Ditch subwatershed. Table 8 summarizes source control activities.

Table 8: Source Control Project Summary, Lower Fifth Plain Creek/China Ditch subwatershed

Metric	Number
Number of sites visited	1
Number of sites with source control issues	1
Number of repeat visits	0
Number of sites with issues successfully	1

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resolved	
Number of sites referred to other agencies	0

Overview

The Lower Fifth Plain Creek/China Ditch subwatershed lies in south central Clark County, flowing out of the southern boundaries of Brush Prairie and Hockinson rural centers.

Other than a small golf course and small number of churches, Type 4 parcels were few and presented no source control problems. This subwatershed is mostly large farm and rural residential properties, so would be a low priority for future Type 4 (business) source control visits.

Stream Reconnaissance and Feature Inventory

Purpose

The Feature Inventory records the type and location of significant stream impairments, potential environmental and safety hazards and project opportunities in selected stream reaches.

Feature Inventory results are used primarily to document conditions and identify potential improvement projects or management actions for implementation by the CWP or other agencies. They also provide an extensive GIS database of sites that can be evaluated for project mitigation needs and as a county-wide planning tool for riparian and habitat enhancement projects.

Methods/Limitations

Geographic scope of the Feature Inventory was established by the CWP taking into consideration projected TIA, DNR water types, stream gradient, zoning, Clark County development permitting authority, and land ownership.

The Feature Inventory recorded significant conditions in the stream corridor relevant to SNAP components. Feature types are listed in Table 9.

The in-stream assessment approach allowed investigators to observe stream corridor features that are not always identifiable through desk methods, such as analysis of existing aerial photographs and GIS data.

A GPS position, one or more digital photos, and relevant attribute information were collected for each logged feature. All data and linked photos are stored in the Stormwater SQL Geodatabase located on the Clark County server. Feature data includes field observations, estimated measurements, and notes describing important feature characteristics or potential projects.

The Feature Inventory project is not intended to be an exhaustive inventory of all human alterations to the stream corridor. Rather, the project seeks to identify the most significant features pertaining to stormwater management and potential stormwater mitigation projects.

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Feature dimensions and other attribute data are estimates, and should not be utilized for quantitative calculations.

Study Area

The extent of the completed Feature Inventory in Lower Fifth Plain Creek subwatershed is shown in Figure 3. Approximately 2.1 miles of the stream corridor was assessed in the subwatershed. All of the proposed survey extent was assessed.

Results/Findings

A total of 13 features were identified in the Lower Fifth Plain Creek subwatershed. A breakdown of recorded features by type is presented in Table 9. Stream crossings (bridge) were the most prevalent feature type identified, followed by impacted stream buffers.

In addition to stream features, three geomorphology data points (shown as GG points on Figure 4 and Figure 5) were collected.

Table 9: Summary of Features Recorded in Lower Fifth Plain Creek Subwatershed

Feature Type	Number Recorded
AGR - Aggradation	0
AP – Access point	1
CM – Channel modification	0
ER – Severe bank erosion	0
IB – Impacted stream buffer	3
IW – Impacted wetland	0
MB – Miscellaneous barrier	0
MI – Miscellaneous point	1
OT – Stormwater outfall	2
RR – Road Reconnaissance feature	0
SCB – Stream crossing, bridge	4
SCC – Stream crossing, culvert	0
SCF – Stream crossing, ford	0
TR – Trash and debris	1
UT – Utility impact	0
WQ – Water quality impact	1
Total	13

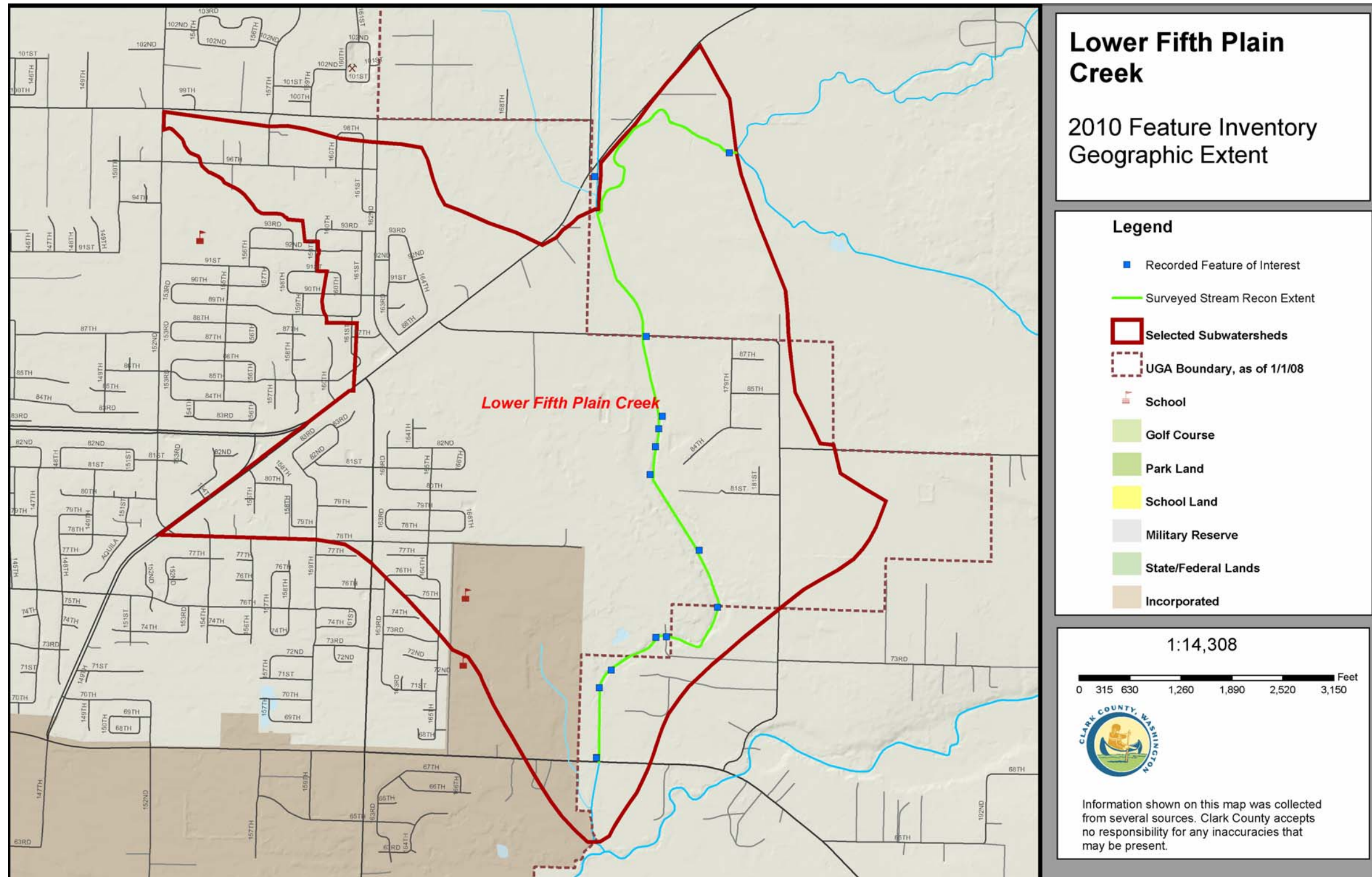


Figure 3: Lower Fifth Plain Creek Geographic Extent of 2010 Feature Inventory

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The following subsections contain general descriptions of the Lower Fifth Plain Creek subwatershed conditions. The descriptions include observations, trends, and issues that were identified either during the field work or during subsequent review of collected information.

Stormwater Infrastructure

The stormwater conveyance to Lower Fifth Plain Creek is mainly via agricultural field and roadside ditches. Flow in the subwatershed is predominately north to south through an historically straightened channel. The predominant source of stormwater in the subwatershed is runoff from agricultural land and rural residential developments draining to streams via small open channels such as field drain ditches, grassy swales and roadside ditches. Few facilities that treat consolidated stormwater flow are present in this subwatershed.

The majority of this subwatershed is in the Vancouver UGA. Although development has slowed recently, considerable residential development is expected, along with a significant increase in stormwater infrastructure.

Riparian Vegetation

Impacted stream buffers are prevalent in the Lower Fifth Plain Creek subwatershed. Although well-protected from livestock access by fencing, intact riparian zones are quite narrow and tend to be dominated by reed canary grass and blackberry undergrowth. Sparse canopy cover is present in the upper and middle portions of the subwatershed, with a mix of deciduous and coniferous trees. A substantial stand of Japanese Knotweed is present near the downstream end of the subwatershed.

Potential Project Opportunities

Listed opportunities represent potential projects or project areas. They are not fully developed projects, and therefore require additional evaluation and development by Clark County or consultant staff.

Potential project opportunities were identified based on the results of the Feature Inventory conducted in the Lower Fifth Plain Creek subwatershed. The CWP will evaluate the potential projects for further development or referral to the appropriate organization. Each potential project is listed in tables, including the basis for the project and a description of the potential project. The location of each potential project is shown in the figure(s) below. A total of four potential projects were identified. A summary of identified project opportunities by category is shown in Table 10.

Table 10: Breakdown of Potential Project Opportunities by Category

Potential Project Category	Potential Projects Identified
Emergency/Immediate Actions	0
Stormwater Capital Projects	1
Referrals for Followup by DES (or County programs supporting DES)	3

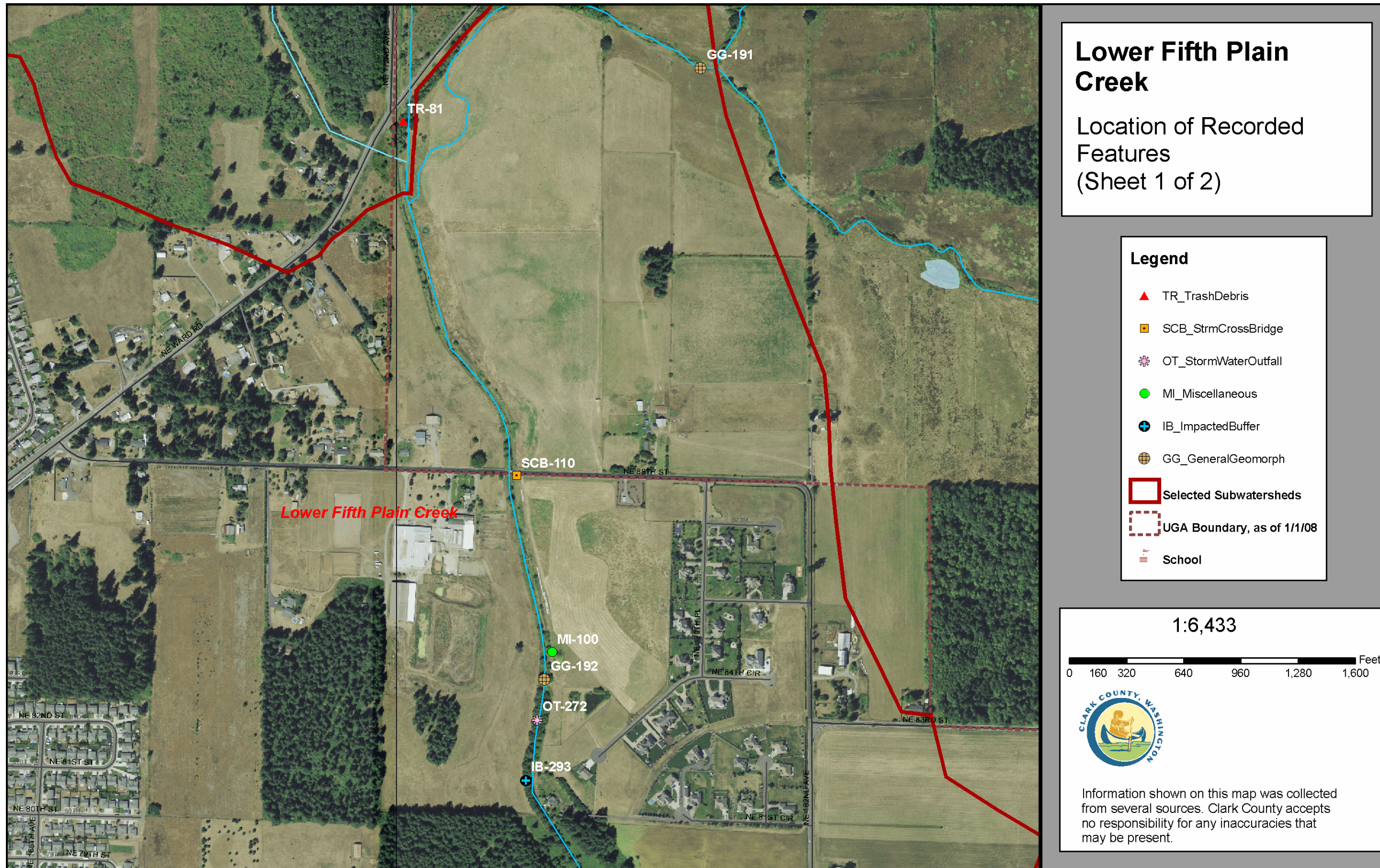


Figure 4: Lower Fifth Plain Creek location of recorded features

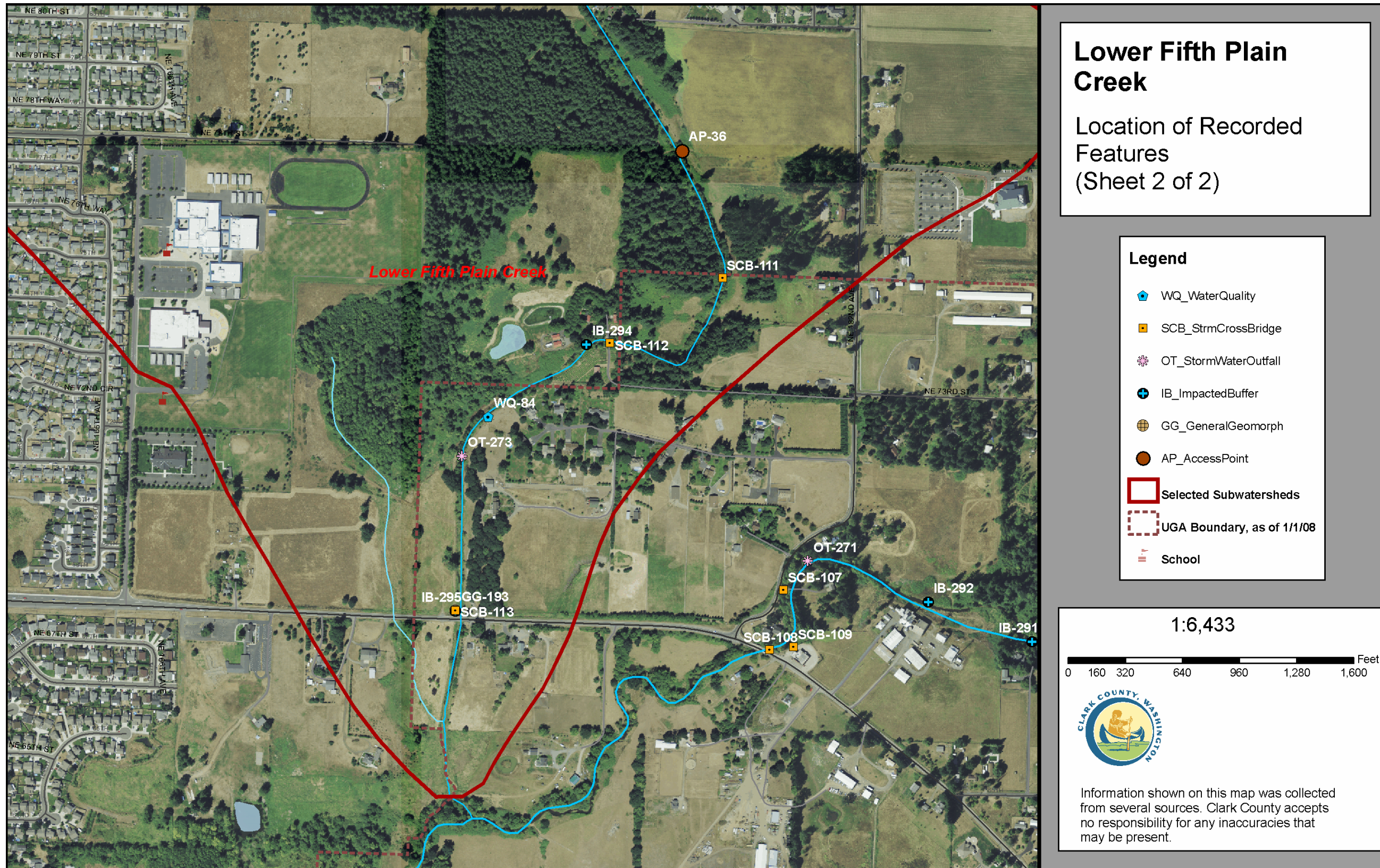


Figure 5: Lower Fifth Plain Creek location of recorded features

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Emergency/Immediate Actions

Emergency/Immediate Actions require a timely response to address a potential or imminent threat to public health, safety, or the environment.

No opportunities were identified in this category.

Stormwater Capital Improvement Projects

Stormwater Capital Improvement Projects include projects that create new or retrofit existing stormwater flow control or treatment facilities, substantial infrastructure maintenance projects, habitat enhancement projects, or property acquisition to mitigate for stormwater impacts. Facility retrofits refer to projects that will increase an existing facility's ability to control or treat stormwater in excess of the original facility's design goals.

Table 11: Description of Potential Stormwater Capital Improvement Project Opportunities

ID	Basis for Project	Project Description
IB-293	Channel historically straightened for approximately 3500' upstream and 1500' downstream of this location. Narrow riparian is primarily invasives; uplands primarily cleared pasture. Channel disconnected from floodplain. Contributes to downstream flow issues at and below 4 th Plain Road. Area is within UGA, likely to develop.	Potential large-scale project could involve property acquisition, stormwater mitigation, riparian improvement and/or channel realignment, and upland reforestation.

Referrals for Followup by DES (or County programs under DES oversight)

This category includes opportunities other than capital projects that are dependent upon DES programs or oversight. Examples include referrals to: Public Works Operations for public stormwater infrastructure maintenance or private facility inspection; DES Sustainability and Outreach for landowner letters regarding trash pickup or agricultural BMPs; Illicit Discharge screening project; and general reach information forwarded to DES engineers for capital planning purposes. Possible fish barriers or culvert maintenance issues may also be included.

Table 12: Description of Referrals for followup by DES

ID	Basis for Project	Project Description	Action
IB-294	Japanese knotweed infestation, both banks, approximately 100'.	Map location and schedule for treatment	Refer to DES Vegetation Management
WQ-84	Livestock access on left bank	Fence livestock away from channel	Refer to DES Outreach; contact landowner about BMPs, CCD assistance
TR-81	Large bag of diapers and	Trash removal	Refer to PW Operations

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ID	Basis for Project	Project Description	Action
	other trash on or near public ROW.		

Stormwater Management Recommendations

A number of general stormwater management measures should be implemented throughout the Lower Fifth Plain Creek subwatershed:

- Provide landowners a list of suggested plants for stream revegetation and local nurseries that stock them
- Encourage appropriate agricultural practices that emphasize soil and water conservation and reduction in nutrient load to streams
- Post stream identification signs where roads cross streams; repair or replace deteriorated signs
- Protect streams from future stormwater impacts by creating stream buffers, establishing conservation easements, and eliminating agricultural runoff inputs
- Encourage reforestation
- Implement development regulations to minimize impacts, particularly enhanced nutrient control regulations to protect Lacamas Lake

Physical Habitat Assessment

A physical habitat assessment was not conducted.

Geomorphology Assessment

A geomorphology assessment was not conducted.

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, Washington State University (WSU) Watershed Stewards Program and Clark Conservation District for possible implementation.

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This section focuses on opportunities likely located on public 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 reports prepared for the Lower Columbia Fish Recovery Board. These include the Habitat Assessment reports (R2 Resource Consultants, Inc., 2004) and the 2010 Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan. Both can be found on the LCFRB website at: <http://www.lcfrb.gen.wa.us/default1.htm>.

These reports apply primarily to salmon-bearing stream reaches and therefore do 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 are discussed in their respective sections and most are included on a final list for referral to outside agencies.

Aerial photographs were also reviewed for specific project opportunities in each subwatershed. Potential project sites have been reviewed and verified through field reconnaissance and are detailed in the results.

Results

The 2004 LCFRB Habitat Assessment did not include the Lower Fifth Plain Creek or China Ditch subwatersheds. Therefore, LWD recruitment potential and shade rating analyses were based on a qualitative review of 2010 aerial photographs available through Google Earth.

At the subwatershed scale, the LCFRB rated the riparian conditions in the Lower Fifth Plain Creek and China Ditch subwatersheds as “Impaired.”

Riparian (Large Woody Debris (LWD) Delivery)

The China Ditch subwatershed is characterized by a series of straight, channelized drainages which discharge into a central ditch flowing parallel to NE 172nd Ave. Most reaches flow through agricultural land lacking woody riparian vegetation and as such, would have Low LWD recruitment potential. There are a few exceptions where the drainages flow patches of sparse forest, such as from appx (45.72089, -122.50889) to (45.71948, -122.50576), from appx (45.72479, -122.52766) to (45.72300, -122.52464), and from appx (45.716997, -122.47927) to (45.719185, -122.48672). These areas may exhibit Moderate LWD recruitment potential.

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China Ditch converges with Fifth Plain Creek in the south side of NE Ward Road, at appx (45.691957, -122.49568). Within the Lower Fifth Plain Creek subwatershed, the majority of Fifth Plain Creek flows through open agricultural areas lacking forested riparian zones. Therefore, the majority of Fifth Plain Creek would be expected to have Low LWD recruitment potential. One exception is where Fifth Plain Creek flows beside a patch of forest, from appx (45.67961, -122.49033) to (45.67706, -122.48953). This reach may exhibit Moderate LWD recruitment potential.

An unnamed tributary discharges into Fifth Plain Creek from the west at appx (45.670354, -122.49502). This appx 0.4 mi long tributary flows through open field and would have no LWD recruitment potential.

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Shade

The China Ditch subwatershed is characterized by a series of straight, channelized drainages which discharge into a central ditch flowing parallel to NE 172nd Ave. Most reaches flow through agricultural land lacking woody riparian vegetation and as such would have low shade values. There are a few exceptions where the drainages flow patches of sparse forest, such as from appx (45.72089, -122.50889) to (45.71948, -122.50576), from appx (45.72479, -122.52766) to (45.72300, -122.52464), and from appx (45.716997, -122.47927) to (45.719185, -122.48672). These areas may have moderate shade values.

China Ditch converges with Fifth Plain Creek in the south side of NE Ward Road, at appx (45.691957, -122.49568). Within the Lower Fifth Plain Creek subwatershed, the majority of Fifth Plain Creek flows through open agricultural areas lacking forested riparian zones. Therefore, the majority of Fifth Plain Creek would be expected to have low shade values. One exception is where Fifth Plain Creek flows beside a patch of forest, from appx (45.67961, -122.49033) to (45.67706, -122.48953). This reach may moderate shade values.

An unnamed tributary discharges into Fifth Plain Creek from the west at appx (45.670354, -122.49502). This appx 0.4 mi long tributary flows through open field and would have no shade.

Management Recommendations

Overall recommended management activities for the China Ditch and Lower Fifth Plain Creek subwatersheds include riparian forest restoration in areas degraded by agricultural use. Partnerships with private landowners would be essential for projects on most reaches.

Potential Projects

Potential riparian restoration projects for the China Ditch and Lower Fifth Plain Creek subwatersheds were identified from analysis of aerial photographs. One potential project is located on a tributary to China Ditch within Hockinson Meadows Community Park, as described in Table 13. In the park, appx 0.75 mi of stream flows through an open field (cow pasture). This reach, from appx (45.70834, -122.50595) to (45.70303, -122.49601), would benefit from replanting.

Table 13: Tax Exempt Parcels Overlapping Potential Riparian Restoration Areas

ASSR_SN	ASSR_AC	OWNER	PT1DESC	Description
200548-000	120	Clark	Unused or	Appx 0.75 miles of reforestation potential on tributary to China ditch in Hockinson Meadows Community Park
200550-000	40	County	vacant land	
200549-000	80	Parks	– no improvements	

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Floodplain Assessment

A floodplain assessment was not conducted.

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
- 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, Watershed Characterization and Analysis of Clark County (Ecology Publication # 09-06-019, 2009) and personal communication with other county programs.

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 county vacant buildable lands model (VBLM) information to identify possible wetland enhancement opportunities.

Results

Figure 6 shows potential wetland areas within the Lower Fifth Plain Creek and China Ditch subwatersheds based on data from the county wetlands atlas, including the Clark County wetland model and National Wetlands Inventory.

The China Ditch subwatershed has slope and depressional wetlands that are interconnected by an actively managed drainage ditch network. There also are a number of closed or highly constricted depressional systems. Hydrology in these wetlands is generally dominated by seasonal groundwater discharge and impoundment of surface run-off. Many of these wetlands are highly seasonal and in agricultural use.

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Table 14: Distribution of Wetlands by Hydrogeomorphic Class

HGM Class	Area (ac.)	% of Sub-basin*	% of total wetland
Slope Wetlands	1,318	18.4	61.9
Depressional Wetlands	662	9.2	31
Riverine Wetlands	151	2.1	7.1
All Wetlands	2,131	29.7	

*Subwatershed area 7,170 ac.

The Lower Fifth Plain Creek subwatershed has wetlands associated with the main channels of the creek and its tributaries, including natural depressions and man-made impoundments, flood influenced riverine wetlands, and sloped seep wetlands dominated by groundwater discharge.

The wetlands in these subwatersheds generally are located in landscape positions where there could be significant opportunities to improve water quality or hydrologic functions. However, a review of the wetland inventories and studies identified the only significant project opportunity in publicly held or tax-exempt land to be at Hockinson Community Park (Clark County). It is significant to note that the China Ditch subwatershed is served by an active drainage district, which could limit the extent wetland functions can be improved or restored.

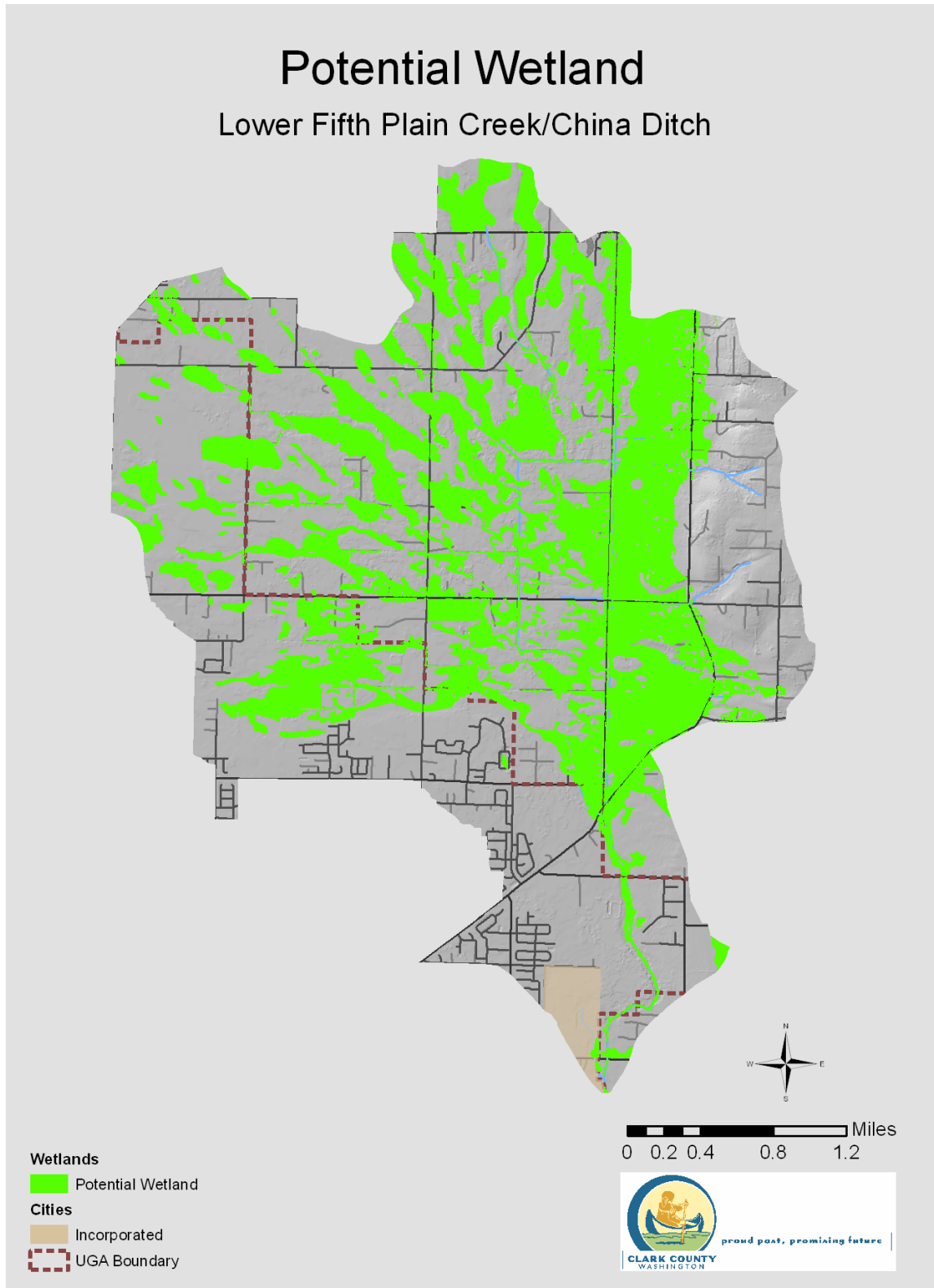


Figure 6: Lower Fifth Plain Creek and China Ditch Potential Wetlands

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Watershed Characterization

The Washington Department of Ecology completed the Watershed Characterization and Analysis of Clark County (2009) to assist in planning wetland and riparian habitat restoration and preservation projects.

Results pertaining to the Lower Fifth Plain Creek and China Ditch subwatersheds are summarized below.

The Lower Fifth Plain Creek and China Ditch subwatersheds are part of the Rain Dominated Terrace hydrogeologic unit. This unit is dominated by rain and has a: westward to southwestern trending groundwater flow pattern; large delta (now a terrace) formed by glacial floods consisting of gravels, sand, silts and clay; relatively level to moderately steep topography in the foothills and slopes above the Columbia River (Ecology, 2009).

Figure 7 depicts priority areas for protection and restoration of hydrologic and denitrification processes countywide based on an analysis of the relative importance and level of alteration in each subwatershed.

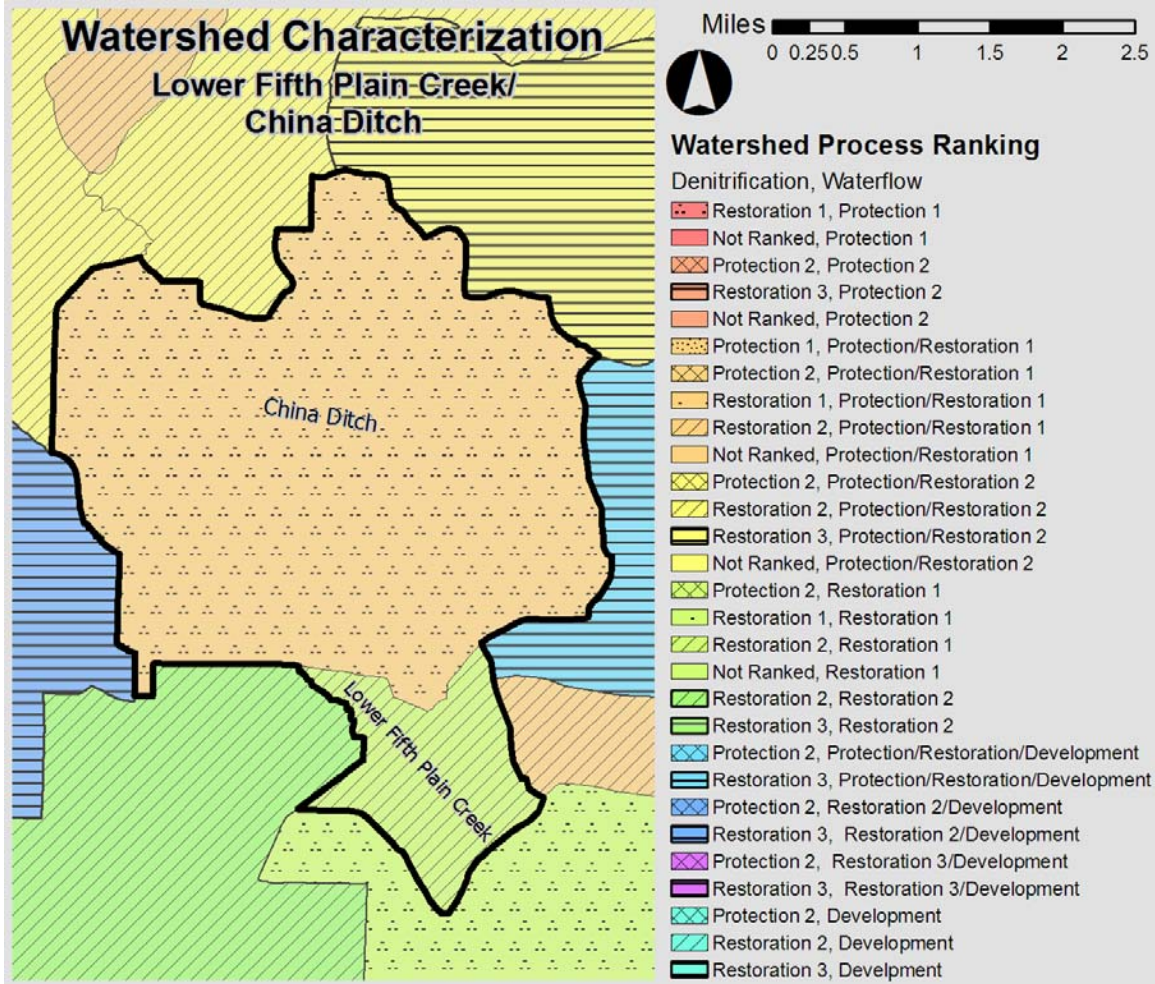


Figure 7: Priorities for suitability of areas for protection and restoration for the hydrogeologic process (from Watershed Characterization and Analysis of Clark County (Ecology, 2009))

In general, red 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. Green to blue areas have lower levels of importance for watershed processes and higher levels of alteration, and should be considered as more suitable for development. Because green, purple and blue areas represent a transition from restoration areas, planning measures employing both restoration and appropriately sited development should be considered (Ecology, 2009). Hatch patterns represent the importance of denitrification processes.

Protection and restoration of hydrologic (waterflow) processes is recommended for the China Ditch subwatershed (orange). This subwatershed also is ranked for restoration of denitrification processes (triangular dot pattern). The Lower Fifth Plain Creek subwatershed is recommended for restoration of both hydrologic (green) and denitrification (horizontal line pattern) processes, indicating that watershed processes are degraded to the point that protection of existing function is not much of a priority.

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Potential Projects

Potential project locations for further exploration based on this wetland assessment include those listed in Table 15.

Table 15: Tax Exempt Parcels Overlapping Potential Wetlands

ASSR_SN	ASSR_AC	OWNER	PT1DESC	Description
200550 200549 200548	240 acres	Clark County	Parks, Unused Land	Depressional and slope wetlands in actively grazed pastures.

This site has been master planned and partially developed as a community park. There are approximately 40 acres of degraded wetlands on the site and significant potential to create additional wetlands.

Table 16: Description of Potential Project Opportunities

ID	Basis for Project	Project Description
OS-230	Active grazing and lack of native wetland vegetation and widespread invasive plant species within wetland areas	Re-establish native undergrowth and canopy vegetation within wetland areas to shade out invasive plants and enhance wetland habitat. Eradicate reed canary grass. Create additional wetlands to increase water quality and hydrologic functions.

Macroinvertebrate Assessment

A macroinvertebrate assessment was not conducted.

Fish Use and Distribution

Purpose

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

Methods

Fish distribution for the Lower Fifth Plain Creek and China Ditch 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.

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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 also was reviewed for specific project opportunities in 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 available evidence suggests there is no anadromous fish use in the Lower Fifth Plain Creek or China Ditch subwatersheds.

Barriers

The WDFW barrier database provides the most complete assessment of barriers in the Lower Fifth Plain Creek and China Ditch subwatersheds. There are no mapped barriers in these subwatersheds.

Recommendations

There are no project recommendations for fish passage at this time.

Hydrologic and Hydraulic Models

Hydrologic and Hydraulic modeling was not conducted.

Analysis of Potential Projects

The analysis of potential projects:

- Briefly summarizes stormwater conditions, problems and opportunities
- Notes recently completed or current projects in 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

Project descriptions summarize more detailed descriptions found in report sections. Project planners are encouraged to reference the longer descriptions and use the information found for each potential project in the SNAP GIS database available from the Clean Water Program. Reference IDs for the database are included in the tables for each project.

Summary of Conditions, Problems, and Opportunities

Conditions and Problems

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

Coordination with Other Programs

The DES coordinates with the Washington Department of Ecology, Lower Columbia Fish Recovery Board and Vancouver-Clark Parks and Recreation in efforts to improve stream health. In the study area, Ecology is collecting field data for a multi-parameter TMDL in 2010-2011. Clark County participates in the TMDL process.

There are no planned road improvement projects included in the 2010-2015 Clark County Transportation Improvement Program and no planned projects in the 2011-2012 stormwater capital program.

Broad-Scale Characterization

The study area is primarily agricultural land, with some low density urban residential development. The eastern portion is primarily drained historical wetlands; numerous agricultural drainage ditches are in the China Ditch subwatershed. The topography is generally flat plains, with hills rising to 450 feet elevation along the eastern border. Geology consists of fine-grained Ice Age Cataclysmic Flood deposits below about 300 feet elevation. Above 300 feet, soils are underlain by ancestral Columbia River gravel deposits known as the Troutdale Formation. Soils are typically loams, with low slopes in the range of 0 to 5 percent. Stream hydrology is altered significantly from a natural condition.

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Standard subwatershed scale metrics such as percent forest, percent total impervious area, road density and effective impervious area, when compared to NOAA fisheries standards, suggest stream habitat is not properly functioning.

Water Quality Assessment

Stream segments in this assessment area are included on the 2008 303(d) Ecology list of impaired water bodies. Both subwatersheds are included in ongoing TMDL development for fecal coliform, temperature, dissolved oxygen and pH in Lacamas Creek above Lacamas Lake.

A large historical water quality dataset is available for the area. However, virtually no data have been collected in the past decade.

Drainage System Inventory and Condition

Stormwater infrastructure is relatively limited, consisting primarily roadside ditches with some piped infrastructure within the Urban Growth Boundary. Significant updates to the drainage mapping database were completed in 2008-2009. More than 3,700 stormwater infrastructure features were added during this time. A total of 5,364 features are mapped in this study area, including 58 stormwater facilities, of which 32 are publicly owned and operated.

Two facilities were inspected. One was in compliance with standards in the *2005 Stormwater Management Manual for Western Washington Volume 5* and one was referred for evaluation as a potential retrofit project. No major defects or hazardous conditions were noted.

Source Control

This study area had only one business qualifying for a Source Control visit. The inspection discovered existing source control issues at this site, which were subsequently resolved.

Illicit Discharge Screening

Illicit discharge screening was not conducted.

Stream Reconnaissance Feature Inventory

A feature inventory was conducted for approximately 2.1 miles of stream corridor in the Lower Fifth Plain Creek subwatershed. Thirteen features were recorded, primarily stream crossings and impacted stream buffers. Four potential stream improvement opportunities were identified.

Physical Habitat

A physical habitat assessment was not conducted.

Geomorphology Assessment

A geomorphology assessment was not conducted.

Riparian Assessment

The 2004 LCFRB Habitat Assessment did not include this study area. However, overall riparian conditions at a subwatershed scale were rated impaired in both subwatersheds. With few exceptions, stream reaches in this study area have little to no large woody debris recruitment potential, and shade levels are well below state targets.

Wetland Assessment

Thirty percent of the study area is wetlands. The China Ditch subwatershed has slope and depression wetlands interconnected by a network of drainage ditches. Many of these wetlands are seasonal and in agricultural use. Lower Fifth Plain Creek wetlands are primarily associated with the main creek channels.

Wetlands generally are located in landscape positions where there may be significant opportunities to improve water quality or hydrologic functions. However, publicly held land is quite limited. China Ditch is served by an active drainage district, which also may limit the extent to which wetland functions can be improved or restored.

Ecology's watershed characterization of Clark County places China Ditch subwatershed in a category suitable for protection and restoration of hydrologic processes. The Lower Fifth Plain subwatershed is recommended for restoration of both hydrologic and denitrification processes, indicating that watershed processes are degraded to the point that protection of existing function is not a high priority.

Macroinvertebrate Assessment

A macroinvertebrate assessment was not conducted.

Fish Use and Distribution

The available information suggests there is no anadromous fish use in this study area. The Lacamas watershed is blocked to anadromous fish by a natural waterfall below Lacamas Lake. There are no mapped barriers in these subwatersheds.

Recently Completed or Current Projects

No projects in this study are in the 2011-2012 stormwater capital plan or 2010-2015 TIP. The stormwater capital database contains one potential reforestation project at Cherry Neighborhood Park (CP-118). This project has not been scheduled.

Analysis Approach

Purpose

The Analysis of Potential Projects narrows the initial list of possible opportunities to a subset of higher priority items. Listed opportunities in sections of the SNAP report include sites requiring immediate follow-up, possible stormwater capital improvement projects, internal followup by DES staff, and, in some cases, information to be forwarded 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 capital planning process. Sites flagged for internal action by ongoing programs such as illicit discharge screening, operations and maintenance, and source control outreach receive follow-up within the

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context and schedules of the individual programs. Information forwarded to other county departments, such as Public Health, or to outside agencies, such as Clark Conservation District and Clark Public Utilities, may lead to additional activities outside the scope of DES work.

Methods

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, capital project opportunities are initially evaluated by considering problem severity, land availability, access, proximity and potential for grouping with other projects, and potential for leveraging resources. Staff considers supporting data and information from throughout the SNAP report to assist in the initial project review.

Based on this review, lower priority opportunities are removed and higher priority opportunities are recommended for further consideration below.

Emergency/Immediate Actions

Emergency/Immediate actions may be pursued by Clark County staff or referred to other appropriate agencies. These cases represent a potential or immediate threat to public health, safety, or the environment, and require timely follow-up.

No projects of this type were identified.

Potential Stormwater Capital Projects

Stormwater Capital Improvement Projects include projects that create new or retrofit existing stormwater flow control or treatment facilities, substantial infrastructure maintenance projects, habitat enhancement projects, or property acquisition to mitigate for stormwater impacts. Facility retrofits refer to projects that will increase an existing facility's ability to control or treat stormwater in excess of the original facility's design goals.

Stormwater Facility Capital Improvement Projects

ID	Basis for Project	Project Description	Action
OS-229	Large lot with little infrastructure. Mountain View stormwater facility, ID# 1160	Potential storage retrofit	Refer to DES Capital Planning

Stormwater Infrastructure Maintenance CIPs

No projects of this type were identified

Stormwater Class V Underground Injection Control (UIC) Projects

No projects of this type were identified

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Habitat Rehabilitation/Enhancement Projects

ID	Basis for Project	Project Description	Action
IB-293	Channel historically straightened for approximately 3500' upstream and 1500' downstream of this location. Narrow riparian is primarily invasives; uplands primarily cleared pasture. Channel disconnected from floodplain. Contributes to downstream flow issues at and below 4 th Plain Road. Area is within UGA, likely to develop.	Potential large-scale project could involve property acquisition, stormwater mitigation, riparian improvement and/or channel realignment, and upland reforestation.	Refer to DES Capital Planning
OS-230	Clark County Parks land, Hockinson Meadows Community Park Multiple parcels with reforestation and/or wetland restoration potential: 200548-000 200550-000 200549-000	Approximately 0.75 miles of reforestation potential on tributary to China ditch; approximately 40 acres of degraded wetland on 240-acre master-planned site	Refer to DES Capital Planning

Property Acquisition for Stormwater Mitigation

No projects of this type were identified.

Follow-up Activities for Referral within DES

This category includes opportunities other than capital projects that are dependent on DES programs or oversight. Examples include referrals to: Public Works Operations for public stormwater infrastructure maintenance or private facility inspection; DES Sustainability and Outreach for landowner letters regarding trash pickup or agricultural BMPS; the Illicit Discharge screening project; and general reach information forwarded to DES engineers for capital planning purposes. Other opportunities such as possible fish barriers or culvert maintenance issues may also be included.

Private Stormwater Facilities Maintenance

No projects of this type were identified.

Public Works Stormwater Infrastructure Maintenance

No projects of this type were identified.

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CWP Outreach/Technical Assistance

Identifier	Issue	Project	Action
WQ-84	Livestock access on left bank	Fence livestock away from channel	Refer to DES Outreach; contact landowner about BMPs, CCD assistance

CWP Infrastructure Inventory

No projects of this type were identified

CWP Capital Planning

No projects of this type were identified.

CWP Illicit Discharge Screening

No projects of this type were identified.

Other

Identifier	Issue	Project	Action
IB-294	Japanese knotweed infestation, both banks, approximately 100'.	Map location and schedule for treatment	Refer to DES Vegetation Management
TR-81	Large bag of diapers and other trash on or near public ROW.	Trash removal	Refer to PW Operations

Non-Project Management Recommendations

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

Management and programmatic recommendations in the study area subwatersheds, by NPDES permit component, include:

Storm Sewer Mapping and Inventory

None

Coordination of Stormwater Activities

None

Mechanisms for public involvement

None

Development Regulations for Stormwater and Erosion Control

- Implement development regulations to minimize impacts, particularly enhanced nutrient control regulations to protect Lacamas Lake

Stormwater Source Control Program for Existing Development

None

Operation and Maintenance Actions to Reduce Pollutants

None

Education and Outreach to Reduce Behaviors that Contribute Stormwater Pollution

- Educate private landowners on importance of native riparian vegetation and intact riparian forests for shading streams and preserving hydrology
- Provide landowners a list of suggested plants for stream revegetation and local nurseries that stock them

TMDL Compliance

- Continue collaboration on Lacamas Creek TMDL development. Clark County fulfills its TMDL compliance obligations through ongoing implementation of the Stormwater Management Program

Monitoring Stormwater Program Effectiveness

None

Overall management actions that may lead to improved watershed health include:

- Encourage appropriate agricultural practices that emphasize soil and water conservation and reduction in nutrient load to streams
- Post stream identification signs where roads cross streams. Repair or replace deteriorated signs

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- Protect streams from future stormwater impacts by creating stream buffers, establishing conservation easements, and eliminating agricultural runoff inputs
- Encourage reforestation

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